FINAL
Site Inspection Report
Lake Charles Chennault Airport
NGLA, Louisiana

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

June 2022

Prepared for:

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

UNCLASSIFIED

THIS PAGE INTENTIONALLY BLANK

Table of Contents

Appendices

Figures

Tables

THIS PAGE INTENTIONALLY BLANK

Acronyms and Abbreviations

%	percent
°F	degrees Fahrenheit
µg/kg	micrograms per kilogram
6:2 FTS	6:2 Fluorotelomer sulfonic acid
8:2 FTS	8:2 Fluorotelomer sulfonic acid
AECOM	AECOM Technical Services, Inc.
AFFF	aqueous film forming foam
AOI	Area of Interest
ARNG	Army National Guard
ASTM	American Society for Testing and Materials
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CIAA	Chennault International Airport Authority
CoC	chain of custody
CSM	conceptual site model
DA	Department of the Army
DL	detection limit
DO	dissolved oxygen
DoD	Department of Defense
DPT	direct push technology
DQI	data quality indicator
DQO	data quality objective
DUA	data usability assessment
DVR	data validation report
EIS	extraction internal standards
ELAP	Environmental Laboratory Accreditation Program
EM	Engineer Manual
ERB	equipment rinsate blank
FedEx	Federal Express
FRB	field reagent blank
HA	Health Advisory
HDPE	high-density polyethylene
IDW	investigation-derived waste
IIS	Injection internal standards
ITRC	Interstate Technology Regulatory Council
LAARNG	Louisiana Army National Guard
LC/MS/MS	liquid chromatography with tandem mass spectrometry
LCS	laboratory control spike
LCSD	laboratory control spike duplicate
LOD	limit of detection
LOQ	limit of quantitation
MDL	method detection limit
mph	miles per hour

MS	matrix spike
MSD	matrix spike duplicate
msl	mean sea level
NELAP	National Environmental Laboratory Accreditation Program
NEtFOSAA	N-ethyl perfluorooctanesulfonamidoacetic acid
ng/L	nanograms per liter
NMeFOSAA	N-methyl perfluorooctanesulfonamidoacetic acid
ORP	oxidation-reduction potential
OSD	Office of the Secretary of Defense
OWS	oil/water separator
PA	Preliminary Assessment
PFAS	per- and polyfluoroalkyl substances
PFBA	perfluorobutyrate
PFBS	perfluorobutanesulfonic acid
PFCs	perfluorinated compounds
PFDA	perfluorodecanoic acid
PFDoA	perfluoroheptanoic acid
PFHpA	perfluorododecanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFTeDA	perfluorotetradecanoic acid
PFTrDA	perfluorotridecanoic acid
PFUdA	perfluoroundecanoic acid
PID	photoionization detector
PVC	polyvinyl chloride
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual
RI	Remedial Investigation
RPD	relative percent differences
SI	Site Inspection
SL	screening level
SOP	standard operating procedure
TCRA	Time Critical Removal Action
TOC	total organic carbon
TPP	Technical Project Planning
UCMR 3	Unregulated Contaminant Rule 3
UFP	Uniform Federal Policy
US	United States
USACE	United States Army Corps of Engineers

USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WWTP	wastewater treatment plant

THIS PAGE INTENTIONALLY BLANK

Executive Summary

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

Lake Charles Chennault Airport NGLA occupies 61.352 acres along Interstate 210, adjacent to Chennault International Airport in Lake Charles, Louisiana. The property is leased from the Chennault International Airport Authority (CIAA), and the facility is the future location of the Lake Charles Readiness Center and currently consists of undeveloped field, concrete pads, drainage ditches, and a small storage building.

During the PA for PFAS, two potential PFAS release areas were identified: Former Wastewater Treatment Plant (WWTP) A and the Drainage Ditch (AECOM, 2020). PFAS-containing aqueous film-forming foam (AFFF) may have been released at adjacent source areas during fire training activities, emergency response, or fire suppression system testing. Such potential releases may have drained to Former WWTP A, where wastewater was treated prior to ARNG involvement; or flowed to the Drainage Ditch via overland flow. The potential PFAS release areas were grouped into two Areas of Interest (AOIs), AOI 1 and AOI 2, which were investigated during the SI. The SI field activities were conducted from 4 to 5 August 2021 and included the collection of soil and groundwater samples.

To fulfill the project Data Quality Objectives set forth in the approved SI Quality Assurance Project Plan Addendum (AECOM, 2021a), samples were collected and analyzed for a subset of 18 PFAS by liquid chromatography with tandem mass spectrometry compliant with Quality Systems Manual 5.3 Table B-15. The 18 PFAS analyzed as part of the ARNG SI program are specified in **Section 5.9** of this Report.

The DoD has adopted a policy to retain facilities in the CERCLA process based on risk-based SLs for soil and groundwater, as described in a memorandum from the Office of the Secretary of Defense (OSD) dated 15 September 2021 (Assistant Secretary of Defense, 2021). The ARNG program under which this SI was performed follows this DoD policy. Should the maximum site concentration for sampled media exceed the SLs established in the OSD memorandum, the AOI will proceed to the next phase under CERCLA. The SLs established in the OSD memorandum apply to three compounds: PFOS, PFOA, and PFBS.

The SLs are presented on **Table ES-1** below. All other results presented in this report are considered informational in nature and serve as an indication as to whether soil and groundwater contain or do not contain the 18 PFAS analyzed within the boundaries of the facility.

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

- At AOI 1, PFOA and PFOS in groundwater at the Former WWTP A potential PFAS release area exceeded the SLs of 40 nanograms per liter (ng/L), with maximum concentrations of 107 ng/L and 290 ng/L, respectively, at location AOI01-01. PFBS was detected in groundwater in concentrations below the SL of 600 ng/L, with a maximum concentration of 71.9 ng/L in the duplicate sample collected at AOI01-02.

- At AOI 2, PFOS and PFBS in groundwater at the Drainage Ditch potential PFAS release area were detected in concentrations below their respective SLs of 40 ng/L and 600 ng/L, with concentrations of 16.9 ng/L and 5.69 ng/L, respectively. PFOA was not detected in groundwater.
- At the sitewide sample locations along the facility boundary, PFOS was detected in concentrations above the SL, with a maximum concentration of 123 ng/L at LCC-01 along the western boundary and downgradient of the AOIs. PFOA and PFBS were detected but in concentrations below the SLs.
- The detected concentrations of PFOA and PFOS in soil at all AOIs were below the SLs. No PFBS was detected in any of the soil samples.

Table ES-2 summarizes the SI results for soil and groundwater. Based on the conceptual site models developed and revised in light of the SI findings, there is no potential for exposure to drinking water receptors caused by previous activities at or adjacent to the facility.

Table ES-3 summarizes the rationale used to determine if an AOI should be considered for further investigation under CERCLA and undergo a Remedial Investigation (RI). Since all potential releases occurred prior to ARNG involvement, no further action by the ARNG is recommended. CIAA is not under the control of the ARNG but based on the results of this SI, CIAA may consider the need for further evaluation in an RI for AOI 1: Former WWTP A and AOI 2: Drainage Ditches.

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

Analyte	Residential (Soil) (µg/kg)[a] 0-2 feet bgs	Industrial/ Commercial Composite Worker (Soil) (µg/kg)[a] 2-15 feet bgs	Tap Water (Groundwater) (ng/L)[a]
PFOA	130	1,600	40
PFOS	130	1,600	40
PFBS	1,900	25,000	600

Notes:
a.) Assistant Secretary of Defense, 2021. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater and Soil using United States Environmental Protection Agency's (USEPA's) Regional Screening Level Calculator. Hazard Quotient (HQ) = 0.1. 15 September 2021.

Table ES-2: Summary of Site Inspection Findings

AOI	Potential PFAS Release Area	Soil – Source Area	Groundwater – Source Area	Groundwater – Facility Boundary
1	Former WWTP A	◐	●	●
2	Drainage Ditch	◐	◐	●

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

Table ES-3: Site Inspection Recommendations

AOI	Description	Rationale	Future Action
1	Former WWTP A	Exceedances of PFOA and PFOS SLs in groundwater. Detections of PFBS in groundwater but no exceedances of the SL. Detections of PFOA and PFOS in soil but no exceedances of SLs.	No further action by ARNG. CIAA is not under control of the ARNG. Based on the results of the SI, CIAA may consider the need to proceed to RI.
2	Drainage Ditch	Detections of PFOS and PFBS in groundwater but no exceedances of SLs. Detections of PFOS in soil but no exceedances of SL.	No further action by ARNG. CIAA is not under control of the ARNG. Based on the results of the SI, CIAA may consider the need to proceed to RI.

THIS PAGE INTENTIONALLY BLANK

1. Introduction

1.1 Project Authorization

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

The SI project elements were performed in compliance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; US Environmental Protection Agency [USEPA], 1980), as amended, the National Oil and Hazardous Substances Pollution Contingency Plan (40 Code of Federal Regulations Part 300; USEPA, 1994), and in compliance with US Department of the Army (DA) requirements and guidance for field investigations including specific requirements for sampling for PFOA, PFOS, and perfluorobutanesulfonic acid (PFBS), and the group of related compounds known in the industry as per- and polyfluoroalkyl substances (PFAS). The term PFAS is used throughout this report to encompass all PFAS chemicals being evaluated, including PFOA, PFOS, and PFBS, which are the key components of the suspected releases being evaluated, and the other 15 related compounds listed in the task order.

1.2 SI Purpose

A PA was performed at Lake Charles Chennault Airport NGLA (AECOM, 2020) that identified two potential PFAS release areas at the facility, which were grouped into two Areas of Interest (AOIs). The objective of the SI is to identify whether there has been a release to the environment from the AOIs and determine the presence or absence of PFOA, PFOS, and PFBS at or above screening levels (SLs).

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

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

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

THIS PAGE INTENTIONALLY BLANK

2. Facility Background

2.1 Facility Location and Description

The facility is in Lake Charles, Calcasieu Parish, Louisiana and is within the property of Chennault International Airport, at the westernmost portion of the property, just east of Interstate 210. The facility location is depicted on **Figure 2-1**.

The original airfield was developed in 1941 by the US Army Air Corps, but was abandoned in 1963, at which point the City of Lake Charles obtained the land to use as a regional airport. The Chennault International Airport Authority (CIAA) manages the property, and the Louisiana ARNG (LAARNG) began leasing the facility in 2012. The LAARNG-leased property consists of a 61.352-acre parcel of land situated on the western perimeter of the larger CIAA footprint and is adjacent to Interstate 210. The current facility property consists of undeveloped fields, concrete pads on the northern portion land and a small storage building. Construction of the future LAARNG Lake Charles Readiness Center is planned at the facility within the next few years.

2.2 Facility Environmental Setting

Calcasieu Parish is in the West Gulf Coastal Plain, which is characterized by low relief with elevations ranging from 2 to 90 feet above mean sea level (msl). The West Gulf Coastal Plain province is underlain by Quaternary-aged deposits that were deposited due to sea levels dropping during glaciations (Harder, 1960). Topography at the facility is flat, with relief ranging from 0 to 10 feet (**Figure 2-2**).

2.2.1 Geology

The facility is underlain by the Beaumont Alloformation, which is part of the Prairie Allogroup (or Prairie Terraces). The Beaumont Alloformation consists of coastal plain sediments deposited by Pleistocene-aged streams. The sediments are composed of clay, silty clay loam, or sand clay loam and grade to sand and gravel (Harder, 1960; Heinrich et al., 2002). The surficial geology is characterized as predominately clay with some sand lenses and layers (US Geological Survey [USGS], 2017). The Prairie Terraces are underlain by the Montgomery, Bentley, and Williana Formations, which were all deposited during the Pleistocene (Harder, 1960). The geology underlying the facility and surrounding area is depicted on **Figure 2-3**.

Soil borings completed during the SI found the lithology consistent across the site. The top 5 feet of soil contained sandy lean clay followed by approximately 10 feet of silty lean clay. Poorly graded sand was encountered at 15 feet below ground surface (bgs) across the facility and varied between 2.5 and 5 feet in thickness. More fine-grained sediments (clayey silt to silty lean clay) was typically encountered beneath the sand. Grain size analyses of these fine-grained sediments are presented in **Appendix F**. These field observations are consistent with reported descriptions of the Beaumont Alloformation (USGS, 2017). The borings were completed at depths between 8 and 20 feet bgs. Boring logs are presented in **Appendix E**.

2.2.2 Hydrogeology

The primary aquifer underlying the facility is the Chicot aquifer system, which extends across the majority of southwestern Louisiana. The Chicot aquifer resides within the Prairie Terraces and the Montgomery, Bentley, and Williana Formations (Harder, 1960). The Chicot aquifer system is divided into three divisions: the 200-foot, 500-foot, and 700-foot sands, which are confined from one another by thick layers of clay. However, near the Lake Charles area, the 500-foot sand terminates; the 200-foot sands and 700-foot sands are often referred to as the upper and lower sands respectively (Harder, 1960; USGS, 2017). To the north and northeast of Calcasieu Parish, the divisions of the Chicot aquifer system are undifferentiated and crop out, resulting in recharge (Harder, 1960; USGS, 2017).

Surficial clay layers act as the upper confining unit for the Chicot aquifer system and range from 40 to 280 feet in thickness. The top of the 200-foot sand is present at approximately 0 to 50 feet above msl in the northeastern portion of Calcasieu Parish and greater than 300 feet below msl in the southwestern portion. The top of the 500-foot sand is present at 400 to 600 feet below msl, whereas the top of the 700-foot sand ranges from less than 400 feet below msl in the northern portion of the Parish to greater than 1,000 feet below msl in the southeastern portion of the Parish (USGS, 2017).

Generally groundwater in the water table aquifer beneath the facility is inferred to flow to the west/southwest, toward Calcasieu River (**Figure 2-3**). Using additional online resources, such as state and local geographic information system databases, wells were researched to a 4-mile radius of the facility. Within approximately 4 miles of the facility, 87 active wells are screened in the water table aquifer (i.e., groundwater resting atop of the upper confining unit of the Chicot aquifer system), although none of these wells are domestic or supply wells and instead are mostly monitoring wells. Groundwater in the water table aquifer ranges in depth from less than 2 feet bgs to 39 feet bgs; however, 39 feet bgs is an outlier, and the majority of wells have recorded water depths of less than 10 feet bgs (Louisiana Department of Natural Resources, 2020).

Drinking water at the facility is supplied by the City of Lake Charles, which obtains its water from 17 wells screened within the 500-foot and 700-foot sands of the Chicot aquifer system (City of Lake Charles, no date). Based on the USEPA Unregulated Contaminant Monitoring Rule 3 (UCMR 3) data, it was indicated that no PFAS were detected in a public water system above the USEPA lifetime Health Advisory (HA) within 20 miles of the facility (USEPA, 2017a). The HA is 70 parts per trillion for PFOS and PFOA, individually or combined. PFAS analyses performed in 2016 had method detection limits (DLs) that were higher than currently achievable. Thus, it is possible that low concentrations of PFAS were not detected during the UCMR 3 but might be detected if analyzed today.

Depths to water measured in August 2021 during the SI ranged from 1.70 to 8.98 feet bgs. Groundwater elevation contours from the SI are presented on **Figure 2-4** and indicate groundwater flow direction is generally to the southwest. AOI01-01 has the highest elevation of groundwater, likely due to buried cement, which was encountered between 4 and 8 feet bgs during drilling. The cement appears to act as an impermeable surface causing groundwater mounding (i.e., perched groundwater) in the immediate area.

2.2.3 Hydrology

The facility lies within the Kayouche Coulee Watershed. A system of concrete- and grass-covered ditches and underground culverts/piping convey surface and stormwater on the facility and from the larger CIAA footprint. A portion of this drainage system crosses the facility and continues west offsite, towards Kayouche Coulee. Other portions of the CIAA stormwater system convey flow to the golf course along the southern CIAA boundary, which drains to Kayouche Coulee. Kayouche Coulee drains into the English Bayou, approximately 3.5 miles north, which then discharges into the Calcasieu River located 1.5 miles to the west. English Bayou and Calcasieu River are used for recreational uses, including fishing. Additionally, over 95 percent (%) of surface water withdrawn from the Calcasieu River is used for industrial purposes (USGS, 2017). Surface water features surrounding the facility are shown in **Figure 2-5**.

2.2.4 Climate

The climate of Lake Charles is mild and similar to areas along the Gulf Coast (Harder, 1960). average temperature at Lake Charles is 69.7 degrees Fahrenheit (°F), with an average high of 79.3 °F and an average low of 60.1 °F. Lake Charles receives an average of 59.75 inches of precipitation per year (National Oceanic and Atmospheric Administration, 2021).

2.2.5 Current and Future Land Use

Current land use of the facility and CIAA property is commercial/industrial. Access to the facility is restricted by gated fencing. Other properties surrounding the facility and CIAA property are primarily residential. The facility currently has two potable water tanks and a storage building, but most of the leased property consists of undeveloped fields and concrete pads. LAARNG has plans to construct the Lake Charles Readiness Center on the facility within the next few years (LAARNG, 2020). Future land use in the vicinity is not anticipated to change.

2.2.6 Sensitive Habitat and Threatened/ Endangered Species

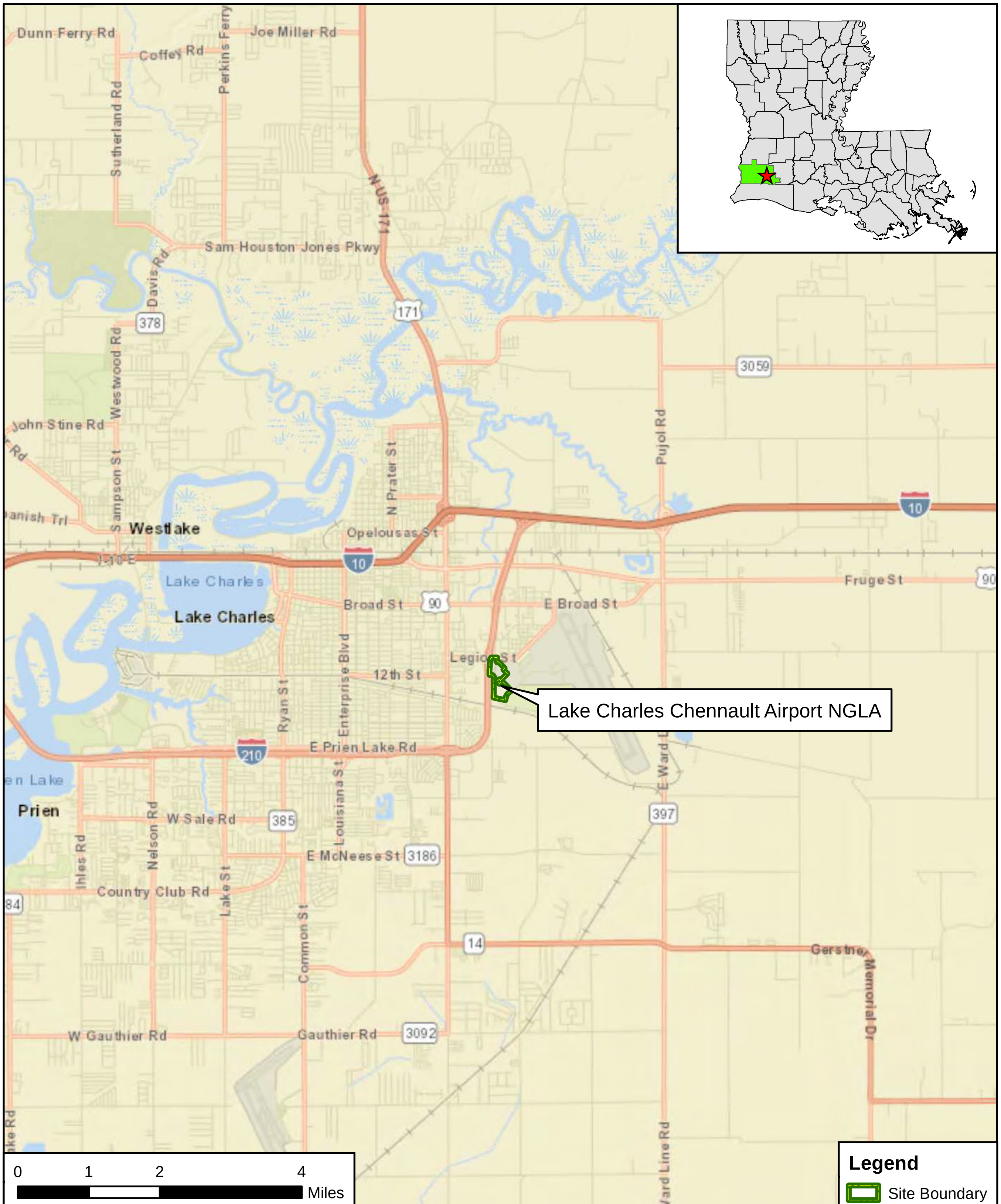
The following birds, plants, mammals, and reptiles are federally endangered, threatened, proposed, and/ or are listed as candidate species in Calcasieu Parish, Louisiana (US Fish and Wildlife Service [USFWS], 2021).

- **Insects:** Monarch butterfly, *Danaus plexippus* (candidate);
- **Mammals:** West Indian manatee, *Trichechus manatus* (threatened); and
- **Birds:** Red-cockaded woodpecker, *Picoides borealis* (endangered).

2.3 History of PFAS Use

Two potential PFAS release areas were identified at Lake Charles Chennault Airport NGLA during the PA where aqueous film forming foam (AFFF) may have been historically released (AECOM, 2020). Lake Charles Chennault Airport NGLA consists of a storage building, concrete pads, and undeveloped fields through which a series of drainage ditches run. AFFF may have been released at the facility prior to LAARNG leasing in 2012 due to potential treatment of PFAS-laden wastewater at the Former Wastewater Treatment Plant (WWTP) A and run-off from adjacent sources. Between 1952 and the 1990s, Former WWTP A was in use and any potential PFAS-laden water may have been treated at this location. The potential PFAS release areas were grouped into two AOIs based on proximity to one another and presumed groundwater flow. Descriptions of AOIs 1 and 2 are presented in **Section 3**.

THIS PAGE INTENTIONALLY BLANK



CLIENT	ARNG			
Site Inspection for PFAS at Lake Charles Chennault Airport NGLA, LA				
REVISED	11/15/2021	GIS BY	MS	11/15/2021
SCALE	1:126,720	CHK BY	SS	11/15/2021
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI,		PM	CM	11/15/2021

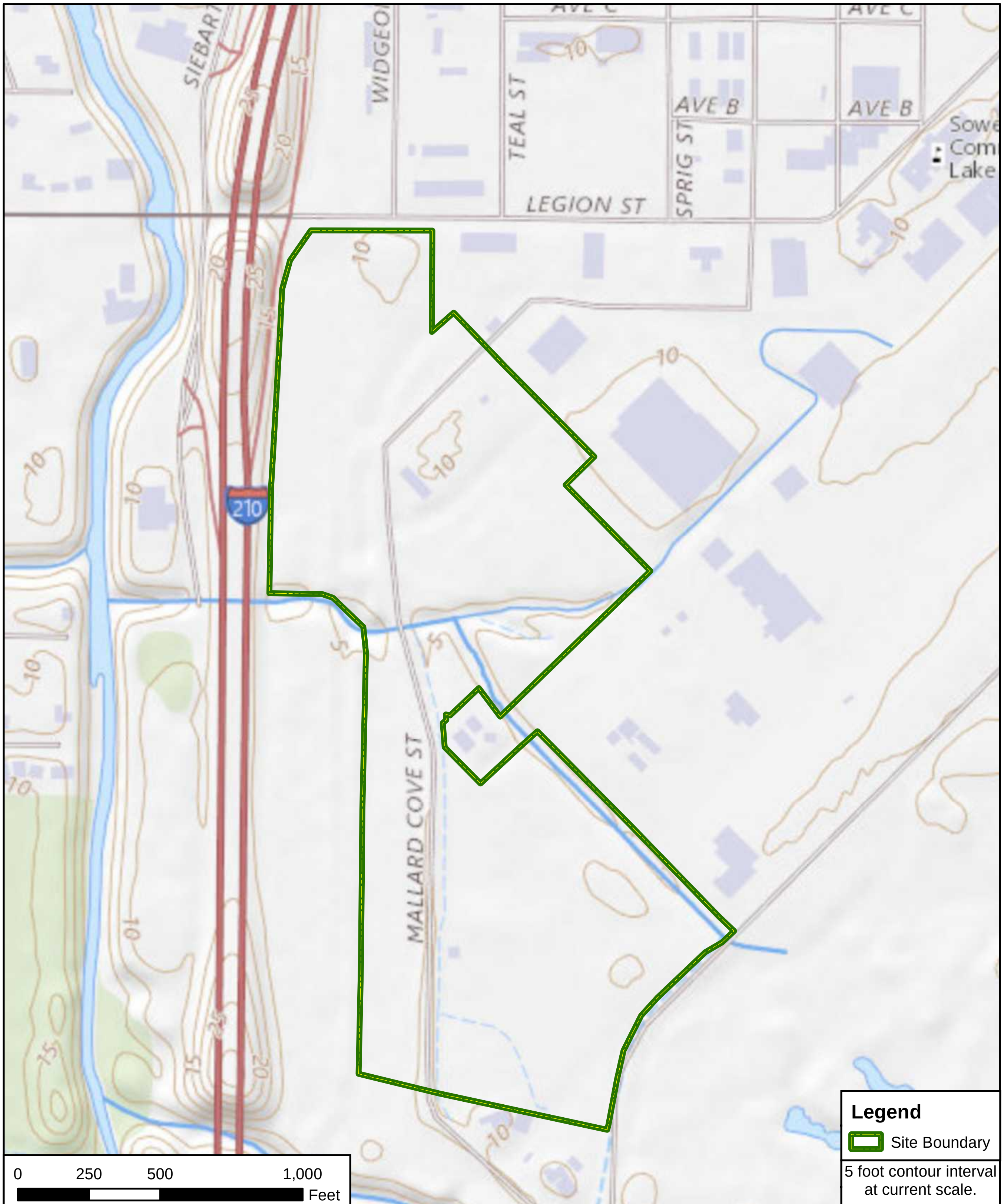
N

Facility Location

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-1

C:\Users\stankevichm\OneDrive - AECOM Directory\ARNG_PFAS_GIS_60552172\MXDs\LA\Lake_Charles_Chennault\SI_Figures\SI_Report\Fig_2-1_Lake_Charles_Chennault_Facility_Location.mxd



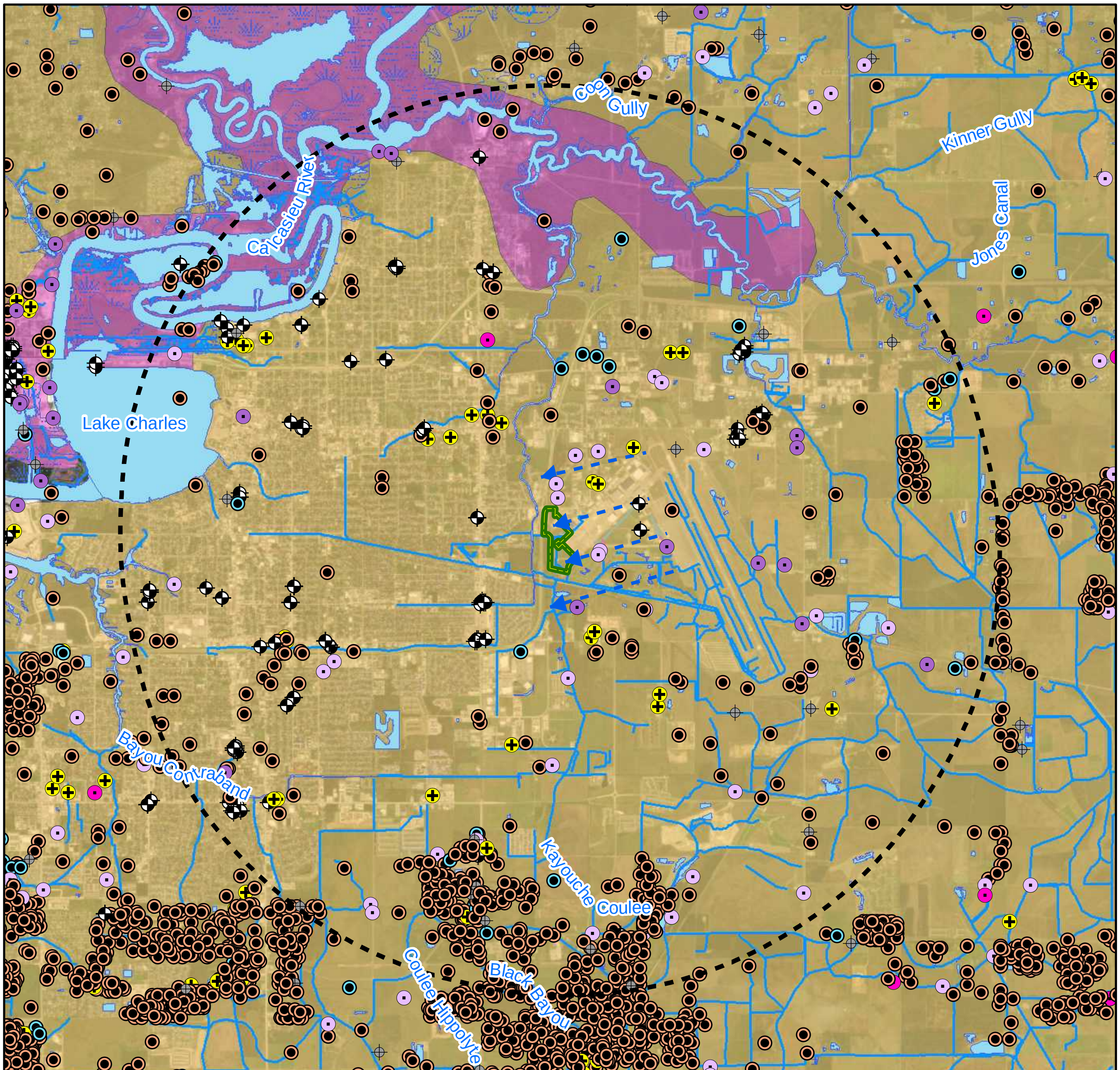
CLIENT	ARNG			
Site Inspection for PFAS at Lake Charles Chennault Airport NGLA, LA				
REVISED	12/14/2021	GIS BY	MS	12/14/2021
SCALE	1:6,000	CHK BY	SS	12/14/2021
Base Map: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program,		PM	CM	12/14/2021

Facility Topgraphy Map

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-2

C:\Users\stankevichm\OneDrive - AECOM Directory\ARNG_PFAS_GIS_60552172\MXDs\LA\Lake_Charles_Chennault\SI_Figures\SI_Report\Fig_2-2_Lake_Charles_Chennault_Facility_Topography.mxd



Legend

- 4-mile radius
- Site Boundary
- Water Body
- Wetland
- River/Stream/Canal/Ditch
- Underground Drainage Piping
- Inferred Groundwater Flow Direction

Geology

- Alluvium
- Prairie Terraces

Wells

- Domestic
- Commercial
- Industrial
- Irrigation
- Agricultural
- Public Supply
- Monitoring/Piezometer
- Other/Unknown

0 0.75 1.5 3 Miles

CLIENT	ARNG			
Site Inspection for PFAS at Lake Charles Chennault Airport NGLA, LA				
REVISED	1/4/2022	GIS BY	MS	1/4/2022
SCALE	1:95,040	CHK BY	SS	1/4/2022
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,		PM	CM	1/4/2022

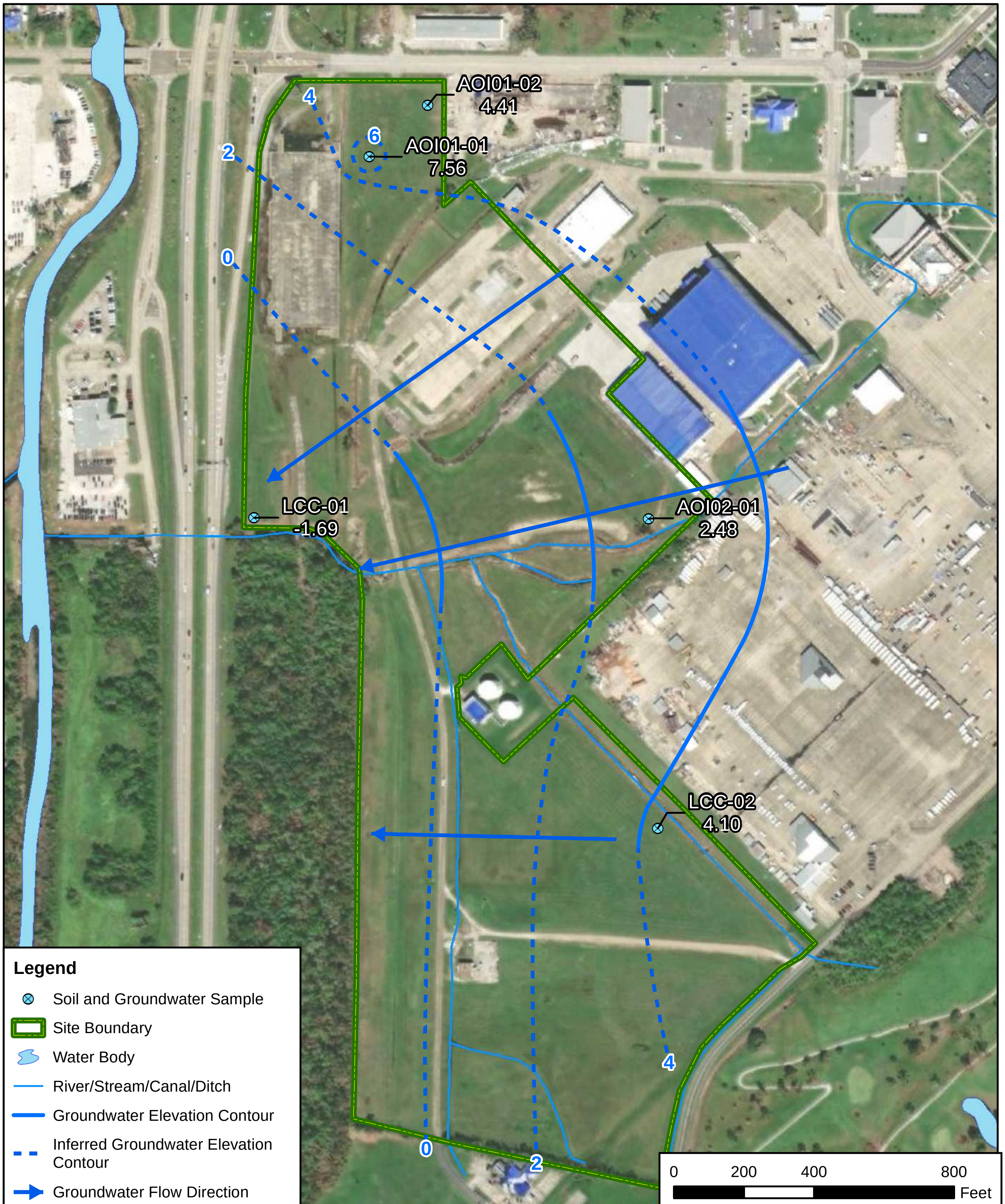
N

Groundwater Features

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-3

C:\Users\stankevichm\OneDrive - AECOM Directory\ARNG_PFAS_GIS_60552172\MXDs\LA\Lake_Charles_Chennault\SI_Figures\SI_Report\Fig_2-3_Lake_Charles_Chennault_Groundwater.mxd



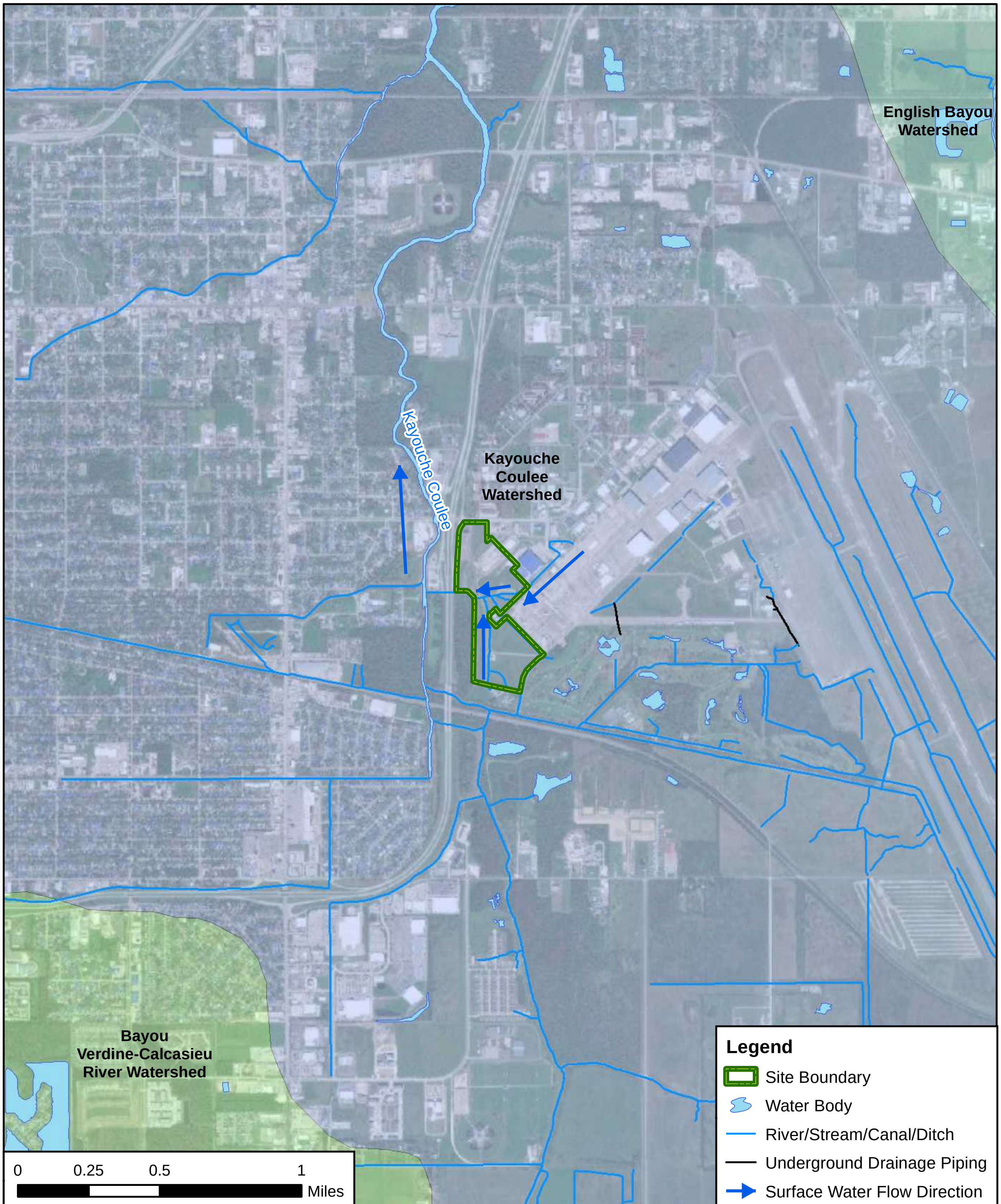
CLIENT	ARNG			
Site Inspection for PFAS at Lake Charles Chennault Airport NGLA, LA				
REVISED	11/15/2021	GIS BY	MS	11/15/2021
SCALE	1:4,864	CHK BY	SS	11/15/2021
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,		PM	CM	11/15/2021

Groundwater Elevation Contours

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-4

C:\Users\stankevichm\OneDrive - AECOM Directory\ARNG_PFAS_GIS_60552172\MXDs\LA\Lake_Charles_Chennault\SI_Figures\SI_Report\Fig_2-4_Lake_Charles_Chennault_SI_GW_Contours.mxd



CLIENT	ARNG			
Site Inspection for PFAS at Lake Charles Chennault Airport NGLA, LA				
REVISED	11/15/2021	GIS BY	MS	11/15/2021
SCALE	1:31,680	CHK BY	SS	11/15/2021
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,		PM	CM	11/15/2021

Surface Water Features

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-5

C:\Users\stankevichm\OneDrive - AECOM Directory\ARNG_PFAS_GIS_60552172\MXDs\LA\Lake_Charles_Chennault\SI_Figures\SI_Report\Fig_2-5_Lake_Charles_Chennault_Surface_water.mxd

THIS PAGE INTENTIONALLY BLANK

3. Summary of Areas of Interest

This section presents a summary of each potential PFAS release area by AOI. Based on the PA findings, two potential PFAS release areas, the Former WWTP A and Drainage Ditch, were identified at Lake Charles Chennault Airport NGLA and grouped into two AOIs (AECOM, 2020). Additionally, seven potential adjacent sources were identified during the PA, six of which are located within the CIAA property. The potential PFAS release areas and adjacent sources are shown on **Figure 3-1**.

3.1 AOI 1

AOI 1 consists of one potential PFAS release area. The AOI is described below.

3.1.1 Former WWTP A

WWTP A was historically located in what is now the northern portion of the LAARNG facility. Based on *the Preconstruction Assessment for the Lake Charles Readiness Center and Future Facility Maintenance Shop* (LAARNG, 2020) and available historical aerial photographs (AECOM, 2020) the Former WWTP A was constructed by the Air Force, adjacent to Johnston Avenue, in or before 1952 and demolished in the 1990s, prior to ARNG involvement at the property. It is unknown what buildings drained to WWTP A and how the disposal of biosolids/sludge was handled. If drains at Hangars A, C, or D historically drained to Former WWTP A, a potential exists for PFAS contamination at this location. The geographic coordinates of the Former WWTP A are 30°12'58.0"N; 93°10'07.3"W.

3.2 AOI 2

AOI 2 consists of one potential PFAS release area. The AOI is described below.

3.2.1 Drainage Ditch

A system of concrete- and grass-covered ditches and underground culverts/piping convey surface and stormwater on the facility and surrounding larger CIAA footprint. This drainage system includes a ditch that crosses the facility and is visible on historical aerial photography as early as 1952 (AECOM, 2020). This ditch continues west offsite towards Kayouche Coulee. Historical or current discharges at adjacent CIAA sources (described further in **Section 3.3**) may be directed into this system or onto paved or grass surfaces at those facilities, which then may flow/migrate to the ditch. The geographic coordinates of the drainage ditch are 30°12'46.0"N; 93°10'03.7"W.

3.3 Adjacent Sources

Seven potential adjacent sources of PFAS were identified during the PA (AECOM, 2020). These adjacent sources are described in detail below.

3.3.1 Northrop Grumman Hangars A and C

Northrop Grumman leases three hangars (Hangars A, B, and C) from CIAA. These hangars lie adjacent to each other on the apron, which is located in the northern portion of the CIAA property. Fire suppression systems equipped with AFFF are housed in Hangar A and Hangar C. No AFFF system in Hangar B was reported. The fire suppression system at Hangar A is equipped with 1% Ansulite, whereas Hangar C uses 3% Ansulite. The fire suppression systems are tested every 5 years in a closed-loop system. After AFFF discharge, the foam is treated with an anti-foam agent then discharged to containment areas. Trenches at Hangar A comprise the containment area, whereas a containment pond is used at Hangar C. The containment areas discharge to the sanitary sewer.

It is unknown when Northrop Grumman started leasing the hangars or when the fire suppression systems were installed. Inspection of the hangar interiors was not conducted during the PA; therefore, the sizes and layouts of the fire suppression systems are unknown.

3.3.2 Citadel Completions Hangar D

Citadel Completions LLC leases Hangar D from CIAA. Hangar D is located on the apron, in the northern portion of the CIAA property, and houses a fire suppression system. The fire suppression system is equipped with 3% Ansulite. System tests are performed every 5 years in a closed-loop system. After the AFFF is discharged, it is treated with an anti-foam agent then discharged to a containment pond where it drains to the sanitary sewer.

It is unknown when Citadel Completions LLC started leasing the hangar or when the fire suppression system was installed. Inspection of the hangar interior was not conducted during the PA; therefore, the sizes and layouts of the fire suppression systems are unknown.

3.3.3 CIAA Fire Department

The CIAA Fire Department is located west of the flight line and houses four firefighting trucks. These trucks are equipped with 3% Chemguard, which is pumped into the reservoirs on the trucks from 55-gallon plastic drums. Interviewees recalled minor leaks that occurred which were contained and flowed to the oil/water separator (OWS). The OWS is located off the southeastern corner of the fire station, and it has two chambers with a diverter valve. Water flows into the CIAA sewer system, with overflow diverted to the CIAA stormwater system, which in this area is conveyed to the golf course along the southern CIAA boundary. OWS sludge/sediment is removed via vacuum truck. No information was provided regarding the disposal of the sludge. The City of Lake Charles Fire Department trained with the CIAA Fire Department on the CIAA property; however, no AFFF was used (AECOM, 2020).

3.3.4 Northern and Southern Nozzle Testing

The CIAA conducted firetruck nozzle spray tests, during which an unknown amount of AFFF was discharged, quarterly from 1998 to 2018 and semi-annually from 2018 to present. These tests occurred off the south end of the runway (Southern Nozzle Testing) and occurred only once off the north end of the runway (Northern Nozzle Testing). After testing was complete, water was sprayed to dilute the AFFF and rinse it off paved areas.

3.3.5 Lear Jet Crash and Helicopter Emergency

In the late 1980s to early 1990s, an emergency helicopter landing occurred during which the runway was sprayed with foam. No documentation was found on the incident, and it is unclear what type of foam was used and whether the foam was removed or allowed to dissipate naturally (AECOM, 2020). In 2009, a small private Lear jet made a crash landing at Chennault International Airport, which resulted in a fuel leak. The fire department contained and cleaned up the fuel leak. It is unclear if any AFFF was used as a preventative measure. At the time of the PA, several Purple K units were staged along the flight line; however, it is not known if any units equipped with AFFF were previously staged along the flight line (AECOM, 2020).

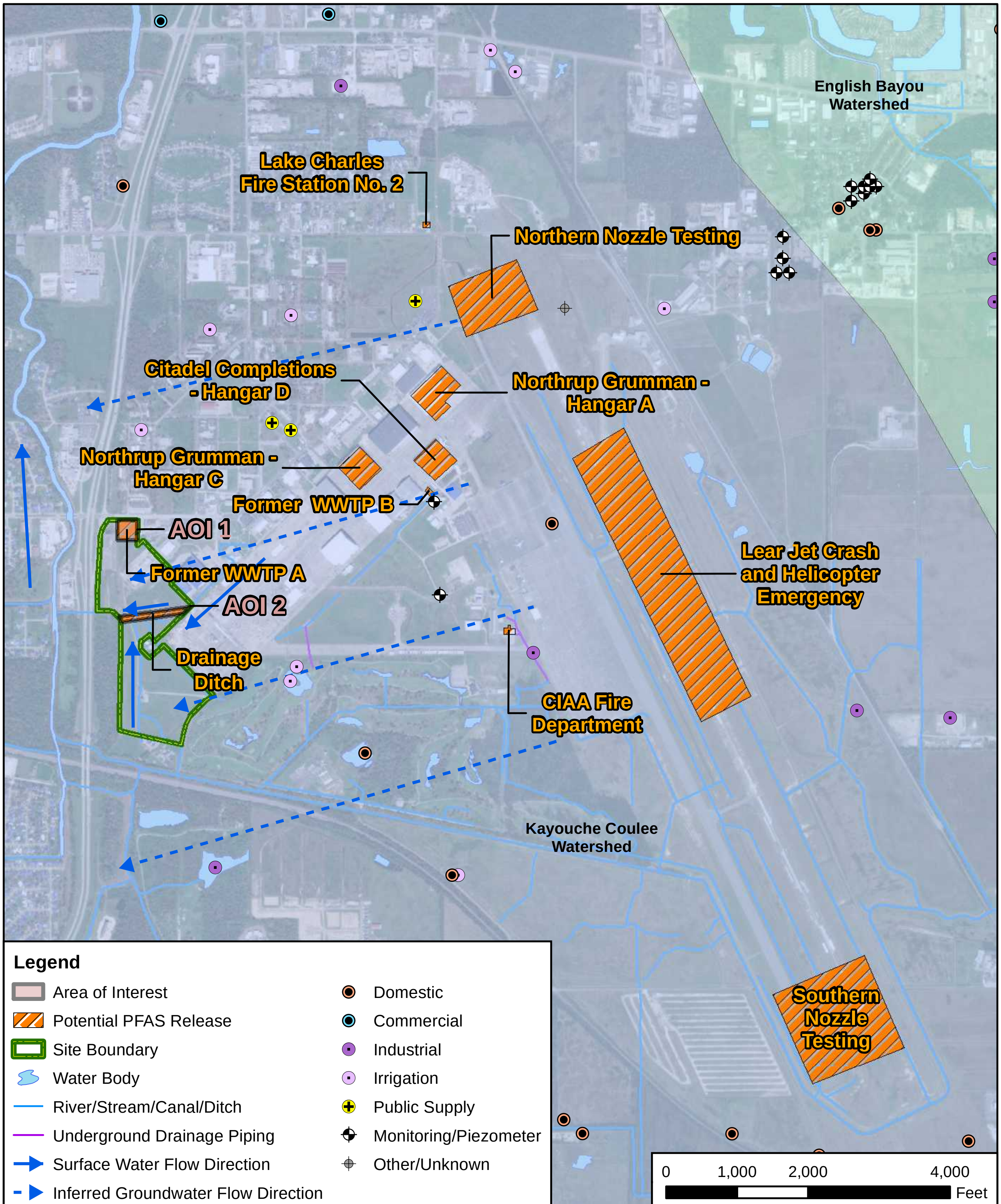
3.3.6 Former WWTP B

Former WWTP B was historically located adjacent to the LAARNG facility and is southwest of Hangar D. Interviewees did not mention the presence of this WWTP; however, a map from G&E Engineering, Inc. shows the presence of a small WWTP (see Appendix A of AECOM, 2020). It is unknown what buildings drained to the WWTP and how biosolids/sludge was disposed of. If drains at Hangars A, C, or D historically drained to Former WWTP B, there may be potential PFAS contamination at this location.

3.3.7 Lake Charles Fire Station No. 2

The Lake Charles Fire Station No. 2 is located outside the CIAA property boundary approximately 0.25 miles northwest of the runway. No information was gathered during the PA regarding this adjacent source; however, it is possible AFFF is stored at this location.

THIS PAGE INTENTIONALLY BLANK



CLIENT	ARNG			
Site Inspection for PFAS at Lake Charles Chennault Airport NGLA, LA				
REVISED	11/15/2021	GIS BY	MS	11/15/2021
SCALE	1:24,000	CHK BY	SS	11/15/2021
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,		PM	CM	11/15/2021

N

Area of Interest

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 3-1

C:\Users\stankevichm\OneDrive - AECOM Directory\ARNG_PFAS_GIS_60552172\MXDs\LA\Lake_Charles_Chennault\SI_Figures\SI_Report\Fig_3-1_Lake_Charles_Chennault_AOI.mxd

THIS PAGE INTENTIONALLY BLANK

4. Project Data Quality Objectives

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

4.1 Problem Statement

The following problem statement was developed during project planning:

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

The DoD has adopted a policy to retain facilities in the CERCLA process based on risk-based SLs for soil and groundwater, as described in a memorandum from the Office of the Secretary of Defense (OSD) dated 15 September 2021 (Assistant Secretary of Defense, 2021). The ARNG program under which this SI was performed follows this DoD policy. Should the maximum site concentration for sampled media exceed the SLs established in the OSD memorandum, the AOI will proceed to the next phase under CERCLA. The SLs established in the OSD memorandum apply to three compounds: PFOS, PFOA, and PFBS. The SLs are presented in **Section 6.1** of this Report.

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

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

4.2 Goals of the Study

The following goals were established for this SI:

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

3. Determine the potential need for a Time Critical Removal Action (TCRA) (applies to drinking water only). The primary actions that will be considered include provision of alternative water supplies or wellhead treatment.

4. Collect data to better characterize the release areas for more effective and rapid initiation of an RI (if determined necessary).

5. If PFOA, PFOS, and PFBS are determined to be present, aim to evaluate whether the concentrations can be attributed to on-facility or off-facility sources that were identified within 4 miles of the installation as part of the PA (e.g., fire stations, major manufacturers, other DoD facilities).

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

4.3 Information Inputs

Primary information inputs included:

- The PA for Lake Charles Chennault NGLA (AECOM, 2020);
- Analytical data from groundwater and soil samples collected as part of this SI in accordance with the site-specific Uniform Federal Policy (UFP)-Quality Assurance Project Plan (QAPP) Addendum (AECOM, 2021a); and
- Field data collected during the SI, including groundwater elevation and water quality parameters measured at the time of sampling.

4.4 Study Boundaries

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

4.5 Analytical Approach

Samples were analyzed by Pace Analytical Gulf Coast, accredited under the DoD Environmental Laboratory Accreditation Program (ELAP; Accreditation Number 74960) and the National Environmental Laboratory Accreditation Program (NELAP; Certificate Number 01955). Data were compared to applicable SLs and decision rules as defined in the SI QAPP Addendum (AECOM, 2021a). These rules governed response actions based on the results of the SI sampling effort.

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

Groundwater:

- Is there a human receptor within 4 miles of the facility?
- What is the concentration of PFOA, PFOS, and PFBS at the potential release areas?
- What is the concentration of PFOA, PFOS, and PFBS at the facility boundary upgradient and downgradient of the potential release areas?

- What does the conceptual site model (CSM) suggest in terms of source, pathway and receptor?

Soil:

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

Soil and groundwater samples were collected from each of the potential release areas. Groundwater was encountered at approximately 1.70 to 8.98 feet bgs.

4.6 Data Usability Assessment

The Data Usability Assessment (DUA) is an evaluation at the conclusion of data collection activities that uses the results of both data verification and validation in the context of the overall project decisions or objectives. Using both quantitative and qualitative methods, the assessment determines whether project execution and the resulting data have met installation-specific DQOs. Both sampling and analytical activities are considered to assess whether the collected data are of the right type, quality, and quantity to support the decision-making (DoD, 2019a; DoD, 2019b; USEPA, 2017b).

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

4.6.1 Precision

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

Calibration verifications were performed routinely to ensure that instrument responses for all calibrated analytes were within established QC criteria. No associated calibration verifications displayed results outside the project established precision limits presented in the QAPP Addendum (AECOM, 2021a).

LCS/LCS duplicate (LCSD) pairs were prepared by addition of known concentrations of each analyte in a matrix-free media known to be free of target analytes. LCS/LCSD pairs were analyzed for every analytical batch to demonstrate the ability of the laboratory to detect similar concentrations of a known quantity in matrix-free media. The LCS/LCSD samples were within the project established precision limits presented in the QAPP Addendum (AECOM, 2021a).

MS/MS duplicate (MS/MSD) samples were prepared, analyzed, and reported for all preparation batches. MS/MSD samples demonstrated that the analytical system was in control for the matrix being tested. MS/MSD samples were submitted to the laboratory for analysis at a rate of 5%. The MS/MSD samples were within the project established control limits presented in the QAPP

Addendum (AECOM, 2021a), with one exception. The MS/MSD performed on field sample AOI02-01-SB-00-02 displayed an RPD greater than the upper Quality Control (QC) limit of 20% for TOC. The parent sample result associated with this positive bias was qualified as estimated and should be considered usable as qualified.

Field duplicate samples were collected at a rate of 10% to assess the overall sampling and measurement precision for this sampling effort. The field duplicate samples were analyzed for PFAS and general chemistry parameters. The field duplicate samples were within the project established precision limits presented in the QAPP Addendum (AECOM, 2021a), with several exceptions. The field duplicates performed on field samples AOI01-01-SB-00-02 and AOI01-02-SB-00-02 displayed positive results for several analytes, while the associated field duplicates displayed non-detect results. The field duplicate pair results associated with the duplicate imprecision were qualified as estimated and should be considered usable as qualified.

4.6.2 Accuracy

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

LCS/LCSD samples were prepared by addition of known concentrations of each analyte in a matrix free media known to be free of target analytes. LCS/LCSD samples were analyzed for every analytical batch and demonstrated that the analytical system was in control during sample preparation and analysis. The LCS/LCSD samples were within the project established accuracy limits presented in the QAPP Addendum (AECOM, 2021a).

MS/MSD samples were prepared, analyzed, and reported at a rate of 5%. MS/MSD samples demonstrated that the analytical system was in control for the matrix being tested. The MS/MSD samples were within the project established control limits presented in the QAPP Addendum (AECOM, 2021a), with two exceptions. The MS/MSD performed on field sample LCC-02-GW displayed percent recoveries greater than the upper QC limit for PFBS and perfluorohexanesulfonic acid (PFHxS) The field sample results associated with the high percent recoveries were positive and were qualified “J+” and should be considered usable as estimated values with a positive bias.

Extraction internal standards (EIS) were added by the laboratory during sample extraction to measure relative responses of target analytes and used to correct for bias associated with matrix interferences and sample preparation efficiencies, injection volume variances, mass spectrometry ionization efficiencies, and other associated preparation and analytical anomalies. The field sample AOI01-01-GW displayed EIS samples outside the project established precision limits presented in the QAPP Addendum (AECOM, 2021a) for isotopes 6:2 sodium 1 H, 1 H,2H,2H-perfluoro-1-[1 ,2-$^{13}C_2$]octanesulfonate (M_2 6:2 FTS), M_2 sodium 1 H, 1 H,2H,2H-perfluoro-1-[1 ,2$^{13}C_2$]decanesulfonate (M_2 8:2 FTS), M_2 perfluoro-n-[1 ,2-$^{13}C_2$]tetradecanoic acid (PFTA), and perfluoro-n-[$^{13}C_4$]butanoic acid (MPFBA). The field sample results associated with area counts greater than the upper QC limit were non-detect and should be considered usable as reported. The positive field sample results associated with area counts less than the lower QC limit were qualified as estimated with a high bias, while the non-detect results were qualified as estimated. The associated results should be considered usable as qualified as estimated values.

Injection internal standards (IIS) were added by the laboratory after sample extraction and prior to analysis as a legacy requirement of DoD QSM 5.1 to measure relative responses of target analytes. Even though not required under the current DoD QSM 5.3 analysis, the IIS are still added to the sample after extraction as an additional QC measure. The IIS percent recoveries were within the established precision limits presented in the QAPP Addendum (AECOM, 2021a).

4.6.3 Representativeness

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

Relating to the use of standard analytical methods, the laboratory followed the method as established in PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15, including the specific preparation requirements (i.e., ENVI-Carb or equivalent used), mass calibration, spectra, all the ion transitions identified in Table B-15 were monitored, standards that contained both branched and linear isomers when available were used, and isotopically labeled standards were used for quantitation.

Field QC samples were collected to assess the representativeness of the data collected. Field duplicates were collected at a rate of 10% for all field samples, while MS/MSD samples were collected at a rate of 5%. The laboratory used approved standard methods in accordance with the QAPP Addendum (AECOM, 2021a) for all analyses. All technical and analytical holding times were met by the laboratory for the initial results. However, samples of the water used for decontamination LAKE CHARLES DECON (sampled directly from the facility spigot) and TWE DECON WATER (sampled from a spigot at the Tolunay-Wong Engineers, Inc. Sulphur, Louisiana location) were re-extracted outside of the technical holding time. When practical, the initial results were selected by the data reviewer for data use, and all results were considered usable as qualified. Also, the holding time for pH analysis is considered ‘immediate’, so all pH sample results have been qualified as estimated.

Instrument blanks and method blanks were prepared by the laboratory in each batch as a negative control. Two PFAS instrument blanks displayed target analyte concentrations greater than the DL for N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA) and N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA). One field sample result was qualified “U” during data validation due to associated detections in the instrument blanks and the reported field sample numerical value was adjusted to be equal to the limit of detection (LOD). The result is usable as qualified but should be considered a false positive and treated as non-detect.

Field blanks and equipment blanks were also collected for groundwater and soil samples. The field reagent blank (FRB) sample, LCC-FRB-01, displayed a concentration greater than the DL for PFOS. The associated field sample results were non-detect or displayed a concentration greater than five times the blank detection. The results should be considered usable as reported.

A sample of the water used for decontamination of the drill rig was collected in advance of the field effort. The decontamination sample, LAKE CHARLES DECON, displayed a concentration greater than the DL for PFDoA and PFOA. The associated field sample results were either non-detect or displayed a concentration greater than five times the blank detection. The results should be considered usable as reported.

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

4.6.4 Comparability

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

4.6.5 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount of data expected under normal conditions. The laboratory provided data meeting system QC acceptance criteria for all samples tested. Project completeness was determined by evaluating the planned versus actual quantities of data. Percent completeness per parameter is as follows and reflects the exclusion of “X/UX” flagged data, if applicable:

- PFAS in aqueous media by DoD QSM Table B-15 at 100%
- PFAS in solid media by DoD QSM Table B-15 at 100%
- pH in soil by USEPA Method 9045D at 100%
- TOC by USEPA Method 9060 at 100%

4.6.6 Sensitivity

Sensitivity is the capability of a test method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest. Examples of QC measures for determining sensitivity include laboratory fortified blanks, a method DL (MDL) study, and calibration standards at the limit of quantitation (LOQ). In order to meet the needs of the data users, project data must meet the measurement performance criteria for sensitivity and project LOQs specified in the QAPP Addendum (AECOM, 2021a). The laboratory provided the requested MDL studies and provided applicable calibration standards at the LOQ. In order to achieve the DQOs for sensitivity outlined in the QAPP Addendum (AECOM, 2021a), the laboratory reported all field sample results at the lowest possible dilution. Additionally, any analytes detected below the LOQ and above the DL were reported and qualified “J” as estimated values by the laboratory.

5. Site Inspection Activities

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

- *Final Preliminary Assessment Report, Lake Charles Chennault Airport NGLA, Louisiana* dated September 2020 (AECOM, 2020);
- *Final Site Inspection Programmatic Uniform Federal Policy-Quality Assurance Project Plan* dated March 2018 (AECOM, 2018a);
- *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, Lake Charles Chennault Airport NGLA, Louisiana* dated July 2021 (AECOM, 2021a);
- *Final Programmatic Accident Prevention Plan* dated July 2018 (AECOM, 2018b); and
- *Final Site Safety and Health Plan, Lake Charles Chennault Airport NGLA, Louisiana* dated July 2021 (AECOM, 2021b).

The SI field activities were conducted from 4 to 5 August 2021 and consisted of utility clearance, direct push boring, soil sample collection, temporary monitoring well installation, grab groundwater sample collection, and land surveying. Field activities were conducted in accordance with the SI QAPP Addendum (AECOM, 2021a).

The following samples were collected during the SI and analyzed for a subset of 18 PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15 to fulfill the project DQOs:

- Seventeen (17) soil samples from eight boring locations;
- Five grab groundwater samples from five temporary well locations; and
- Ten (10) quality assurance (QA)/ QC samples.

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

5.1 Pre-Investigation Activities

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

5.1.1 Technical Project Planning

The USACE TPP Process, Engineer Manual (EM) 200-1-2 (USACE, 2016) defines four phases to project planning: 1.) defining the project phase; 2.) determining data needs; 3.) developing data collection strategies; and 4.) finalizing the data collection plan. The process encourages stakeholder involvement in the SI, beginning with defining overall project objectives, including quantitative and qualitative DQOs, and formulating a sampling approach to address the AOIs identified in the PA.

A combined TPP Meeting 1 and 2 was held on 26 May 2021, prior to SI field activities. The combined TPP Meeting 1 and 2 was conducted in general accordance with EM 200-1-2. The stakeholders for this SI include the ARNG, LAARNG, USACE, and the Louisiana Department of Environmental Quality. Stakeholders were provided the opportunity to make comments on the technical sampling approach and methods at the combined TPP Meeting 1 and 2. The outcome of the combined TPP Meeting 1 and 2 was memorialized in the SI QAPP Addendum (AECOM, 2021a).

A TPP Meeting 3 was held on TBD after the field event to discuss the results of the SI. Meeting minutes for TPP 3 are included in **Appendix D** of this report. Future TPP meetings will provide an opportunity to discuss the results and findings, and future actions, where warranted.

5.1.2 Utility Clearance

AECOM's drilling subcontractor, Tolunay-Wong Engineers, Inc. placed a ticket with the Louisiana 811 utility clearance provider to notify them of intrusive work on 16 April 2021. However, because Lake Charles Chennault Airport NGLA is a private facility, the participating Louisiana 811 locators did not clear utilities at the entire facility. Therefore, AECOM contracted GPRS, a private utility location service, to perform utility clearance. GPRS performed utility clearance of the proposed boring locations on 23 July 2021 with input from the AECOM field team. General locating services, including electromagnetic pipe and cable locators and ground-penetrating radar (GPR) were used to complete the clearance. Additionally, the first 5 feet of each boring were pre-cleared using a hand auger to verify utility clearance in shallow subsurface where utilities would typically be encountered.

5.1.3 Source Water and PFAS Sampling Equipment Acceptability

The potable water source used for decontamination of drilling equipment was confirmed to be acceptable for use in a PFAS investigation prior to the start of field activities. A sample from a potable water source at Lake Charles Chennault Airport NGLA was collected on 17 June 2021, prior to mobilization, and analyzed for PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15. The results of the decontamination water sample are provided in **Appendix F**. A discussion of the results is presented in **Section 4.6.3**. Other non-dedicated sampling equipment was decontaminated using PFAS-free American Society of Testing and Materials (ASTM) Type II deionized water and Alconox™.

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

5.2 Soil Borings and Soil Sampling

Soil samples were collected via direct push technology (DPT), in accordance with the SI QAPP Addendum (AECOM, 2021a). A GeoProbe® 7822DT Macro-Core® soil sampling system (LWCR) was used to collect continuous soil cores to the target depth. A hand auger was used to collect soil from the top five feet of the boring, in accordance with AECOM utility clearance procedures. The soil boring locations are shown on **Figure 5-1** and depths are provided **Table 5-1**. Borings were installed in grass areas to avoid disturbing concrete or asphalt surfaces.

In general, three discrete soil samples were collected from the vadose zone for chemical analysis from each soil boring: one surface soil sample (0 to 2 feet bgs), one subsurface soil sample approximately 2 feet above the groundwater table, and one subsurface soil sample at the mid-point between the surface and the groundwater table. In borings where groundwater was encountered at 6 feet bgs or shallower, only two soil samples were collected per boring, in accordance with the QAPP Addendum (AECOM, 2021a). Specifically, only two soil samples were collected at location AOI01-01 for this reason.

The soil cores were continuously logged for lithological descriptions by a field geologist using the Unified Soil Classification System (USCS). A photoionization detector (PID) was used to screen the breathing zone during boring activities as part of personal safety requirements. Observations and measurements were recorded on sampling forms (**Appendix B2**) and in a non-treated field logbook (i.e., composition notebook). Depth interval, recovery thickness, PID concentrations, moisture, relative density, color (using a Munsell soil color chart), and texture (using the USCS) were recorded. The boring logs are provided in **Appendix E**.

Soil borings completed during the SI found consistent lithology across the site. The top 5 feet of soil consisted of sandy lean clay followed by approximately 10 feet of silty lean clay. Poorly graded sand was encountered at 15 feet bgs across the facility and varied between 2.5 and 5 feet in thickness. Silty lean clay was typically encountered beneath the sand. These field observations are consistent with reported descriptions of the Beaumont Alloformation (USGS, 2017). The borings were completed at depths between 8 and 20 feet bgs.

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

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

5.3 Temporary Well Installation and Groundwater Grab Sampling

DPT borings were converted to temporary wells. Once the borehole was advanced to the desired depth, wherever conditions allowed, a temporary well was constructed of a 5-foot section of 1-inch Schedule 40 poly-vinyl chloride (PVC) screen with sufficient casing to reach ground surface. New PVC pipe and screen were used to avoid cross contamination between locations. The screen intervals for the temporary wells are provided in **Table 5-2**.

The temporary wells were allowed to recharge after installation and before collection of groundwater samples. After the recharge period, groundwater samples were collected using a peristaltic pump with PFAS-free HDPE tubing. Each sample was collected into laboratory-supplied PFAS-free HDPE bottles and labeled using a PFAS-free marker or pen. The temporary wells were purged at a rate determined in the field to reduce turbidity and drawdown prior to sampling. Water quality parameters (e.g., temperature, specific conductance, pH, dissolved oxygen [DO], and oxidation-reduction potential [ORP]) were measured using a water quality meter and recorded on the field sampling form (**Appendix B2**) after each grab sample was collected. Additionally, a subsample of each groundwater sample was collected in a separate container, and a shaker test was completed to identify if there were any foaming. No foaming was noted in any of the groundwater samples.

Samples were packaged on ice and transported via FedEx under standard CoC procedures to the laboratory and analyzed for PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15 in accordance with the SI QAPP Addendum (AECOM, 2021a).

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

Temporary wells and boreholes were abandoned in accordance with the SI QAPP Addendum (AECOM, 2021a) by removing the PVC and backfilling the hole with bentonite chips

5.4 Synoptic Water Level Measurements

A synoptic groundwater gauging event was performed on 5 August 2021. Groundwater elevation measurements were collected from the five new temporary monitoring wells. Water level measurements were taken from the northern side of the well casing. A groundwater flow contour map is provided in **Figure 2-4**, and groundwater elevation data are provided in **Table 5-2**.

5.5 Surveying

The northern side of each well casing was surveyed by Louisiana-licensed land surveyors following guidelines provided in the SOPs provided in the SI QAPP Addendum (AECOM, 2021a). Survey data from the newly installed wells on the facility were collected on 5 August 2021 in the applicable Universal Transverse Mercator zone projection with North American Datum 1983 (horizontal) and North American Vertical Datum 1988 (vertical). The surveyed well data are provided in **Appendix B3**.

5.6 Investigation-Derived Waste

As of the date of this report, the disposal of PFAS investigation-derived waste (IDW) is not regulated federally. PFAS IDW generated during the SI is considered non-hazardous waste and was managed in accordance with the SI QAPP Addendum (AECOM, 2019b) and with the DA Guidance for Addressing Releases of PFAS, Q18 (DA, 2018).

Solid (i.e., soil cuttings) and liquid (i.e., purge water and decontamination fluids) generated during SI activities were containerized in properly labeled and covered 5-gallon buckets. The IDW was stored at a secure and covered location designated by the LAARNG, pending the receipt of sample results. Solid and liquid IDW will be transferred to DOT-approved 55-gallon steel drums prior to disposal. The solid and liquid IDW will be disposed of via a RCRA Subtitle C landfill. The disposal contract is being managed under a separate contract (EA Engineering, Science, and Technology, Inc., 2021). Specifics on the disposal of solid and liquid IDW will be addressed in an IDW Treatment Memorandum.

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

5.7 Laboratory Analytical Methods

Samples were analyzed for a subset of 18 PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15 at Pace Analytical Gulf Coast in Baton Rouge, Louisiana, a DoD ELAP and NELAP certified laboratory. The 18 PFAS analyzed as part of the ARNG SI program include the following:

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

Selected soil samples were also analyzed for TOC using USEPA Method 9060A, pH by USEPA Method 9045D, and grain size by ASTM Method D-422.

5.8 Deviations from SI QAPP Addendum

One deviation from the SI QAPP Addendum has resulted from a change in the soil and groundwater SLs for PFBS in the OSD Memo (dated 15 September 2021), which was issued after the submittal of the Final SI QAPP. The revised SLs were developed using the USEPA Regional Screening Levels Calculator and are considered valid toxicity-based values after peer review (Assistant Secretary of Defense, 2021).

THIS PAGE INTENTIONALLY BLANK

Table 5-1
Site Inspection Samples by Medium
Site Inspection Report, Lake Charles Chennault Airport NGLA, Louisiana

Sample Identification	Sample Collection Date/Time	Sample Depth (feet bgs)	PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Grain Size (ASTM D-422)	Comments
Soil Samples							
AOI01-01-SB-00-02	8/4/2021 12:55	0 - 2	x	x	x		
AOI01-01-SB-00-02-D	8/4/2021 12:55	0 - 2	x	x	x		FD
AOI01-01-SB-03-05	8/4/2021 13:15	3 - 5	x				
AOI01-02-SB-00-02	8/4/2021 14:26	0 - 2	x				
AOI01-02-SB-00-02-D	8/4/2021 14:26	0 - 2	x				FD
AOI01-02-SB-6.5-8.5	8/4/2021 14:38	6.5 - 8.5	x				
AOI01-02-SB-12-14	8/4/2021 14:50	12 - 14	x				
AOI01-02-SB-18-20	8/4/2021 15:00	18 - 20				x	
AOI01-03-SB-00-02	8/5/2021 13:00	0 - 2	x				
AOI02-01-SB-00-02	8/4/2021 11:03	0 - 2	x	x	x		
AOI02-01-SB-00-02-MS	8/4/2021 11:03	0 - 2		x	x		MS
AOI02-01-SB-00-02-MSD	8/4/2021 11:03	0 - 2		x	x		MSD
AOI02-01-SB-6.5-8.5	8/4/2021 11:20	6.5 - 8.5	x				
AOI02-01-SB-10-12	8/4/2021 11:25	10 - 12				x	
AOI02-01-SB-12-14	8/4/2021 11:27	12 - 14	x				
AOI02-02-SB-00-02	8/5/2021 12:20	0 - 2	x				
AOI02-03-SB-00-02	8/5/2021 12:00	0 - 2	x				
LCC-01-SB-00-02	8/4/2021 9:37	0 - 2	x				
LCC-01-SB-6.5-8.5	8/4/2021 9:55	6.5 - 8.5	x				
LCC-01-SB-12-14	8/4/2021 10:00	12 - 14	x				
LCC-02-SB-00-02	8/4/2021 8:22	0 - 2	x				
LCC-02-SB-00-02-MS	8/4/2021 8:22	0 - 2	x				MS
LCC-02-SB-00-02-MSD	8/4/2021 8:22	0 - 2	x				MSD
LCC-02-SB-6.5-8.5	8/4/2021 8:40	6.5 - 8.5	x				
LCC-02-SB-12-14	8/4/2021 8:45	12 - 14	x				
Groundwater Samples							
AOI01-01-GW	8/5/2021 11:15	NA	x				
AOI01-02-GW	8/5/2021 12:30	NA	x				
AOI01-02-GW-D	8/5/2021 12:30	NA	x				FD
AOI02-01-GW	8/5/2021 14:00	NA	x				
LCC-01-GW	8/5/2021 10:40	NA	x				
LCC-02-GW	8/5/2021 9:10	NA	x				
LCC-02-GW-MS	8/5/2021 9:10	NA	x				MS
LCC-02-GW-MSD	8/5/2021 9:10	NA	x				MSD

Table 5-1
Site Inspection Samples by Medium
Site Inspection Report, Lake Charles Chennault Airport NGLA, Louisiana

Sample Identification	Sample Collection Date/Time	Sample Depth (feet bgs)	PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Grain Size (ASTM D-422)	Comments
Quality Control Samples							
LCC-FRB-01	8/5/2021 8:00	NA	x				
LCC-ERB-01	8/4/2021 12:00	NA	x				from DPT shoe
LCC-ERB-02	8/5/2021 12:10	NA	x				from hand auger

Notes:
ASTM = American Society for Testing and Materials
bgs = below ground surface
ERB = equipment rinsate blank
FD = field duplicate
FRB = field reagent blank
LC/MS/MS = Liquid Chromatography Mass Spectrometry
MS/MSD = matrix spike/ matrix spike duplicate
PFAS = per- and polyfluoroalkyl substances
QSM = Quality Systems Manual
TOC = total organic carbon
USEPA = United States Environmental Protection Agency

Table 5-2
Soil Boring Depths, Temporary Well Screen Intervals, and Groundwater Elevations
Site Inspection Report, Lake Charles Chennault Airport NGLA, Louisiana

Area of Interest	Boring Location	Soil Boring Depth (feet bgs)	Temporary Well Screen Interval (feet bgs)	Top of Casing Elevation (feet NAVD88)	Ground Surface Elevation (feet NAVD88)	Depth to Water (feet btoc)	Depth to Water (feet bgs)	Groundwater Elevation (feet NAVD88)
1	AOI01-01	8	3 - 8	11.23	9.26	3.67	1.70	7.56
	AOI01-02	20	15 - 20	9.88	9.31	5.47	4.90	4.41
2	AOI02-01	20	15 - 20	11.00	7.70	8.52	5.22	2.48
Sitewide	LCC-01	20	15 - 20	7.29	6.24	8.98	7.94	-1.69
	LCC-02	20	15 - 20	9.20	8.35	5.10	4.25	4.10

Notes:
bgs = below ground surface
btoc = below top of casing
NA = not applicable
NAVD88 = North American Vertical Datum 1988

THIS PAGE INTENTIONALLY BLANK

CLIENT	ARNG			
Site Inspection for PFAS at Lake Charles Chennault Airport NGLA, LA				
REVISED	11/15/2021	GIS BY	MS	11/15/2021
SCALE	1:4,800	CHK BY	SS	11/15/2021
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,		PM	CM	11/15/2021

SI Sample Locations

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 5-1

C:\Users\stankevichm\OneDrive - AECOM Directory\ARNG_PFAS_GIS_60552172\MXDs\LA\Lake_Charles_Chennault\SI_Figures\SI_Report\Fig_5-1_Lake_Charles_Chennault_SI_Sample_Locations.mxd

THIS PAGE INTENTIONALLY BLANK

6. Site Inspection Results

This section presents the analytical results of the SI. The SLs used in this evaluation are presented in **Section 6.1**. A discussion of the results for each AOI is provided in **Section 6.3** through **Section 6.4**. **Table 6-2** through **Table 6-4** present PFAS results for samples with detections in soil or groundwater; only constituents detected in one or more samples are included. Tables that contain all results are provided in **Appendix F**, and the laboratory reports are provided in **Appendix G**.

6.1 Screening Levels

The DoD has adopted a policy to retain facilities in the CERCLA process based on risk-based SLs for soil and groundwater, as described in a memorandum from the OSD dated 15 September 2021 (Assistant Secretary of Defense, 2021). The ARNG program under which this SI was performed follows this DoD policy. Should the maximum site concentration for sampled media exceed the SLs established in the OSD memorandum, the AOI will proceed to the next phase under CERCLA. The SLs established in the OSD memorandum apply to three compounds: PFOS, PFOA, and PFBS.

The SLs are presented on **Table 6-1** below. All other results presented in this report are considered informational in nature and serve as an indication as to whether soil and groundwater contain or do not contain PFAS within the boundaries of the facility.

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

Analyte	Residential (Soil) (µg/kg)[a] 0-2 feet bgs	Industrial/ Commercial Composite Worker (Soil) (µg/kg)[a] 2-15 feet bgs	Tap Water (Groundwater) (ng/L)[a]
PFOA	130	1,600	40
PFOS	130	1,600	40
PFBS	1,900	25,000	600

Notes:
a.) Assistant Secretary of Defense, 2021. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater and Soil using United States Environmental Protection Agency's (USEPA's) Regional Screening Level Calculator. Hazard Quotient (HQ) = 0.1. 15 September 2021.

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

6.2 Soil Physicochemical Analyses

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

The data collected in this investigation will be used in subsequent investigations, where appropriate, to assess fate and transport of PFAS contaminants. According to the Interstate

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

6.3 AOI 1

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 1, which includes one potential PFAS release area: Former WWTP A. The detected compounds in soil and groundwater are summarized on **Table 6-2** through **Table 6-4**. The detections of PFOA, PFOS, and PFBS in soil and groundwater are presented on **Figure 6-1** through **Figure 6-4**.

6.3.1 AOI 1 Soil Analytical Results

PFOA, PFOS, and PFBS did not exceed the SLs in soil at the potential PFAS release area: Former WWTP A. **Figure 6-1** through **Figure 6-3** present the ranges of detections of PFOA, PFOS, and PFBS in soil. **Table 6-2** and **Table 6-3** summarize the detected compounds in soil.

At the Former WWTP A, soil was sampled from surface soil (0 to 2 feet bgs) and shallow subsurface soil (3 to 5 feet bgs) from boring location AOI01-01. Soil was also sampled from the surface soil (0 to 2 feet bgs) and shallow subsurface soil (6.5 to 8.5 feet bgs and 12 to 14 feet bgs) at boring location AOI01-02 and surface soil (0 to 2 feet bgs) at location AOI01-03. PFOA and PFOS were detected in soil at concentrations over an order of magnitude lower than the SLs.

In the surface soil, PFOA was only detected at AOI01-02, with a concentration of 0.158 J micrograms per kilogram (µg/kg). PFOS was detected in surface soil at all three locations at concentrations, ranging from 0.897 J µg/kg to 1.44 µg/kg, with the maximum detection at AOI01-02. PFBS was not detected in surface soil at any boring location.

In the shallow subsurface soil, PFOS was detected at AOI01-01 and AOI01-02, with concentrations of 0.830 J µg/kg and 0.216 J µg/kg, respectively. PFOS was not detected in the second shallow subsurface soil sample collected at AOI01-02 from 12 to 14 feet bgs. PFOA and PFBS were not detected in any of the shallow subsurface soil samples.

6.3.2 AOI 1 Groundwater Analytical Results

PFOA and PFOS in groundwater exceeded the SLs at one potential PFAS release area, AOI 1: Former WWTP A. PFBS did not exceed the SL at this potential PFAS release area. **Figure 6-4** presents the ranges of detections of PFOA, PFOS, and PFBS in groundwater. **Table 6-4** summarizes the detected compounds in groundwater.

Within the Former WWTP A potential PFAS release area, groundwater was sampled from temporary monitoring well locations AOI01-01 and AOI01-02. The SLs of 40 nanograms per liter (ng/L) for PFOA and PFOS were exceeded at both temporary wells, with maximum concentrations occurring at AOI01-01. PFOA and PFOS detections at AOI 1 ranged from 94.3 ng/L to 107 ng/L and 213 ng/L to 290 ng/L, respectively. PFBS was detected below the SL of 600 ng/L at both temporary well locations, with concentrations ranging from 17.9 ng/L to 71.9 ng/L and the maximum concentration occurring at AOI01-02.

6.3.3 AOI 1 Conclusions

Based on the results of the SI, PFOA and PFOS were detected in soil at AOI 1; however, the detected concentrations were over an order of magnitude lower than the soil SLs. At both temporary well locations, PFOA and PFOS were detected in groundwater at concentrations exceeding the individual SLs of 40 ng/L. PFBS was detected in groundwater at concentrations below the SL. Based on the exceedances of the SLs for PFOA and PFOS in groundwater, further evaluation at AOI 1 is warranted.

6.4 AOI 2

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 2, which includes one potential PFAS release area: Drainage Ditch. The detected compounds in soil and groundwater are summarized on **Table 6-2** through **Table 6-4**. The detections of PFOA, PFOS, and PFBS in soil and groundwater are presented on **Figure 6-1** through **Figure 6-4**.

6.4.1 AOI 2 Soil Analytical Results

PFOA, PFOS, and PFBS did not exceed the SLs in soil at the potential PFAS release area: Drainage Ditch. **Figure 6-1** through **Figure 6-3** present the ranges of detections of PFOA, PFOS, and PFBS in soil. **Table 6-2** and **Table 6-3** summarize the detected compounds in soil.

At the Drainage Ditch, soil was sampled from surface soil (0 to 2 feet bgs) and shallow subsurface soil (6.5 to 8.5 feet bgs and 12 to 14 feet bgs) from boring location AOI02-01. Surface soil (0 to 2 feet bgs) was also sampled at locations AOI02-02 and AOI02-03. PFOS was detected in soil at concentrations over an order of magnitude lower than the SLs. In the surface soil intervals, PFOS was detected at all three locations with concentrations ranging from 1.07 J µg/kg to 4.64 µg/kg with the maximum detection occurring at AOI02-01. PFOA and PFBS were not detected in any of the surface soil samples. In the shallow subsurface soil samples collected at AOI02-01, PFOA, PFOS, and PFBS were not detected.

6.4.2 AOI 2 Groundwater Analytical Results

PFOA, PFOS, and PFBS in groundwater did not exceed the SLs at one potential PFAS release area, AOI 2: Drainage Ditch. **Figure 6-4** presents the ranges of detections for PFOA, PFOS, and PFBS in groundwater. **Table 6-4** summarizes the detected compounds in groundwater.

Within the Drainage Ditch potential PFAS release area, groundwater was sampled from temporary monitoring well location AOI02-01. PFOS was detected at levels below the SL of 40 ng/L, with a concentration of 16.9 ng/L. PFBS was detected at levels below the SL of 600 ng/L, with a concentration of 5.69 ng/L. PFOA was not detected in groundwater at AOI02-01.

6.4.3 AOI 2 Conclusions

Based on the results of the SI, PFOS were detected in surface soil at AOI 2; however, the detected concentrations were over an order of magnitude lower than the soil SLs. At location AOI02-01, PFOS and PFBS were detected in groundwater at concentrations below the individual SLs of 40 ng/L and 600 ng/L. Based on these data, further evaluation at AOI 2 is not warranted.

6.5 Sitewide

This section presents the analytical results for soil and groundwater in comparison to SLs for sitewide locations, which includes sampling locations at the eastern and western facility boundaries, which are upgradient and downgradient of the AOIs, respectively. The detected compounds in soil and groundwater are presented in **Table 6-2** through **Table 6-4**. The detections of PFOA, PFOS, and PFBS in soil and groundwater are presented on **Figure 6-1** through **Figure 6-4**.

6.5.1 Sitewide Soil Analytical Results

PFOA, PFOS, and PFBS in soil did not exceed the SLs in soil at the two sitewide boundary boring locations. **Figure 6-1** through **Figure 6-3** present the ranges of detections of PFOA, PFOS, and PFBS in soil. **Table 6-2** and **Table 6-3** summarize the detected compounds in soil.

At LCC-01 and LCC-02, soil was sampled from surface soil (0 to 2 feet bgs) and shallow subsurface soil (6.5 to 8.5 feet bgs and 12 to 14 feet bgs). PFOA and PFOS were detected at concentrations over an order of magnitude lower than the SLs.

In surface soil, PFOA was only detected at LCC-01, at a concentration of 0.119 J µg/kg. PFOS was detected in surface soil at boring locations LCC-01 and LCC-02 at concentrations of 2.20 µg/kg and 1.24 µg/kg, respectively. PFBS was not detected in either surface soil sample.

In shallow subsurface soil, PFOS was detected in three of the four samples, with concentrations ranging from 0.69 J µg/kg to 0.166 J µg/kg. The maximum detection of PFOS is several orders of magnitude below the SL and was observed at LCC-01 in the sample collected from 6.5 to 8.5 feet bgs. PFOS was not detected in the second shallow subsurface soil sample collected at LCC-02 from 12 to 14 feet bgs. PFOA and PFBS were not detected in any of the shallow subsurface soil samples.

6.5.2 Sitewide Groundwater Analytical Results

PFOS in groundwater exceeded the SL in the downgradient temporary well located on the western boundary of the facility. PFOA and PFBS did not exceed their respective SLs in either of the two temporary wells. **Figure 6-4** presents the ranges of detections for PFOA, PFOS, and PFBS in groundwater. **Table 6-4** summarizes the detected compounds in groundwater.

Groundwater was sampled from the western (downgradient) and eastern (upgradient) boundary temporary monitoring well locations, LCC-01 and LCC-02, respectively. PFOS was detected in groundwater at both temporary well locations, with concentrations at LCC-01 exceeding the SL of 40 ng/L. PFOS concentrations detected at LCC-01 and LCC-02 were 123 ng/L and 38.8 ng/L, respectively. PFOA was only detected at LCC-01 at a concentration of 1.86 J ng/L. PFBS was detected in groundwater at both temporary well locations, with concentrations of 3.99 J ng/L and 28.4 J+ ng/L, with the maximum detection occurring at LCC-02.

6.5.3 Sitewide Conclusions

Based on the results of the SI, PFOA and PFOS were detected in soil at the two sitewide locations; however, the maximum detected concentrations were close to two orders of magnitude lower than the soil SLs. PFOS was detected in groundwater at the downgradient western boundary location at concentrations exceeding the SL of 40 ng/L. PFOS at the upgradient eastern boundary location, LCC-02, was detected in concentrations just below the SL. PFOA and PFBS were also detected in the boundary well locations. Data from upgradient well location LCC-02 indicate that PFAS may be migrating onsite from offsite facility sources.

Table 6-2
PFAS Detections in Surface Soil
Site Inspection Report, Lake Charles Chennault Airport

	Area of Interest	AOI 1										AOI 2						Sitewide			
	Sample ID	AOI01-01-SB-00-02		AOI01-01-SB-00-02-D		AOI01-02-SB-00-02		AOI01-02-SB-00-02-D		AOI01-03-SB-00-02		AOI02-01-SB-00-02		AOI02-02-SB-00-02		AOI02-03-SB-00-02		LCC-01-SB-00-02		LCC-02-SB-00-02	
	Sample Date	08/04/2021		08/04/2021		08/04/2021		08/04/2021		08/05/2021		08/04/2021		08/05/2021		08/05/2021		08/04/2021		08/04/2021	
	Depth	0 - 2 ft		0 - 2 ft		0 - 2 ft		0 - 2 ft		0 - 2 ft		0 - 2 ft		0 - 2 ft		0 - 2 ft		0 - 2 ft		0 - 2 ft	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Soil, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)																					
PFBA	-	ND	UJ	0.051	J	ND		ND		0.076	J	0.065	J	0.071	J	ND		ND		0.098	J
PFDA	-	ND		ND		0.061	J	ND	UJ	ND		ND		ND		ND		ND		ND	
PFDoA	-	ND		ND		0.023	J	ND	UJ	ND		ND		ND		ND		ND		ND	
PFHpA	-	0.049	J	0.064	J	0.037	J	ND	UJ	0.105	J	0.030	J	0.133	J	ND		0.033	J	0.035	J
PFHxA	-	0.068	J	0.078	J	0.031	J	ND	UJ	0.150	J	0.153	J	0.174	J	ND		0.113	J	0.186	J
PFHxS	-	0.071	J	0.061	J	0.039	J	ND	UJ	ND		0.080	J	0.097	J	0.123	J	0.391	J	0.688	J
PFNA	-	0.037	J	0.030	J	0.056	J	0.025	J	0.027	J	ND		0.037	J	ND		0.038	J	ND	
PFOA	130	ND		ND		0.158	J	ND		ND		ND		ND		ND		0.119	J	ND	
PFOS	130	1.28		0.897	J	1.44		0.906	J	1.15	J	4.64		1.34		1.07	J	2.20		1.24	
PFPeA	-	0.067	J	0.080	J	ND		ND		0.219	J	0.070	J	0.264	J	ND		0.035	J	0.089	J
PFUnDA	-	ND		ND		0.026	J	ND	UJ	ND		ND		ND		ND		ND		ND	

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2021. Risk Based Screening Levels Calculated for PFBS, PFOS, and PFOA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 September 2021. Soil screening levels based on residential scenario for direct ingestion of contaminated soil.

Interpreted Qualifiers

J = Estimated concentration

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

Chemical Abbreviations

PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFUnDA	perfluoro-n-undecanoic acid

Acronyms and Abbreviations

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

Table 6-3
PFAS Detections in Shallow Subsurface Soil
Site Inspection Report, Lake Charles Chennault Airport

	Area of Interest	AOI 1						AOI 2				Sitewide							
	Sample ID	AOI01-01-SB-03-05		AOI01-02-SB-6.5-8.5		AOI01-02-SB-12-14		AOI02-01-SB-6.5-8.5		AOI02-01-SB-12-14		LCC-01-SB-6.5-8.5		LCC-01-SB-12-14		LCC-02-SB-6.5-8.5		LCC-02-SB-12-14	
	Sample Date	08/04/2021		08/04/2021		08/04/2021		08/04/2021		08/04/2021		08/04/2021		08/04/2021		08/04/2021		08/04/2021	
	Depth	3 - 5 ft		6.5 - 8.5 ft		12 - 14 ft		6.5 - 8.5 ft		12 - 14 ft		6.5 - 8.5 ft		12 - 14 ft		6.5 - 8.5 ft		12 - 14 ft	
Analyte	**OSD Screening Level [a]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)																			
PFHxS	-	0.059	J	ND		0.050	J	ND		ND		0.153	J	0.061	J	0.085	J	ND	
PFOS	1600	0.830	J	0.216	J	ND		ND		ND		0.166	J	0.097	J	0.069	J	ND	

Grey Fill — Detected concentration exceeded OSD Screening Levels

References
a. Assistant Secretary of Defense, 2021. Risk Based Screening Levels Calculated for PFBS, PFOS, and PFOA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 September 2021. Soil screening levels based on industrial/commercial composite worker scenario for incidental ingestion of contaminated soil.

Interpreted Qualifiers
J = Estimated concentration

Chemical Abbreviations

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

Acronyms and Abbreviations

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

Table 6-4
PFAS Detections in Groundwater
Site Inspection Report, Lake Charles Chennault Airport

		Area of Interest	AOI 1						AOI 2		Sitewide			
		Sample ID	AOI01-01-GW		AOI01-02-GW		AOI01-02-GW-D		AOI02-01-GW		LCC-01-GW		LCC-02-GW	
		Sample Date	08/05/2021		08/05/2021		08/05/2021		08/05/2021		08/05/2021		08/05/2021	
Analyte	**OSD Screening Level [a]**	**USEPA HA [b]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Water, PFAS by LCMSMS compliant with QSM 5.3 Table B-15 (ng/l)														
NEtFOSAA	-	-	18.8		ND		ND		ND		ND		ND	
PFBA	-	-	33.5	J+	44.8		46.7		ND		4.37		ND	
PFBS	600	-	17.9		69.5		71.9		5.69		3.99	J	28.4	J+
PFDA	-	-	2.41	J	ND		ND		ND		ND		ND	
PFHpA	-	-	24.6		4.29		4.52		ND		ND		ND	
PFHxA	-	-	43.1		3.46	J	3.61	J	ND		1.47	J	ND	
PFHxS	-	-	114		460		461		39.3		134		241	J+
PFNA	-	-	5.96		4.64		4.85		ND		ND		ND	
PFOA	40	70	**107**		**94.3**		**97.5**		ND		1.86	J	ND	
PFOS	40	70	**290**		**213**		**220**		16.9		**123**		38.8	
PFPeA	-	-	38.8		2.62	J	2.74	J	ND		ND		ND	
Total PFOA+PFOS	-	70	**397**		**307**		**318**		16.9		**125**		38.8	

Grey Fill	Detected concentration exceeded OSD Screening Levels
Bold Font	Detected concentration exceeded USEPA HA Screening Levels

References

a. Assistant Secretary of Defense, 2021. Risk Based Screening Levels Calculated for PFBS, PFOS, and PFOA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 September 2021. Groundwater screening levels based on residential scenario for direct ingestion of groundwater.

b. USEPA, 2016. Drinking Water Health Advisory for PFOA. Office of Water (4304T). Health and Ecological Criteria Division, Washington, DC 20460. EPA Document Number: 822-R-16-005. May 2016. / EPA. 2016. Drinking Water Health Advisory for PFOS. Office of Water (4304T). Health and Ecological Criteria Division, Washington, DC 20460. EPA Document Number: 822-R-16-004. May 2016.

Interpreted Qualifiers

J = Estimated concentration

J+ = Estimated concentration, biased high

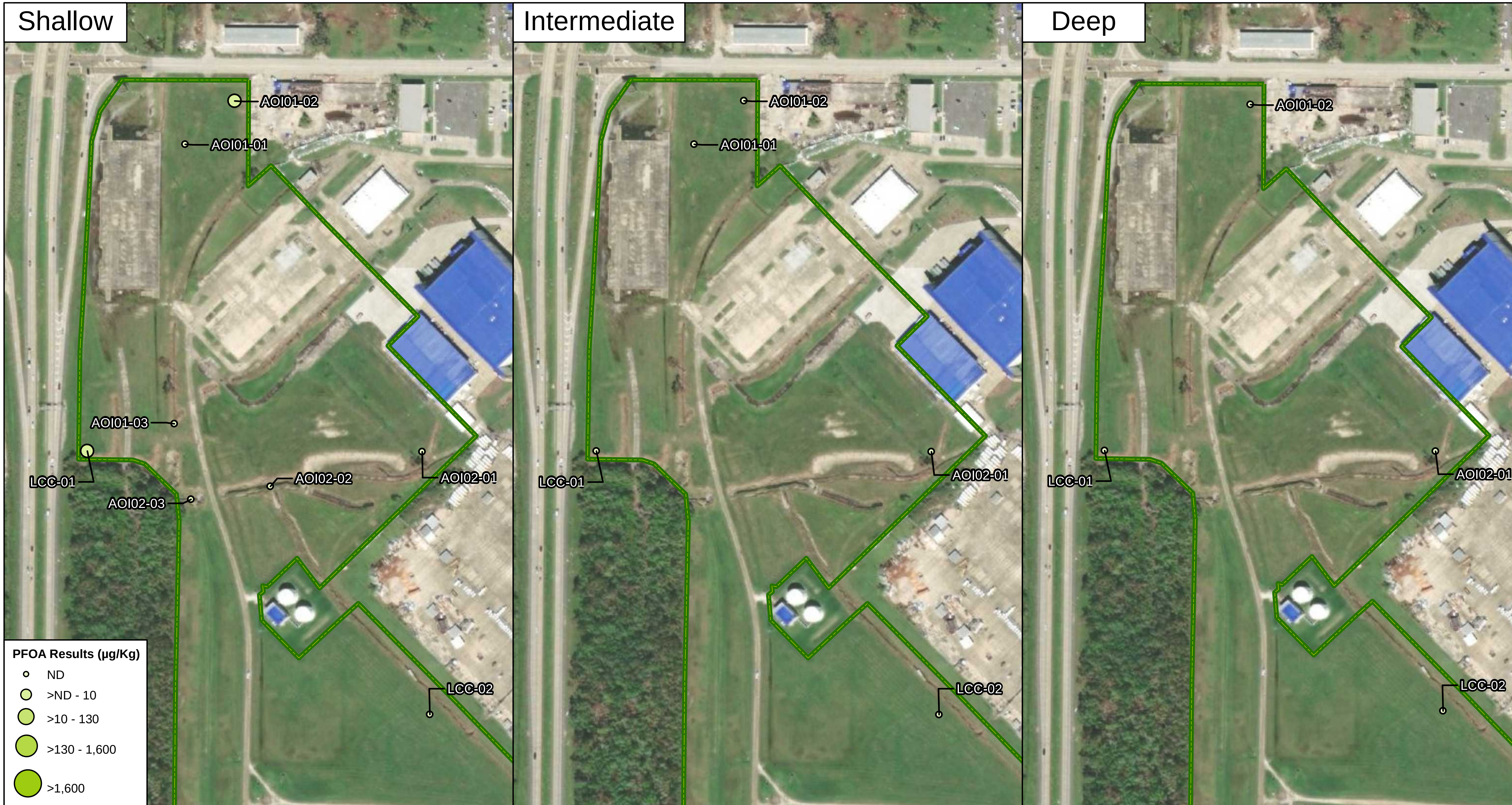
Chemical Abbreviations

NEtFOSAA	N-ethyl perfluorooctane- sulfonamidoacetic acid
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid

Acronyms and Abbreviations

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

THIS PAGE INTENTIONALLY BLANK



CLIENT	ARNG			
PROJECT	Site Inspection for PFAS at Lake Charles Chennault, LA			
REVISED	11/12/2021	GIS BY	MS	11/12/2021
SCALE	1:3,960	CHK BY	MC	11/12/2021
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	CM	11/12/2021

Legend

Site Boundary

0 165 330 660 Feet

N

PFOA Detections in Soil

AECOM 12420 Milestone Center Drive Germantown, MD 20876

Figure 6-1

C:\Users\stankevichm\OneDrive - AECOM Directory\ARNG_PFAS_GIS_60552172\MXDs\LA\Lake_Charles_Chennault\SI_Figures\SI_Report\Results\Fig_6-1_Lake_Charles_Chennault_SI_Soil_Results_PFOA.mxd

CLIENT	ARNG			
PROJECT	Site Inspection for PFAS at Lake Charles Chennault, LA			
REVISED	11/12/2021	GIS BY	MS	11/12/2021
SCALE	1:3,960	CHK BY	MC	11/12/2021
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	CM	11/12/2021

Legend

Site Boundary

0 165 330 660 Feet

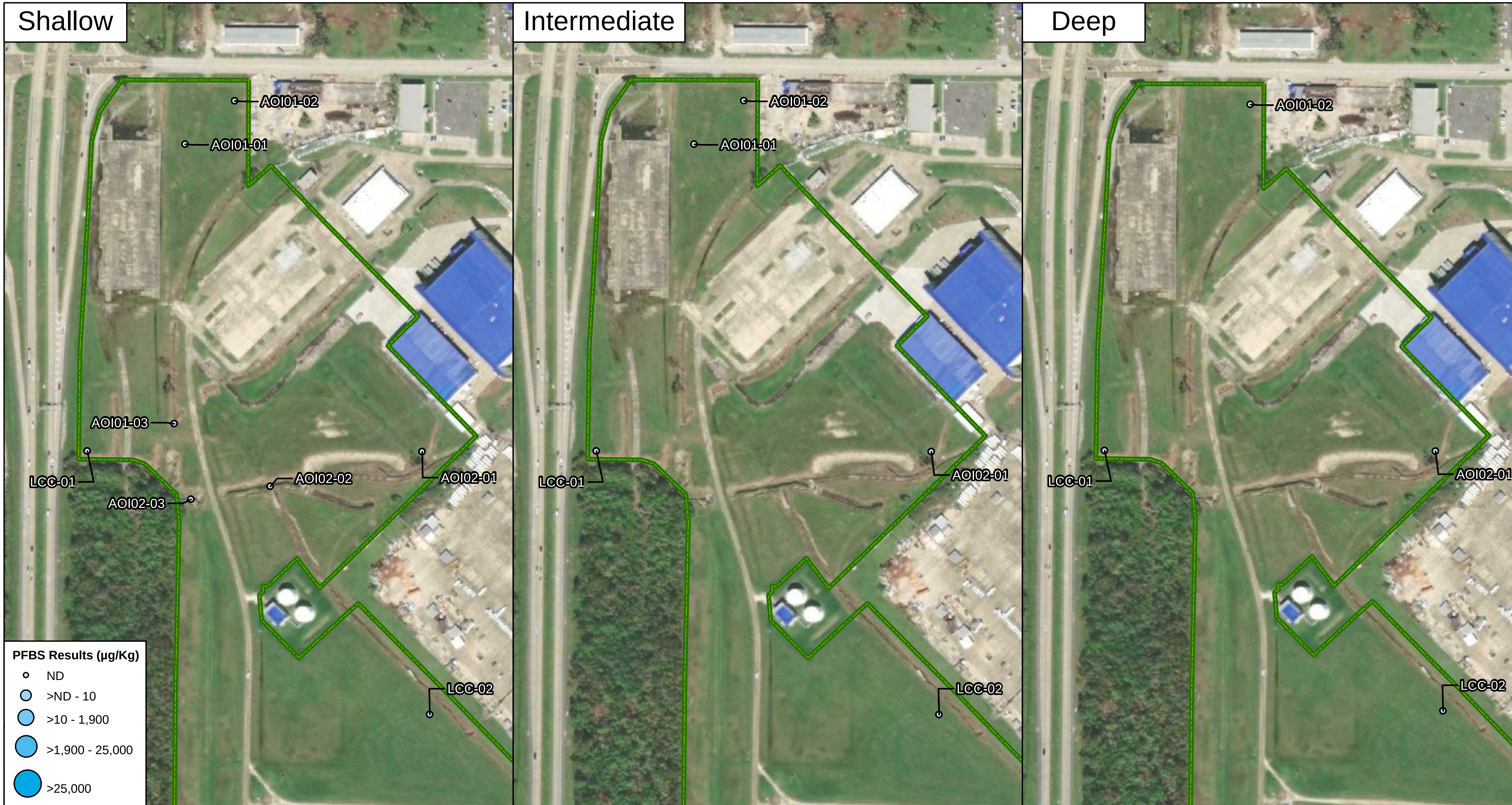
N

PFOS Detections in Soil

AECOM 12420 Milestone Center Drive Germantown, MD 20876

Figure 6-2

C:\Users\stankevichm\OneDrive - AECOM Directory\ARNG_PFAS_GIS_60552172\MXDs\LA\Lake_Charles_Chennault\SI_Figures\SI_Report\Results\Fig_6-2_Lake_Charles_Chennault_SI_Soil_Results_PFOS.mxd



CLIENT	ARNG				
PROJECT	Site Inspection for PFAS at Lake Charles Chennault, LA				
REVISED	11/12/2021	GIS BY	MS	11/12/2021	
SCALE	1:3,960	CHK BY	MC	11/12/2021	
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	CM	11/12/2021	

Legend

Site Boundary

0 165 330 660 Feet

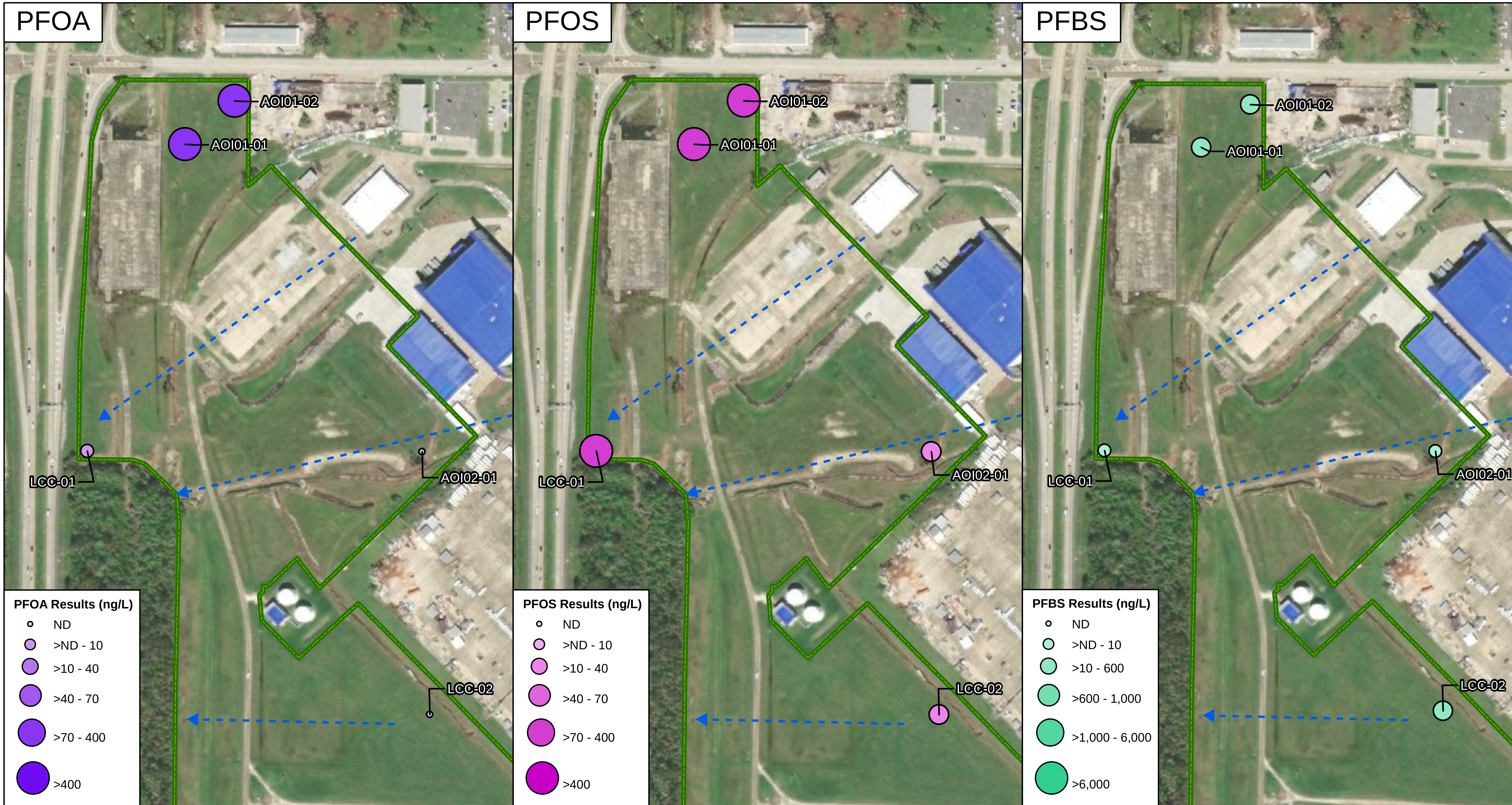
N

PFBS Detections in Soil

AECOM 12420 Milestone Center Drive Germantown, MD 20876

Figure 6-3

C:\Users\stankevichm\OneDrive - AECOM Directory\ARNG_PFAS_GIS_60552172\MXDs\LA\Lake_Charles_Chennault\SI_Figures\SI_Report\Results\Fig_6-3_Lake_Charles_Chennault_SI_Soil_Results_PFBS.mxd



CLIENT	ARNG				
PROJECT	Site Inspection for PFAS at Lake Charles Chennault, LA				
REVISED	11/18/2021	GIS BY	MS	11/18/2021
SCALE	1:3,960	CHK BY	MC	11/18/2021
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	CM	11/18/2021

Legend

Site Boundary

Groundwater Flow Direction

0 165 330 660 Feet

N

PFOA, PFOS, and PFBS Detections in Groundwater

AECOM 12420 Milestone Center Drive Germantown, MD 20876

Figure 6-4

C:\Users\stankevichm\OneDrive - AECOM Directory\ARNG_PFAS_GIS_60552172\MXDs\LA\Lake_Charles_Chennault\SI_Figures\SI_Report\Results\Fig_6-4_Lake_Charles_Chennault_SI_GW_Results.mxd

7. Exposure Pathways

The CSMs for each AOI, revised based on the SI findings, are presented on **Figure 7-1** and **Figure 7-2**. A CSM presents the current understanding of the site conditions with respect to known and suspected sources, potential transport mechanisms and migration pathways, and potentially exposed human receptors. A human exposure pathway is considered potentially complete when the following conditions are present:

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

If any of these elements are missing, the pathway is incomplete. The CSM figures use an empty circle symbol to represent an incomplete exposure pathway. Areas with an incomplete pathway generally warrant no further action. However, the pathway is considered potentially complete if PFOA, PFOS, or PFBS are detected, in which case the CSM figure uses a half-filled circle symbol to represent a potentially complete exposure pathway. Additionally, a completely filled circle symbol is used to indicate when a potentially complete exposure pathway has detections of PFOA, PFOS, or PFBS above the SLs. Areas with an identified potentially complete pathway may warrant further investigation.

In general, the potential routes of exposure to PFAS are ingestion and inhalation. Human exposure via the dermal contact pathway may occur, and current risk practice suggests it is an insignificant pathway compared to ingestion; however, exposure data for dermal pathways are sparse and continue to be the subject of PFAS toxicological study. The receptors evaluated are consistent with those listed in USEPA guidance for risk screening (USEPA, 2001). Receptors at the facility include site workers (e.g., facility staff and visiting soldiers), construction workers, trespassers (though unlikely due to restricted access), residents outside the facility boundary, and recreational users outside of the facility boundary.

7.1 Soil Exposure Pathway

The SI results for PFOA, PFOS, and PFBS in soil were used to determine whether a potentially complete pathway exists between the source and potential receptors at AOI 1 and AOI 2 based on the aforementioned criteria.

7.1.1 AOI 1

The Former WWTP A was built around 1952 and was demolished in the 1990s. It is unknown what areas or buildings drained to the Former WWTP A; however, AFFF released at adjacent source areas may have drained to the Former WWTP A through stormwater/sanitary sewer conveyance. Consequently, PFAS-laden wastewater may have been treated at Former WWTP A. The disposal of the biosolids/sludge is unknown and may have been spread on the facility property. PFOA and PFOS were detected in soil at AOI 1.

Based on the results of the SI at AOI 1, ground disturbing activities to the surface soil could potentially result in future site worker, construction worker, and trespasser exposure to PFOS and PFOA via inhalation of dust and incidental ingestion of surface soil. Ground-disturbing activities to the subsurface soil could result in potential construction worker exposure to PFOS via incidental ingestion of soil. The CSM for AOI 1 is presented on **Figure 7-1**.

7.1.2 AOI 2

The Drainage Ditch has existed as early as 1952. AFFF released at AOI 1 or at offsite source areas may have flowed into the Drainage Ditch via overland flow. PFOS was detected in surface soil at AOI 2.

Based on the results of the SI at AOI 1, ground disturbing activities to the surface soil could potentially result in future site worker, construction worker, and trespasser exposure to PFOS and via inhalation of dust and incidental ingestion of surface soil. PFOA, PFOS, and PFBS were not detected in the subsurface soil; therefore, exposure pathways to all receptors are considered incomplete. The CSM AOI 2 is presented on **Figure 7-2**.

7.2 Groundwater Exposure Pathway

The SI results for PFOA, PFOS, and PFBS in groundwater were used to determine whether a potentially complete pathway exists between the source and potential receptors at AOI 1 and AOI 2 based on the aforementioned criteria.

7.2.1 AOI 1

PFOA and PFOS exceeded the SLs in both temporary monitoring wells in the Former WWTP A potential PFAS release area. PFBS was detected in concentrations below the SL. There are no identified potable wells screened within the surficial aquifer within 4 miles of the facility boundary. Therefore, the ingestion exposure pathway for offsite residents and recreational users is considered incomplete. Water at Lake Charles Chennault Airport NGLA is supplied from the City of Lake Charles and is sourced from the 500-foot and 700-foot sands of the Chicot aquifer system. Therefore, the ingestion exposure pathway for site workers is considered incomplete. In August 2021, depths to water in the two temporary wells at AOI 1 were 1.70 and 4.90 feet bgs. Therefore, groundwater may be encountered during construction activities and the ingestion exposure pathway for construction workers is considered potentially complete. The CSM for AOI 1 is presented on **Figure 7-1**.

7.2.2 AOI 2

PFOS and PFBS were detected in concentrations below the SLs in the temporary monitoring well in the Drainage Ditch potential PFAS release area. There are no identified potable wells screened within the surficial aquifer within 4 miles of the facility boundary. Therefore, the ingestion exposure pathway for offsite residents and recreational users is considered incomplete. Water at Lake Charles Chennault Airport NGLA is sourced from the 500-foot and 700-foot sands of the Chicot aquifer system. Therefore, the ingestion exposure pathway for site workers is considered incomplete. The measured depth to water at AOI 2 in August 2021 was 5.22 feet bgs. Therefore, groundwater may be encountered during construction activities and the ingestion exposure pathway for construction workers is considered potentially complete. The CSM for AOI 2 is presented on **Figure 7-2**.

7.3 Surface Water and Sediment Exposure Pathway

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

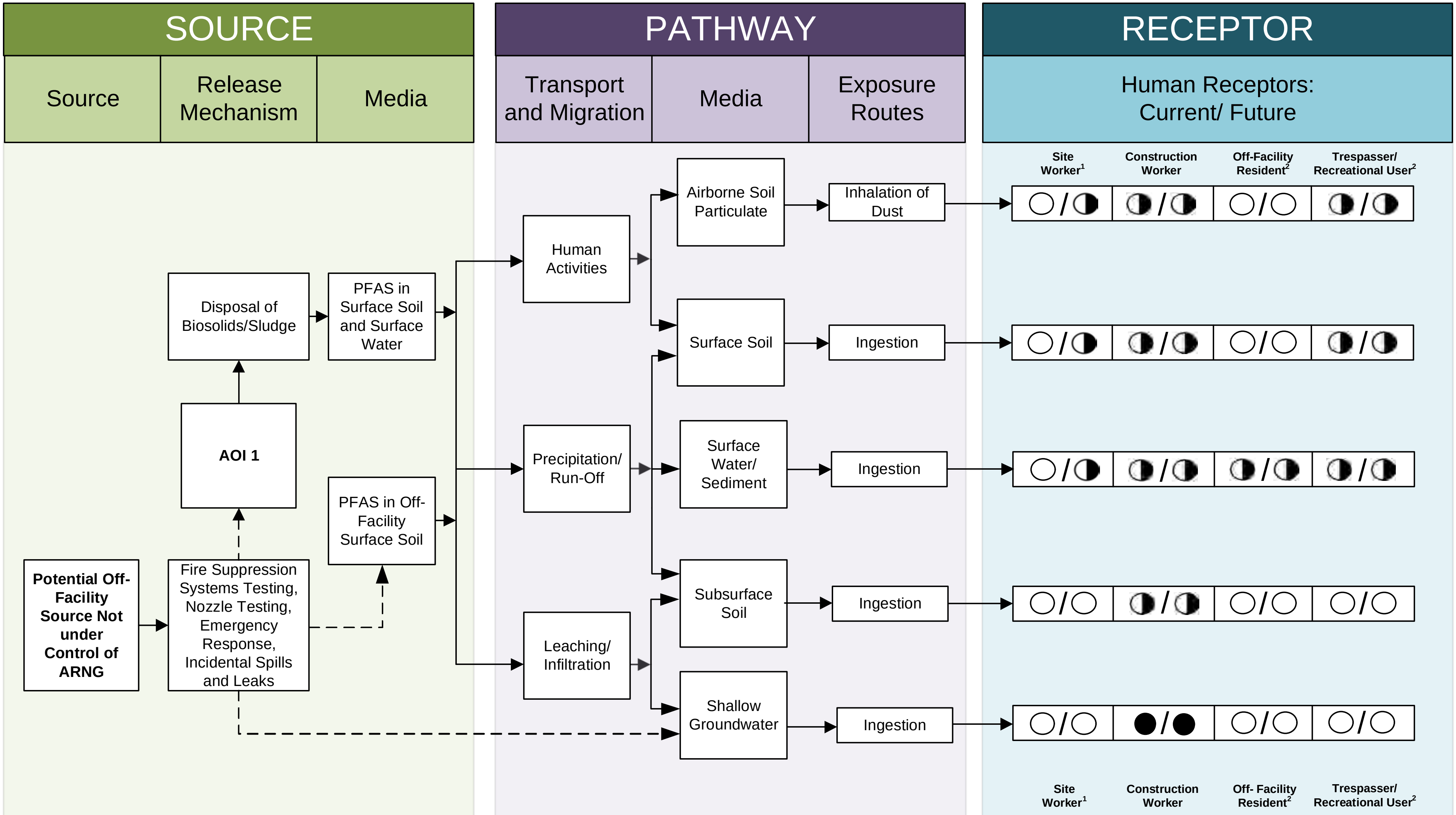
7.3.1 AOI 1

PFAS are water soluble and can migrate readily from soil to surface water via leaching and run-off. Because PFOA and PFOS were detected in soil, and PFOA, PFOS, and PFBS were detected in groundwater at AOI 1, it is possible that those compounds may have migrated from soil and groundwater to the drainage ditches to the south. Therefore, the surface water and sediment ingestion exposure pathways for future site workers, construction workers, and trespassers are considered potentially complete. The drainage ditch flows into the main ditch, AOI 2 Drainage Ditch, which flows to the west and discharges into the Kayouche Coulee off the facility property. The Kayouche Coulee may also be used by recreational users and offsite residents living nearby, thus the surface water and sediment ingestion exposure pathways for offsite residents and recreational users is also considered potentially complete. The CSM for AOI 1 is presented on **Figure 7-1**.

7.3.2 AOI 2

PFOS was detected in soil and PFOS and PFBS were detected in groundwater at AOI 2. It is possible that those compounds may have migrated from soil and groundwater to surface water and sediment in the Drainage Ditch. Therefore, the surface water and sediment ingestion exposure pathways for future site workers, construction workers, and trespassers are considered potentially complete. The Drainage Ditch flows to the west and discharges into the Kayouche Coulee off the facility property. The Kayouche Coulee may also be used by recreational users and offsite residents living nearby; therefore, the surface water and sediment ingestion exposure pathways for offsite residents and recreational users is also considered potentially complete. The CSM for AOI 2 is presented on **Figure 7-2**.

THIS PAGE INTENTIONALLY BLANK



LEGEND

Flow-Chart Stops

Flow-Chart Continues

Partial / Possible Flow

Incomplete Pathway

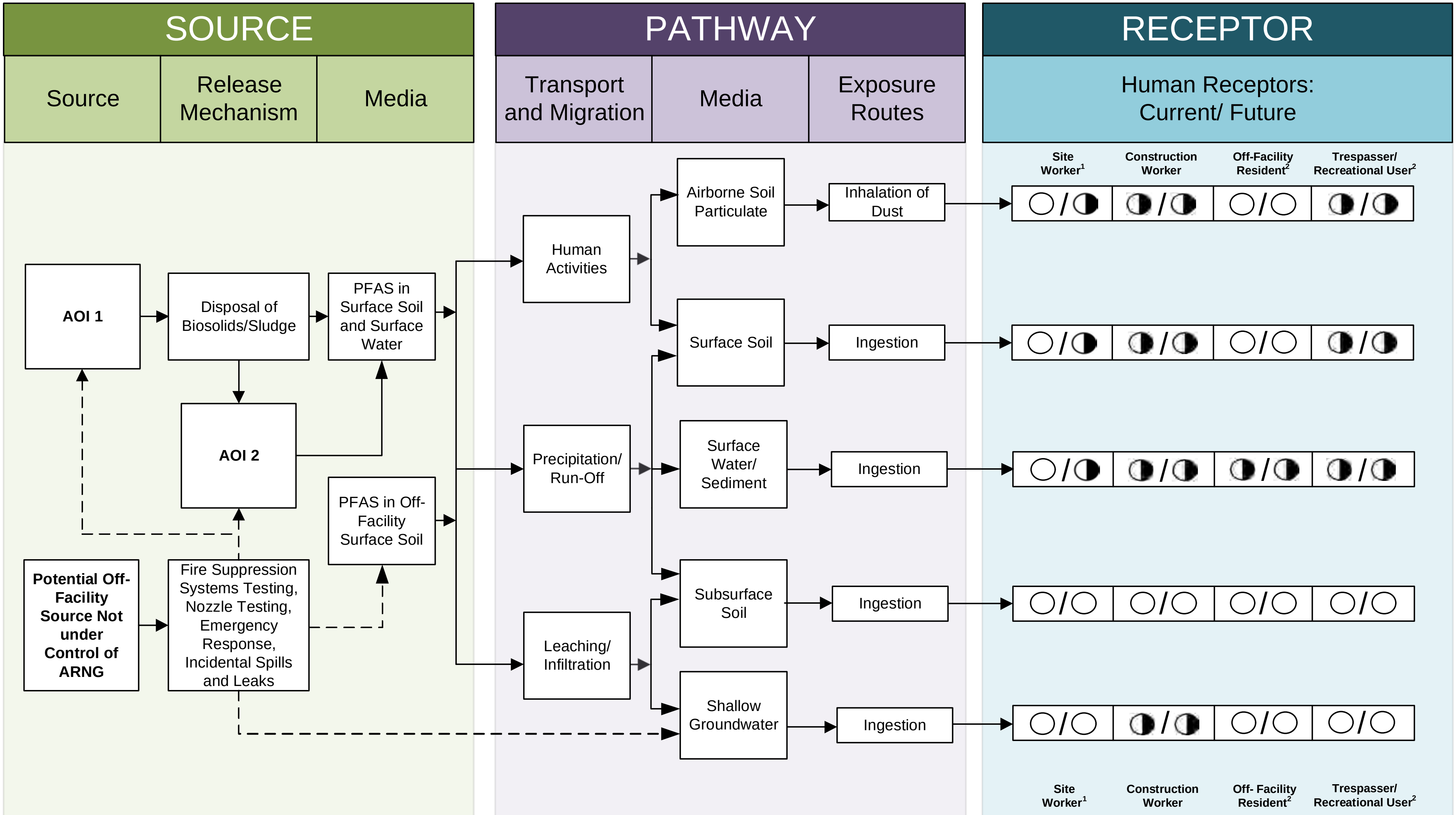
Potentially Complete Pathway

Potentially Complete Pathway with Exceedance of SL

Notes:

1. There are currently no site workers at the facility until the Lake Charles Readiness Center is constructed.
2. The resident and recreational user receptors refer to an off-site resident and recreational user.
3. Dermal contact exposure pathway is incomplete for PFAS.

Figure 7-1
Conceptual Site Model, AOI 1
Lake Charles Chennault Airport NGLA



LEGEND

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

Notes:
1. There are currently no site workers at the facility until the Lake Charles Readiness Center is constructed.
2. The resident and recreational user receptors refer to an off-site resident and recreational user.
3. Dermal contact exposure pathway is incomplete for PFAS.

Figure 7-2
Conceptual Site Model, AOI 2
Lake Charles Chennault Airport NGLA

8. Summary and Outcome

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

8.1 SI Activities

The SI field activities were conducted from 4 to 5 August 2021 and consisted of utility clearance, direct push boring, soil sample collection, temporary monitoring well installation, grab groundwater sample collection, and land surveying. Field activities were conducted in accordance with the SI QAPP Addendum (AECOM, 2021a).

To fulfill the project DQOs set forth in the approved SI QAPP Addendum (AECOM, 2021a), samples were collected and analyzed for a subset of PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15 as follows. The 18 PFAS analyzed as part of the ARNG SI program are specified in **Section 5.7** of this Report.

- Seventeen (17) soil samples from eight boring locations;
- Five (5) grab groundwater samples from five temporary well locations; and
- Twelve (12) QA/QC samples.

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

8.2 SI Goals Evaluation

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

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

   PFOA, PFOS, and PFBS were detected in groundwater at the facility, while PFOA and PFOS were detected in soil. PFOA, PFOS, and PFBS were detected at the potential release areas and at the facility boundaries upgradient and downgradient of the source areas. PFOA and PFOS in groundwater at AOI 1: Former WWTP A exceeded the SLs of 40 ng/L (individually). PFOS at the facility's western boundary, downgradient of the source areas, exceeded the SL of 40 ng/L. PFBS in groundwater did not exceed the SL of 600 ng/L at any location. The detected concentrations of PFOA, PFOS, and PFBS in soil samples from all locations were below the SLs.

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

   No PFAS release areas were removed from further consideration during this SI. PFOA, PFOS, and PFBS were not detected in groundwater and soil above the SLs at AOI 2: Drainage Ditch; however, releases of PFAS occurred prior to ARNG involvement at the facility. Therefore, CIAA may consider the need to further evaluate any potential PFAS releases within their property.

3. *Determine the potential need for a TCRA (applies to drinking water only). The primary actions that will be considered include provision of alternative water supplies or wellhead treatment.*

   Based on the data collected during this SI, groundwater flowing off the facility property is above the SLs for PFOA and PFOS; however, drinking water wells within 4 miles of the facility are screened below the surficial aquifer. Geologic data indicate the deeper aquifers are confined from the surficial aquifer. Consequently, there are no potentially complete pathways between the potential PFAS release areas and downgradient drinking water receptors.

4. *Collect data to better characterize the release areas for more effective and rapid initiation of an RI (if determined necessary).*

   The soil borings drilled as part of the SI displayed consistent lithology results across the facility. The top 15 feet of soil was dominated by lean clay and silt, with varying amounts of sand and gravel. At 15 feet bgs, 2.5- to 5-foot lenses of poorly graded sand were encountered. The lenses of sand were underlain by silty lean clay. These field observations are consistent with reported descriptions of the Beaumont Alloformation (USGS, 2017).

   These geological data indicate the shallow subsurface (<15 feet bgs) soil has relatively low permeability and conductivity due to the prevalence of clay and silt. Conversely, the poorly graded sand lenses at 15 to 20 feet bgs have relatively high permeability and conductivity. The deepest clays and silts (>17.5 feet bgs) that underly the sand lenses also have low permeability and conductivity. Consequently, vertical migration of groundwater is restricted by the silts and clays, which act as the upper confining unit for the Chicot aquifer.

   Depth to water at Lake Charles Chennault Airport NGLA ranges from approximately 1.70 to 7.94 feet bgs. Groundwater flow direction is to the west towards Kayouche Coulee. These geologic and hydrogeologic observations inform development of technical approach for an RI.

5. *If PFOA, PFOS, and PFBS are determined to be present, aim to evaluate whether the concentrations can be attributed to on-facility or off-facility sources that were identified within 4 miles of the installation as part of the PA (e.g., fire stations, major manufacturers, other DoD facilities)*

   Based upon the evaluation of groundwater and soil results in comparison to SLs, in combination with the groundwater flow direction analysis, the results of the SI indicate that the source of detected concentrations of PFOA, PFOS, and PFBS at the facility is attributable to previous releases at adjacent sources prior to ARNG involvement. This is evidenced by detections of PFOA, PFOS, and PFBS along the upgradient eastern boundary and the lack of identified primary release areas within the facility.

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

   Detections of PFOA, PFOS, and PFBS in groundwater and PFOA and PFOS in soil at source areas and the facility boundary indicate there is a potentially complete pathway between source and receptor. Activities at the facility occurred prior to ARNG involvement; therefore, PFAS contamination identified at the facility is not attributable to the ARNG.

8.3 Outcome

Based on the CSMs developed and revised in light of the SI findings, potential for drinking water receptor exposure to PFAS detected at AOI 1, AOI 2 and the facility boundaries is not indicated. Any releases of PFAS that have impacted the facility occurred prior to ARNG involvement. Sample analytical concentrations collected during the SI were compared against the project SLs for PFOA, PFOS, and PFBS in soil and groundwater, as described in **Table 6-1**. A summary of the results of the SI data relative to the SLs is as follows:

- At AOI 1, PFOA and PFOS in groundwater at the Former WWTP A potential PFAS release area exceeded the SLs of 40 ng/L, with maximum concentrations of 107 ng/L and 290 ng/L, respectively, at location AOI01-01. PFBS was detected in groundwater in concentrations below the SL of 600 ng/L, with a maximum concentration of 71.9 ng/L in the duplicate sample collected at AOI01-02.
- At AOI 2, PFOS and PFBS in groundwater at the Drainage Ditch potential PFAS release area were detected in concentrations below their respective SLs of 40 ng/L and 600 ng/L, with concentrations of 16.9 ng/L and 5.69 ng/L, respectively. PFOA was not detected in groundwater.
- At the sitewide sample locations along the facility boundary, PFOS was detected in concentrations above the SL, with a maximum concentration of 123 ng/L at LCC-01, along the western boundary and downgradient of the AOIs. PFOA and PFBS were detected but in concentrations below the SLs.
- The detected concentrations of PFOA and PFOS in soil at all AOIs were below the SLs. No PFBS was detected in any of the soil samples.

Table 8-1 summarizes the SI results for soil and groundwater. Based on the CSMs developed and revised in light of the SI findings, potential for drinking water receptor exposure to PFAS detected at AOI 1, AOI 2 and the facility boundaries is not indicated.

Table 8-2 summarizes the rationale used to determine if an AOI should be considered for further investigation under CERCLA and undergo an RI. Since all potential releases occurred prior to ARNG involvement, no further action by the ARNG is recommended. CIAA is not under the control of the ARNG but based on the results of this SI, CIAA may consider the need for further evaluation in an RI for AOI 1: Former WWTP A and AOI 2: Drainage Ditches.

Table 8-1: Summary of Site Inspection Findings

AOI	Potential PFAS Release Area	Soil – Source Area	Groundwater – Source Area	Groundwater – Facility Boundary
1	Former WWTP A	◐	●	●
2	Drainage Ditch	◐	◐	●

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

Table 8-2: Site Inspection Recommendations

AOI	Description	Rationale	Future Action
1	Former WWTP A	Exceedances of PFOA and PFOS SLs in groundwater. Detections of PFBS in groundwater but no exceedances of the SL. Detections of PFOA and PFOS in soil but no exceedances of SLs.	No further action by ARNG. CIAA is not under control of the ARNG. Based on the results of the SI, CIAA may consider the need to proceed to RI.
2	Drainage Ditch	Detections of PFOS and PFBS in groundwater but no exceedances of SLs. Detections of PFOS in soil but no exceedances of SL.	No further action by ARNG. CIAA is not under control of the ARNG. Based on the results of the SI, CIAA may consider the need to proceed to RI.

9. References

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

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

AECOM. 2020. *Final Preliminary Assessment Report, Lake Charles Chennault Airport NGLA, Louisiana*. September.

AECOM. 2021a. *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, Lake Charles Chennault Airport NGLA, Perfluorooctane Sulfonic Acid (PFOS) and Perfluorooctanoic Acid (PFOA) Impacted Sites ARNG Installations, Nationwide.* July.

AECOM. 2021b. *Final Site Safety and Health Plan, Lake Charles Chennault Airport NGLA, Louisiana, Perfluorooctane Sulfonic Acid (PFOS) and Perfluorooctanoic Acid (PFOA) Impacted Sites ARNG Installations, Nationwide*. July.

Assistant Secretary of Defense. 2021. *Investigation Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program*. United States Department of Defense. 15 September.

City of Lake Charles. No date. *Water Production and Facilities*. Accessed 3 September 2020 at https://www.cityoflakecharles.com/egov/apps/document/center.egov?view=item&id=18.

DA. 2016. *Army Guidance to Address Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA) Contamination*. August.

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

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

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

EA Engineering Science and Technology, 2021. *SOP No. 042A for Treating Liquid Investigation-Derived Material (Purge water, drilling water, and decontamination fluids).*

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

Harder, Alfred H. 1960. *Ground-Water Resources of Calcasieu Parish Louisiana*. United States Geological Survey: Geological Survey Water-Supply Paper 1488. 102 p.

Heinrich, P., Snead, J., and McCulloh, R. 2002. *Lake Charles 30 X 60 Minute Geologic Quadrangle.* Louisiana Geological Survey: 30 X 60 Minute Geologic Quadrangle Series.

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

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

LAARNG. 2020. *Draft Report, Preconstruction Assessment for the Lake Charles Readiness Center and Future Facility Maintenance Shop, Chennault International Airport Authority, Lake Charles, Louisiana.* June.

Louisiana Department of Natural Resources. 2020. *SONRIS^{NG} Interactive Maps – Oil/Gas*. Accessed 2 September 2020 at http://sonris-www.dnr.state.la.us/gis/agsweb/IE/JSViewer/index.html?TemplateID=181.

National Oceanic and Atmospheric Administration. 2021. *Monthly Climate Normals (1991 – 2020) – Lake Charles Area, LA*. Accessed 22 September 2021 at https://www.weather.gov/wrh/Climate?wfo=lch.

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

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

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

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

USEPA. 2005. *Federal Facilities Remedial Site Inspection Summary Guide*.

USEPA. 2006. *Guidance on Systematic Planning using the Data Quality Objectives Process*. February.

USEPA. 2016a. *Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA). Office of Water (4304T).* Health and Ecological Criteria Division, Washington, DC 20460. US USEPA Document Number: 822-R-16-005. May 2016.

USEPA. 2016b. *Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS). Office of Water (4304T).* Health and Ecological Criteria Division, Washington, DC 20460. US USEPA Document Number: 822-R-16-004. May 2016.

USEPA. 2017a. *UCMR 3 (2013-2015) Occurrence Data by State. Occurrence Data for the Unregulated Contaminant Monitoring Rule.* Accessed 9 July 2019 at https://www.epa.gov/dwucmr/occurrence-data-unregulated-contaminant-monitoring-rule. January.

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

USFWS. 2021. *Species by County Report, County: Calcasieu, Louisiana.* Environmental Conservation Online System. Accessed 7 September 2021 at https://ecos.fws.gov/ecp/report/species-listings-by-current-range-county?fips=22019.

USGS. 2017. *Water Resources of Calcasieu Parish, Louisiana*. Fact Sheet 2016-3066. January.

Xiao, F., Simcik, M. F., Halbach, T. R., and Gulliver, J. S. 2015. *Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoate (PFOA) in Soils and Groundwater of a U.S. Metropolitan Area: Migration and Implications for Human Exposure.* Water Research 72: 64-74.