FINAL

SITE INSPECTION REPORT

PATRICK AIR FORCE BASE, FL

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas Environmental Programs Worldwide

Contract FA8903-16-D-0027
Task Order 0004

Prepared for:

Air Force Civil Engineer Center
JBSA Lackland, Texas

December 2017

Submitted by:

amec foster wheeler

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SITE INSPECTION REPORT

SITE INSPECTION OF AQUEOUS FILM FORMING FOAM (AFFF) RELEASE AREAS ENVIRONMENTAL PROGRAMS WORLDWIDE

PATRICK AIR FORCE BASE
BREVARD COUNTY, FLORIDA

Project No. RPMO20167118

Prepared for:
Air Force Civil Engineer Center
Joint Base San Antonio – Lackland, Texas

Prepared by:

Amec Foster Wheeler Environment & Infrastructure, Inc.

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ACRONYMS

AFB	Air Force Base
AFCEC	Air Force Civil Engineer Center
AFFF	Aqueous Film Forming Foam
Amec Foster Wheeler	Amec Foster Wheeler Environment & Infrastructure, Inc.
bgs	below ground surface
BRAC	Base Realignment and Closure
CCAFS	Cape Canaveral Air Force Station
CoC	Chain-of-Custody
DL	detection limit
DoD	Department of Defense
DPT	direct push technology
DQO	data quality objectives
ESMC	Eastern Space and Missile Center
FDEP	Florida Department of Environmental Protection
FTA	fire training area
FTS	fluorotelomer sulfonate
HA	Health Advisory
HDPE	high-density polyethylene
HGL	HydroGeoLogic
IDW	Investigation-Derived Waste
IRP	Installation Restoration Program
ISWP	Installation-Specific Work Plan
LC-MS-MS	Liquid Chromatography and Tandem Mass Spectrometry
LOQ	Limit of Quantification
µg/L	micrograms per liter
µg/kg	micrograms per kilogram
mg/kg	milligrams per kilogram
NEtFOSAA	N-Ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)
NFA	No Further Action
NMeFOSAA	N-Methyl perfluorooctanesulfonamidoacetic acid
PA	Preliminary Assessment
PFAS	per- and polyfluorinated alkyl substances
PFBS	perfluorobutanesulfonic acid

PFC	perfluorinated compound
PFDA	Perfluorodecanoic acid
PFDoA	Perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	Perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFTA	Perfluorotetradecanoic acid
PFTrDA	Perfluorotridecanoic acid
PFUnA	Perfluoroundecanoic acid
PPE	personal protective equipment
PVC	polyvinyl chloride
QPP	Quality Program Plan
RSL	Regional Screening Level
SI	Site Investigation
SIR	Site Investigation Report
SOP	Standard Operating Procedure
S.U.	Standard Unit
SWMU	Solid Waste Management Unit
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USEPA	United States Environmental Protection Agency

EXECUTIVE SUMMARY

This Site Inspection (SI) Report (SIR) was prepared by Amec Foster Wheeler Programs, Inc. and affiliate Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler) under Contract No. FA8903-16-D-0027, Task Order 0004, to document the results of SI activities conducted at three aqueous film forming foam (AFFF) release areas located at Patrick Air Force Base (AFB). The purpose of the SI was to determine, through environmental media sampling, if a release of per- and polyfluorinated alkyl substances (PFAS) has occurred at potential AFFF release areas identified during a Preliminary Assessment (PA) conducted by HydroGeologic Inc. (HGL) (2015), or from the installation scoping visit conducted by Amec Foster Wheeler on 15 November 2016. The data presented in this SIR were collected and evaluated in accordance with the Final Installation-Specific Work Plan (ISWP) (Amec Foster Wheeler, 2017a) and the General Quality Program Plan (QPP) (Amec Foster Wheeler, 2017b).

PFAS are a class of synthetic organofluorine compounds that possess a chemical structure that gives them unique properties, including thermal stability and the ability to repel both water and oil. These chemical properties make them useful components in a wide variety of consumer and industrial products, including non-stick cookware, food packaging, waterproof clothing, fabric stain protectors, lubricants, paints, and firefighting foams such as AFFF. AFFF concentrate contains fluorocarbon surfactants to meet required performance standards for fire extinguishing agents (Department of Defense [DoD] Military Specification MIL-F-24385F [SH], Amendment 1, 5 August 1984). The United States Air Force (USAF) began purchasing and using AFFF containing PFAS (perfluorooctanesulfonic acid [PFOS] and/or perfluorooctanoic acid [PFOA]) for extinguishing petroleum fires and during firefighting training activities in 1970. AFFF was primarily used on USAF installations at fire training areas (FTAs), but may have also been used, stored or released from hangar fire suppression systems, at firefighting equipment testing and maintenance areas, and during emergency response actions for fuel spills and/or aircraft mishaps.

The United States Environmental Protection Agency (USEPA) Office of Water issued lifetime drinking water Health Advisory (HA) values for PFOS and PFOA in May 2016 that replaced the 2009 Preliminary HA values. The HA values for PFOS and PFOA are 0.07 micrograms per liter (µg/L) for each constituent; however, when these two chemicals co-occur in a drinking water source, a conservative and health-protective approach is recommended that compares the sum of the concentrations (PFOS + PFOA) to the HA value (0.07 µg/L). HA values are not to be construed as legally enforceable federal standards and are subject to change as new information becomes available (USEPA, 2016a and 2016b). Although the USEPA has not established HA values for PFAS in soil, the USAF calculated a residential screening level of 1.26 milligrams per kilogram (mg/kg) for PFOS and PFOA in soil using the USEPA Regional Screening Level (RSL) calculator (https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search).

While PFOS and PFOA are the focus of the HA and provide specific targets for the USAF to address in the SI, USEPA has also derived RSL values for perfluorobutanesulfonic acid (PFBS) for which there is a Tier 2 toxicity value (Provisional Peer Review Toxicity Value) (USEPA, 2017a). Concentrations of PFBS detected in groundwater and soil were compared to the RSLs of 400 µg/L and 1,300 mg/kg, respectively.

Neither the USEPA nor the Florida Department of Environmental Protection (FDEP) have issued HA values or promulgated standards for any other PFAS constituents to date.

Patrick AFB is located along the east-central Florida coastline, between the communities of Satellite Beach and Cocoa Beach in Brevard County, Florida, and encompasses approximately 2,324 acres. The installation is located on a barrier island bordered by the Atlantic Ocean to the east and the Banana River to the west (HGL, 2015).

Patrick AFB was established in 1940 by the U.S. Navy as the Banana River Naval Air Station, and served as an active base for antisubmarine sea-patrol planes during World War II. The installation was deactivated in 1947, transferred to the USAF in 1948, and renamed Patrick AFB in 1950, in honor of Major General Mason M. Patrick, the Chief of the United States Army Air Service from 1921 to 1927. The USAF began development of the Eastern Test Range in 1950. From 1950 to present, the 45th Space Wing (45 SW), formerly the Eastern Space and Missile Center (ESMC), has been headquartered at Patrick AFB and is responsible for launch, test and support operations associated with the cruise missile program, ballistic missiles, the Apollo and Space Shuttle programs, and the Delta, Atlas, Titan, and other commercial launch programs (SpaceX, Athena, etc.) (45th Civil Engineer Squadron, Installation Management Flight, Environmental Conservation Element [45 CES/CEIE], 2015).

Patrick AFB is the center of administrative activities that support 45 SW Headquarters, Cape Canaveral Air Force Station (CCAFS) where space launch activities occur, and downrange tracking and support facilities at Jonathon Dickinson Missile Tracking Annex, Malabar Annex, and Ascension Island. The mission of Patrick AFB includes the responsibility of safety, planning, engineering, support services, scheduling, test operations, launch and range operation, directing or supporting operations, and test results evaluation for the 45 SW (45 CES/CEIE, 2015).

Nine AFFF release areas were recommended for SI at Patrick AFB based on research conducted during a PA by HGL (2015), and one additional AFFF release area was included during the installation scoping visit conducted by Amec Foster Wheeler on 15 November 2016. The following three AFFF release areas were included in this SI since they had not been previously investigated for PFAS:

- AFFF Release Area 1: Former FTA 2.
- AFFF Release Area 2: Fire Truck Rollover Area.
- AFFF Release Area 3: Northern Sewage Treatment Plant.

The following seven AFFF release areas were not included in this SI since PFAS were identified at concentrations above regulatory screening levels during a previous investigation (SES Construction and Fuel Services LLC [SCF], 2014):

- AFFF Release Area 4: Hangar 630.
- AFFF Release Area 5: Hangar 647.
- AFFF Release Area 6: Building 705 Pump House.
- AFFF Release Area 7: Hangar 750.

- AFFF Release Area 8: Fire Station, Building 810 (Solid Waste Management Unit [SWMU] P186, Installation Restoration Program [IRP] Site ID TA058).
- AFFF Release Area 9: Outfall 21 to Banana River.
- AFFF Release Area 10: Building 313, Former Plating Shop (SWMU P041, IRP Site ID OT030).

The specific objectives of the SI were as follows:

- Determine if PFAS are present in soil, groundwater, sediment, and/or surface water at AFFF release areas selected for SI or investigated previously by others;
- Determine if PFOS and PFOA concentrations in soil exceed the calculated RSL of 1.26 mg/kg, based on a residential exposure scenario, and PFBS concentrations in soil exceed the USEPA RSL of 1,300 mg/kg, based on a residential exposure scenario;
- Determine if concentrations of PFOS, PFOA, or the sum of PFOS and PFOA, in groundwater and surface water exceed the USEPA HA value of 0.07 µg /L, and if PFBS concentrations in groundwater exceed the USEPA Tap Water RSL of 400 µg/L;
- Determine if concentrations of PFOS or PFOA in sediment exceed the calculated RSL of 1.26 mg/kg, based on a residential exposure scenario; and,
- Identify potential receptor pathways with immediate impacts to human health (immediate impact to human health is considered consumption of drinking water with PFOS/PFOA above the USEPA HA value, or PFBS above the USEPA Tap Water RSL).

PFAS Analytical Results

Analytical results indicated the presence of PFAS in groundwater at Patrick AFB in excess of the applicable USEPA HA values. PFOS, PFOA, and/or PFOS+PFOA in groundwater exceeded the USEPA HA values at AFFF Release Areas 1 through 8 and 10. PFAS were detected in soil at AFFF Release Areas 1 through 8, but were below the RSL for PFOS, PFOA, and PFBS. PFAS were detected in sediment at AFFF Release Areas 4 and 9, but were below the calculated RSLs for PFOS and PFOA, based on a residential exposure scenario. PFAS concentrations in surface water at AFFF Release Area 9 exceeded the USEPA HA values for PFOS, PFOA, and PFOS+PFOA.

Potential human health pathways were identified during this SI. The potential receptors and targets vary by AFFF release area and are summarized below.

Surface and Subsurface Soil Receptors

The highest potential for exposure to PFAS from soil is to on-site workers, specifically those involved with excavation or drilling activities. PFOS, PFOA, and/or PFBS were detected in soil at AFFF Release Areas 1 through 8; however, all detections were below applicable RSLs, based on a residential exposure scenario.

Groundwater Receptors

PFAS in groundwater exceeded the USEPA HA value of 0.07 µg/L for PFOS, PFOA, and/or PFOS+PFOA at AFFF Release Areas 1 through 8 and 10. Human groundwater receptors via the ingestion pathway are not present for any AFFF release area at or downgradient of Patrick AFB since the installation utilizes drinking

water supplied by the City of Cocoa (HGL, 2015). In addition, human groundwater receptors via the ingestion pathway are not present downgradient of Patrick AFB since the primary groundwater exposure points downgradient of the installation are the Banana River to the west or the Atlantic Ocean to the east, which are not used as drinking water sources for the area. As a result, there is currently no potential receptor pathway with immediate impacts to human health at or downgradient of Patrick AFB.

Sediment Receptors

PFOS and PFOA were detected in sediments at concentrations below the calculated RSL from the drainage channel and Outfall 21 to Banana River (AFFF Release Area 9) during the previous site investigation by SCF (2014). Potential exposure receptors include USAF personnel, on-site workers, visitors, and trespassers that may come into contact with sediment within the drainage channel and at Outfall 21 to Banana River.

Surface Water Receptors

PFOS and PFOA were detected in surface water samples collected at the headwaters of the drainage channel and at Outfall 21 to the Banana River (AFFF Release Area 9) at concentrations exceeding the USEPA HA value of 0.07 µg/L during the previous site investigation by SCF (2014). However, the USEPA HA value for PFOS and PFOA is only applicable to drinking water sources, and the Banana River is not currently used as a drinking water source for Patrick AFB or the surrounding community. Potential exposure receptors include USAF personnel, on-site workers, visitors, and trespassers that may come into contact with surface water within the drainage channel and at Outfall 21 to the Banana River.

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1.0 INTRODUCTION

This Site Inspection (SI) Report (SIR) was prepared by Amec Foster Wheeler Programs, Inc. and affiliate Amec Foster Wheeler Environment & Infrastructure (Amec Foster Wheeler) under Contract No. FA8903-16-D-0027, Task Order 0004, to document the results of SI activities conducted at seven aqueous film forming foam (AFFF) release areas located at Patrick Air Force Base (AFB). The purpose of the SI was to determine, through environmental media sampling, if a release of per- and polyfluorinated alkyl substances (PFAS) has occurred at potential AFFF release areas identified by others during a Preliminary Assessment (PA) (HydroGeologic Inc. [HGL], 2015) or installation scoping visit conducted by Amec Foster Wheeler on 15 November 2016.

The data presented in this SIR were collected and evaluated in accordance with the Final Installation-Specific Work Plan (ISWP) (Amec Foster Wheeler, 2017a), and the General Quality Program Plan (QPP) (Amec Foster Wheeler, 2017b).

1.1 PER- AND POLY-FLUORINATED ALKYL SUBSTANCES OVERVIEW

PFAS are a class of synthetic organofluorine compounds that possess a chemical structure that gives them unique properties, including thermal stability and the ability to repel both water and oil. These chemical properties make them useful components in a wide variety of consumer and industrial products, including non-stick cookware, food packaging, waterproof clothing, fabric stain protectors, lubricants, paints, and firefighting foams such as AFFF. AFFF concentrate contains fluorocarbon surfactants to meet required performance standards for fire extinguishing agents (Department of Defense [DoD] Military Specification MIL-F-24385F [SH], Amendment 1, 5 August 1984). The United States Air Force (USAF) began purchasing and using AFFF containing PFAS (perfluorooctanesulfonic acid [PFOS] and/or perfluorooctanoic acid [PFOA]) for extinguishing petroleum fires and during firefighting training activities in 1970, as confirmed by the following federal government documents:

- Military Specification for AFFF (MIL-F-24385), formally issued in 1969;
- General Accounting Office determination on sole source award protest to provide AFFF to the Navy in December 1969; and,
- *A History of USAF Fire Protection Training at Chanute Air Force Base*, 1964-1976 (Coates, 1977).

AFFF was primarily used on USAF installations at fire training areas (FTAs), but may have also been used, stored or released from hangar fire suppression systems, at firefighting equipment testing and maintenance areas, and during emergency response actions for fuel spills and/or aircraft mishaps.

The United States Environmental Protection Agency (USEPA) Office of Water issued lifetime drinking water Health Advisory (HA) values for PFOS and PFOA in May 2016 that replaced the 2009 Preliminary HA values. The HA values for PFOS and PFOA are 0.07 micrograms per liter (µg/L) for each constituent; however, when these two chemicals co-occur in a drinking water source, a conservative and health-protective approach is recommended that compares the sum of the concentrations (PFOS + PFOA) to the HA value (0.07 µg/L). The HA values are non-regulatory concentrations of drinking water contaminants

at or below which adverse health effects are not anticipated to occur over specific exposure durations (e.g., 1 day, 10 days, and a lifetime). They serve as informal technical guidance to assist federal, state, and local officials, and managers of public or community water systems in protecting public health when emergency spills or other contamination situations occur. A HA document provides information on the environmental properties, health effects, analytical methodology, and treatment technologies for removing drinking water contaminants. HA values are not to be construed as legally enforceable federal standards and are subject to change as new information becomes available (USEPA, 2016a and 2016b).

The USEPA has not published Regional Screening Levels (RSLs) for PFOS or PFOA for soil or sediment; however; for this project, a screening level of 1.26 milligrams per kilogram (mg/kg) for soil and sediment was calculated using the USEPA RSL calculator (https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search). The toxicity value input for the calculator is the Tier 3 value reference dose of 0.00002 mg/kg per day derived by the USEPA in their Drinking Water HA values for both PFOS and PFOA (USEPA, 2016a and 2016b).

While PFOS and PFOA are the focus of the HA and provide specific targets for the USAF to address in the SI, USEPA has also derived RSL values for perfluorobutanesulfonic acid (PFBS) for which there is a Tier 2 toxicity value (Provisional Peer Review Toxicity Value) (USEPA, 2017a). PFBS concentrations detected in groundwater and soil were compared to the RSLs of 400 µg/L and 1,300 mg/kg, respectively.

Table 1.1-1 below presents the screening values for comparing analytical results for PFOS, PFOA, and PFBS. Neither the USEPA nor the Florida Department of Environmental Protection (FDEP) have issued HA values or promulgated standards for any other PFAS constituents to date.

Table 1.1-1. Regulatory Screening Values.

Parameter	Chemical Abstract Number	USEPA Regional Screening Level Table (June 2017)[a]		Calculated RSL for Soils and Sediments[b] (µg/kg)	USEPA Health Advisory for Drinking Water (Surface Water or Groundwater) (µg/L)[c]
		Residential Soil (µg/kg)	Tap Water (µg/L)		
PFOS	1763-23-1	NL	NL	1,260	0.07[d]
PFOA	335-67-1	NL	NL	1,260	
PFBS	375-73-5	1.3E+6	400	NL	NL

Notes:

a USEPA Regional Screening Levels (June, 2017a) [https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-june-2017].

b Screening levels, based on residential exposure, calculated using the USEPA Regional Screening Level calculator (https://epa-prgs.ornl.gov/cgi-bin/ chemicals/csl_search).

c USEPA, May 2016a. "Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)" and USEPA, May 2016b. "Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA)."

d When both PFOA and PFOS are both present, the combined concentrations of PFOA and PFOS should be compared with the 0.07 µg/L health advisory level.

µg/kg - micrograms per kilogram
µg/L - micrograms per liter
NL - not listed
PFBS - perfluorobutanesulfonic acid
PFOA - perfluorooctanoic acid
PFOS - perfluorooctanesulfonic acid
RSL - Regional Screening Level
USEPA - United States Environmental Protection Agency

1.2 PROJECT OBJECTIVES

In accordance with DoD Instruction 4715.18, "Emerging Contaminants (ECs)" (DoD, 2009), the *Interim AF Guidance on Sampling and Response Actions for Perfluorinated Compounds at Active and Base Realignment and Closure (BRAC) Installations* (USAF, 2012), and the *SAF/IE Policy on Perfluorinated Compounds of Concern* (USAF, 2016) the USAF will:

1) Identify locations where there is a reasonable expectation that there may have been a release of PFAS (defined below) associated with USAF actions;
2) Determine if there is unacceptable risk to human health and the environment; and,
3) Address releases that pose an unacceptable risk, including offsite migration.

The primary objectives of this SI were to:

- Determine if PFOS, PFOA, or PFBS are present in soil, groundwater, sediment, and/or surface water at AFFF release areas selected for SI or investigated previously by others;
- Determine if PFOS and PFOA concentrations in soil exceed the calculated RSL of 1.26 mg/kg, based on a residential exposure scenario, and if PFBS concentrations in soil exceed the USEPA RSL of 1,300 mg/kg, based on a residential exposure scenario;
- Determine if PFOS, PFOA, or sum of PFOS and PFOA concentrations in groundwater and surface water exceed the USEPA HA value of 0.07 µg/L, and if PFBS concentrations in groundwater exceed the USEPA Tap Water RSL of 400 µg/L;
- Determine if concentrations of PFOS or PFOA in sediment exceed the calculated RSL of 1.26 mg/kg; and,
- Identify potential receptor pathways with immediate impacts to human health (immediate impact to human health is considered consumption of drinking water with PFOS/PFOA above the USEPA HA value, or PFBS above the USEPA Tap Water RSL).

1.3 PROJECT SCOPE

Nine AFFF release areas were recommended for SI at Patrick AFB based on research conducted during a PA by HGL (2015), and one additional AFFF release area was included during the installation scoping visit conducted by Amec Foster Wheeler on 15 November 2016. The following three AFFF release areas were included in this SI since they had not been previously investigated for PFAS:

- AFFF Release Area 1: Former FTA 2.
- AFFF Release Area 2: Fire Truck Rollover Area.
- AFFF Release Area 3: Northern Sewage Treatment Plant.

The following seven AFFF release areas were not included in this SI since PFAS was identified at concentrations above regulatory screening levels during a previous investigation (SES Construction and Fuel Services LLC [SCF], 2014):

- AFFF Release Area 4: Hangar 630.
- AFFF Release Area 5: Hangar 647.
- AFFF Release Area 6: Building 705 Pump House.
- AFFF Release Area 7: Hangar 750.
- AFFF Release Area 8: Fire Station, Building 810 (Solid Waste Management Unit [SWMU] P186, Installation Restoration Program [IRP] Site ID TA058).
- AFFF Release Area 9: Outfall 21 to Banana River.
- AFFF Release Area 10: Building 313, Former Plating Shop (SWMU P041, IRP Site ID OT030).

Media evaluated at each area included surface and subsurface (vadose zone) soil and groundwater collected from temporary and existing monitoring wells at AFFF Release Areas 1 through 3. Surface and subsurface (vadose zone) soil, groundwater, sediment, and surface water analytical data were also evaluated from AFFF Release Areas 4 through 10, as reported in the site investigation by SCF (2014).

This SIR discusses and provides a comparison of the analytical results to screening values for PFOS, PFOA, and PFBS in soil, groundwater, sediment, and surface water. The remaining PFAS do not have screening values. As a result, only the results of PFOS, PFOA, and PFBS from AFFF Release Areas 1 through 3 are discussed in detail and presented in figures in the SIR; however, all data are presented in the soil, groundwater, sediment, and surface water analytical tables. Figures and tables from the previous site investigation report completed by SCF (2014) are included as an appendix in this SIR that document the detected PFAS results from AFFF Release Areas 4 through 10.

2.0 AFFF RELEASE AREA BACKGROUND

2.1 SITE LOCATION AND SETTING

Patrick AFB is located along the east-central Florida coastline, between the communities of Satellite Beach and Cocoa Beach in Brevard County, Florida, and encompasses approximately 2,324 acres (**Figure 2.1.1**). The installation is located on a barrier island bordered by the Atlantic Ocean to the east and the Banana River to the west (HGL, 2015).

2.2 SITE HISTORY

Patrick AFB was established in 1940 by the U.S. Navy as the Banana River Naval Air Station, and served as an active base for antisubmarine sea-patrol planes during World War II. The installation was deactivated in 1947, transferred to the USAF in 1948, and renamed Patrick AFB in 1950, in honor of Major General Mason M. Patrick, the Chief of the United States Army Air Service from 1921 to 1927. The USAF began development of the Eastern Test Range in 1950. From 1950 to present, the 45th Space Wing (45 SW), formerly the Eastern Space and Missile Center (ESMC), has been headquartered at Patrick AFB and is responsible for launch, test and support operations associated with the cruise missile program, ballistic missiles, the Apollo and Space Shuttle programs, and the Delta, Atlas, Titan, and other commercial launch programs (SpaceX, Athena, etc.) (45th Civil Engineer Squadron, Installation Management Flight, Environmental Conservation Element [45 CES/CEIE], 2015).

Patrick AFB is the center of administrative activities that support 45 SW Headquarters, Cape Canaveral Air Force Station (CCAFS) where space launch activities occur, and downrange tracking and support facilities at Jonathon Dickinson Missile Tracking Annex, Malabar Annex, and Ascension Island. Major tenants at Patrick AFB include: Air Force Reserve Command (920th Rescue Wing); 301st, 39th, and 308th Rescue Squadrons; 17th Test Squadron, Detachment 3; Air Combat Command Program Project Management Squadron/QA; Air Force Office of Special Investigations (8th Field Investigative Region, Detachment 802); United States Army Corps of Engineers; Defense Equal Opportunity Management Institute; Department of State/Air Wing; Air Force Technical Applications Center; National Geospatial Intelligence Agency; Joint Stars Joint Test Force; and, the Florida Air National Guard - 114th Combat Communications. The 920th Rescue Wing is the primary user of the Patrick AFB airfield. The mission of Patrick AFB includes the responsibility of safety, planning, engineering, support services, scheduling, test operations, launch and range operation, directing or supporting operations, and test results evaluation for the 45 SW (45 CES/CEIE, 2015).

2.3 PREVIOUS INVESTIGATIONS

HGL was contracted by the Air Force Civil Engineer Center (AFCEC) to prepare a PA of FTA and non-FTA sites at Patrick AFB to identify locations where PFAS may have been used and released into the environment, and to provide an initial assessment of possible migration pathways and receptors of potential contamination (HGL, 2015). Fifteen potential AFFF release areas were identified during the PA research, with the following nine potential AFFF release areas recommended for SI (**Figure 2.3-1**):

1) Former FTA 2: Fire training exercises were performed in two burn pits potentially using an unknown amount of AFFF. Burn Pit 1 was unlined and was used for fire training activities from 1970 to 1985, while Burn Pit 2 was concrete-lined and used for fire training activities from 1985 to 2001, with AFFF potentially released outside the concrete-lined area.
2) Fire Truck Rollover Area: A fire truck rolled over in 1997 when turning from Taxiway E onto Taxiway B and released an unknown quantity of AFFF onto the taxiway and surrounding grass.
3) Northern Sewage Treatment Plant: This facility received wastewater, potentially containing AFFF, from releases at various hangars and buildings from 1968 to 1995. An unknown amount of AFFF was observed at the plant in 1994 that discharged onto the surrounding grounds.
4) Hangar 630: The hangar AFFF fire suppression system was activated in 1999 and 2004, and AFFF discharged onto grassy areas and into storm sewer inlets north and south of the hangar.
5) Hangar 647: The hangar AFFF fire suppression system was activated during a hurricane in 2004, and AFFF discharged onto a grassy area and into storm sewer inlets north of the hangar.
6) Building 705 Pump House: Approximately 800 to 1,000 gallons of AFFF were released from leaks in underground piping to Hangars 750 and 751 from 2007 to 2011.
7) Hangar 750: AFFF from system activations was contained by a 30,000-gallon Underground Storage Collection Tank located south of the hangar, and periodically pumped out onto the adjacent grassy areas.
8) Fire Station, Building 810 (SWMU P186, IRP Site ID TA058): Daily operational checks and periodic flushing of hoses with AFFF occurred at the 800 airfield ramp and in adjacent grassy areas surrounding the building.
9) Outfall 21 to Banana River: AFFF releases from Hangars 630 and 647 drained into the storm sewer inlets and discharged through Outfall 21 into a drainage canal that led to the Banana River.

Building 313, Former Plating Shop (SWMU P041, IRP Site ID OT030; **Figure 2.3-1**), was omitted from the PA; however, it was determined during a 2009 USEPA-Region 5 PFOS chromium receptor study that PFOS-containing compounds were sometimes used for mist suppression during the plating process (SCF, 2014). As such, this potential AFFF release area was also recommended for SI.

As referenced in the PA (HGL, 2015), SCF previously conducted a site investigation of firefighting foam (AFFF) usage at Patrick AFB to determine the presence or absence of PFAS at select sites and whether further investigation is required based on the presence of PFAS and their relative concentrations (SFC, 2014). Surface and subsurface soil, groundwater, sediment, and/or surface water samples were collected from seven areas where AFFF may have been potentially released. These seven AFFF release previously investigated are listed below, along with a description of the sampled media that contained PFAS concentrations in excess of the current regulatory screening values. Since PFOS and/or PFOA in groundwater were detected at these areas above criteria, these areas were not proposed for further action under this SI. Pertinent data tables and figures from the SCF site investigation report are provided in Appendix A.

- Hangar 630: PFOS concentrations in groundwater exceeded the current USEPA HA value.
- Hangar 647: PFOS and PFOA concentrations in groundwater exceeded the current USEPA HA value.
- Building 705 Pump House: PFOS and PFOA concentrations in groundwater exceeded the current USEPA HA value.
- Hangar 750: PFOS and PFOA concentrations in groundwater exceeded the current USEPA HA value.
- Building 313, Former Plating Shop: PFOS concentrations in groundwater exceeded the current USEPA HA value.
- Fire Station, Building 810: PFOS and PFOA concentrations in groundwater exceeded the current USEPA HA value.
- Outfall to Banana River: PFOS and PFOA concentrations in surface water exceeded the current USEPA HA value for surface water used as drinking water; however, surface water at the installation is not used as a drinking water source.

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3.0 FIELD ACTIVITIES AND ANALYTICAL PROTOCOL

SI activities were conducted at Patrick AFB from 22 to 25 May 2017 at the three AFFF release areas identified during the PA (HGL, 2015), but not previously investigated by others (**Figure 3.0-1**). Sample locations were determined following discussions between Amec Foster Wheeler, Patrick AFB, and AFCEC personnel, and were documented in the Final ISWP (Amec Foster Wheeler, 2017a). Media sampled during the SI included surface soil, subsurface soil, and groundwater collected from temporary and permanent (existing) monitoring wells.

Photographic documentation of the SI activities is provided in **Appendix B** and field documentation is provided in **Appendix C**. Inspection activities were recorded by field personnel on field activity daily logs (**Appendix C-1**), and daily PFAS protocol checklists were completed to ensure PFAS were not introduced by Amec Foster Wheeler employees or subcontractors (**Appendix C-2**). A tailgate safety meeting was conducted each morning prior to beginning work, with the tailgate safety meeting reports provided in **Appendix C-3**.

Soil Boring Advancement and Soil Sample Collection

Ten soil borings were advanced for the collection of soil samples and temporary monitoring well installation, while an eleventh boring was advanced for temporary monitoring well installation, by a Florida-licensed driller, Amdrill, Inc. of Brooksville, Florida. Soil borings were initially cleared to a depth of five feet below ground surface (bgs) with a hand auger and completed using direct push technology (DPT) drilling methods. Soil samples were continuously collected from ground surface to first-encountered groundwater using a hand auger and decontaminated 5-foot Macro-Core® samplers with acetate liners, in accordance with Standard Operating Procedure (SOP) AFW-02 (PFAS)–*Soil Sampling* and DEP-SOP-001/01, FS 3000, Soil. The samples were also field-screened with a photoionization detector equipped with a 10.6 electron volt lamp for volatile organic vapors, and logged by a qualified geoscientist in accordance with the Unified Soil Classification System. The resulting soil boring information, photoionization detector readings, lithologic data, and soil sample locations are included on soil boring/monitoring well records provided in **Appendix C-4**, while the soil sample data (sample ID numbers, date/time collected, and depths) are included on soil sample collection logs in **Appendix C-5**. Cross-sections illustrating lithologic data are presented on **Figures 3.0-2 and 3.0-3**.

Samples for laboratory analysis were extracted from the hand auger bucket or acetate liners with a decontaminated stainless steel spoon and transferred directly into laboratory-provided high-density polyethylene (HDPE) containers. Sample containers were sealed, labeled, packed into ice-filled coolers, and delivered under chain-of-custody (CoC) to SGS Accutest in Orlando, Florida for PFAS analysis or CT Laboratories in Baraboo, Wisconsin for physiochemical properties analysis.

Monitoring Well Installation and Development

Eleven temporary monitoring wells were installed during the SI through 3.75-inch outside-diameter rods using DPT. Monitoring well construction was based on observed depth to water at the time of drilling and

geologic conditions encountered. All new monitoring wells were constructed in accordance with the ISWP, SOP AFW-04 (PFAS)-*Monitoring Well Installation*, and the FDEP's Monitoring Well Design and Construction Guidance Manual (FDEP, 2008), to effectively bracket the water table. The temporary monitoring wells were constructed of two-inch-diameter, Schedule 40 polyvinyl chloride (PVC) casing and a threaded 10-foot section of 0.010-inch slotted two-inch-diameter Schedule 40 PVC pre-pack well screen wrapped with a stainless steel wire mesh containing a 0.25-inch-thick filter pack and end cap. Well construction details for the 11 temporary monitoring wells are provided on well construction forms in **Appendix C-6**, while **Table 3.0-1** provides a summary of the well construction details for the temporary monitoring wells.

The monitoring wells were developed with a peristaltic pump outfitted with disposable HDPE tubing, in accordance with SOP AFW-05 (PFAS)–*Well Development* and the FDEP's Monitoring Well Design and Construction Guidance Manual (FDEP, 2008). Water quality parameters (pH, specific conductance, temperature, oxidation-reduction potential [ORP], dissolved oxygen [DO], and turbidity) of the development water were measured with water quality meters and recorded on Well Development Logs (**Appendix C-7**). A minimum of three saturated casing volumes of water were purged from each new well during development, and continued until the field water quality parameters stabilized. The aforementioned instrumentation was field calibrated as per DEP-SOP-001/01, FT 1000, General Field Testing and Measurement, and the results included on water quality sampling instrument calibration forms (**Appendix C-8**).

Groundwater Elevations

Depth to water measurements were recorded from each temporary and permanent monitoring well prior to groundwater purging and sampling, and groundwater elevations were calculated relative to top-of-casing elevations surveyed by a professionally licensed Florida surveyor. Depth to groundwater ranged from 4.28 to 7.65 feet below top of casing, and the calculated groundwater elevations ranged from -0.93 to 1.01 feet above mean sea level, in May 2017 (**Table 3.0-2**). Groundwater flow was generally to the west-northwest towards the Banana River in the central and western portions of the installation (near AFFF Release Areas 1 and 3, and the western portion of AFFF Release Area 2) at an average hydraulic gradient of 0.0004 feet/feet. However, groundwater flow is to the southeast towards the Atlantic Ocean in the southeastern portion of the installation (the eastern portion of AFFF Release Area 2) at an average hydraulic gradient of 0.01 feet/feet (**Figure 3.0-4**)**.**

Groundwater Sampling

The groundwater sampling program included the collection of groundwater samples for laboratory chemical analysis of PFAS from 11 new temporary monitoring wells and one existing permanent monitoring well. Samples were collected using low-flow groundwater sampling methods with a peristaltic pump. The HDPE tubing was connected to a flow-through cell whereby recovered groundwater was monitored for pH, temperature, specific conductivity, DO, and ORP. Turbidity was measured with a

separate turbidity meter. Groundwater sampling equipment was calibrated on a daily basis prior to use, with the resulting data recorded on water quality sampling instrument calibration forms contained in **Appendix C-8**. Depth to water measurements and field parameters were monitored until groundwater indicator parameters reached stabilization criteria in accordance with SOP AFW-03 (PFAS)-*Groundwater Sampling* and DEP-SOP-001/01, FS 2200, Groundwater Sampling. The flow-through cell was then removed and groundwater samples were collected directly into laboratory-provided HDPE containers from the discharge tubing. The sample containers were sealed, labeled, packed on ice in an insulated cooler, and delivered to SGS Accutest under CoC protocol. Groundwater sampling activities were documented on groundwater sampling records provided in **Appendix C-9**.

Soil Boring Abandonment

The casings and screens from the 11 temporary monitoring wells were initially removed from the ground subsequent to groundwater sampling, steam cleaned, and disposed of in a dumpster at the installation. The 11 temporary monitoring well boreholes were abandoned with neat Portland cement on 24 and 25 May 2017 as per SOP AFW-06 (PFAS), *Borehole Abandonment*, the St. John's River Water Management District, Chapter 40C-3, Florida Administrative Code, and the FDEP's Monitoring Well Design and Construction Guidance Manual (FDEP, 2008).

Total Sample Counts

The following total sample counts for each media (including field duplicate samples) during SI initial and follow-on SI activities at Patrick AFB are listed below:

- 27 soil samples were collected at 10 soil boring locations during the SI; and,
- 16 groundwater samples were collected from 11 temporary monitoring wells and one existing monitoring well during the SI.

Samples collected during the SI were analyzed for the following 16 PFAS compounds:

- PFOS;
- PFOA;
- PFBS;
- Perfluoroheptanoic acid (PFHpA);
- Perfluorohexanesulfonic acid (PFHxS);
- Perfluorononanoic acid (PFNA);
- N-Ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA);
- N-Methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA);
- Perfluorodecanoic acid (PFDA);
- Perfluorotetradecanoic acid (PFTA);
- Perfluorododecanoic acid (PFDoA);
- Perfluorohexanoic acid (PFHxA);

- Perfluorotridecanoic acid (PFTrDA);
- Perfluoroundecanoic acid (PFUnA);
- 6:2 fluorotelomer sulfonate (FTS); and,
- 8:2 FTS.

Soil and groundwater samples were analyzed by SGS Accutest in Orlando, Florida, a DoD Environmental Laboratory Accreditation Program accredited laboratory. Samples were analyzed by Modified USEPA Method 537 using Liquid Chromatography and Tandem Mass Spectrometry (LC-MS-MS). The LC-MS-MS method provides acceptable detection limits to confirm the presence of PFAS listed above. The laboratory analytical reports for the PFAS samples collected during the SI are included in **Appendix D**.

Analytical results for PFOS, PFOA, and PFBS are discussed in the following sections, while the analytical results for the remaining PFAS constituents are provided in tables at the conclusion of this SIR.

Co-occurrence of PFOS and PFOA (PFOS+PFOA) in aqueous samples was reported using the following guidelines:

1. If PFOS and PFOA are both detected in concentrations at or above the laboratory detection limit (DL) in groundwater, then the reported concentration for PFOA was added to the reported concentration for PFOS.
2. If only PFOS or only PFOA is detected at or above the DL in groundwater, then the concentration of the detected analyte only is reported.
3. If neither PFOA nor PFOS are detected at concentrations at or above the DL, then co-occurrence was reported as *Not Detected*.

One composite surface soil sample and one composite subsurface soil sample were also collected at each AFFF release area and submitted to CT Laboratories in Baraboo, Wisconsin for laboratory analysis of physiochemical properties, including soil pH (USEPA Method 9045B), particle size analysis (ASTM International [ASTM] D422), and total organic carbon (TOC) content (Lloyd Kahn 9060A Method). The particle size analysis was subcontracted to Mi-Tech Services, Inc. in Weston, Wisconsin. The laboratory analytical reports for the physiochemical properties samples collected during the SI are included in **Appendix D**.

Data Validation and Usability Assessment

Laboratory analytical data from soil and groundwater samples analyzed for PFAS were validated in June 2017. Amec Foster Wheeler evaluated a total of 576 data records from field samples during the validation process and J or UJ qualified 133 records (23%) as estimated values because of field duplicate imprecision, low LCS recoveries, high or low surrogate recoveries, and/or analyte concentrations between the DL and the Limit of Quantification (LOQ). During validation, Amec Foster Wheeler J qualified two PFBS results and one PFOA result as estimated concentrations because the concentrations were between the DL and the LOQ. All of these results were at least one order of magnitude lower than the applicable screening

criteria of PFBS (400 µg/L) and PFOA (0.07 µg/L), and the uncertainty in the analytical results is not interpreted to adversely affect overall data usability. Amec Foster Wheeler also J qualified four PFOS results as being estimated concentrations because of high surrogate recoveries and/or field duplicate imprecision. All of these results are at least one order of magnitude greater than the screening criteria of 0.07 µg/L. The analytical uncertainty due to the potential high bias and/or imprecision is insufficient to indicate that the reported results are not representative of true screening criteria exceedances. All PFOA, PFOS, and PFBS results from soil samples that were qualified during validation were orders of magnitude lower than their respective screening criteria, and uncertainty in the analytical results is not interpreted to affect overall data usability. For the AFFF release areas sampled in this SI, the decision to advance each of the areas for further investigation was based on non-qualified data. A description of the data validation scope, procedures, observations and actions is presented in the Data Validation Reports provided in Appendix D.

Surveying

Soil borings, temporary monitoring wells, and existing permanent monitoring well were surveyed by a Florida Licensed Professional Surveyor (Amec Foster Wheeler, Orlando, Florida) for horizontal coordinates and groundwater surface and/or top-of-casing elevations (**Table 3.0-1**). Horizontal coordinates were surveyed based on Florida State Plane Coordinate System, East Zone, United States Survey Feet, North American Datum of 1983. Groundwater surface and top-of-casing elevations were collected based on North American Vertical Datum of 1988.

Investigation-Derived Waste

Investigation-Derived Waste (IDW) consisted of soil cuttings from soil boring advancement, well development water, groundwater sampling purge water, equipment decontamination water, disposable personal protective equipment (PPE), and other miscellaneous refuse. Used PPE and other miscellaneous refuse was placed in plastic bags and discarded into an on-site sanitary trash container for disposal at a sanitary landfill. Soil and liquid IDW was containerized in Department of Transportation-approved 55-gallon steel drums. Composite grab samples were collected on 25 May 2017 from the one drum of soil IDW and seven drums of liquid IDW generated during the SI. The samples were laboratory analyzed by SGS Accutest in Orlando, Florida for laboratory analysis of PFAS, volatile organic compounds, semi-volatile organic compounds, pesticides, herbicides, and metals, polychlorinated biphenyls, total petroleum hydrocarbons (gasoline range organics and diesel range organics), flashpoint, pH, sulfide, and cyanide, to determine the applicable disposal options (**Appendix D**). The eight drums of IDW were transported from the installation by Evergreen Waste LLC on 20 October 2017 for incineration at the Covanta Environmental Solutions facility in Augusta, Georgia. The non-hazardous waste manifest for the one drum of solid IDW and seven drums of liquid IDW are found in **Appendix F**.

A detailed description of sampling locations and results at each AFFF release area is provided in the following sections.

3.1 AFFF RELEASE AREA 1: FORMER FTA 2

Fire training exercises were performed in two burn pits potentially using an unknown amount of AFFF. Burn Pit 1 was unlined and was used for fire training activities from 1970 to 1985, while Burn Pit 2 was concrete-lined and used for fire training activities from 1985 to 2001, with AFFF potentially released outside the concrete-lined area (HGL, 2015).

3.1.1 Sample Location and Methodologies

3.1.1.1 Soil Samples

Soil borings MW01001, MW01002, and MW01003 were advanced at the former location of Burn Pit 1 and soil borings MW01004, MW01005, and MW01006 were advanced around the concrete-lined former Burn Pit 2 on 23 and 24 May 2017 (**Figure 3.1-1**). Surface soil samples were collected from soil borings MW01001, MW01002, MW01004, MW01005, and MW01006 at 0 to 0.5 feet bgs, and subsurface soil samples were collected at 2 to 3 feet bgs, for PFAS analysis. Composite soil samples were collected from all soil borings at 0 to 1 foot bgs and 2 to 3 feet bgs for TOC, pH, and particle size analysis. Groundwater was encountered at approximately 4 to 5 feet bgs during boring advancement.

3.1.1.2 Groundwater Samples MW01003

Temporary monitoring wells were installed in soil borings MW01001, MW01002, MW01003, MW01004, MW01005, and MW01006 on 23 and 24 May 2017 to assess PFAS concentrations at the former burn pits (**Figure 3.1-1**). The temporary monitoring wells were developed on 23 and 24 May 2017 and sampled on 25 May 2017.Analytical Results

3.1.2.1 Soil Results

Five surface soil samples and five subsurface soil samples were collected from borings MW01001, MW01002, MW01004, MW01005, and MW01006 on 23 and 24 May 2017. PFAS results are provided in **Table 3.1-1**, illustrated on **Figure 3.1-2**, and summarized below.

MW01001:

- PFOS was detected below the RSL at the two sampling intervals at a maximum concentration of 0.474 mg/kg (0 to 0.5 feet bgs).
- PFOA was detected below the RSL at the two sampling intervals at a maximum concentration of 0.0239 mg/kg (2 to 3 feet bgs).
- PFBS was detected below the RSL at the two sampling intervals at an approximate maximum concentration of 0.00126 mg/kg (2 to 3 feet bgs).

MW01002:

- PFOS was detected below the RSL at the two sampling intervals at a maximum concentration of 0.292 mg/kg (2 to 3 foot bgs).

- PFOA was detected below the RSL at the two sampling intervals at a maximum concentration of 0.00487 mg/kg (2 to 3 foot bgs).
- PFBS was not detected at either interval.

MW01004:

- PFOS was detected below the RSL at the two sampling intervals at an approximate maximum concentration of 0.115 mg/kg (2 to 3 foot bgs).
- PFOA was not detected at either interval.
- PFBS was not detected at either interval.

MW01005:

- PFOS was detected below the RSL at the two sampling intervals at a maximum concentration of 0.344 mg/kg (0 to 0.5 foot bgs).
- PFOA was detected below the RSL at the two sampling intervals at a maximum concentration of 0.0294 mg/kg (2 to 3 foot bgs).
- PFBS was detected below the RSL at the two sampling intervals at a maximum concentration of 0.004 mg/kg (0 to 0.5 foot bgs).

MW01006:

- PFOS was detected below the RSL at the two sampling intervals at a maximum concentration of 1.18 mg/kg (0 to 0.5 foot bgs).
- PFOA was detected below the RSL at the two sampling intervals at a maximum concentration of 0.0233 mg/kg (2 to 3 foot bgs).
- PFBS was detected below the RSL at the two sampling intervals at a maximum concentration of 0.00463 mg/kg (0 to 0.5 foot bgs).

The composite TOC concentrations ranged from 6,610 mg/kg (0 to 1 foot bgs) to 10,100 mg/kg (2 to 3 feet bgs), while the composite pH concentrations ranged from 8.13 Standard Unit (S.U.) (2 to 3 feet bgs) to 8.53 S.U. (0 to 1 foot bgs) (**Table 3.1-2**). The particle size analytical results for the 0 to 1 foot bgs sample was 5.7% fines (silt and clay), 88.7% sand (fine to coarse), and 5.6% gravel (fine), while the 2 to 3 feet bgs sample was 4.5% fines (silt and clay), 86.2% sand (fine to coarse), and 9.3% gravel (fine to coarse). The material description for the 0 to 1 foot bgs sample was a pale brown, poorly graded fine to medium sand, while the 2 to 3 feet bgs sample was described as light brownish gray silty sand.

3.1.2.2 Groundwater Results

Seven groundwater samples (six normal and one field duplicate) were collected from temporary monitoring wells MW01001, MW01002, MW01003, MW01004, MW01005, and MW01006. PFAS results are provided in **Table 3.1-3**, illustrated in **Figure 3.1-3,** and summarized below.

MW01001:

- PFOS was detected above the USEPA HA value at a concentration of 0.195 µg/L.
- PFOA was detected below the USEPA HA value at a concentration of 0.0311 µg/L.
- PFOS+PFOA was detected above the USEPA HA value at a concentration of 0.2261 µg/L.
- PFBS was detected below the USEPA Tap Water RSL at a concentration of 0.0245 µg/L.

MW01002:

- PFOS was detected above the USEPA HA value at a concentration of 0.926 µg/L.
- PFOA was detected above the USEPA HA value at a concentration of 0.0817 µg/L.
- PFOS+PFOA was detected above the USEPA HA value at a concentration of 1.0077 µg/L.
- PFBS was detected below the USEPA Tap Water RSL at a concentration of 0.0376 µg/L.

MW01003:

- PFOS was detected above the USEPA HA value at a concentration of 1.32 µg/L.
- PFOA was detected above USEPA HA value at a concentration of 0.236 µg/L.
- PFOS+PFOA was detected above USEPA HA value at a concentration of 1.556 µg/L.
- PFBS was below the USEPA Tap Water RSL at a concentration of 0.064 µg/L.

MW01004:

- PFOS was detected above the USEPA HA value at a concentration of 152 µg/L.
- PFOA was detected above the USEPA HA value at a concentration of 6.06 µg/L.
- PFOS+PFOA was detected above the USEPA HA value at a concentration of 158.06 µg/L.
- PFBS was not detected.

MW01005:

- PFOS was detected above the USEPA HA value at a concentration of 11.9 µg/L.
- PFOA was detected above USEPA HA value at a concentration of 0.0768 µg/L.
- PFOS+PFOA was detected above USEPA HA value at a concentration of 11.9768 µg/L.
- PFBS was below the USEPA Tap Water RSL at a concentration of 0.0342 µg/L.

MW01006:

- PFOS was detected above the USEPA HA value at a concentration of 159 µg/L.
- PFOA was detected above USEPA HA value at a concentration of 4.99 µg/L.
- PFOS+PFOA was detected above USEPA HA value at a concentration of 163.99 µg/L.
- PFBS was below the USEPA Tap Water RSL at an approximate concentration of 2.37 µg/L.

3.1.2 Conclusions

PFOS, PFOA, and PFBS were detected in soil at AFFF Release Area 1 at concentrations below the USEPA RSLs. The highest concentrations of PFAS constituents were identified in surface soils at MW01006,

located on the south side of Burn Pit 2. PFOS and PFOS+PFOA concentrations exceeded the USEPA HA values in each temporary monitoring well, while PFOA concentrations exceeded the USEPA HA value at locations MW01002 through MW01006. PFBS was detected at concentrations below the USEPA Tap Water RSL from temporary monitoring wells MW01001, MW01002, MW01003, MW01005, and MW01006, and was not detected at MW01004.

3.2 AFFF RELEASE AREA 2: FIRE TRUCK ROLLOVER AREA

AFFF Release Area 2 is the location where a fire truck rolled over in 1997 when turning from Taxiway E onto Taxiway B and released an unknown quantity of AFFF onto the taxiway and surrounding grass.

3.2.1 Sample Location and Methodologies

3.2.1.1 Soil Samples

Three soil borings (MW02001, MW02002 and MW02003) were advanced northwest, southwest, and southeast, respectively, of the intersection of Taxiways B and E on 23 May 2017 (**Figure 3.2-1**). Surface soil samples were collected from 0 to 0.5 feet bgs and subsurface soil samples were collected from 2 to 3 feet bgs for PFAS analysis. Composite soil samples were also collected from each soil boring from 0 to 1 foot bgs and 2 to 3 feet bgs for TOC, pH, and particle size analysis. Groundwater was encountered at approximately 4 feet bgs during boring advancement.

3.2.1.2 Groundwater Samples

Three temporary monitoring wells were installed in soil borings MW02001, MW02002, and MW02003 on 23 May 2017 to assess PFAS concentrations northwest, southwest, and southeast, respectively, of the intersection of Taxiways B and E (**Figure 3.2-1**). The temporary monitoring wells were developed and sampled on 23 May 2017.

3.2.2 Analytical Results

3.2.2.1 Soil Results

Three surface soil samples and four subsurface soil samples (three regular and one field duplicate) were collected from soil borings MW02001, MW02002, and MW02003 on 23 May 2017. PFAS results are provided in **Table 3.1-1**, illustrated in **Figure 3.2-2**, and summarized below.

MW02001:

- PFOS was detected below the RSL at the surface (0 to 0.5 feet bgs) interval at an approximate concentration of 0.000593 mg/kg, and was not detected at the subsurface (2 to 3 feet bgs) interval.
- PFOA was not detected at either interval.
- PFBS was not detected at either interval.

MW02002:

- PFOS was detected below the RSL at the two sampling intervals at an approximate maximum concentration of 0.00144 mg/kg (0 to 0.5 feet bgs).
- PFOA was not detected at either interval.
- PFBS was not detected at either interval.

MW02003:

- PFOS was detected below the RSL at the two sampling intervals at an approximate maximum concentration of 0.00381 mg/kg (2 to 3 feet bgs).
- PFOA was not detected at either interval.
- PFBS was not detected at either interval.

The composite TOC concentrations ranged from 6,920 mg/kg (0 to 1 foot bgs) to 16,000 mg/kg (2 to 3 feet bgs), while the composite pH concentrations ranged from 8.20 S.U. (0 to 1 foot bgs) to 8.32 S.U. (2 to 3 feet bgs) (**Table 3.1-2**). The particle size analytical results for the 0 to 1 foot bgs sample was 2.5% fines (silt and clay), 78.7% sand (fine to coarse), and 18.8% gravel (fine to coarse), while the 2 to 3 feet bgs sample was 2.2% fines (silt and clay), 92.6% sand (fine to coarse), and 5.2% gravel (fine). The material description for the 0 to 1 foot bgs sample was a pale brown, poorly graded medium to fine sand with trace organics, while the 2 to 3 feet bgs sample was described as a light brownish gray silty sand.

3.2.2.2 Groundwater Results

Four groundwater samples (three normal and one field duplicate) were collected from MW02001, MW02002, and MW02003 on 23 May 2017. PFAS results are provided in **Table 3.1-3**, illustrated in **Figure 3.2-3,** and summarized below.

MW02001:

- PFOS was detected above the USEPA HA value at a concentration of 0.0743 µg/L.
- PFOA was detected below the USEPA HA value at an approximate concentration of 0.00968 µg/L.
- PFOS+PFOA was detected above the USEPA HA value at a concentration of 0.08398 µg/L.
- PFBS was not detected.

MW02002:

- PFOS was detected above the USEPA HA value at an approximate concentration of 1.17 µg/L (field duplicate).
- PFOA was detected below the USEPA HA value at a concentration of 0.0482 µg/L.
- PFOS+PFOA was detected above the USEPA HA value at an approximate concentration of 1.2181 µg/L.
- PFBS was detected below the USEPA Tap Water RSL at a concentration of 0.0248 µg/L (field duplicate).

MW02003:

- PFOS was detected above the USEPA HA value at an approximate concentration of 1.33 µg/L.
- PFOA was detected below the USEPA HA value at a concentration of 0.0179 µg/L.
- PFOS+PFOA was detected above the USEPA HA value at an approximate concentration of 1.3479 µg/L.
- PFBS was detected below the USEPA Tap Water RSL at an approximate concentration of 0.0127 µg/L.

3.2.3 Conclusions

PFOS was detected in soil at AFFF Release Area 2 at concentrations below the RSLs. The highest concentrations of PFOS were observed in surface soil (0 to 0.5 foot bgs) at sample location MW02003. PFOA and PFBS were not detected in any of the soil samples. PFOS and PFOS+PFOA concentrations exceeded the USEPA HA values in the three temporary monitoring wells, while PFOA concentrations were detected below the USEPA HA value in all three temporary monitoring wells. PFBS was detected at concentrations below the USEPA Tap Water RSL in temporary monitoring wells MW02002 and MW02003.

3.3 AFFF RELEASE AREA 3: NORTHERN SEWAGE TREATMENT PLANT

AFFF Release Area 3 received wastewater, and potentially AFFF from releases at various hangars and buildings, from 1968 to 1995. The areas surrounding the main treatment tank/structure (Building 652) were primarily grass.

3.3.1 Sample Location and Methodologies

3.3.1.1 Soil Samples

Two soil borings (MW03001 and MW03002) were advanced west and east, respectively, of Building 652 on 22 and 23 May 2017 (**Figure 3.3-1**). Surface soil samples were collected from 0 to 0.5 feet bgs, and subsurface soil samples were collected from 2 to 3 feet bgs, for PFAS analysis. Composite soil samples were also collected from each soil boring from 0 to 1 foot bgs and 2 to 3 feet bgs for TOC, pH, and particle size analysis. Groundwater was encountered at approximately 4 feet bgs during boring advancement.

3.3.1.2 Groundwater Samples

Two temporary monitoring wells were installed in soil borings MW03001 and MW03002 on 22 and 23 May 2017 to assess PFAS concentrations adjacent to Building 652 (**Figure 3.3-1**). The temporary monitoring wells were developed on 22 and 23 May 2017 and sampled on 24 May 2017. An existing monitoring well, 610-MW17, was also sampled on 24 May 2017.

3.3.2 Analytical Results

3.3.2.1 Soil Results

Two surface and subsurface soil samples were collected for PFAS analysis, with the results provided in **Table 3.1-1**, illustrated in **Figure 3.3-2**, and summarized below.

MW03001:

- PFOS was detected below the RSL at the two sampling intervals at an approximate maximum concentration of 0.00181 mg/kg (0 to 0.5 feet bgs).
- PFOA was not detected at either interval.
- PFBS was not detected at either interval.

MW03002:

- PFOS was detected below the RSL at the two sampling intervals at an approximate maximum concentration of 0.00797 mg/kg (2 to 3 feet bgs).
- PFOA was not detected at either interval.
- PFBS was not detected at either interval.

The composite TOC concentrations ranged from 4,800 mg/kg (2 to 3 feet bgs) to 5,920 mg/kg (0 to 1 foot bgs), while the composite pH concentrations ranged from 8.86 S.U. (0 to 1 foot bgs) to 9.17 S.U. (2 to 3 feet bgs) (**Table 3.1-2**). The particle size analytical results for the 0 to 1 foot bgs sample was 3.4% fines (silt and clay), 70.7% sand (fine to coarse), and 25.9% gravel (fine to coarse), while the 2 to 3 feet bgs sample was 2.3% fines (silt and clay), 69.4% sand (fine to coarse), and 28.3% gravel (fine to coarse). The material description for the 0 to 1 foot bgs sample was a pale brown, fine to medium poorly graded sand with trace organics, while the 2 to 3 feet bgs sample was described as a light brownish gray silty sand.

3.3.2.2 Groundwater Results

Four groundwater samples (three normal and one field duplicate) were collected for PFAS analysis, with the results provided in **Table 3.1-3**, illustrated in **Figure 3.3-3**, and summarized below.

MW03001:

- PFOS was detected above the USEPA HA value at a concentration of 12.2 µg/L.
- PFOA was detected above the USEPA HA value at a concentration of 0.937 µg/L.
- PFOS+PFOA was detected above the USEPA HA value at a concentration of 13.137 µg/L.
- PFBS was detected below the USEPA Tap Water RSL at a concentration of 2.58 µg/L.

MW03002:

- PFOS was detected above the USEPA HA value at an approximate concentration of 3.07 µg/L.
- PFOA was detected above the USEPA HA value at a concentration of 0.155 µg/L.

- PFOS+PFOA was detected above the USEPA HA value at an approximate concentration of 3.225 µg/L.
- PFBS was detected below the USEPA Tap Water RSL at a concentration of 0.396 µg/L.

610-MW17:

- PFOS was detected above the USEPA HA value at a concentration of 1.28 µg/L.
- PFOA was detected below the USEPA HA value at a concentration of 0.068 µg/L.
- PFOS+PFOA was detected above the USEPA HA value at a concentration of 1.348 µg/L.
- PFBS was detected below the USEPA Tap Water RSL at a concentration of 0.193.

3.3.3 Conclusions

PFOS in soil was detected at concentrations below the USEPA RSLs, while PFOA and PFBS were not detected. PFOS and PFOS+PFOA in groundwater exceeded the USEPA HA values in each of the three monitoring wells. PFOA in groundwater exceeded the USEPA HA values in locations MW03001 and MW03002 and was detected at concentrations below the USEPA HA value in 610-MW17. PFBS was detected at concentrations below the USEPA Tap Water RSL in all three wells.

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4.0 MIGRATION/EXPOSURE PATHWAYS AND TARGETS

An updated base-wide conceptual site model table is provided as **Table 4.0-1**. The table provides an overview of the facility, physical, release, land use, exposure, and ecological profiles at Patrick AFB. The table has been updated to include information collected during this SI, as well as the information collected during the previous site investigation conducted by SCF (2014). A more detailed description of source area conditions and exposure pathways is described in the following sections.

4.1 SOIL (SURFACE AND SUBSURFACE) EXPOSURE PATHWAY

4.1.1 Local Geologic Setting

The principle soil types at Patrick AFB include the Canaveral Complex, Urban Land, and Galveston-Urban Land Complex that generally consist of highly permeable, fine-grained beach sands (CH2M Hill, 2000). Surficial sediments consist of approximately 100 feet of undifferentiated Pleistocene and Holocene beach deposits underlain by coquina and sandy clay of the Anastasia Formation, the Caloosahatchee Marl Formation, and limestone of the Tamiami Formation (CH2M Hill, 2000). The underlying Miocene Age Hawthorn Group is composed predominantly of clays, silts, and marls (CH2M Hill, 2000). Basewide geologic cross sections developed from the SI well installation activities are provided in **Figures 3.0-2 and 3.0-3**.

4.1.2 Soil Exposure Pathways and Targets

PFOS, PFOA, and/or PFBS were detected in soil at AFFF Release Areas 1 through 8 and 10; however, all of the detections in soil were below the calculated and USEPA RSLs.

Surface soil at Patrick AFB is potentially accessible by on-site workers, site visitors, and/or trespassers. Subsurface soil is primarily accessible by on-site construction workers involved with excavating, drilling, or any activity that exposes them to subsurface soil. Access to source area soil is not expected to change in the future.

Potential exposure routes for soil include inhalation of impacted surface soil dust particles and dermal contact of contaminants in soil.

4.1.3 Soil Exposure Conclusions

Exposure to soil with PFAS concentrations exceeding the RSLs would not occur based on the soil analytical results from this SI and the previous site investigation by SCF (2014). Potential exposure receptors for PFAS detections below RSLs include Patrick AFB personnel, on-site workers, visitors, and trespassers that may come into contact with surface and/or subsurface soil at the respective AFFF release areas via inhalation or dermal contact. The highest potential of exposure to PFAS from soil is to on-site workers that may be involved with excavation or drilling activities.

4.2 GROUNDWATER MIGRATION PATHWAY

4.2.1 Local Hydrogeologic Setting

The surficial aquifer system near Patrick AFB is contained in undifferentiated Late Miocene, Pliocene, and Recent Pleistocene deposits composed primarily of medium to coarse quartz sands and coquina under unconfined conditions. Groundwater is typically encountered at an average depth of five feet below land surface and generally flows to the west. The Floridan Aquifer is comprised of a series of highly permeable limestone formations of the Eocene Age Ocala Group and Avon Park Limestone that is separated from the surficial aquifer by the Hawthorn Group, which acts as an aquitard (CH2M Hill, 2000).

4.2.2 Groundwater Exposure Pathways and Targets

PFAS, once in groundwater, are highly mobile and will migrate near the same velocity as groundwater due to their high solubility and low partition coefficient value. PFAS are chemically and biologically stable in the environment and resist typical environmental degradation processes. As a result, these chemicals are extremely persistent in the environment, with a half-life greater than 41 years for PFOS and greater than 92 years for PFOA (USEPA, 2014). PFBS is generally less toxic and less bioaccumulative in wildlife and humans (USEPA, 2017b).

PFOS, PFOA, and/or PFBS were detected in groundwater at AFFF Release Areas 1 through 8 and 10. PFOS and/or PFOA also exceeded the USEPA HA value of 0.07 µg/L at AFFF Release Areas 1 through 8 and 10, and are therefore considered release areas for pathway analysis.

Groundwater flow from these areas is towards either the Banana River (AFFF Release Areas 1 and 3) or the Atlantic Ocean (AFFF Release Area 2) (**Figure 3.0-4**). Groundwater flow from AFFF Release Areas 4 through 7, 9, and 10 is anticipated to be to the west, while groundwater flow from AFFF Release Area 8 is anticipated to be to the east. No primary human groundwater receptors were identified at or downgradient of Patrick AFB from PFAS-impacted AFFF release areas since the drinking water supply to Patrick AFB is provided by the City of Cocoa (HGL, 2015). No primary human groundwater receptors were identified downgradient of Patrick AFB since the primary groundwater exposure points at Patrick AFB are the Banana River located along the western installation boundary and the Atlantic Ocean located along the eastern installation boundary.

4.2.3 Groundwater Migration Pathway Conclusions

PFOS and PFOA in groundwater exceeded the USEPA HA value of 0.07 µg/L for PFOS, PFOA, and/or the sum of PFOS/PFOA, at AFFF Release Areas 1 through 8 and 10. Receptors are not present on Patrick AFB since the installation utilizes drinking water supplied by the City of Cocoa. Groundwater from these area is towards either the Banana River (AFFF Release Areas 1 and 3) or the Atlantic Ocean (AFFF Release Area 2), and human receptors were not identified in the Preliminary Assessment (HGL, 2015).

4.3 SEDIMENT EXPOSURE PATHWAY

4.3.1 Sediment Exposure Pathways and Targets

PFOS and PFOA were detected in sediments from AFFF Release Area 9 at concentrations below the calculated RSL. Sediment at Patrick AFB is potentially accessible by USAF personnel, on-site workers, visitors, and trespassers. Potential exposure routes for sediment include dermal contact with submerged and/or exposed sediment during work activities such as maintenance of drainage ditches and canals that contain PFAS-impacted sediment.

4.3.2 Sediment Exposure Conclusions

PFOS and PFOA were detected in sediments at concentrations below the calculated RSL from AFFF Release Area 9 during the previous site investigation by SCF (2014). Potential exposure receptors include USAF personnel, on-site workers, visitors, and trespassers that may come into contact with sediment within the drainage channel and Outfall 21 to the Banana River.

4.4 SURFACE WATER EXPOSURE PATHWAY

4.4.1 Surface Water Exposure Pathways and Targets

PFOS and PFOA were detected in surface water samples collected at the headwaters of the drainage channel and at Outfall 21 to the Banana River (AFFF Release Area 9) at concentrations exceeding the USEPA HA value of 0.07 µg/L during the previous site investigation by SCF (2014). However, the USEPA HA value for PFOS and PFOA is only applicable to surface water used as a drinking water source, and the Banana River is not currently used as a drinking water source for Patrick AFB or the surrounding community. Potential exposure receptors include USAF personnel, on-site workers, visitors, and trespassers that may come into contact with surface water within the drainage channel and at Outfall 21 to the Banana River.

4.4.2 Surface Water Exposure Conclusions

PFOS and PFOA were detected in surface water at concentrations above the USEPA HA value from AFFF Release Area 9 during the previous site investigation by SCF (2014). However, the USEPA HA value for PFOS and PFOA is only applicable to drinking water sources, and the Banana River is not currently used as a drinking water source for Patrick AFB or the surrounding community. Potential exposure receptors include USAF personnel, on-site workers, visitors, and trespassers that may come into contact with surface water within the drainage channel and at Outfall 21 to the Banana River.

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5.0 SUMMARY AND CONCLUSIONS

As stated in the introduction, the objectives of this study were to:

- Determine if PFOS, PFOA, or PFBS are present in soil, groundwater, sediment, and/or surface water at AFFF release areas selected for SI or investigated previously by others;
- Determine if PFOS and PFOA concentrations in soil exceed the calculated RSL of 1.26 mg/kg, based on a residential exposure scenario, and if PFBS concentrations in soil exceed the USEPA RSL of 1,300 mg/kg, based on a residential exposure scenario;
- Determine if PFOS, PFOA, or sum of PFOS and PFOA concentrations in groundwater and surface water exceed the USEPA HA value of 0.07 µg/L, and if PFBS concentrations in groundwater exceed the USEPA Tap Water RSL of 400 µg/L;
- Determine if concentrations of PFOS or PFOA in sediment exceed the calculated RSL of 1.26 mg/kg; and,
- Identify potential receptor pathways with immediate impacts to human health (immediate impact to human health is considered consumption of drinking water with PFOS/PFOA above the USEPA HA value, or PFBS above the USEPA Tap Water RSL).

Section 3 of this SI detailed the analytical results for PFAS at AFFF Release Areas 1, 2, and 3 included in this SI, while figures and tables from the previous site investigation report completed by SCF (2014) are included in Appendix A of this SIR that document the detected PFAS results from AFFF Release Areas 4 through 10. In addition, Section 4 includes an assessment of exposure/migration pathways and targets for media impacted with PFAS at all 10 AFFF release areas. A summary table (**Table 5.0-1**) is also provided below which lists specific exceedances by area and media, fulfilling the objectives of the SI.

Table 5.0-1. Summary of Analytical Results and Screening Level Exceedances.

AFFF Release Area	Parameter	Maximum Detected Concentration	Screening Value	Units	Number of Samples*/ Number of Exceedances	Exceeds Screening Level
AFFF Release Area 1 Former FTA 2	Surface Soil (0 to 0.5 feet)					
	PFOS	1.18	1.26	mg/kg	5/0	No
	PFOA	0.0129 J	1.26	mg/kg	5/0	No
	PFBS	0.00463	1,300	mg/kg	5/0	No
	Subsurface Soil (2 to 3 feet)					
	PFOS	0.312	1.26	mg/kg	5/0	No
	PFOA	0.0294	1.26	mg/kg	5/0	No
	PFBS	0.00223	1,300	mg/kg	5/0	No
	Groundwater					
	PFOS	**159**	0.07	µg/L	6/6	**Yes**
	PFOA	**6.06**	0.07	µg/L	6/5	**Yes**
	PFOS+PFOA	**163.99**	0.07	µg/L	6/6	**Yes**
	PFBS	2.37 J	400	µg/L	6/0	No

AFFF Release Area	Parameter	Maximum Detected Concentration	Screening Value	Units	Number of Samples*/ Number of Exceedances	Exceeds Screening Level
AFFF Release Area 2 Fire Truck Rollover Area	Surface Soil (0 to 0.5 feet)					
	PFOS	0.0023	1.26	mg/kg	3/0	No
	PFOA	ND	1.26	mg/kg	3/0	No
	PFBS	ND	1,300	mg/kg	3/0	No
	Subsurface Soil (2 to 3 feet)					
	PFOS	0.00381 J	1.26	mg/kg	3/1	No
	PFOA	ND	1.26	mg/kg	3/0	No
	PFBS	ND	1,300	mg/kg	3/0	No
	Groundwater					
	PFOS	**1.33 J**	0.07	µg/L	3/3	**Yes**
	PFOA	0.0482	0.07	µg/L	3/0	No
	PFOS+PFOA	**1.3479 J**	0.07	µg/L	3/3	**Yes**
	PFBS	0.0248	400	µg/L	3/0	No
AFFF Release Area 3 Northern Sewage Treatment Plant	Surface Soil (0 to 0.5 feet)					
	PFOS	0.00426	1.26	mg/kg	2/0	No
	PFOA	ND	1.26	mg/kg	2/0	No
	PFBS	ND	1,300	mg/kg	2/0	No
	Subsurface Soil (2 to 3 feet)					
	PFOS	0.00797 J	1.26	mg/kg	2/0	No
	PFOA	ND	1.26	mg/kg	2/0	No
	PFBS	ND	1,300	mg/kg	2/0	No
	Groundwater					
	PFOS	**12.2**	0.07	µg/L	3/3	**Yes**
	PFOA	**0.937**	0.07	µg/L	3/2	**Yes**
	PFOS+PFOA	**13.137**	0.07	µg/L	3/3	**Yes**
	PFBS	2.58	400	µg/L	3/0	No
AFFF Release Area 4 Hangar 630	Surface Soil (0 to 0.5 feet)					
	PFOS	0.0065	1.26	mg/kg	2/0	No
	PFOA	0.00055 J	1.26	mg/kg	2/0	No
	PFBS	ND	1,300	mg/kg	2/0	No
	Subsurface Soil (4 to 5 feet)					
	PFOS	0.0069	1.26	mg/kg	8/0	No
	PFOA	0.00092	1.26	mg/kg	8/0	No
	PFBS	ND	1,300	mg/kg	8/0	No
	Sediment					
	PFOS	0.022	1.26	mg/kg	2/0	No
	PFOA	0.0019	1.26	mg/kg	2/0	No

AFFF Release Area	Parameter	Maximum Detected Concentration	Screening Value	Units	Number of Samples*/ Number of Exceedances	Exceeds Screening Level
	Groundwater					
	PFOS	**3. 8 J**	0.07	µg/L	7/7	**Yes**
	PFOA	**1.7**	0.07	µg/L	7/3	**Yes**
	PFOS+PFOA	**5.5 J**	0.07	µg/L	7/7	**Yes**
	PFBS	0.058	400	µg/L	7/0	No
AFFF Release Area 5 Hangar 647	Subsurface Soil (3 to 5 feet)					
	PFOS	0.0091	1.26	mg/kg	4/0	No
	PFOA	0.0059	1.26	mg/kg	4/0	No
	PFBS	ND	1,300	mg/kg	4/0	No
	Groundwater					
	PFOS	**1.1**	0.07	µg/L	3/3	**Yes**
	PFOA	**6.3 J**	0.07	µg/L	3/3	**Yes**
	PFOS+PFOA	**6.47 J**	0.07	µg/L	3/3	**Yes**
	PFBS	0.017 J	400	µg/L	3/0	No
AFFF Release Area 6 Building 705 Pump House	Surface Soil (0 to 0.5 feet)					
	PFOS	0.160 J	1.26	mg/kg	2/0	No
	PFOA	0.0022 J	1.26	mg/kg	2/0	No
	PFBS	0.0059 J	1,300	mg/kg	2/0	No
	Subsurface Soil (4 to 5 feet)					
	PFOS	0.660 J	1.26	mg/kg	4/0	No
	PFOA	0.110 J	1.26	mg/kg	4/0	No
	PFBS	0.029 J	1,300	mg/kg	4/0	No
	Groundwater					
	PFOS	**4,300 J**	0.07	µg/L	4/4	**Yes**
	PFOA	**100 J**	0.07	µg/L	4/4	**Yes**
	PFOS+PFOA	**4,338 J**	0.07	µg/L	4/4	**Yes**
	PFBS	110 J	400	µg/L	4/0	No
AFFF Release Area 7 Hangar 750	Surface Soil (0 to 0.5 feet)					
	PFOS	0.0031	1.26	mg/kg	2/0	No
	PFOA	0.0035	1.26	mg/kg	2/0	No
	PFBS	ND	1,300	mg/kg	2/0	No
	Subsurface Soil (3 to 5 feet)					
	PFOS	0.00067 J	1.26	mg/kg	4/0	No
	PFOA	0.0006 J	1.26	mg/kg	4/0	No
	PFBS	ND	1,300	mg/kg	4/0	No
	Groundwater					
	PFOS	**7.6 J**	0.07	µg/L	4/4	**Yes**
	PFOA	**0.17 J**	0.07	µg/L	4/4	**Yes**

AFFF Release Area	Parameter	Maximum Detected Concentration	Screening Value	Units	Number of Samples*/ Number of Exceedances	Exceeds Screening Level
AFFF Release Area 7 Hangar 750	PFOS+PFOA	**7.77 J**	0.07	µg/L	4/4	**Yes**
	PFBS	0.063 J	400	µg/L	4/0	No
AFFF Release Area 8 Fire Station, Building 810	Surface Soil (0 to 0.5 feet)					
	PFOS	0.180	1.26	mg/kg	2/0	No
	PFOA	0.0096	1.26	mg/kg	2/0	No
	PFBS	0.0019	1,300	mg/kg	2/0	No
	Subsurface Soil (2 to 5 feet)					
	PFOS	0.190	1.26	mg/kg	4/0	No
	PFOA	0.011	1.26	mg/kg	4/0	No
	PFBS	0.0014	1,300	mg/kg	4/0	No
	Groundwater					
	PFOS	**930 J**	0.07	µg/L	4/4	**Yes**
	PFOA	**13.0 J**	0.07	µg/L	4/4	**Yes**
	PFOS+PFOA	**940 J**	0.07	µg/L	4/4	**Yes**
	PFBS	21.0 J	400	µg/L	4/0	No
AFFF Release Area 9 Outfall 21 to Banana River	Sediment					
	PFOS	0.022 J	1.26	mg/kg	3/0	No
	PFOA	0.0013 J	1.26	mg/kg	3/0	No
	PFBS	0.000015 J	1,300	mg/kg	3/0	No
	Surface Water					
	PFOS	**1.4**	0.07	µg/L	2/2	**Yes**
	PFOA	**0.17**	0.07	µg/L	2/2	**Yes**
	PFOS+PFOA	**1.476**	0.07	µg/L	2/2	**Yes**
	PFBS	0.022	400	µg/L	2/0	No
AFFF Release Area 10 Building 313, Former Plating Shop	Groundwater					
	PFOS	**0.61 J**	0.07	µg/L	4/4	**Yes**
	PFOA	0.033 J	0.07	µg/L	4/0	No
	PFOS+PFOA	**0.637 J**	0.07	µg/L	4/4	**Yes**
	PFBS	ND	400	µg/L	4/0	No

Notes:

* normal samples (count does not include QC samples)

AFFF – aqueous film forming foam

J - The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample

µg/L - micrograms per liter

mg/kg - milligrams per kilogram

ND – not detected

Potential human health pathways were identified and detailed in Section 4 of this SIR. The potential receptors and targets vary by AFFF release area. Media-specific pathways and receptors are discussed below.

Surface and Subsurface Soil Receptors

The highest potential for exposure to PFAS from soil is to on-site workers, specifically those involved with excavation or drilling activities. PFOS, PFOA, and/or PFBS were detected in soil at AFFF Release Areas 1 through 8; however, all detections were below applicable RSLs, based on a residential exposure scenario.

Groundwater Receptors

PFAS in groundwater exceeded the USEPA HA value of 0.07 µg/L for PFOS, PFOA, and/or PFOS+PFOA, at AFFF Release Areas 1 through 8 and 10. Human groundwater receptors via the ingestion pathway are not present for any AFFF release area at or downgradient of Patrick AFB since the installation utilizes drinking water supplied by the City of Cocoa (HGL, 2015). In addition, human groundwater receptors via the ingestion pathway are not present downgradient of Patrick AFB since the primary groundwater exposure points downgradient of the installation are the Banana River to the west or the Atlantic Ocean to the east, which are not used as drinking water sources for the area. As a result, there is currently no potential receptor pathway with immediate impacts to human health at Patrick AFB.

Sediment Receptors

PFOS and PFOA were detected in sediments at concentrations below the calculated RSL from AFFF Release Area 9 (the drainage channel and Outfall 21 to Banana River) during the previous site investigation by SCF (2014). Potential exposure receptors include USAF personnel, on-site workers, visitors, and trespassers that may come into contact with sediment within the drainage channel and at Outfall 21 to Banana River.

Surface Water Receptors

PFOS and PFOA were detected in surface water samples collected at the headwaters of the drainage channel and at Outfall 21 to the Banana River (AFFF Release Area 9) at concentrations exceeding the USEPA HA value of 0.07 µg/L during the previous site investigation by SCF (2014). However, the USEPA HA value for PFOS and PFOA is only applicable to drinking water sources, and the Banana River is not currently used as a drinking water source for Patrick AFB or the surrounding community. Potential exposure receptors include USAF personnel, on-site workers, visitors, and trespassers that may come into contact with surface water within the drainage channel and at Outfall 21 to the Banana River.

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FIGURES

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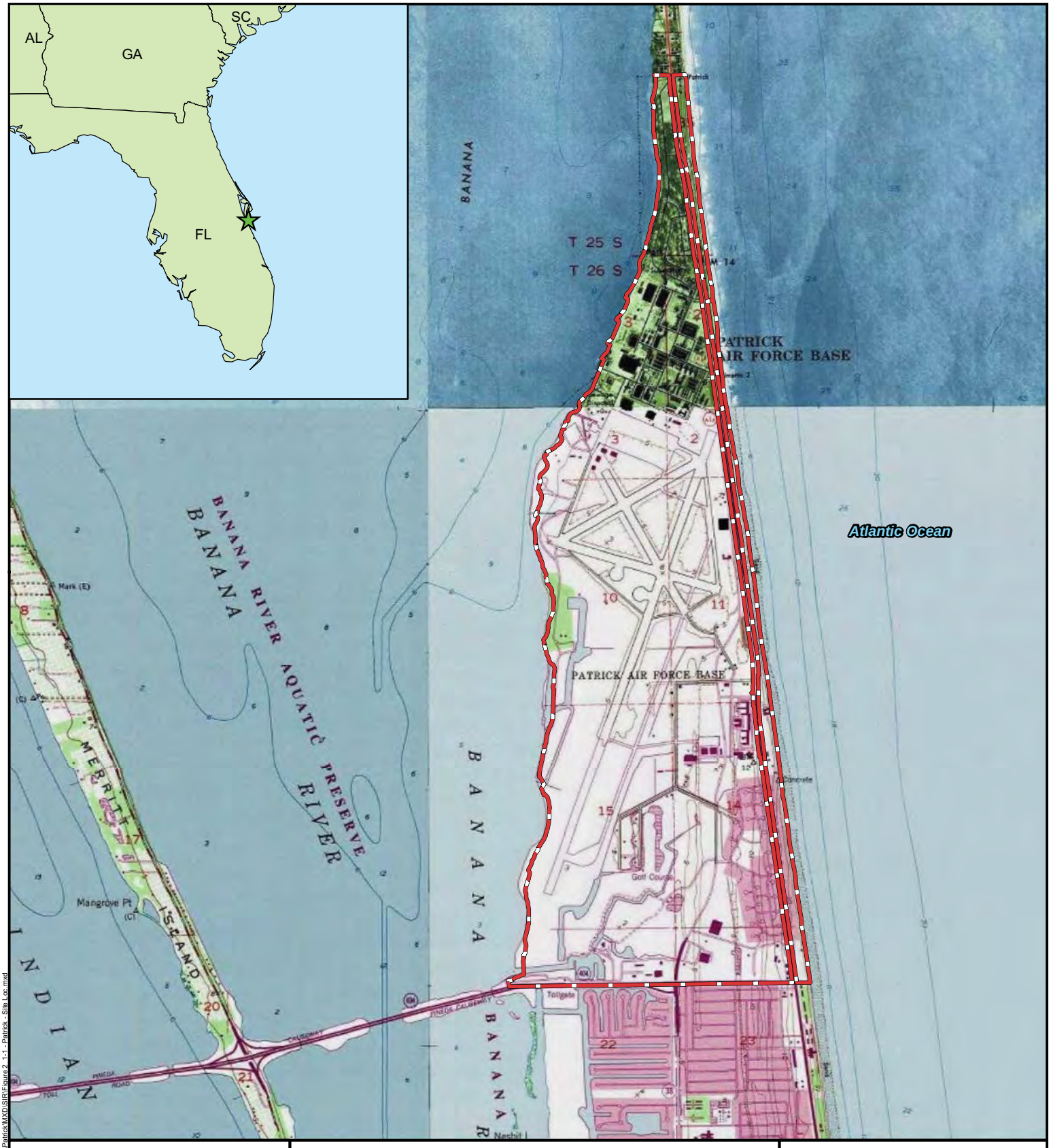

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By: MJV | Date: 7/22/2017

0 1,550 3,100 Feet

Symbol Key

Patrick AFB Installation Boundary

FIGURE 2.1-1
Installation Location Map
Patrick Air Force Base
Brevard County, Florida

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Site Inspection Report

Path: C:\Worksace\GIS_Projects\Knoxville\775303101_AFCEC_PFC\Patrick\MXD\SIR\Figure 2_1-1 - Patrick - Site Loc.mxd

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By: P.Stokes | Date: 8/4/2017

0 450 900 Feet

Symbol Key

- Potential AFFF Release Area
- Patrick AFB Installation Boundary

FIGURE 2.3-1
AFFF Release Areas for SI in the PA
For Site Inspection
Patrick Air Force Base
Brevard County, Florida

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide Installation-Specific Work Plan

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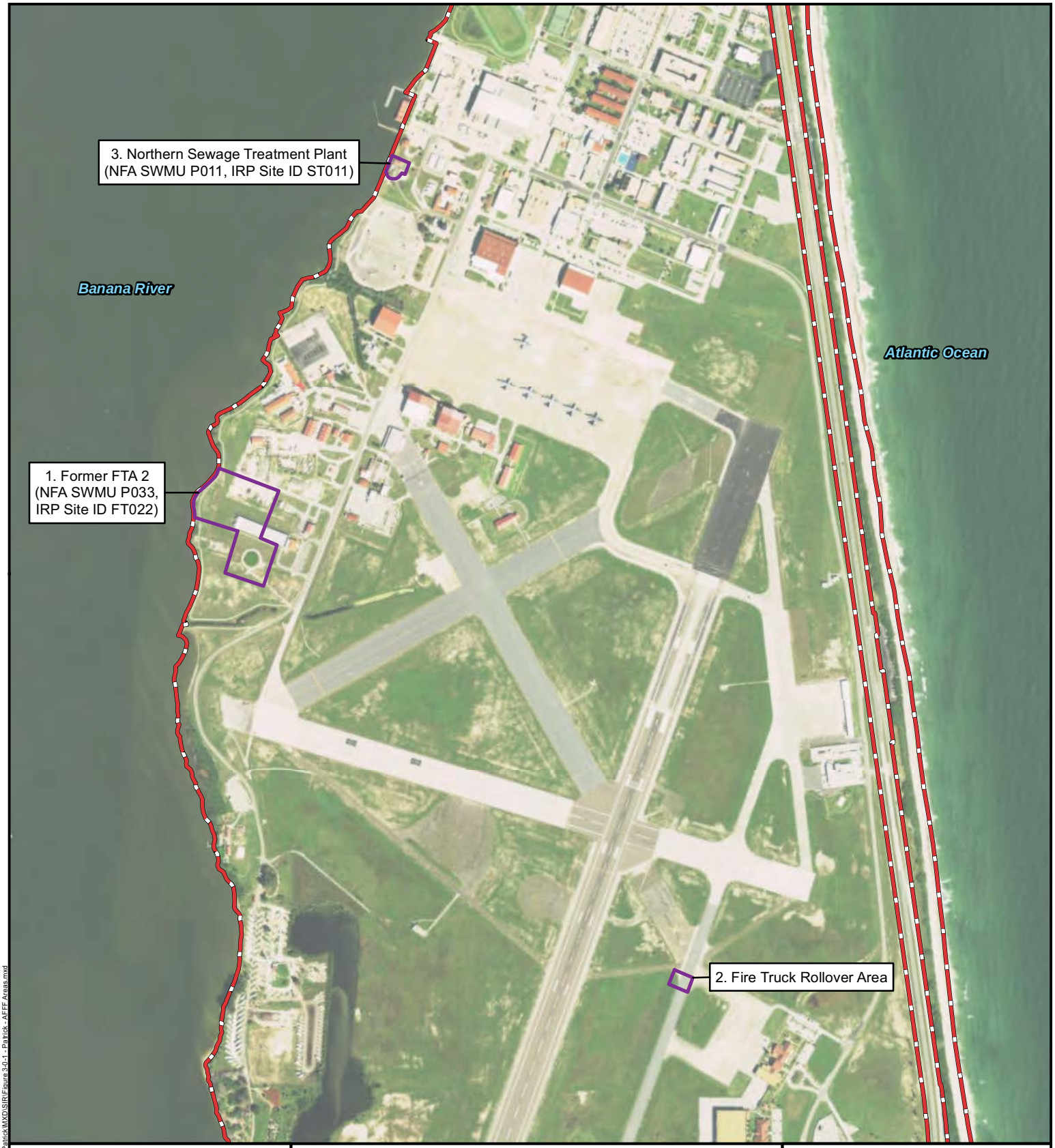

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0 450 900 Feet

Symbol Key

- AFFF Release Area
- Patrick AFB Installation Boundary

FIGURE 3.0-1
AFFF Release Areas
Patrick Air Force Base
Brevard County, Florida

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Site Inspection Report

Path: C:\Worksapce\GIS_Projects\Knoxville\775303101_AFCEC_PEC\Patrick\MXD\SIR\Figure 3.0-1 - Patrick - AFFF Areas.mxd

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Project: 775303101

By: A. Yorke | Date: 07/18/2017

amec foster wheeler

Symbol Key

- Temporary Monitoring Well
- Water Level (May 2017)
- Approximate Ground Level
- Approximate Water Table
- Inferred Extent
- Screen

- USCS Poorly-graded Sand
- USCS Silty Sand

amsl = above mean sea level

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FIGURE 3.0-2
Base Cross-Section A-A'
Patrick Air Force Base
Brevard County, FL

Site Inspection of
Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Site Inspection Report

AMEC 11X17_03 PATRICK TO 0004.GPJ AMECFW TEMPLATE.GDT 7/18/17

(b) (9)

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Project: 775303101

By: A. Yorke | Date: 07/19/2017

amec foster wheeler

Symbol Key

- Temporary Monitoring Well
- Water Level (May 2017)
- Approximate Ground Level
- Approximate Water Table
- Inferred Extent
- Screen

- USCS Poorly-graded Sand
- USCS Silty Sand

amsl = above mean sea level

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FIGURE 3.0-3
Base Cross-Section B-B'
Patrick Air Force Base
Brevard County, FL

Site Inspection of
Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Site Inspection Report

AMEC 11X17_03 PATRICK TO 0004.GPJ AMECFW TEMPLATE.GDT 7/19/17

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0 450 900 Feet

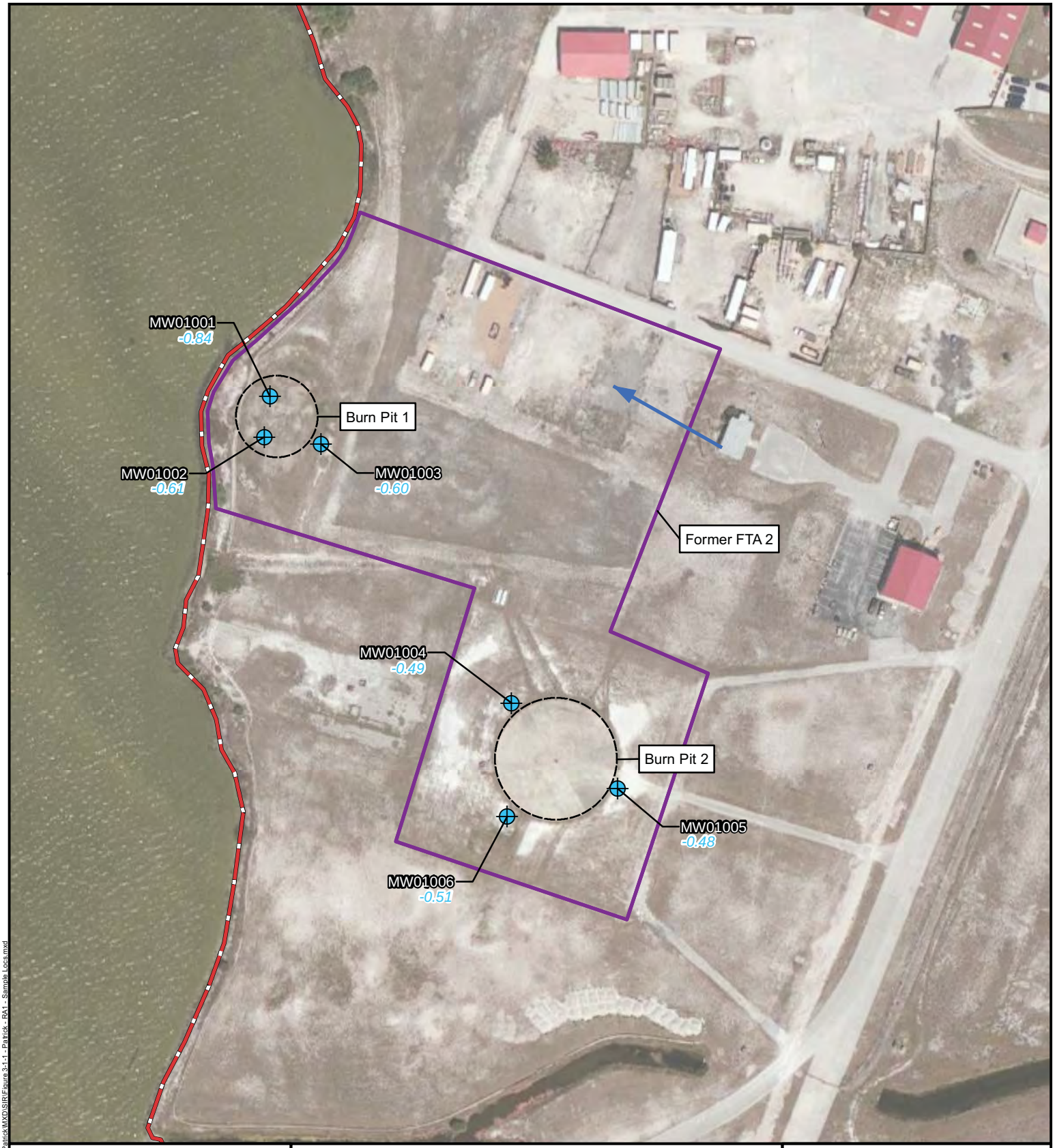
Symbol Key

- Monitoring Well
- Temporary Monitoring Well
- Groundwater Contours
- Approximate Groundwater Flow Direction
- AFFF Release Area
- Patrick AFB Installation Boundary

FIGURE 3.0-4
Basewide Groundwater Elevations (May 2017)
Patrick Air Force Base
Brevard County, Florida

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide Site Inspection Report

Path: C:\Workspace\GIS_Projects\Knoxville\775303101_AFCEC_PFC\Patrick\MXD\SIR\Figure 3.0-4 - Patrick - Basewide Groundwater.mxd



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By: MJV | Date: 7/24/2017

0 75 150 Feet

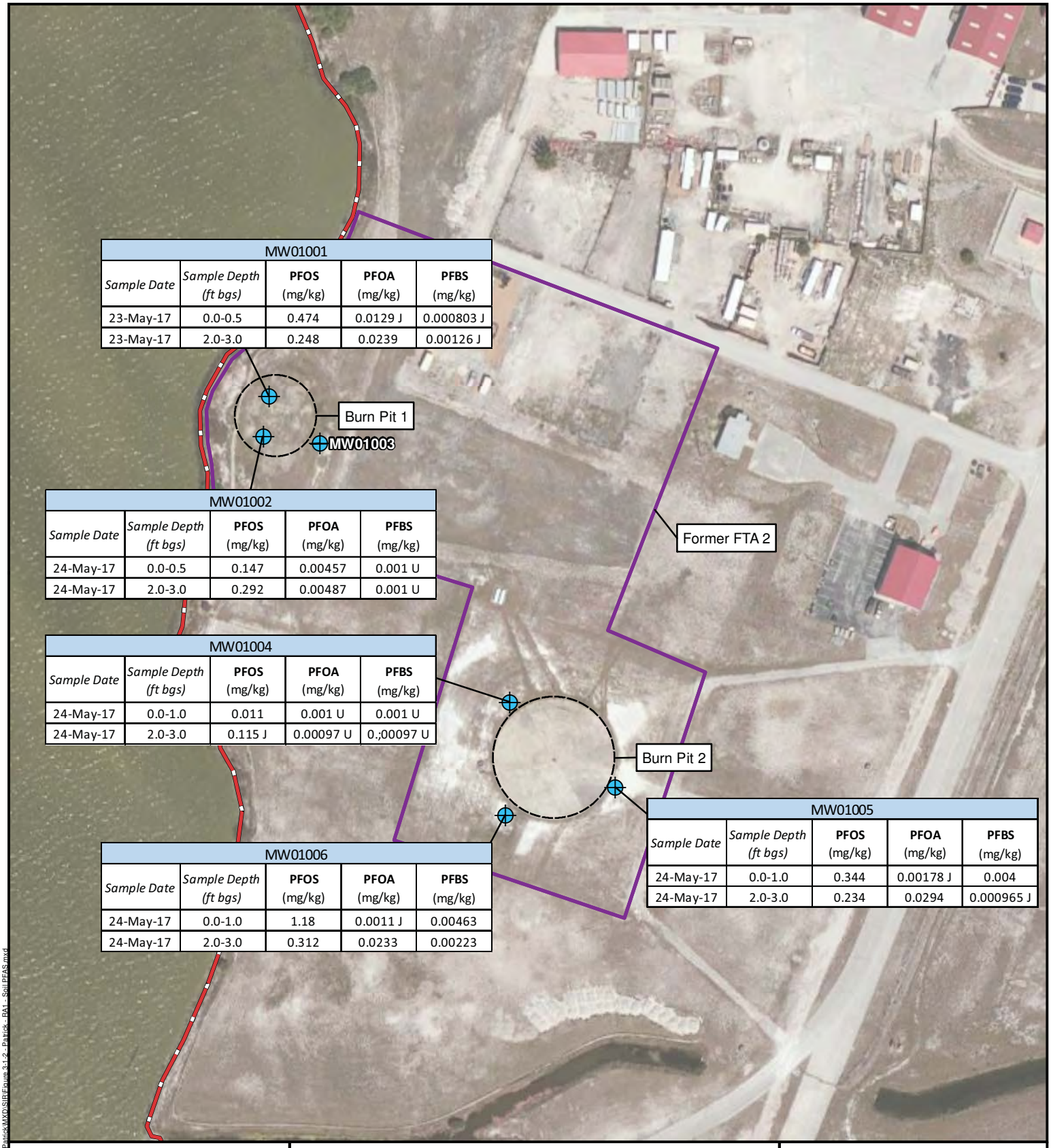
Symbol Key

- Temporary Monitoring Well
- Approximate Groundwater Flow Direction
- AFFF Release Area
- Patrick AFB Installation Boundary

FIGURE 3.1-1
Sampling Locations and Groundwater Elevations
Former FTA 2
AFFF Release Area 1
Patrick Air Force Base
Brevard County, Florida

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Site Inspection Report

Path: C:\Workspace\GIS_Projects\Knoxville\775303101_AFCEC_PFC\Patrick\MXD\SIR\Figure 3-1-1 - Patrick - RA1 - Sample Locs.mxd



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Project: 775303101

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0 75 150 Feet

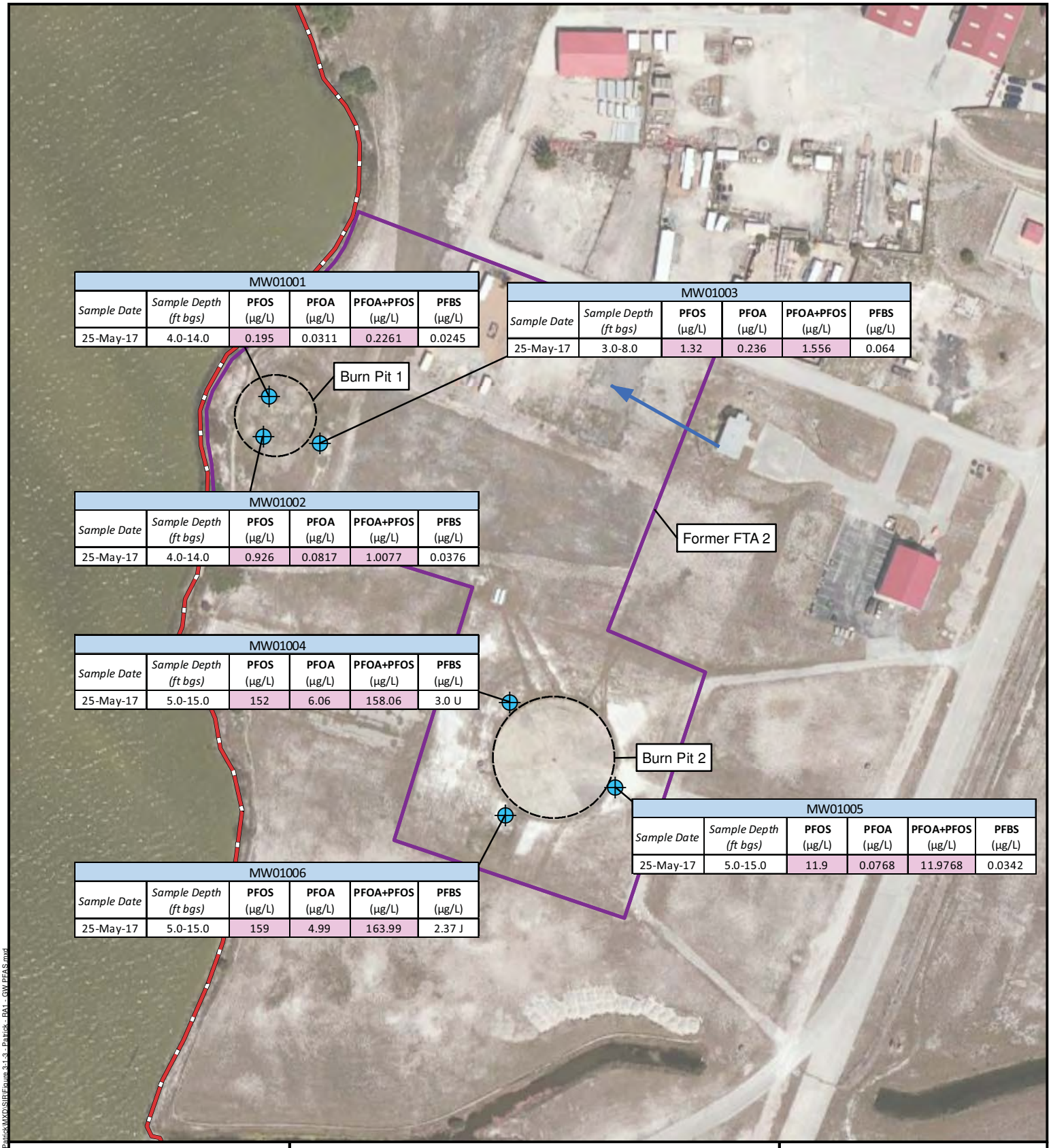
Symbol Key

- Temporary Monitoring Well
- AFFF Release Area
- Patrick AFB Installation Boundary

FIGURE 3.1-2
PFAS In Soil
Former FTA 2
AFFF Release Area 1
Patrick Air Force Base
Brevard County, Florida

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Site Inspection Report

Path: C:\Workspace\GIS Projects\Knoxville\775303101_AFCEC_PFC\Patrick\MXD\SIR\Figure 3.1-2 - Patrick - RA1 - Soil PFAS.mxd



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0 75 150 Feet

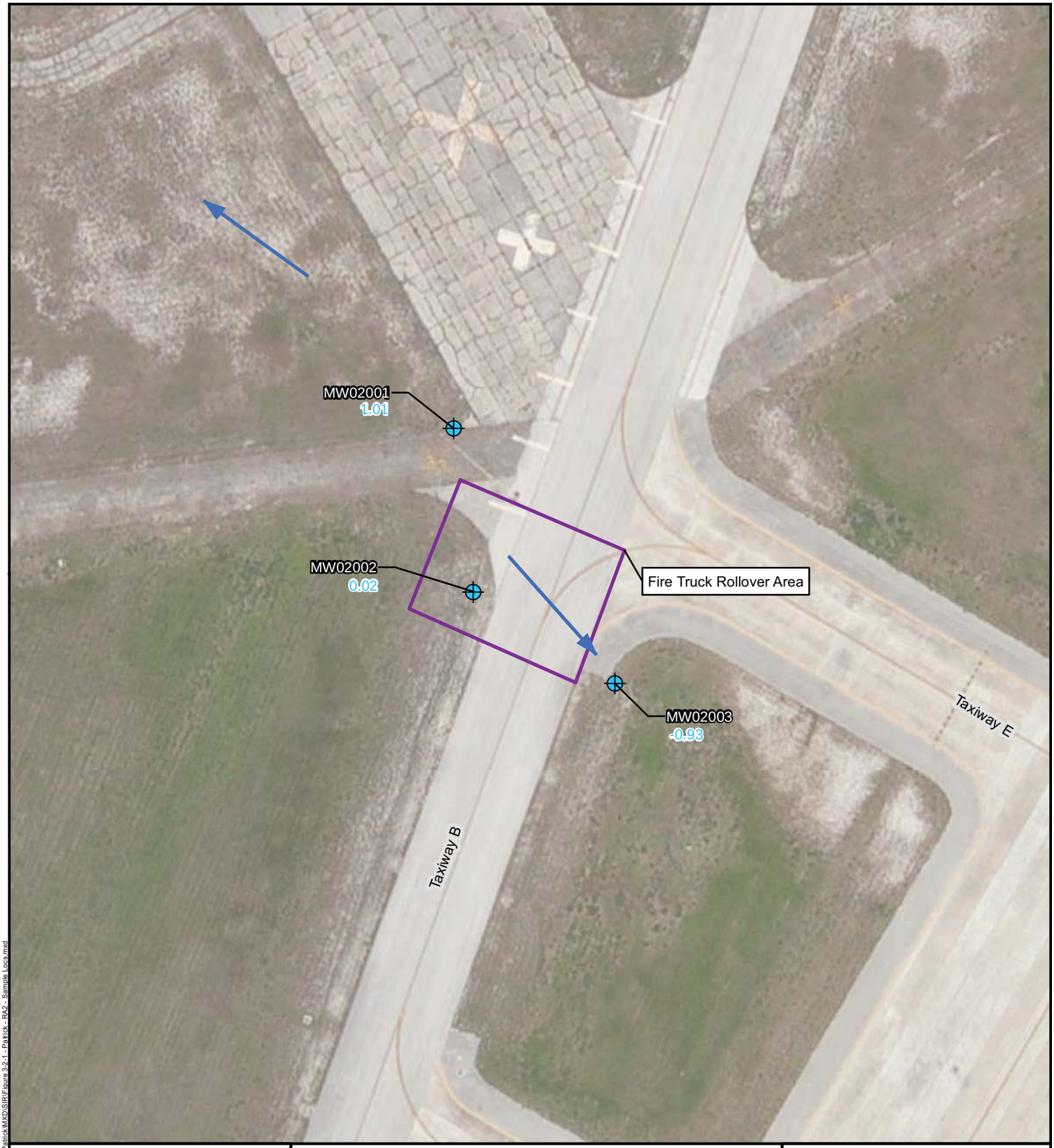
Symbol Key

- Temporary Monitoring Well
- Approximate Groundwater Flow Direction
- AFFF Release Area
- Patrick AFB Installation Boundary

FIGURE 3.1-3
PFAS In Groundwater
Former FTA 2
AFFF Release Area 1
Patrick Air Force Base
Brevard County, Florida

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Site Inspection Report

Path: C:\Workspace\GIS Projects\Knoxville\775303101 AFCEC PFC\Patrick\MXD\SIR\Figure 3.1-3 - Patrick - BA1 - GW PFAS.mxd



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0 75 150 Feet

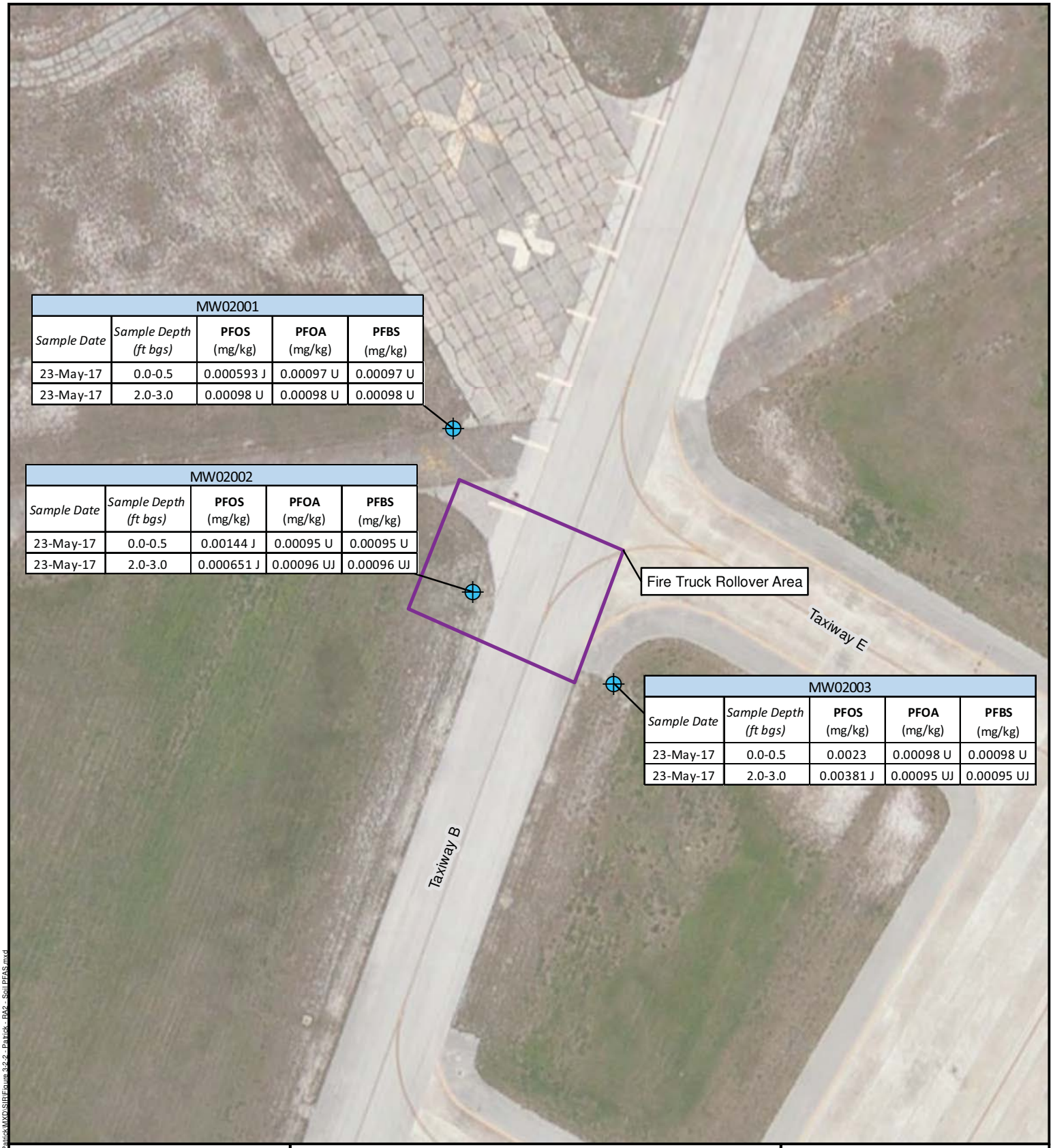
Symbol Key

- Temporary Monitoring Well
- Approximate Groundwater Flow Direction
- AFFF Release Area

FIGURE 3.2-1
Sampling Locations and Groundwater Elevations
Fire Truck Rollover Area
AFFF Release Area 2
Patrick Air Force Base
Brevard County, Florida

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Site Inspection Report

Path: C:\Workspace\GIS_Projects\Knoxville\775303101_AFCEC_PFC\Patrick\MXD\SIR\Figure 3.2-1 - Patrick - RA2 - Sample Locs.mxd



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N W E S

0 75 150 Feet

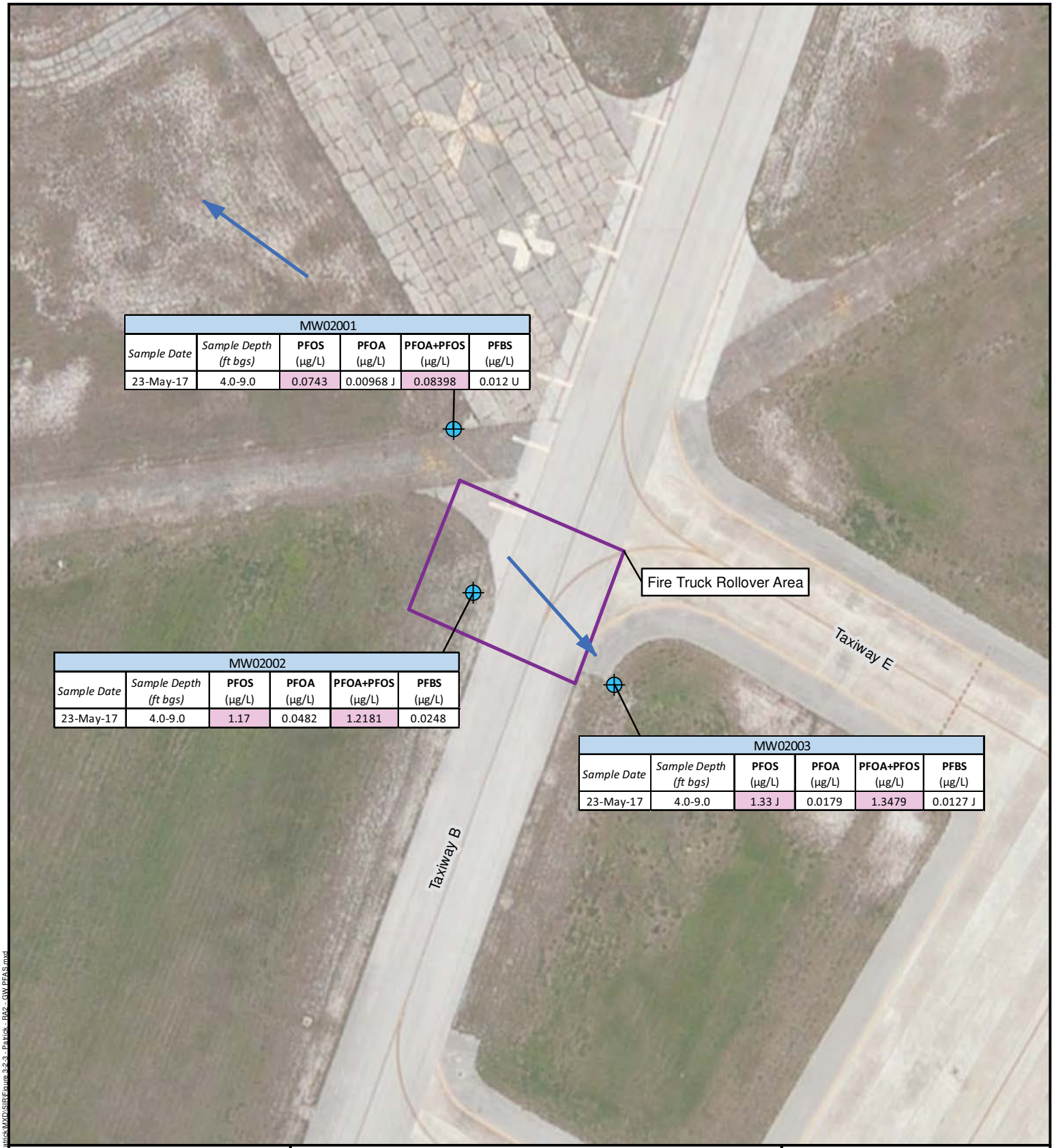
Symbol Key

- Temporary Monitoring Well
- AFFF Release Area

FIGURE 3.2-2
PFAS In Soil
Fire Truck Rollover Area
AFFF Release Area 2
Patrick Air Force Base
Brevard County, Florida

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Site Inspection Report

Path: C:\Workspace\GIS Projects\Knoxville\775303101_AFCEC_PFC\Patrick\MXD\SIR\Figure 3.2-2 - Patrick - BA2 - Soil PFAS.mxd



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0 75 150 Feet

Symbol Key

- Temporary Monitoring Well
- Approximate Groundwater Flow Direction
- AFFF Release Area

FIGURE 3.2-3
PFAS In Groundwater
Fire Truck Rollover Area
AFFF Release Area 2
Patrick Air Force Base
Brevard County, Florida

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Site Inspection Report

Path: C:\Workspace\GIS Projects\Knoxville\775303101 AFCEC PFC\Patrick\MXD\SIR\Figure 3.2-3 - Patrick - BA2 - GW PFAS.mxd

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0 30 60 Feet

Symbol Key

- Monitoring Well
- Temporary Monitoring Well
- Approximate Groundwater Flow Direction
- AFFF Release Area
- Patrick AFB Installation Boundary

FIGURE 3.3-1
Sampling Locations and Groundwater Elevations
Northern Sewage Treatment Plant
AFFF Release Area 3
Patrick Air Force Base
Brevard County, Florida

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Site Inspection Report

Path: C:\Workspace\GIS_Projects\Knoxville\775303101_AFCEC_PFC\Patrick\MXD\SIR\Figure 3.3-1 - Patrick - RA3 - Sample Locs.mxd

MW03001				
Sample Date	*Sample Depth (ft bgs)*	**PFOS** (mg/kg)	**PFOA** (mg/kg)	**PFBS** (mg/kg)
22-May-17	0.0-0.5	0.00181 J	0.00098 U	0.0098 U
22-May-17	2.0-3.0	0.00124 J	0.00097 U	0.00097 U

MW03002				
Sample Date	*Sample Depth (ft bgs)*	**PFOS** (mg/kg)	**PFOA** (mg/kg)	**PFBS** (mg/kg)
23-May-17	0.0-0.5	0.00426	0.001 U	0.001 U
23-May-17	2.0-3.0	0.00797 J	0.00099 U	0.00099 U

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Project: 775303101

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0 30 60 Feet

Symbol Key

- Monitoring Well
- Temporary Monitoring Well
- AFFF Release Area
- Patrick AFB Installation Boundary

FIGURE 3.3-2
PFAS In Soil
Northern Sewage Treatment Plant
AFFF Release Area 3
Patrick Air Force Base
Brevard County, Florida

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Site Inspection Report

Path: C:\Workspace\GIS Projects\Knoxville\775303101_AFCEC_PFC\Patrick\MXD\SIR\Figure 3.3-2 - Patrick - BA3 - Soil PFAS.mxd

MW03001					
Sample Date	*Sample Depth (ft bgs)*	**PFOS** (µg/L)	**PFOA** (µg/L)	**PFOA+PFOS** (µg/L)	**PFBS** (µg/L)
24-May-17	15.0-25.0	12.2	0.937	13.137	2.58

MW03002					
Sample Date	*Sample Depth (ft bgs)*	**PFOS** (µg/L)	**PFOA** (µg/L)	**PFOA+PFOS** (µg/L)	**PFBS** (µg/L)
24-May-17	15.0-25.0	3.07 J	0.155	3.225	0.396

610-MW17					
Sample Date	*Sample Depth (ft bgs)*	**PFOS** (µg/L)	**PFOA** (µg/L)	**PFOA+PFOS** (µg/L)	**PFBS** (µg/L)
24-May-17	5.0-15.0	1.28	0.068	1.348	0.193

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0 30 60 Feet

Symbol Key

- Monitoring Well
- Temporary Monitoring Well
- Approximate Groundwater Flow Direction
- AFFF Release Area
- Patrick AFB Installation Boundary

FIGURE 3.3-3
PFAS In Groundwater
Northern Sewage Treatment Plant
AFFF Release Area 3
Patrick Air Force Base
Brevard County, Florida

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Site Inspection Report

Path: C:\Workspace\GIS_Projects\Knoxville\775303101_AFCEC_PFC\Patrick\MXD\SIR\Figure 3.3.3 - Patrick - RA3 - GW PFAS.mxd

TABLES

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Table 3.0-1
Monitoring Well Construction Details
Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Site Inspection Report, Patrick AFB, Florida

AFFF Release Area	Location ID	Installation Date	Well Material	Northing	Easting	Ground Elevation (ft amsl)	TOC Elevation (ft amsl)	Well Depth (ft bgs)	Well Diameter (in)	Screen Length (ft)	Screen Size (in)	Screen Interval (ft bgs)
1	MW01001	5/23/2017	PVC	1,422,262.48	779,695.76	4.2	4.69	14.7	2	10	0.01	4.5-14.5
	MW01002	5/24/2017	PVC	1,422,215.61	779,688.90	4.1	4.70	14.6	2	10	0.01	4.4-14.4
	MW01003	5/24/2017	PVC	1,422,207.81	779,754.07	2.4	4.82	7.8	2	5	0.01	2.6-7.6
	MW01004	5/24/2017	PVC	1,421,911.45	779,972.12	3.5	4.86	13.8	2	10	0.01	3.6-13.6
	MW01005	5/24/2017	PVC	1,421,813.11	780,093.55	4.8	5.04	15.0	2	10	0.01	4.8-14.8
	MW01006	5/24/2017	PVC	1,421,781.11	779,967.08	4.5	4.91	14.8	2	10	0.01	4.6-14.6
2	MW02001	5/23/2017	PVC	1,419,067.35	782,924.48	5.4	7.70	7.9	2	5	0.01	2.7-7.7
	MW02002	5/23/2017	PVC	1,418,942.39	782,939.44	5.2	7.20	8.2	2	5	0.01	3-8
	MW02003	5/23/2017	PVC	1,418,872.37	783,047.43	5.2	6.72	8.7	2	5	0.01	3.5-8.5
3	MW03001	5/22/2017	PVC	1,424,539.24	780,970.68	3.9	4.90	14.2	2	10	0.01	4-14
	MW03002	5/23/2017	PVC	1,424,516.90	781,028.18	4.1	4.68	14.6	2	10	0.01	4.4-14.4
	610-MW17	Unknown	PVC	1,424,499.00	780,962.69	4.5	4.25	13.0	2	10	NA	3-13

Notes:
amsl - above mean sea level
bgs - below ground surface
ft - feet
in - inches
NA - not available
PVC - Polyvinyl Chloride
TOC - top of casing

Table 3.0-2
Groundwater Elevations
Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Site Inspection Report, Patrick AFB, Florida

AFFF Release Area	Location ID	Well Depth (ft bgs)	Ground Surface Elevation (ft amsl)	TOC Elevation (ft amsl)	Date Measured	Depth to Groundwater (ft btoc)	Groundwater Elevation (ft amsl)
1	MW01001	14.5	4.2	4.69	5/25/2017	5.53	-0.84
	MW01002	14.4	4.1	4.70	5/25/2017	5.31	-0.61
	MW01003	7.6	2.4	4.82	5/25/2017	5.42	-0.60
	MW01004	13.6	3.5	4.86	5/25/2017	5.35	-0.49
	MW01005	14.8	4.8	5.04	5/25/2017	5.52	-0.48
	MW01006	14.6	4.5	4.91	5/25/2017	5.42	-0.51
2	MW02001	7.7	5.4	7.70	5/23/2017	6.69	1.01
	MW02002	8.0	5.2	7.20	5/23/2017	7.18	0.02
	MW02003	8.5	5.2	6.72	5/23/2017	7.65	-0.93
3	MW03001	14.0	3.9	4.90	5/24/2017	5.56	-0.66
	MW03002	14.4	4.1	4.68	5/24/2017	5.25	-0.57
	610-MW17	13.0	4.5	4.25	5/24/2017	4.28	-0.03

Notes:
amsl - above mean sea level
bgs - below ground surface
btoc - below top of casing
ft - feet
TOC - top of casing

Table 3.1-1
Summary of Soil Analytical Testing Results
Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Site Inspection Report, Patrick Air Force Base, Florida

						Analyte:	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluorobutanesulfonic acid (PFBS)	6:2 Fluorotelomer sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonate (8:2 FTS)	N-Ethyl perfluorooctanesulfonamido acetic acid (NETFOSAA)	N-Methyl perfluorooctanesulfonamido acetic acid (NMEFOSAA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
						Screening Level:	1.26[1]	1.26[1]	1300[2]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AFFF Release Area	**Location ID**	**Sample ID**	**Sample Date**	**Sample Depth (ft)**	**Sample Type**		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
1	MW01001	PTRK01-SO-001	23-May-17	0.0-0.5	N		0.474	0.0129 J	0.000803 J	0.00294 J	0.0179	0.004 U	0.004 U	0.00524	0.00119 J	0.0016 J	0.0473 J	0.00462 J	0.00211	0.001 U	0.001 U	0.00179 J
		PTRK01-SO-002	23-May-17	2.0-3.0	N		0.248	0.0239	0.00126 J	0.00699	0.0118	0.004 U	0.004 U	0.000976 J	0.001 U	0.00246	0.0562	0.00653	0.0019 J	0.001 U	0.001 U	0.000732 J
	MW01002	PTRK01-SO-003	24-May-17	0.0-0.5	N		0.147	0.00457	0.001 U	0.00741	0.0396	0.004 U	0.00371 J	0.00149 J	0.0117	0.00191 J	0.0164	0.00316	0.00099 J	0.001 U	0.001 U	0.00654
		PTRK-FD-SO-001	23-May-17	0.0-0.5	FD		0.00097 UJ	0.00097 UJ	0.00097 UJ	0.0039 UJ	0.0039 U	0.0039 U	0.0039 U	0.00097 U	0.00097 U	0.00097 UJ	0.00097 UJ	0.00097 UJ	0.00097 U	0.00097 U	0.00097 U	0.00097 U
		PTRK01-SO-004	24-May-17	2.0-3.0	N		0.292	0.00487	0.001 U	0.00393 J	0.0356	0.0041 U	0.0041 U	0.00319	0.001 U	0.00154 J	0.0181	0.00145 J	0.00256	0.001 U	0.001 U	0.00224
	MW01004	PTRK01-SO-005	24-May-17	0.0-1.0	N		0.011	0.001 U	0.001 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.000672 J	0.001 U	0.001 U	0.0012 J	0.000742 J	0.001 U	0.001 U	0.001 U	0.001 U
		PTRK01-SO-006	24-May-17	2.0-3.0	N		0.115 J	0.00097 U	0.00097 U	0.0039 U	0.0226	0.0039 U	0.0039 U	0.00097 U	0.00097 U	0.00097 U	0.000707 J	0.000336 J	0.00097 U	0.00097 U	0.00097 U	0.00097 U
	MW01005	PTRK01-SO-007	24-May-17	0.0-1.0	N		0.344	0.00178 J	0.004	0.0514	0.0039 U	0.0039 U	0.0039 U	0.00097 U	0.00097 U	0.000609 J	0.0313	0.00718	0.000645 J	0.00097 U	0.00097 U	0.00097 U
		PTRK01-SO-008	24-May-17	2.0-3.0	N		0.234	0.0294	0.000965 J	0.828	0.04 U	0.004 U	0.004 U	0.001 U	0.001 U	0.00229	0.232	0.00527	0.000961 J	0.001 U	0.001 U	0.001 U
	MW01006	PTRK01-SO-009	24-May-17	0.0-1.0	N		1.18	0.0011 J	0.00463	0.0261	0.0331	0.0039 U	0.0039 U	0.000555 J	0.00098 U	0.00117 J	0.0272	0.0114	0.00185 J	0.00098 U	0.00098 U	0.00098 U
		PTRK01-SO-010	24-May-17	2.0-3.0	N		0.312	0.0233	0.00223	0.752	0.041 U	0.0041 U	0.0041 U	0.001 U	0.001 U	0.00195 J	0.0816	0.00862	0.00221	0.001 U	0.001 U	0.001 U
2	MW02001	PTRK02-SO-001	23-May-17	0.0-0.5	N		0.000593 J	0.00097 U	0.00097 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U
		PTRK02-SO-002	23-May-17	2.0-3.0	N		0.00098 U	0.00098 U	0.00098 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U
	MW02002	PTRK02-SO-003	23-May-17	0.0-0.5	N		0.00144 J	0.00095 U	0.00095 U	0.0038 U	0.0038 U	0.0038 U	0.0038 U	0.00095 U	0.00095 U	0.00095 U	0.00095 U	0.00095 U	0.00095 U	0.00095 U	0.00095 U	0.00095 U
		PTRK02-SO-004	23-May-17	2.0-3.0	N		0.000651 J	0.00096 UJ	0.00096 UJ	0.0038 UJ	0.0038 U	0.0038 U	0.0038 U	0.00096 U	0.00096 U	0.00096 UJ	0.00096 UJ	0.00096 UJ	0.00096 U	0.00096 U	0.00096 U	0.00096 U
	MW02003	PTRK02-SO-005	23-May-17	0.0-0.5	N		0.0023	0.00098 U	0.00098 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U
		PTRK02-SO-006	23-May-17	2.0-3.0	N		0.00381 J	0.00095 UJ	0.00095 UJ	0.0038 UJ	0.0038 U	0.0038 U	0.0038 U	0.00095 U	0.00095 U	0.00095 UJ	0.00095 UJ	0.00095 UJ	0.00095 U	0.00095 U	0.00095 U	0.00095 U
3	MW03001	PTRK03-SO-001	22-May-17	0.0-0.5	N		0.00181 J	0.00098 U	0.00098 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U	0.000341 J	0.00098 U	0.00098 U	0.00098 U	0.00098 U
		PTRK03-SO-002	22-May-17	2.0-3.0	N		0.00124 J	0.00097 U	0.00097 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U
	MW03002	PTRK03-SO-003	23-May-17	0.0-0.5	N		0.00426	0.001 U	0.001 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
		PTRK03-SO-004	23-May-17	2.0-3.0	N		0.00797 J	0.00099 U	0.00099 U	0.004 U	0.004 U	0.004 U	0.004 U	0.00099 U	0.00099 U	0.00099 U	0.00099 U	0.00099 U	0.00099 U	0.00099 U	0.00099 U	0.00099 U
		PTRK-FD-SO-002	23-May-17	2.0-3.0	FD		0.00439 J	0.001 U	0.001 U	0.004 U	0.004 U	0.004 U	0.004 U	0.001 U	0.001 U	0.001 U	0.001 U	0.000292 J	0.001 U	0.001 U	0.001 U	0.001 U

Notes:

PFAS analysis by Modified USEPA Method 537 using Liquid Chromatography and Tandem Mass Spectrometry

[1]Screening levels calculated using the EPA Regional Screening Level calculator [https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search]

[2]USEPA Residential Screening Levels (June 2017) [https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-june-2017]

Highlighted cells indicate concentrations exceeding the Screening Level.

FD - field duplicate sample

ft - feet

ID - identification

J - The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.

mg/kg - milligrams per kilogram

N - normal field sample

NA - not applicable

U - The analyte was analyzed for but was not detected above the reporting limit of detection (LOD).

UJ - The reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

Table 3.1-2
Summary of Soil General Chemistry Analytical Testing Results
Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Site Inspection Report, Patrick Air Force Base, Florida

					Analyte:	pH	TOC
AFFF Release Area	**Location ID**	**Sample ID**	**Sample Date**	**Sample Depth (ft)**	**Sample Type**	S. U.	mg/kg
1	PTRCK01	PTRCK01-(0-1)	25-May-17	0.0-1.0	N	8.53	6610
		PTRCK01-(2-3)	25-May-17	2.0-3.0	N	8.13	10100
2	PTRCK02	PTRCK01-(0-1)	25-May-17	0.0-1.0	N	8.2	6920
		PTRCK01-(2-3)	25-May-17	2.0-3.0	N	8.32	16000
3	PTRCK03	PTRCK01-(0-1)	25-May-17	0.0-1.0	N	8.86	5920
		PTRCK01-(2-3)	25-May-17	2.0-3.0	N	9.17	4800

Notes:
ft - feet
ID - identification
N - normal field sample
mg/kg - milligrams per kilogram
S.U. - standard units
TOC - Total Organic Carbon

Table 3.1-3
Summary of Groundwater Analytical Testing Results
Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Site Inspection Report, Patrick Air Force Base, Florida

Analyte:						Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	PFOS+PFOA	Perfluorobutanesulfonic acid (PFBS)	6:2 Fluorotelomer sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonate (8:2 FTS)	N-Ethyl perfluorooctanesulfonamidoacetic acid (NETFOSAA)	N-Methyl perfluorooctanesulfonamidoacetic acid (NMEFOSAA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
USEPA Health Advisory[1]:						0.07	0.07	0.07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
USEPA Tap Water RSL[2]:						NA	NA	NA	400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AFFF Release Area	**Location ID**	**Sample ID**	**Sample Date**	**Sample Depth (ft)**	**Sample Type**	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
1	MW01001	PTRK01-GW-001	25-May-17	4.5-14.5	N	0.195	0.0311	0.2261	0.0245	0.0254 J	0.031 U	0.031 U	0.031 U	0.012 U	0.012 UJ	0.042	0.126	0.0383	0.00806 J	0.012 UJ	0.012 UJ	0.012 U
	MW01002	PTRK01-GW-002	25-May-17	4.4-14.4	N	0.926	0.0817	1.0077	0.0376	0.0752	0.489 J	0.031 U	0.031 U	0.012 U	0.012 UJ	0.155	0.248	0.141	0.0271 J	0.012 UJ	0.012 UJ	0.012 U
	MW01003	PTRK01-GW-003	25-May-17	2.6-7.6	N	1.32	0.236	1.556	0.064	0.0996	0.26	0.032 UJ	0.032 UJ	0.0101 J	0.012 U	0.442	0.655	0.456	0.0557	0.012 UJ	0.012 UJ	0.012 U
	MW01004	PTRK01-GW-004	25-May-17	3.6-13.6	N	152	6.06	158.06	3 U	97.9	17.1	8 U	8 U	3 U	3 U	3 U	20.6	5.87	2.81 J	3 UJ	3 UJ	3 U
	MW01005	PTRK01-GW-005	25-May-17	4.8-14.8	N	11.9	0.0768	11.9768	0.0342	0.592	4.6	0.032 U	0.032 U	0.0298	0.012 U	0.0971	0.573	0.173	0.0357	0.012 UJ	0.012 UJ	0.012 U
	MW01006	PTRK01-GW-006	25-May-17	4.6-14.6	N	159	4.99	163.99	2.37 J	129	25.3	7.7 U	7.7 U	2.9 U	2.9 U	2.44 J	25.4	10.5	1.18 J	2.9 UJ	2.9 UJ	2.9 U
2	MW02001	PTRK02-GW-001	23-May-17	2.7-7.7	N	0.0743	0.00968 J	0.08398 J	0.012 U	0.031 U	0.031 U	0.031 U	0.031 U	0.012 U	0.012 UJ	0.00859 J	0.0754	0.0099 J	0.00449 J	0.012 UJ	0.012 UJ	0.012 U
	MW02002	PTRK02-GW-002	23-May-17	3-8	N	0.95	0.0482	0.9982	0.0245	0.031 U	0.031 U	0.031 U	0.031 U	0.012 U	0.012 UJ	0.0776	0.618	0.0996	0.0253	0.012 UJ	0.012 UJ	0.012 U
		PTRK-FD-GW-001	23-May-17	3-8	FD	1.17 J	0.0481	1.2181 J	0.0248	0.031 U	0.031 U	0.031 U	0.031 U	0.012 U	0.012 UJ	0.0771	0.637	0.0969	0.0269 J	0.012 UJ	0.012 UJ	0.012 U
	MW02003	PTRK02-GW-003	23-May-17	3.5-8.5	N	1.33 J	0.0179	1.3479 J	0.0127 J	0.032 U	0.032 U	0.032 U	0.032 U	0.012 U	0.012 UJ	0.0121 J	0.346	0.0348	0.0133 J	0.012 UJ	0.012 UJ	0.012 U
3	MW03001	PTRK03-GW-001	24-May-17	4-14	N	12.2	0.937	13.137	2.58	1.34	0.031 U	0.031 U	0.031 U	0.012 U	0.012 UJ	0.372	7.93	2.08	0.0195 J	0.012 UJ	0.012 UJ	0.012 U
	MW03002	PTRK03-GW-002	24-May-17	4.4-14.4	N	3.07 J	0.155	3.225 J	0.396	0.03 J	0.031 U	0.031 U	0.031 U	0.012 U	0.012 UJ	0.0707	1.91 J	0.279	0.0115 J	0.012 UJ	0.012 UJ	0.012 U
		PTRK-FD-GW-002	24-May-17	4.4-14.4	FD	1.84 J	0.151	1.991 J	0.411	0.0289 J	0.032 U	0.032 UJ	0.032 UJ	0.012 U	0.012 U	0.0825	1.14 J	0.324	0.00984 J	0.012 UJ	0.012 UJ	0.012 U
	610-MW17	PTRK03-GW-610-MW17	24-May-17	3-13	N	1.28	0.068	1.348	0.193	0.032 U	0.032 U	0.0161 J	0.032 U	0.012 U	0.012 U	0.0718	0.207	0.075	0.0308	0.012 UJ	0.012 UJ	0.012 U

Notes:

PFAS analysis by Modified USEPA Method 537 using Liquid Chromatography and Tandem Mass Spectrometry

[1]Health Advisory from USEPA Office of Water, 2016a and 2016b, Health Advisories (HAs) for drinking water.

[2]USEPA Residential Screening Levels (June 2017a) [https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-june-2017]

Highlighted cells indicate concentrations exceeding USEPA Health Advisory

PFOS+PFOA = Co-occurrence of PFOA and PFOS (PFOA+PFOS) in aqueous samples is reported using the following guidelines

1. If both PFOA and PFOS are detected at or above the detection limit (DL), then the sum of PFOA+PFOS is reported
2. If only PFOS or only PFOA is detected at or above the DL in groundwater, then the concentration of the detected analyte only is reported
3. If neither PFOA nor PFOS is detected at or above the DL, then PFOA + PFOS is reported as "ND" representing Not Detected

FD - field duplicate sample

ft - feet

ID - identification

J - The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.

µg/L - micrograms per liter

N - normal field sample

NA - not applicable

U - The analyte was analyzed for but was not detected above the reporting limit of detection (LOD).

UJ - The reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

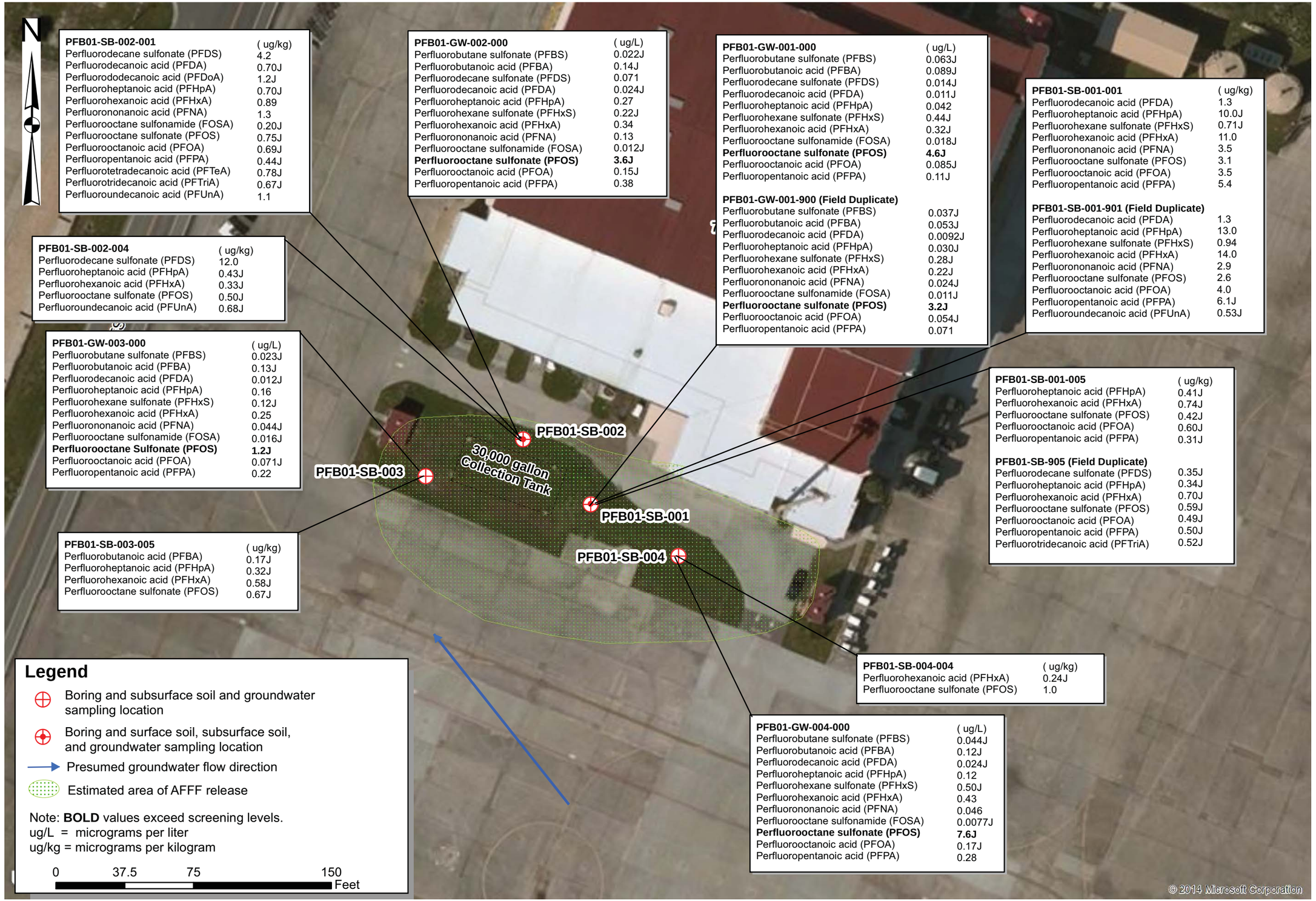
Table 4.0-1
Conceptual Site Model: Installation-Wide Summary
Site Inspection Report of Aqueous Film Forming Foam (AFFF) Release Areas
Site Inspection Report, Patrick Air Force Base, Florida

Facility Profile	Physical Profile	Release Profile	Land Use and Exposure Profile	Ecological Profile
Installation Description/History: • Years of operation: 1940 to present. • Size: Approximately 2,324 acres. • Location: East-central Florida coast between the communities of Satellite Beach and Cocoa Beach, in Brevard County, Florida. • Layout: Patrick AFB is comprised of one primary runway and several smaller transecting runways in the central portion; maintenance, support, and operational facilities north of the runways/flightline; and, residential and commercial facilities in the southeastern portion. • History: Patrick AFB was established in 1940 by the U.S. Navy as the Banana River Naval Air Station, and served as an active base for antisubmarine sea-patrol planes during World War II. The installation was transferred to the USAF in 1948 and renamed Patrick AFB in 1950. The USAF began development of the Eastern Test Range in 1950. From 1950 to present, the 45 SW has been headquartered at Patrick AFB and is responsible for launch, test and support operations associated with the cruise missile program, ballistic missiles, the Apollo and Space Shuttle programs, and the Delta, Atlas, Titan, and other commercial launch programs (SpaceX, Athena, etc.) (45 CES/CEIE). • Current Mission: The responsibility of safety, planning, engineering, support services, scheduling, test operations, launch and range operation, directing or supporting operations, and test results evaluation for the 45 SW (45 CES/CEIE). **AFFF Use:** • AFFF containing PFAS was used for firefighting training activities, testing of firefighting equipment, extinguishing petroleum fires, and in fire suppression systems at several buildings/hangars. • Based on the research conducted during the PA as well as information collected during a site scoping visit conducted by Amec Foster Wheeler on 15 November 2016, the following three potential AFFF release areas were identified as requiring further action: • AFFF Release Area 1 - Former FTA 2. • AFFF Release Area 2 - Fire Truck Rollover Area. • AFFF Release Area 3 - Northern Sewage Treatment Plant.	**Topography:** • Patrick AFB lies within the within the Atlantic Barrier Chain Physiographic Province at elevations less than 20 feet above mean sea level (amsl), with dunal formations immediately inland of the Atlantic Ocean beach forming the highest ridges (10 to 15 feet amsl) that slope gently to the west (CH2M Hill, 2000). **Vegetation:** • The installation is primarily developed; however, limited natural vegetation consists of salt-tolerant plants including sea oats, saw palmetto, sea grapes, coco-plum, wax myrtle, lantana, and bay cedar (Reynolds, Smith and Hills Inc., 1984). **Surface Water:** • The surface water features at Patrick AFB consists of manmade ditches, culverts, and drainage canals that collect and divert rainwater westward into the Banana River (CH2M Hill, 2000). **Soils:** • The principle soil types at Patrick AFB include the Canaveral Complex, Urban Land, and Galveston-Urban Land Complex that generally consist of highly permeable, fine-grained beach sands (CH2M Hill, 2000). Silty sands were encountered at 2 to 3 feet bgs during this investigation. **Geology:** • Surficial sediments consist of approximately 100 feet of undifferentiated Pleistocene and Holocene beach deposits underlain by coquina and sandy clay of the Anastasia Formation, the Caloosahatchee Marl Formation, and limestone of the Tamiami Formation (CH2M Hill, 2000). • The underlying Miocene Age Hawthorn Group is composed predominantly of clays, silts, and marls (CH2M Hill, 2000). **Hydrogeology:** • The surficial aquifer system is contained in undifferentiated Late Miocene, Pliocene, and Recent Pleistocene deposits composed primarily of medium to coarse quartz sands and coquina under unconfined conditions (CH2M Hill, 2000). • Groundwater was encountered at depths of 4 to 5 feet below land surface during this investigation and flows to the generally west (CH2M Hill, 2000), though during this investigation groundwater near AFFF Release Area 3 was observed to be flowing to the southeast towards the Atlantic Ocean. • The Floridian Aquifer is comprised of a series of highly permeable limestone formations of the Eocene Age Ocala Group and Avon Park Limestone that is separated from the surficial aquifer by the Hawthorn Group, which acts as an aquitard (CH2M Hill, 2000). **Meteorology:** • Average annual rainfall is approximately 47 inches/year (CH2M Hill, 2000). • Average high temperature of 81.6 degrees Fahrenheit (°F) occurs in August, while an average low of 62.4°F occurs in January (CH2M Hill, 2000).	**Contaminants of Potential Concern:** • PFAS are the contaminants of potential concern during this investigation. • Petroleum-related compounds, chlorinated solvents, metals and PFAS are historical site contaminants. **Media of Potential Concern:** • Soil and groundwater. **Confirmed AFFF Releases:** • Former FTA 2: Fire training exercises were performed in two burn pits potentially using an unknown amount of AFFF. Burn Pit 1 was unlined and used from 1970 to 1985. Burn Pit 2 was concrete-lined and used from 1985 to 2001, with AFFF potentially released outside the concrete-lined area. • Fire Truck Rollover Area: A fire truck rolled over when turning from Taxiway E onto Taxiway B and released an unknown quantity of AFFF onto the taxiway and surrounding grass. • Northern Sewage Treatment Plant: This facility received wastewater, potentially containing AFFF, from releases at various hangars and buildings from 1968 to 1995. An unknown amount of AFFF was observed at the plant in 1994 that discharged onto the surrounding grounds. • Hangar 630: PFOS concentrations in groundwater exceeded the current USEPA HA value in May 2014 (SCF, 2014). • Hangar 647: PFOS and PFOA concentrations in groundwater exceeded the current USEPA HA value in May 2014 (SCF, 2014). • Hangar 705: PFOS and PFOA concentrations in groundwater exceeded the current USEPA HA value in May 2014 (SCF, 2014). • Hangar 750: PFOS and PFOA concentrations in groundwater exceeded the current USEPA HA value in May 2014 (SCF, 2014). • Building 313, Former Plating Shop): PFOS concentrations in groundwater exceeded the current USEPA HA value in May 2014 (SCF, 2014).	**Current Land Use:** • Occupied by Patrick AFB. **Future Land Use:** • Land use is not expected to change in the future. **Potential Receptors:** • Potential receptors associated with current and future land use include USAF personnel and residents, grounds maintenance workers, utility workers, construction workers, and trespassers.	**Potential Ecological Receptors** (HGL, 2015)**:** • Inland and aquatic plant species, reptiles, birds, and mammals that inhabit or migrate through or adjacent to the installation. • Banana River. • Multiple wetlands on and adjacent to the installation. **Threatened and Endangered Species** (United States Fish and Wildlife Service, 2017)**:** • Threatened species that were identified in Brevard County and may exist at Patrick AFB include the following: • Wood stork - Bird (*Mycteria americana*). • Audubon's crested caracara - Bird (*Polyborus plancas audubonii*) • Florida scrub-jay – Bird (*Aphelocoma coerulescens*) • Southeastern beach mouse – Mammal (*Peromyscus polionotus niveiventris*) • Loggerhead sea turtle – Reptile (*Caretta caretta*) • Atlantic salt marsh snake (*Nerodia clarkia taeniata*) • Eastern Indigo Snake - Reptile (*Drymarchon corais couperi*) • Endangered species that were identified in Brevard County and may exist at Patrick AFB include the following: • Everglade snail kite - Bird (*Rostrhamus sociabilis plumbeus*). • West Indian Manatee – mammal (*Trichechus manatus*)

		• Fire Station, Building 810): PFOS and PFOA concentrations in groundwater exceeded the current USEPA HA value in May 2014 (SCF, 2014). • Outfall 21 to Banana River: PFOS and PFOA concentrations in surface water exceeded the current USEPA HA value in May 2014 (SCF, 2014). **Primary Release Pathways:** • Release or application of AFFF to the ground at potential source areas. • Infiltration of PFAS deeper into the soil column over time reaching groundwater. • AFFF washed into drainage, storm water, and sewer systems. **Secondary Release Pathways:** • None		• Hawksbill sea turtle – Reptile (*Eretmochelys imbricata*) • Leatherneck sea turtle – Reptile (*Dermochelys coriacea*)

APPENDIX A

SCF SITE INVESTIGATION REPORT (2014)
DATA TABLES AND FIGURES



PFB01-SB-002-001

	(ug/kg)
Perfluorodecane sulfonate (PFDS)	4.2
Perfluorodecanoic acid (PFDA)	0.70J
Perfluorododecanoic acid (PFDoA)	1.2J
Perfluoroheptanoic acid (PFHpA)	0.70J
Perfluorohexanoic acid (PFHxA)	0.89
Perfluorononanoic acid (PFNA)	1.3
Perfluorooctane sulfonamide (FOSA)	0.20J
Perfluorooctane sulfonate (PFOS)	0.75J
Perfluorooctanoic acid (PFOA)	0.69J
Perfluoropentanoic acid (PFPA)	0.44J
Perfluorotetradecanoic acid (PFTeA)	0.78J
Perfluorotridecanoic acid (PFTriA)	0.67J
Perfluoroundecanoic acid (PFUnA)	1.1

PFB01-SB-002-004

	(ug/kg)
Perfluorodecane sulfonate (PFDS)	12.0
Perfluoroheptanoic acid (PFHpA)	0.43J
Perfluorohexanoic acid (PFHxA)	0.33J
Perfluorooctane sulfonate (PFOS)	0.50J
Perfluoroundecanoic acid (PFUnA)	0.68J

PFB01-GW-003-000

	(ug/L)
Perfluorobutane sulfonate (PFBS)	0.023J
Perfluorobutanoic acid (PFBA)	0.13J
Perfluorodecanoic acid (PFDA)	0.012J
Perfluoroheptanoic acid (PFHpA)	0.16
Perfluorohexane sulfonate (PFHxS)	0.12J
Perfluorohexanoic acid (PFHxA)	0.25
Perfluorononanoic acid (PFNA)	0.044J
Perfluorooctane sulfonamide (FOSA)	0.016J
Perfluorooctane Sulfonate (PFOS)	**1.2J**
Perfluorooctanoic acid (PFOA)	0.071J
Perfluoropentanoic acid (PFPA)	0.22

PFB01-SB-003-005

	(ug/kg)
Perfluorobutanoic acid (PFBA)	0.17J
Perfluoroheptanoic acid (PFHpA)	0.32J
Perfluorohexanoic acid (PFHxA)	0.58J
Perfluorooctane sulfonate (PFOS)	0.67J

PFB01-GW-002-000

	(ug/L)
Perfluorobutane sulfonate (PFBS)	0.022J
Perfluorobutanoic acid (PFBA)	0.14J
Perfluorodecane sulfonate (PFDS)	0.071
Perfluorodecanoic acid (PFDA)	0.024J
Perfluoroheptanoic acid (PFHpA)	0.27
Perfluorohexane sulfonate (PFHxS)	0.22J
Perfluorohexanoic acid (PFHxA)	0.34
Perfluorononanoic acid (PFNA)	0.13
Perfluorooctane sulfonamide (FOSA)	0.012J
Perfluorooctane sulfonate (PFOS)	**3.6J**
Perfluorooctanoic acid (PFOA)	0.15J
Perfluoropentanoic acid (PFPA)	0.38

PFB01-GW-001-000

	(ug/L)
Perfluorobutane sulfonate (PFBS)	0.063J
Perfluorobutanoic acid (PFBA)	0.089J
Perfluorodecane sulfonate (PFDS)	0.014J
Perfluorodecanoic acid (PFDA)	0.011J
Perfluoroheptanoic acid (PFHpA)	0.042
Perfluorohexane sulfonate (PFHxS)	0.44J
Perfluorohexanoic acid (PFHxA)	0.32J
Perfluorooctane sulfonamide (FOSA)	0.018J
Perfluorooctane sulfonate (PFOS)	**4.6J**
Perfluorooctanoic acid (PFOA)	0.085J
Perfluoropentanoic acid (PFPA)	0.11J

PFB01-GW-001-900 (Field Duplicate)

Perfluorobutane sulfonate (PFBS)	0.037J
Perfluorobutanoic acid (PFBA)	0.053J
Perfluorodecanoic acid (PFDA)	0.0092J
Perfluoroheptanoic acid (PFHpA)	0.030J
Perfluorohexane sulfonate (PFHxS)	0.28J
Perfluorohexanoic acid (PFHxA)	0.22J
Perfluorononanoic acid (PFNA)	0.024J
Perfluorooctane sulfonamide (FOSA)	0.011J
Perfluorooctane sulfonate (PFOS)	**3.2J**
Perfluorooctanoic acid (PFOA)	0.054J
Perfluoropentanoic acid (PFPA)	0.071

PFB01-SB-001-001

	(ug/kg)
Perfluorodecanoic acid (PFDA)	1.3
Perfluoroheptanoic acid (PFHpA)	10.0J
Perfluorohexane sulfonate (PFHxS)	0.71J
Perfluorohexanoic acid (PFHxA)	11.0
Perfluorononanoic acid (PFNA)	3.5
Perfluorooctane sulfonate (PFOS)	3.1
Perfluorooctanoic acid (PFOA)	3.5
Perfluoropentanoic acid (PFPA)	5.4

PFB01-SB-001-901 (Field Duplicate)

Perfluorodecanoic acid (PFDA)	1.3
Perfluoroheptanoic acid (PFHpA)	13.0
Perfluorohexane sulfonate (PFHxS)	0.94
Perfluorohexanoic acid (PFHxA)	14.0
Perfluorononanoic acid (PFNA)	2.9
Perfluorooctane sulfonate (PFOS)	2.6
Perfluorooctanoic acid (PFOA)	4.0
Perfluoropentanoic acid (PFPA)	6.1J
Perfluoroundecanoic acid (PFUnA)	0.53J

PFB01-SB-001-005

	(ug/kg)
Perfluoroheptanoic acid (PFHpA)	0.41J
Perfluorohexanoic acid (PFHxA)	0.74J
Perfluorooctane sulfonate (PFOS)	0.42J
Perfluorooctanoic acid (PFOA)	0.60J
Perfluoropentanoic acid (PFPA)	0.31J

PFB01-SB-905 (Field Duplicate)

Perfluorodecane sulfonate (PFDS)	0.35J
Perfluoroheptanoic acid (PFHpA)	0.34J
Perfluorohexanoic acid (PFHxA)	0.70J
Perfluorooctane sulfonate (PFOS)	0.59J
Perfluorooctanoic acid (PFOA)	0.49J
Perfluoropentanoic acid (PFPA)	0.50J
Perfluorotridecanoic acid (PFTriA)	0.52J

PFB01-SB-004-004

	(ug/kg)
Perfluorohexanoic acid (PFHxA)	0.24J
Perfluorooctane sulfonate (PFOS)	1.0

PFB01-GW-004-000

	(ug/L)
Perfluorobutane sulfonate (PFBS)	0.044J
Perfluorobutanoic acid (PFBA)	0.12J
Perfluorodecanoic acid (PFDA)	0.024J
Perfluoroheptanoic acid (PFHpA)	0.12
Perfluorohexane sulfonate (PFHxS)	0.50J
Perfluorohexanoic acid (PFHxA)	0.43
Perfluorononanoic acid (PFNA)	0.046
Perfluorooctane sulfonamide (FOSA)	0.0077J
Perfluorooctane sulfonate (PFOS)	**7.6J**
Perfluorooctanoic acid (PFOA)	0.17J
Perfluoropentanoic acid (PFPA)	0.28

Legend

- Boring and subsurface soil and groundwater sampling location
- Boring and surface soil, subsurface soil, and groundwater sampling location
- Presumed groundwater flow direction
- Estimated area of AFFF release

Note: **BOLD** values exceed screening levels.
ug/L = micrograms per liter
ug/kg = micrograms per kilogram

0 37.5 75 150 Feet

SES Construction and Fuel Services LLC
1006 Floyd Culler Court
Oak Ridge, Tennessee 37830

Job Title: Site Investigations of Fire Fighting Foam Usage at Various Air Force Bases in the United States
Source: Patrick AFB GIS

Figure 4 Site 1 Hangar 750 Sample Locations and Detection Summary for AFFF Investigations Patrick Air Force Base, Florida

R:\Projects\Q1062.0007 AFFF Site Investigations\Patrick AFB\Graphics\Patrick AFB Hangar 750 Sample Results.mxd (07/24/2014)

PFB02-GW-003-000	(ug/L)
Perfluorobutane sulfonate (PFBS)	110J
Perfluorobutanoic acid (PFBA)	23.0J
Perfluorodecanoic acid (PFDA)	0.13J
Perfluoroheptanoic acid (PFHpA)	15.0J
Perfluorohexane sulfonate (PFHxS)	250J
Perfluorohexanoic acid (PFHxA)	77.0J
Perfluorononanoic acid (PFNA)	0.29J
Perfluorooctane sulfonamide (FOSA)	4.8
Perfluoroctane sulfonate (PFOS)	**4,300J**
Perfluorooctanoic acid (PFOA)	**38.0**
Perfluoropentanoic acid (PFPA)	43.0J
Perfluoroundecanoic acid (PFUnA)	0.033

PFB02-GW-004-000	(ug/L)
Perfluorobutane sulfonate (PFBS)	1.6J
Perfluorobutanoic acid (PFBA)	0.48J
Perfluorodecane sulfonate (PFDS)	0.14J
Perfluorodecanoic acid (PFDA)	0.0091J
Perfluoroheptanoic acid (PFHpA)	0.32
Perfluorohexane sulfonate (PFHxS)	6.8J
Perfluorohexanoic acid (PFHxA)	2.1
Perfluorooctane sulfonamide (FOSA)	0.67
Perfluoroctane sulfonate (PFOS)	**110J**
Perfluorooctanoic acid (PFOA)	**1.6J**
Perfluoropentanoic acid (PFPA)	0.91

PFB02-SB-004-006	(ug/kg)
Perfluorobutane sulfonate (PFBS)	0.81J
Perfluorobutanoic acid (PFBA)	0.40J
Perfluoroheptanoic acid (PFHpA)	0.99
Perfluorohexane sulfonate (PFHxS)	4.3
Perfluorohexanoic acid (PFHxA)	3.0
Perfluorooctane sulfonate (PFOS)	7.5
Perfluoropentanoic acid (PFPA)	2.0
Perfluorotridecanoic Acid (PFTriA)	0.53J

PFB02-GW-001-000	(ug/L)
Perfluorobutane sulfonate (PFBS)	28.0J
Perfluorobutanoic acid (PFBA)	32.0J
Perfluorodecanoic acid (PFDA)	0.018J
Perfluoroheptanoic acid (PFHpA)	16.0J
Perfluorohexane sulfonate (PFHxS)	170.0J
Perfluorohexanoic acid (PFHxA)	56.0J
Perfluorooctane sulfonamide (FOSA)	1.3
Perfluoroctane sulfonate (PFOS)	**2,500J**
Perfluorooctanoic acid (PFOA)	**100J**
Perfluoropentanoic acid (PFPA)	20.0J

PFB02-SB-003-005	(ug/kg)
Perfluorobutane sulfonate (PFBS)	29.0J
Perfluorobutanoic acid (PFBA)	13.0J
Perfluorodecanoic acid (PFDA)	0.86J
Perfluoroheptanoic acid (PFHpA)	17.0J
Perfluorohexane sulfonate (PFHxS)	340J
Perfluorohexanoic acid (PFHxA)	100J
Perfluorooctane sulfonamide (FOSA)	36.0J
Perfluorooctanoic acid (PFOA)	110J
Perfluoropentanoic acid (PFPA)	38.0J
Perfluoroundecanoic acid (PFUnA)	0.46J

PFB02-SB-001-001	(ug/kg)
Perfluorobutane sulfonate (PFBS)	5.9J
Pefluorobutanoic acid (PFBA)	2.2J
Pefluorodecane sulfonate (PFDS)	1.9J
Perfluorodecanoic acid (PFDA)	0.4J
Perfluoroheptanoic acid (PFHpA)	4.4
Perfluorohexane sulfonate (PFHxS)	34.0
Perfluorohexanoic acid (PFHxA)	3.9
Perfluorononanoic acid (PFNA)	0.23J
Perfluorooctane sulfonamide (FOSA)	1.5J
Perfluoroctane sulfonate (PFOS)	160J
Perfluorooctanoic acid (PFOA)	2.2J
Perfluoropentanoic acid (PFPA)	6.4J

PFB02-GW-002-000	(ug/L)
Perfluorobutane sulfonate (PFBS)	21.0J
Perfluorobutanoic acid (PFBA)	7.2J
Perfluorodecanoic acid (PFDA)	0.022J
Perfluoroheptanoic acid (PFHpA)	5.5J
Perfluorohexane sulfonate (PFHxS)	63.0J
Perfluorohexanoic acid (PFHxA)	36.0J
Perfluorooctane sulfonamide (FOSA)	0.10
Perfluorooctane sulfonate (PFOS)	**150J**
Perfluorooctanoic acid (PFOA)	**11.0J**
Perfluoropentanoic acid (PFPA)	17.0J

PFB02-SB-002-001	(ug/kg)
Perfluorobutane sulfonate (PFBS)	1.5
Perfluorobutanoic acid (PFBA)	1.0
Perfluorodecane sulfonate (PFDS)	0.66J
Perfluoroheptanoic acid (PFHpA)	0.39J
Perfluorohexane sulfonate (PFHxS)	5.7
Perfluorohexanoic acid (PFHxA)	2.2
Perfluorooctane sulfonamide (FOSA)	1.2
Perfluorooctane sulfonate (PFOS)	35.0
Perfluorooctanoic acid (PFOA)	0.29J
Perfluoropentanoic acid (PFPA)	1.8

PFB02-SB-002-005	(ug/kg)
Perfluorobutane sulfonate (PFBS)	0.28J
Perfluorobutanoic acid (PFBA)	0.18J
Perfluoroheptanoic acid (PFHpA)	0.38J
Perfluorohexane sulfonate (PFHxS)	4.8
Perfluorohexanoic acid (PFHxA)	0.97
Perfluorooctane sulfonamide (FOSA)	0.47J
Perfluorooctane sulfonate (PFOS)	140
Perfluorooctanoic acid (PFOA)	0.26J
Perfluoropentanoic acid (PFPA)	0.59J
Perfluorotridecanoic Acid (PFTriA)	0.46J

PFB02-SB-001-005	(ug/kg)
PerPerfluorobutane sulfonate (PFBS)	2.2
Perfluorobutanoic acid (PFBA)	1.2
Perfluorodecane sulfonate (PFDS)	5.8
Perfluorodecanoic acid (PFDA)	0.34J
Perfluoroheptanoic acid (PFHpA)	3.0
Perfluorohexane sulfonate (PFHxS)	25.0
Perfluorohexanoic acid (PFHxA)	7.5
Perfluorooctane sulfonamide (FOSA)	13.0
Perfluorooctane sulfonate (PFOS)	660J
Perfluorooctanoic acid (PFOA)	3.9
Perfluoropentanoic acid (PFPA)	4.8

Legend

- Boring and subsurface soil and groundwater sampling location
- Boring and surface soil, subsurface soil, and groundwater sampling location
- Presumed groundwater flow direction
- Estimated area of AFFF release

Note: **BOLD** values exceed screening levels.
ug/L = micrograms per liter
ug/kg = micrograms per kilogram

0 37.5 75 150 Feet

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Figure 5 Site 2 Building 705 Sample Locations and Detection Summary for AFFF Investigations Patrick Air Force Base, Florida

R:\Projects\Q1062.0007 AFFF Site Investigations\Patrick AFB\Graphics\Patrick AFB Bldg 705 Sample Results.mxd (07/24/2014)

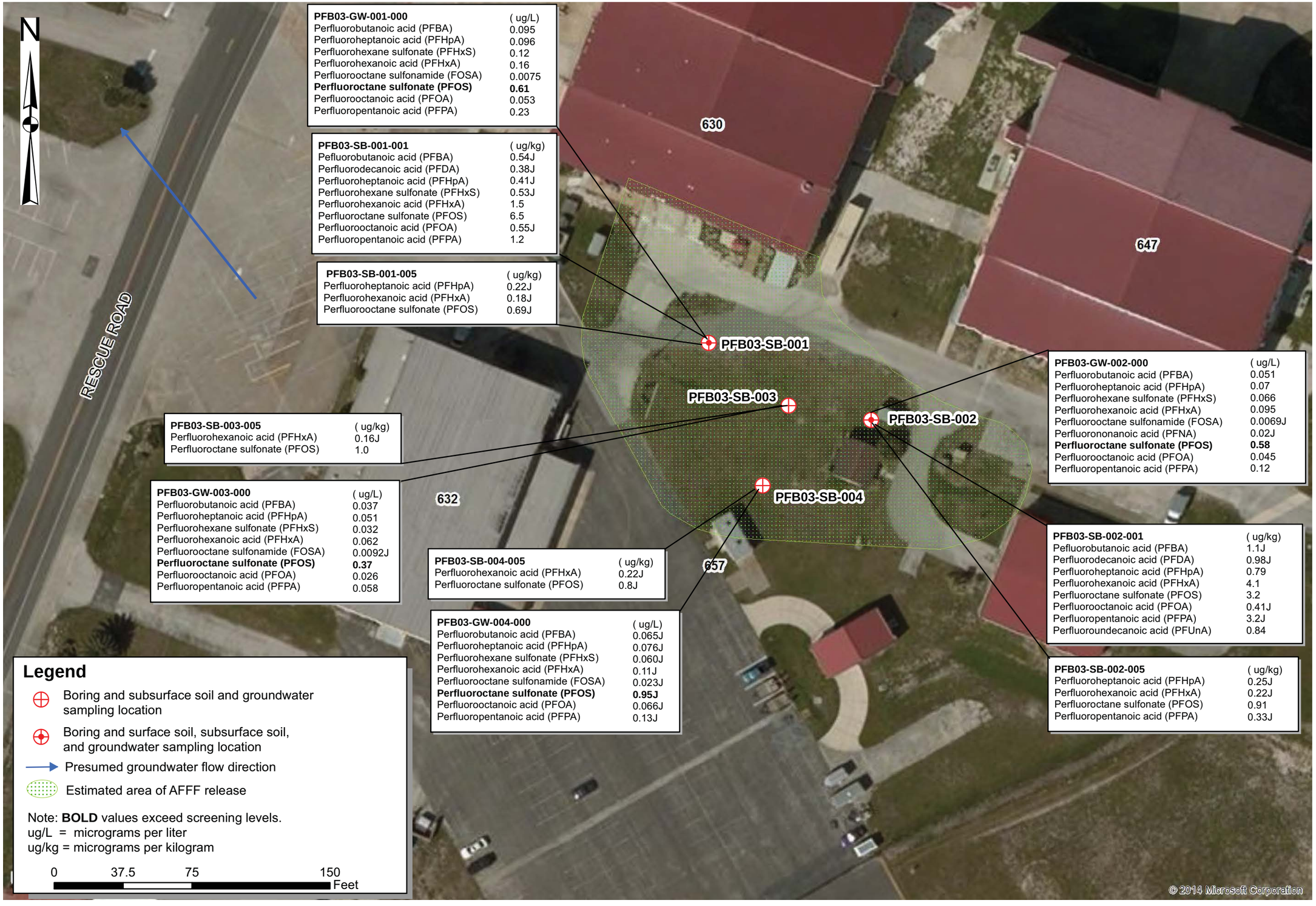

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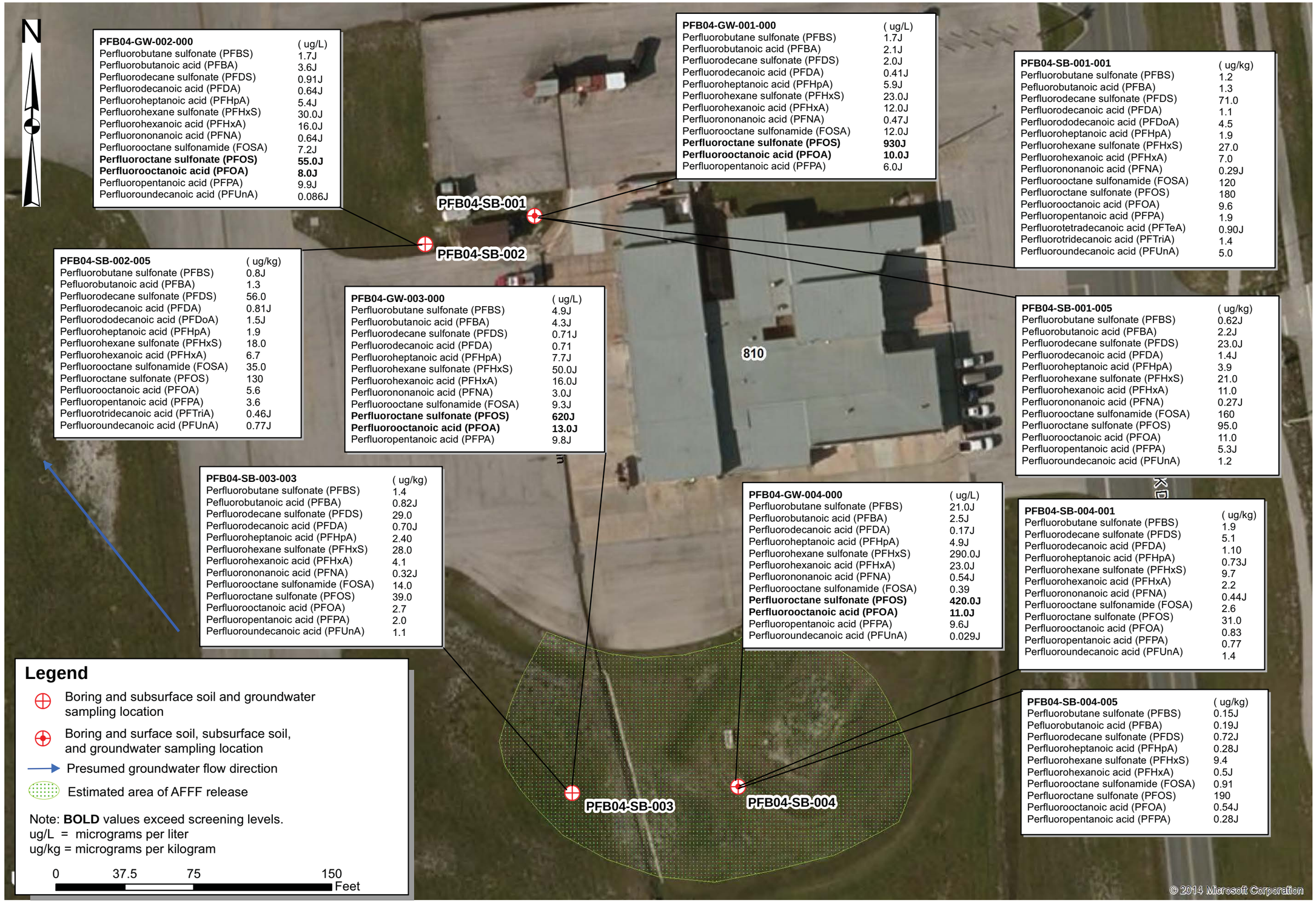
Figure 6 Site 3 Hangar 630/647 (South Side)
Sample Locations and Detection Summary
for AFFF Investigations
Patrick Air Force Base, Florida



PFB04-GW-002-000	(ug/L)
Perfluorobutane sulfonate (PFBS)	1.7J
Perfluorobutanoic acid (PFBA)	3.6J
Perfluorodecane sulfonate (PFDS)	0.91J
Perfluorodecanoic acid (PFDA)	0.64J
Perfluoroheptanoic acid (PFHpA)	5.4J
Perfluorohexane sulfonate (PFHxS)	30.0J
Perfluorohexanoic acid (PFHxA)	16.0J
Perfluorononanoic acid (PFNA)	0.64J
Perfluorooctane sulfonamide (FOSA)	7.2J
Perfluoroctane sulfonate (PFOS)	**55.0J**
Perfluorooctanoic acid (PFOA)	**8.0J**
Perfluoropentanoic acid (PFPA)	9.9J
Perfluoroundecanoic acid (PFUnA)	0.086J

PFB04-GW-001-000	(ug/L)
Perfluorobutane sulfonate (PFBS)	1.7J
Perfluorobutanoic acid (PFBA)	2.1J
Perfluorodecane sulfonate (PFDS)	2.0J
Perfluorodecanoic acid (PFDA)	0.41J
Perfluoroheptanoic acid (PFHpA)	5.9J
Perfluorohexane sulfonate (PFHxS)	23.0J
Perfluorohexanoic acid (PFHxA)	12.0J
Perfluorononanoic acid (PFNA)	0.47J
Perfluorooctane sulfonamide (FOSA)	12.0J
Perfluoroctane sulfonate (PFOS)	**930J**
Perfluorooctanoic acid (PFOA)	**10.0J**
Perfluoropentanoic acid (PFPA)	6.0J

PFB04-SB-001-001	(ug/kg)
Perfluorobutane sulfonate (PFBS)	1.2
Pefluorobutanoic acid (PFBA)	1.3
Perfluorodecane sulfonate (PFDS)	71.0
Perfluorodecanoic acid (PFDA)	1.1
Perfluorododecanoic acid (PFDoA)	4.5
Perfluoroheptanoic acid (PFHpA)	1.9
Perfluorohexane sulfonate (PFHxS)	27.0
Perfluorohexanoic acid (PFHxA)	7.0
Perfluorononanoic acid (PFNA)	0.29J
Perfluorooctane sulfonamide (FOSA)	120
Perfluoroctane sulfonate (PFOS)	180
Perfluorooctanoic acid (PFOA)	9.6
Perfluoropentanoic acid (PFPA)	1.9
Perfluorotetradecanoic acid (PFTeA)	0.90J
Perfluorotridecanoic acid (PFTriA)	1.4
Perfluoroundecanoic acid (PFUnA)	5.0

PFB04-SB-002-005	(ug/kg)
Perfluorobutane sulfonate (PFBS)	0.8J
Pefluorobutanoic acid (PFBA)	1.3
Perfluorodecane sulfonate (PFDS)	56.0
Perfluorodecanoic acid (PFDA)	0.81J
Perfluorododecanoic acid (PFDoA)	1.5J
Perfluoroheptanoic acid (PFHpA)	1.9
Perfluorohexane sulfonate (PFHxS)	18.0
Perfluorohexanoic acid (PFHxA)	6.7
Perfluorooctane sulfonamide (FOSA)	35.0
Perfluoroctane sulfonate (PFOS)	130
Perfluorooctanoic acid (PFOA)	5.6
Perfluoropentanoic acid (PFPA)	3.6
Perfluorotridecanoic acid (PFTriA)	0.46J
Perfluoroundecanoic acid (PFUnA)	0.77J

PFB04-GW-003-000	(ug/L)
Perfluorobutane sulfonate (PFBS)	4.9J
Perfluorobutanoic acid (PFBA)	4.3J
Perfluorodecane sulfonate (PFDS)	0.71J
Perfluorodecanoic acid (PFDA)	0.71
Perfluoroheptanoic acid (PFHpA)	7.7J
Perfluorohexane sulfonate (PFHxS)	50.0J
Perfluorohexanoic acid (PFHxA)	16.0J
Perfluorononanoic acid (PFNA)	3.0J
Perfluorooctane sulfonamide (FOSA)	9.3J
Perfluoroctane sulfonate (PFOS)	**620J**
Perfluorooctanoic acid (PFOA)	**13.0J**
Perfluoropentanoic acid (PFPA)	9.8J

PFB04-SB-001-005	(ug/kg)
Perfluorobutane sulfonate (PFBS)	0.62J
Pefluorobutanoic acid (PFBA)	2.2J
Perfluorodecane sulfonate (PFDS)	23.0J
Perfluorodecanoic acid (PFDA)	1.4J
Perfluoroheptanoic acid (PFHpA)	3.9
Perfluorohexane sulfonate (PFHxS)	21.0
Perfluorohexanoic acid (PFHxA)	11.0
Perfluorononanoic acid (PFNA)	0.27J
Perfluorooctane sulfonamide (FOSA)	160
Perfluoroctane sulfonate (PFOS)	95.0
Perfluorooctanoic acid (PFOA)	11.0
Perfluoropentanoic acid (PFPA)	5.3J
Perfluoroundecanoic acid (PFUnA)	1.2

PFB04-SB-003-003	(ug/kg)
Perfluorobutane sulfonate (PFBS)	1.4
Pefluorobutanoic acid (PFBA)	0.82J
Perfluorodecane sulfonate (PFDS)	29.0
Perfluorodecanoic acid (PFDA)	0.70J
Perfluoroheptanoic acid (PFHpA)	2.40
Perfluorohexane sulfonate (PFHxS)	28.0
Perfluorohexanoic acid (PFHxA)	4.1
Perfluorononanoic acid (PFNA)	0.32J
Perfluorooctane sulfonamide (FOSA)	14.0
Perfluoroctane sulfonate (PFOS)	39.0
Perfluorooctanoic acid (PFOA)	2.7
Perfluoropentanoic acid (PFPA)	2.0
Perfluoroundecanoic acid (PFUnA)	1.1

PFB04-GW-004-000	(ug/L)
Perfluorobutane sulfonate (PFBS)	21.0J
Perfluorobutanoic acid (PFBA)	2.5J
Perfluorodecanoic acid (PFDA)	0.17J
Perfluoroheptanoic acid (PFHpA)	4.9J
Perfluorohexane sulfonate (PFHxS)	290.0J
Perfluorohexanoic acid (PFHxA)	23.0J
Perfluorononanoic acid (PFNA)	0.54J
Perfluorooctane sulfonamide (FOSA)	0.39
Perfluoroctane sulfonate (PFOS)	**420.0J**
Perfluorooctanoic acid (PFOA)	**11.0J**
Perfluoropentanoic acid (PFPA)	9.6J
Perfluoroundecanoic acid (PFUnA)	0.029J

PFB04-SB-004-001	(ug/kg)
Perfluorobutane sulfonate (PFBS)	1.9
Perfluorodecane sulfonate (PFDS)	5.1
Perfluorodecanoic acid (PFDA)	1.10
Perfluoroheptanoic acid (PFHpA)	0.73J
Perfluorohexane sulfonate (PFHxS)	9.7
Perfluorohexanoic acid (PFHxA)	2.2
Perfluorononanoic acid (PFNA)	0.44J
Perfluorooctane sulfonamide (FOSA)	2.6
Perfluoroctane sulfonate (PFOS)	31.0
Perfluorooctanoic acid (PFOA)	0.83
Perfluoropentanoic acid (PFPA)	0.77
Perfluoroundecanoic acid (PFUnA)	1.4

PFB04-SB-004-005	(ug/kg)
Perfluorobutane sulfonate (PFBS)	0.15J
Pefluorobutanoic acid (PFBA)	0.19J
Perfluorodecane sulfonate (PFDS)	0.72J
Perfluoroheptanoic acid (PFHpA)	0.28J
Perfluorohexane sulfonate (PFHxS)	9.4
Perfluorohexanoic acid (PFHxA)	0.5J
Perfluorooctane sulfonamide (FOSA)	0.91
Perfluoroctane sulfonate (PFOS)	190
Perfluorooctanoic acid (PFOA)	0.54J
Perfluoropentanoic acid (PFPA)	0.28J

Legend

- Boring and subsurface soil and groundwater sampling location
- Boring and surface soil, subsurface soil, and groundwater sampling location
- Presumed groundwater flow direction
- Estimated area of AFFF release

Note: **BOLD** values exceed screening levels.
ug/L = micrograms per liter
ug/kg = micrograms per kilogram

0 37.5 75 150 Feet

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Figure 7 Site 4 Building 810 Sample Locations and Detention Summary for AFFF Investigations Patrick Air Force Base, Florida

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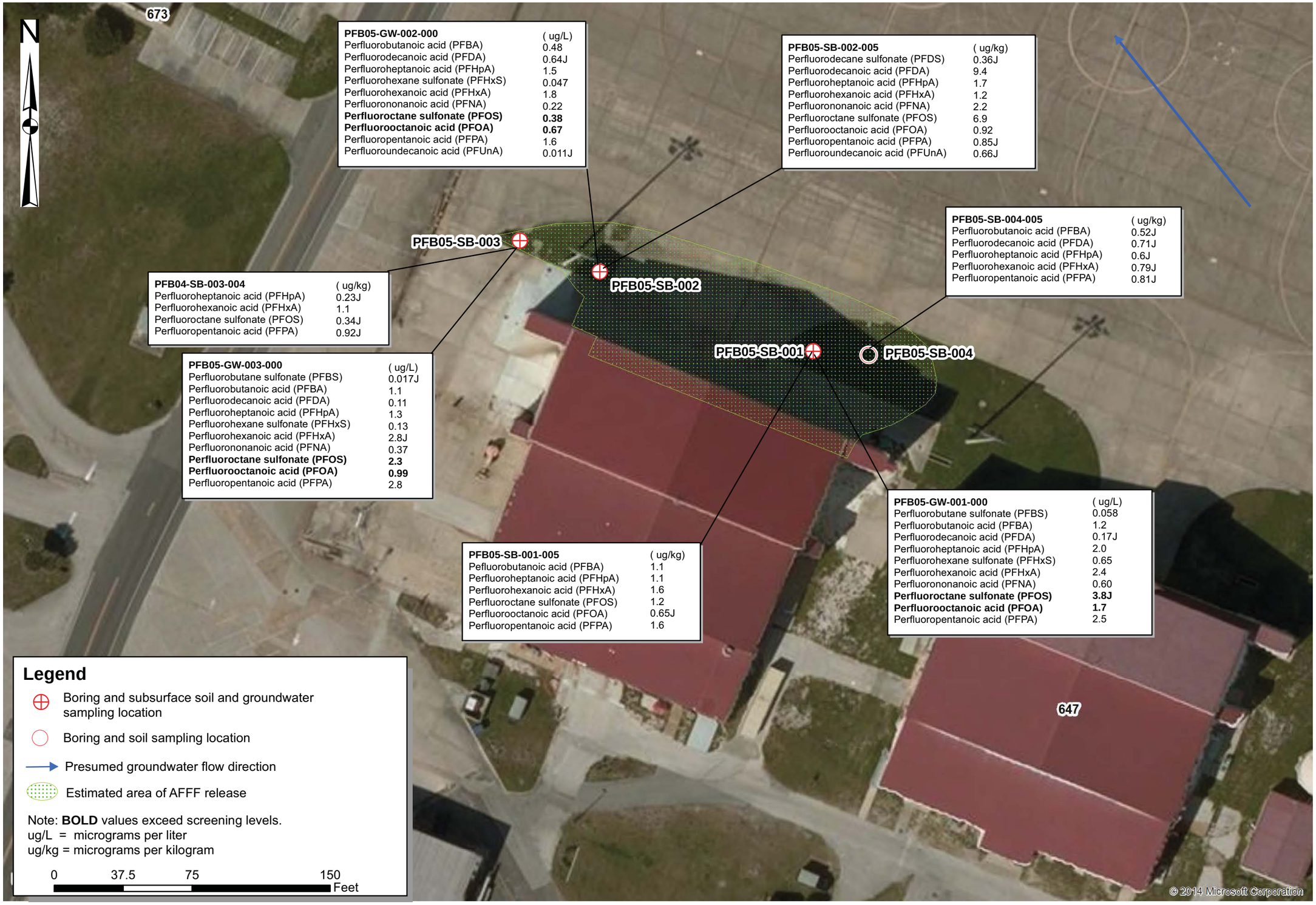

R:\Projects\Q1062.0007 AFFF Site Investigations\Patrick AFB\Graphics\Patrick AFB Hangar 630 Sample Results.mxd (07/24/2014)

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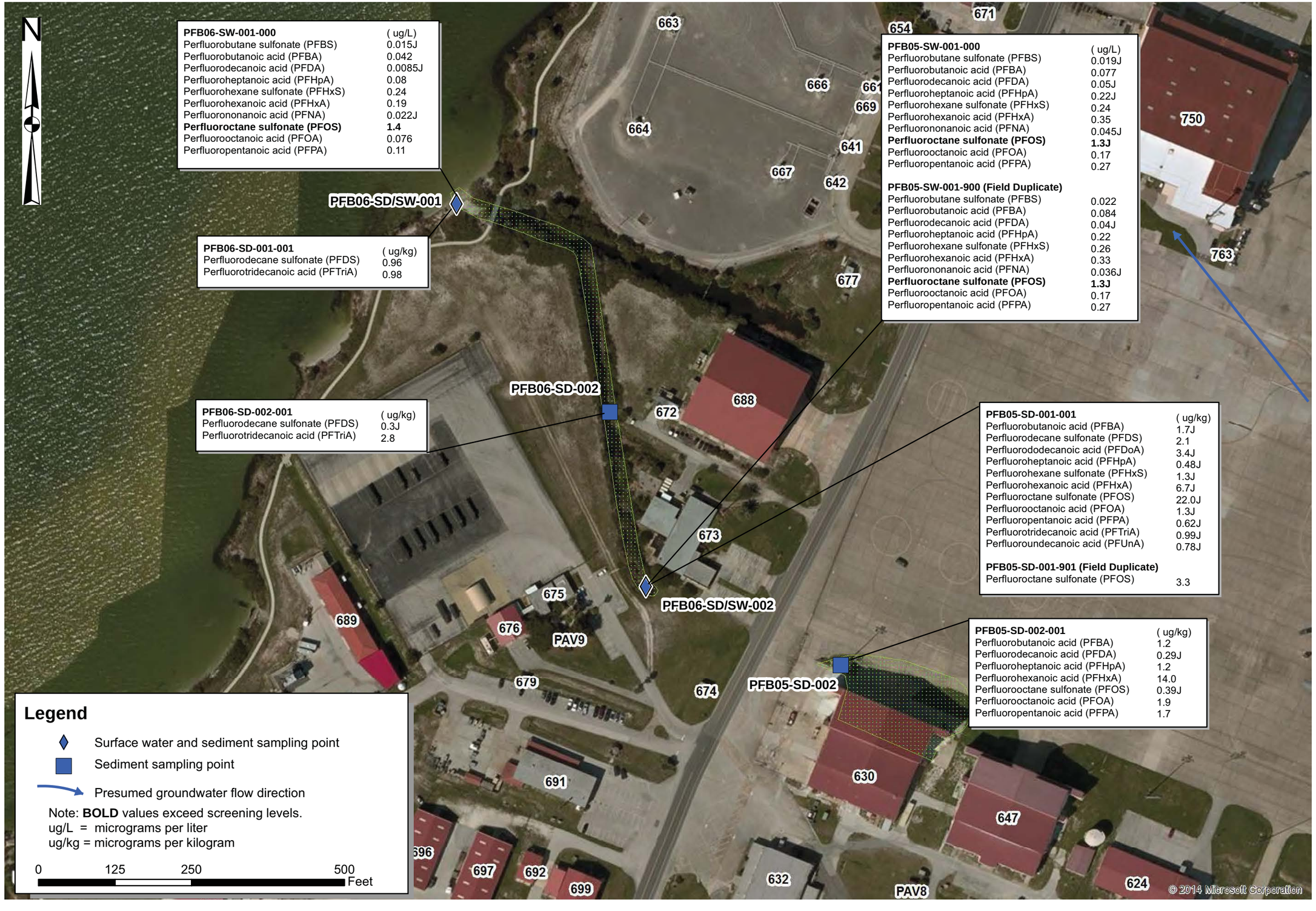
Source: Patrick AFB GIS

Figure 8 Site 5 Hangar 630 (North Side)
Sample Locations and Detection Summary
for AFFF Investigations
Patrick Air Force Base, Florida



R:\Projects\Q1062.0007 AFFF Site Investigations\Patrick AFB\Graphics\Patrick AFB Hangar 630 and 647 Drainage Channel Sample Results.mxd (07/24/2014)

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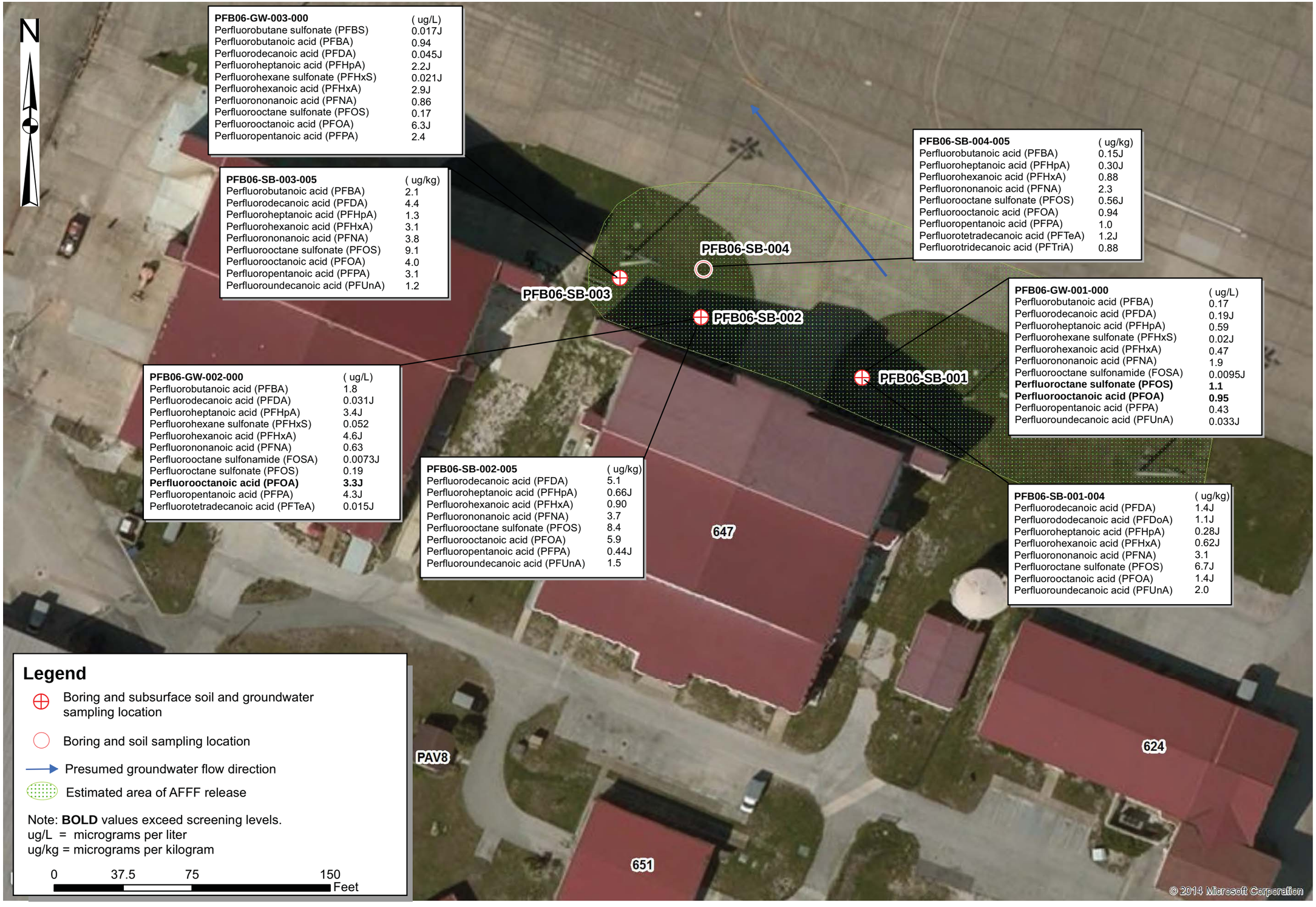
Source: Patrick AFB GIS

Figure 9 Sites 5 & 6 Hangar 630/647 Drainage Channel Sample Locations and Detection Summary for AFFF Investigations Patrick Air Force Base, Florida



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Source: Patrick AFB GIS

Figure 10 Site 6 Hangar 647
Sample Locations and Detection Summary
for AFFF Investigations
Patrick Air Force Base, Florida

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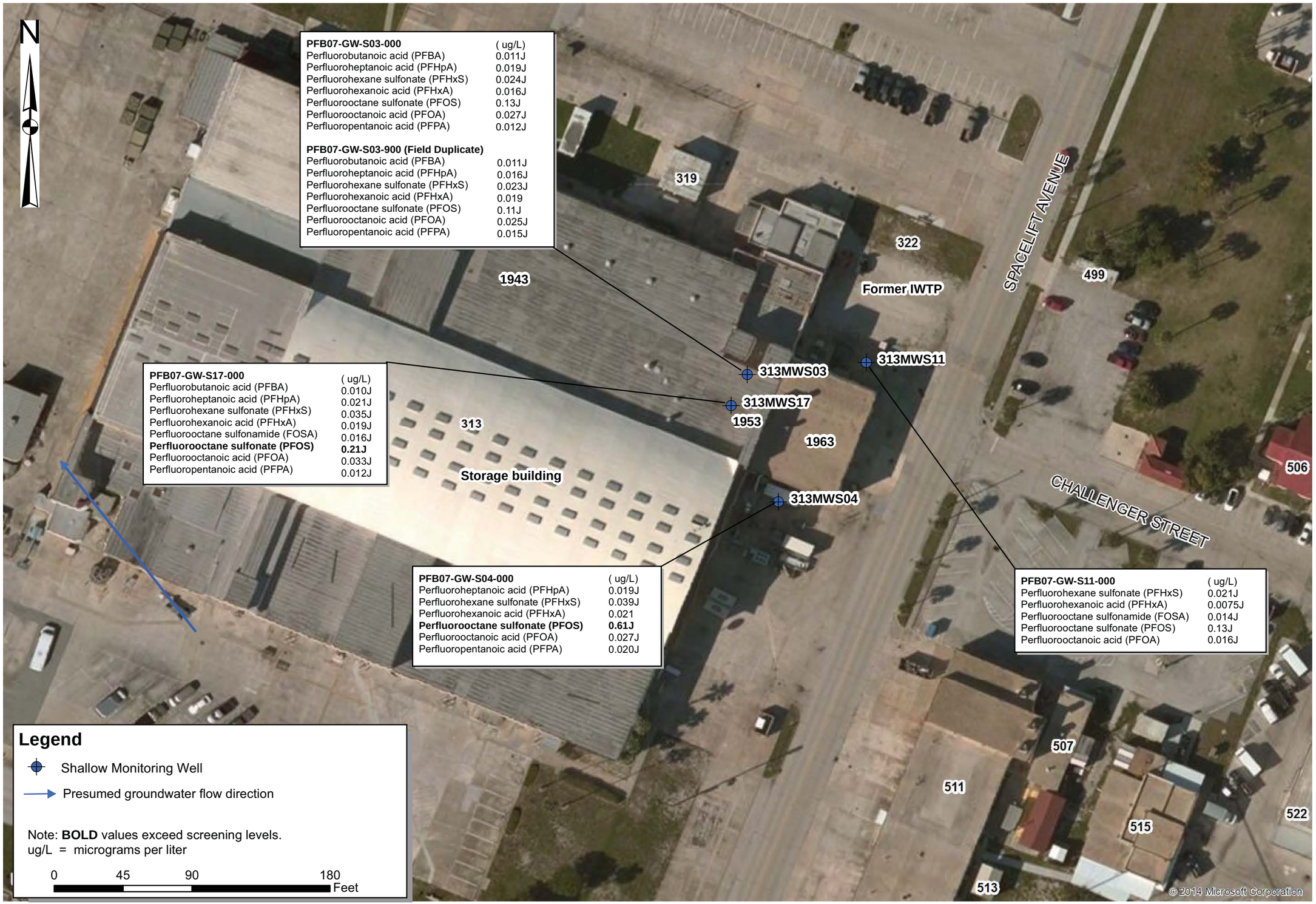

R:\Projects\Q1062.0007 AFFF Site Investigations\Patrick AFB\Graphics\Patrick AFB Building 313 Sample Results.mxd (07/28/2014)

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Job Title: Site Investigations of Fire Fighting Foam Usage at Various Air Force Bases in the United States
Source: Patrick AFB GIS

Figure 11 Site 7 Building 313
Sample Locations and Detection Summary
for AFFF Investigations
Patrick Air Force Base, Florida

Table 1 Environmental Samples Collected at Hangar 750 (Site 1)

Sample Identifier	Matrix	Sample Interval (feet/bgs)	Purpose/Location
PFB01-GW-001-000/ PFB01-GW-001-900 (Field Duplicate)	Groundwater	4-5	Determine if PFCs are present in the shallow groundwater. Sample collected from temporary well point on the east side of the collection tank.
PFB01-GW-002-000	Groundwater	4-5	Determine if PFCs are present in the shallow groundwater. Sample collected from temporary well point on the north side of the collection tank.
PFB01-GW-003-000	Groundwater	4-5	Determine if PFCs are present in the shallow groundwater. Sample collected from temporary well point on the west side of the collection tank.
PFB01-GW-004-000	Groundwater	4-5	Determine if PFCs are present in the shallow groundwater. Sample collected from temporary well point on the east side of the site in the surface drainage path from Hangar 750.
PFB01-SB-001-001/ PFB01-SB-001-901 (Field Duplicate)	Soil	0-0.5	Determine if PFCs remain in the surface soil. Sample collected from surface soil on the east side of the collection tank.
PFB01-SB-001-005/ PFB01-SB-001-905 (Field Duplicate)	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in the soil boring on the east side of the collection tank.
PFB01-SB-002-001	Soil	0-0.5	Determine if PFCs remain in the surface soil. Sample collected from surface soil at location situated on the north side of the collection tank.
PFB01-SB-002-004	Soil	3-4	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in the soil boring on the north side of the collection tank.
PFB01-SB-003-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in a soil boring on the west side of the collection tank.
PFB01-SB-004-004	Soil	3-4	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in a soil boring on the east side of the site in the drainage path from Hangar 750.

bgs = below ground surface

PFC = perfluorinated compound

Table 2 Perfluorinated Chemicals Detected in Groundwater Samples at Hangar 750 (Site 1)

Sample Number			PFB01-GW-001-000		PFB01-GW-001-900 (Field Duplicate)		PFB01-GW-002-000		PFB01-GW-003-000		PFB01-GW-004-000	
Analyte	CAS Number	EPA PHA (µg/L)	Result (µg/L)	Reporting Limit (µg/L)	Result (µg/L)	Reporting Limit (µg/L)	Result (µg/L)	Reporting Limit (µg/L)	Result (µg/L)	Reporting Limit (µg/L)	Result (µg/L)	Reporting Limit (µg/L)
Perfluorobutane Sulfonate (PFBS)	29420-43-3	NL	0.063 J	0.0097	0.037 J	0.0097	0.022 J	0.0091	0.023 J	0.010	0.044 J	0.0086
Perfluorobutanoic acid (PFBA)	375-22-4	NL	0.089 J	0.012	0.053 J	0.012	0.14 J	0.011	0.13 J	0.012	0.12 J	0.010
Perfluorodecane sulfonate (PFDS)	67906-42-7	NL	0.014 J	0.011	0.012 U	0.011	0.071	0.010	0.012 U	0.011	0.010 U	0.0096
Perfluorodecanoic acid (PFDA)	335-76-2	NL	0.011 J	0.0092	0.0092 J	0.0092	0.024 J	0.0086	0.012 J	0.0096	0.024 J	0.0082
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	0.042	0.016	0.030 J	0.016	0.27	0.015	0.16	0.016	0.12	0.014
Perfluorohexane Sulfonate (PFHxS)	108427-53-8	NL	0.44 J	0.0082	0.28 J	0.0082	0.22 J	0.0077	0.12 J	0.0085	0.50 J	0.0073
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	0.32 J	0.0034	0.22	0.0034	0.34	0.0032	0.25	0.0036	0.43	0.0030
Perfluorononanoic acid (PFNA)	375-95-1	NL	0.023 U	0.020	0.024 U	0.020	0.13	0.019	0.044 J	0.021	0.046	0.018
Perfluorooctane Sulfonamide (FOSA)	754-91-6	NL	0.018 J	0.0063	0.011 J	0.0069	0.012 J	0.0061	0.016 J	0.0064	0.0077 J	0.0063
Perfluorooctane Sulfonate (PFOS)	1763-23-1	0.2	**4.6 J**	0.016	**3.2 J**	0.016	**3.6 J**	0.015	**1.2 J**	0.016	**7.6 J**	0.014
Perfluorooctanoic acid (PFOA)	335-67-1	0.4	0.085 J	0.011	0.054 J	0.012	0.15 J	0.011	0.071 J	0.012	0.17 J	0.010
Perfluoropentanoic acid (PFPA)	2706-90-3	NL	0.11 J	0.013	0.071	0.013	0.38	0.012	0.22	0.013	0.28	0.011

Note: Shaded values indicate analyte not detected at the method detection limit. BOLD values exceed the corresponding screening value.
µg/L = micrograms per liter
CAS = Chemical Abstract Service
EPA = United States Environmental Protection Agency
J = Estimated value. The analyte was positively identified, but the value is an estimate because of quantification factors.
NL = not listed. An EPA PHA value has not been established for this analyte.
PHA = Provisional Health Advisory. EPA Memorandum, October 2009.
U = Analyte not detected at the method detection limit

Table 3 Perfluorinated Chemicals Detected in Surface Soil at Hangar 750 (Site 1)

Sample Number			PFB-01-SB-001-001		PFB01-SB-001-901 (Field Duplicate)		PFB01-SB-002-001	
Analyte	CAS Number	EPA RSSL (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)
Perfluorodecane sulfonate (PFDS)	67906-42-7	NL	0.64 U	0.32	0.64 U	0.32	4.2	0.33
Perfluorodecanoic acid (PFDA)	335-76-2	NL	1.3	0.29	1.3	0.29	0.70 J	0.30
Perfluorododecanoic acid (PFDoA)	307-55-1	NL	0.64 U	0.61	0.64 U	0.61	1.2 J	0.62
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	10.0 J	0.13	13.0	0.13	0.70 J	0.13
Perfluorohexane Sulfonate (PFHxS)	108427-53-8	NL	0.71 J	0.30	0.94	0.30	0.66 U	0.31
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	11.0	0.16	14.0	0.16	0.89	0.16
Perfluorononanoic acid (PFNA)	375-95-1	NL	3.5	0.23	2.9	0.24	1.3	0.24
Perfluorooctane Sulfonamide (FOSA)	754-91-6	NL	0.64 U	0.10	0.64 U	0.10	0.20 J	0.11
Perfluorooctane Sulfonate (PFOS)	1763-23-1	6,000	3.1	0.15	2.6	0.15	0.75 J	0.15
Perfluorooctanoic acid (PFOA)	335-67-1	16,000	3.5	0.25	4.0	0.25	0.69 J	0.25
Perfluoropentanoic acid (PFPA)	2706-90-3	NL	5.4	0.26	6.1 J	0.26	0.44 J	0.26
Perfluorotetradecanoic acid (PFTeA)	376-06-7	NL	1.5 U	0.74	1.5 U	0.74	0.78 J	0.76
Perfluorotridecanoic Acid (PFTriA)	72629-94-8	NL	0.64 U	0.34	0.64 U	0.34	0.67 J	0.35
Perfluoroundecanoic acid (PFUnA)	2058-94-8	NL	0.64 U	0.34	0.53 J	0.34	1.1	0.35

Note: Shaded values indicate analyte not detected at the method detection limit.
µg/kg = micrograms per kilogram
CAS = Chemical Abstract Service
EPA = United States Environmental Protection Agency
J = Estimated value. The analyte was positively identified, but the value is an estimate because of quantification factors.
NL = not listed. An EPA Residential Soil Screening Level has not been established for this analyte.
RSSL = Regional Soil Screening Level. EPA Memorandum, November 2009.
U = Analyte not detected at the method detection limit

Table 4 Perfluorinated Chemicals Detected in Subsurface Soil at Hangar 750 (Site 1)

Sample Number			PFB01-SB-001-005		PFB01-SB-001-905 (Field Duplicate)		PFB01-SB-002-004		PFB01-SB-003-005		PFB01-SB-004-004	
Analyte	**CAS Number**	**EPA RSSL (µg/kg)**	**Result (µg/kg)**	**Reporting Limit (µg/kg)**	**Result (µg/kg)**	**Reporting Limit (µg/kg)**	**Result (µg/kg)**	**Reporting Limit (µg/kg)**	**Result (µg/kg)**	**Reporting Limit (µg/kg)**	**Result (µg/kg)**	**Reporting Limit (µg/kg)**
Perfluorobutanoic acid (PFBA)	375-22-4	NL	0.66 U	0.13	0.62 U	0.12	0.71 U	0.14	0.17 J	0.12	0.57 U	0.11
Perfluorodecane sulfonate (PFDS)	67906-42-7	NL	0.66 U	0.33	0.35 J	0.31	12.0	0.35	0.59 U	0.30	0.57 U	0.29
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	0.41 J	0.13	0.34 J	0.12	0.43 J	0.14	0.32 J	0.12	0.57 U	0.11
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	0.74 J	0.16	0.70 J	0.15	0.33 J	0.18	0.58 J	0.15	0.24 J	0.14
Perfluorooctane Sulfonate (PFOS)	1763-23-1	6,000	0.42 J	0.15	0.59 J	0.14	0.50 J	0.17	0.67 J	0.14	1.0	0.13
Perfluorooctanoic acid (PFOA)	335-67-1	16,000	0.60 J	0.25	0.49 J	0.24	0.71 U	0.27	0.59 U	0.23	0.57 U	0.22
Perfluoropentanoic acid (PFPA)	2706-90-3	NL	0.31 J	0.26	0.50 J	0.25	0.71 U	0.28	0.59 U	0.24	0.57 U	0.23
Perfluorotridecanoic Acid (PFTriA)	72629-94-8	NL	0.66 U	0.35	0.52 J	0.33	0.71 U	0.38	0.59 U	0.32	0.57 U	0.31
Perfluoroundecanoic acid (PFUnA)	2058-94-8	NL	0.66 U	0.35	0.62 U	0.33	0.68 J	0.38	0.59 U	0.32	0.57 U	0.31

Note: Shaded values indicate analyte not detected at the method detection limit.
µg/kg = micrograms per kilogram
CAS = Chemical Abstract Service
EPA = United States Environmental Protection Agency
J = Estimated value. The analyte was positively identified, but the value is an estimate due to quantification factors.
NL = Not listed. An EPA RSSL value has not been established for this analyte
RSSL = Residential Soil Screening Level. EPA Memorandum, November 2009.
U = Analyte not detected at the method detection limit

Table 5 Environmental Samples Collected at Hangar 705 (Site 2)

Sample Identifier	Matrix	Sample Interval (feet/bgs)	Purpose/Location
PFB02-GW-001-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point at the southeast side of the mixing tanks.
PFB02-GW-002-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point between the pump house and mixing tanks.
PFB02-GW-003-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point at the southwest side of the pump house.
PFB02-GW-004-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point between the pump house and mixing tanks on the north side.
PFB02-SB-001-001	Soil	0-0.5	Determine if PFCs remain in the surface soil. Sample collected from surface soil at the southeast side of the mixing tanks.
PFB02-SB-001-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in the soil boring at the southeast side of the mixing tanks.
PFB02-SB-002-001	Soil	0-0.5	Determine if PFCs remain in the surface soil. Sample collected from surface soil at between the pump house and mixing tanks.
PFB01-SB-002-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in the soil boring on the north side of the collection tank.
PFB01-SB-003-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in a soil boring at the southwest side of the pump house.
PFB01-SB-004-006	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in a soil boring between the pump house and mixing tanks on the north side.

bgs = below ground surface

PFC = perfluorinated chemical or compound

Table 6 Perfluorinated Chemicals Detected in Groundwater Samples at Building 705 (Site 2)

Sample Number			PFB02-GW-001-000		PFB02-GW-002-000		PFB02-GW-003-000		PFB02-GW-004-000	
Analyte	**CAS Number**	**EPA PHA (µg/L)**	**Result (µg/L)**	**Reporting Limit (µg/L)**	**Result (µg/L)**	**Reporting Limit (µg/L)**	**Result (µg/L)**	**Reporting Limit (µg/L)**	**Result (µg/L)**	**Reporting Limit (µg/L)**
Perfluorobutane sulfonate (PFBS)	29420-43-3	NL	28.0 J	0.0082	21.0 J	0.0092	110 J	0.0084	1.6 J	0.0086
Perfluorobutanoic acid (PFBA)	375-22-4	NL	32.0 J	0.0098	7.2 J	0.011	23.0 J	0.010	0.48 J	0.010
Perfluorodecane sulfonate (PFDS)	67906-42-7	NL	0.01 UJ	0.0091	0.011 UJ	0.010	0.010 UJ	0.0094	0.14 J	0.0096
Perfluorodecanoic acid (PFDA)	335-76-2	NL	0.018 J	0.0078	0.022 J	0.0088	0.13 J	0.0080	0.0091 J	0.0082
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	16.0 J	0.013	5.5 J	0.015	15.0 J	0.014	0.32	0.014
Perfluorohexane Sulfonate (PFHxS)	108427-53-8	NL	170 J	0.0069	63.0 J	0.0078	250 J	0.0071	6.8 J	0.0073
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	56.0 J	0.0029	36.0 J	0.0033	77.0 J	0.0030	2.1	0.0030
Perfluorononanoic acid (PFNA)	375-95-1	NL	0.02 UJ	0.017	0.085 J	0.020	0.29 J	0.018	0.021 UJ	0.018
Perfluorooctane Sulfonamide (FOSA)	754-91-6	NL	1.3	0.0064	0.10	0.0062	4.8	0.0058	0.67	0.0064
Perfluorooctane sulfonate (PFOS)	1763-23-1	0.2	**2,500 J**	0.013	**150 J**	0.015	**4,300 J**	0.014	**110 J**	0.014
Perfluorooctanoic acid (PFOA)	335-67-1	0.4	**100 J**	0.0097	**11.0 J**	0.011	**38.0 J**	0.010	**1.6 J**	0.010
Perfluoropentanoic acid (PFPA)	2706-90-3	NL	20.0 J	0.011	17.0 J	0.012	43.0 J	0.011	0.91	0.011
Perfluoroundecanoic acid (PFUnA)	2058-94-8	NL	0.01 U	0.0069	0.011 U	0.0077	0.033	0.0071	0.010 U	0.0072

Note: Shaded values indicate analyte not detected at the method detection limit. BOLD values exceed EPA PHA.
µg/L = micrograms per liter
CAS = Chemical Abstract Service
EPA = United States Environmental Protection Agency
J = Estimated value. The analyte was positively identified, but the value is an estimate due to quantification factors.
NL = Not listed. An EPA PHA value has not been established for this analyte.
U = Analyte not detected at the method detection limit.
PHA = Provisional Health Advisory. EPA Memorandum, October 2009.

Table 7 Perfluorinated Chemicals Detected in Soil at Building 705 (Site 2)

		Sample Number	PFB02-SB-001-001		PFB02-SB-001-005		PFB02-SB-002-001		PFB02-SB-002-005		PFB02-SB-003-005		PFB02-SB-004-006	
Analyte	CAS Number	EPA RSSL (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)
Perfluorobutane Sulfonate (PFBS)	29420-43-3	NL	5.9 J	0.14	2.2	0.15	1.5	0.14	0.28 J	0.14	29 J	0.14	0.81 J	0.14
Perfluorobutanoic acid (PFBA)	375-22-4	NL	2.2 J	0.12	1.2	0.13	1.0	0.12	0.18 J	0.12	13 J	0.12	0.40 J	0.12
Perfluorodecane sulfonate (PFDS)	67906-42-7	NL	1.9 J	0.3	5.8	0.31	0.66 J	0.29	0.61 U	0.31	0.59 UJ	0.30	0.62 U	0.31
Perfluorodecanoic acid (PFDA)	335-76-2	NL	0.4 J	0.27	0.34 J	0.28	0.59 U	0.27	0.61 U	0.27	0.86 J	0.27	0.62 U	0.28
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	4.4	0.12	3.0	0.13	0.39 J	0.12	0.38 J	0.12	17 J	0.12	0.99	0.12
Perfluorohexane Sulfonate (PFHxS)	108427-53-8	NL	34	0.28	25	0.29	5.7	0.28	4.8	0.28	340 J	0.28	4.3	0.29
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	3.9	0.15	7.5	0.16	2.2	0.15	0.97	0.15	100 J	0.15	3.0	0.15
Perfluorononanoic acid (PFNA)	375-95-1	NL	0.23 J	0.22	0.63 U	0.23	0.59 U	0.22	0.61 U	0.22	0.59 UJ	0.22	0.62 U	0.23
Perfluorooctane Sulfonamide (FOSA)	754-91-6	NL	1.5 J	0.1	13	0.10	1.2	0.096	0.47 J	0.10	36 J	0.097	0.62 U	0.10
Perfluorooctane Sulfonate (PFOS)	1763-23-1	6,000	160 J	0.14	660 J	0.15	35	0.14	140	0.14	0.59 UJ	0.14	7.5	0.14
Perfluorooctanoic acid (PFOA)	335-67-1	16,000	2.2 J	0.23	3.9	0.24	0.29 J	0.23	0.26 J	0.23	110 J	0.23	0.62 U	0.24
Perfluoropentanoic acid (PFPA)	2706-90-3		6.4 J	0.24	4.8	0.25	1.8	0.24	0.59 J	0.24	38 J	0.24	2.0	0.25
Perfluorotridecanoic Acid (PFTriA)	72629-94-8	NL	0.61 U	0.32	0.63 U	0.34	0.59 U	0.31	0.46 J	0.33	0.59 U	0.32	0.53 J	0.33
Perfluoroundecanoic acid (PFUnA)	2058-94-8	NL	0.61 U	0.32	0.63 U	0.34	0.59 U	0.31	0.61 U	0.33	0.46 J	0.32	0.62 U	0.33

Note: Shaded values indicate analyte not detected at the method detection limit.
µg/kg = micrograms per kilogram
CAS = Chemical Abstract Service
EPA = United States Environmental Protection Agency
J = Estimated value. The analyte was positively identified, but the value is an estimate because of quantification factors.
NL = not listed. An EPA RSSL value has not been established for this analyte
RSSL = Residential Soil Screening Level. EPA Memorandum, November 2009.
U = Analyte not detected at the method detection limit

Table 8 Environmental Samples Collected South of Hangars 630 and 647 (Site 3)

Sample Identifier	Matrix	Sample Interval (feet/bgs)	Purpose/Location
PFB03-GW-001-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point at the northwest corner of the site in surface drainage from Hangar 630.
PFB03-GW-002-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point at the northeast corner of the site in surface drainage from Hangar 647.
PFB03-GW-003-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point on the north side of the site between Hangars 630 and 647.
PFB03-GW-004-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point on the south side of the site between Hangars 630 and 647.
PFB03-SB-001-001	Soil	0-0.5	Determine if PFCs remain in the surface soil. Sample collected from surface soil at the northwest corner of the site in surface drainage from Hangar 630.
PFB03-SB-001-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in the soil boring at the northwest corner of the site in surface drainage from Hangar 630.
PFB03-SB-002-001	Soil	0-0.5	Determine if PFCs remain in the surface soil. Sample collected from surface soil on the northeast side of the site in surface drainage from Hangar 647.
PFB03-SB-002-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in the soil boring situated at the northeast corner of site in the drainage from Hangar 647.
PFB03-SB-003-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water saturated zone in a soil boring on the north side of the site between Hangars 630 and 647.
PFB03-SB-004-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in a soil boring on the south side of the site between Hangars 630 and 647.

bgs = below ground surface

PFC = perfluorinated chemical or compound

Table 9 Perfluorinated Chemicals Detected in Groundwater South of Hangars 630 & 647 (Site 3)

Sample Number			PFB03-GW-001-000		PFB03-GW-002-000		PFB03-GW-003-000		PFB03-GW-004-000	
Analyte	**CAS Number**	**EPA PHA (µg/L)**	**Result (µg/L)**	**Reporting Limit (µg/L)**	**Result (µg/L)**	**Reporting Limit (µg/L)**	**Result (µg/L)**	**Reporting Limit (µg/L)**	**Result (µg/L)**	**Reporting Limit (µg/L)**
Perfluorobutanoic acid (PFBA)	375-22-4	NL	0.095	0.01	0.051	0.011	0.037	0.01	0.065 J	0.01
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	0.096	0.014	0.07	0.015	0.051	0.014	0.076 J	0.014
Perfluorohexane sulfonate (PFHxS)	108427-53-8	NL	0.12	0.0072	0.066	0.0077	0.032	0.0072	0.06 J	0.0073
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	0.16	0.003	0.095	0.0032	0.062	0.003	0.11 J	0.003
Perfluorononanoic acid (PFNA)	375-95-1	NL	0.021 U	0.018	0.02 J	0.019	0.021 U	0.018	0.021 UJ	0.018
Perfluorooctane sulfonamide (FOSA)	754-91-6	NL	0.0075 J	0.0058	0.0069 J	0.0059	0.0092 J	0.006	0.023 J	0.0062
Perfluorooctane sulfonate (PFOS)	1763-23-1	0.2	**0.61**	0.014	**0.58**	0.015	**0.37**	0.014	**0.95 J**	0.014
Perfluorooctanoic acid (PFOA)	335-67-1	0.4	0.053	0.01	0.045	0.011	0.026	0.01	0.066 J	0.01
Perfluoropentanoic acid (PFPA)	2706-90-3	NL	0.23	0.011	0.12	0.012	0.058	0.011	0.13 J	0.011

Note: Shaded values indicate analyte not detected at the method detection limit. BOLD values exceed EPA PHA.
µg/L = micrograms per liter
CAS = Chemical Abstract Service
EPA = United States Environmental Protection Agency
J = Estimated value. The analyte was positively identified, but the value is an estimate because of quantification factors.
NL = Not listed. An EPA PHA value has not been established for this analyte.
U = Analyte not detected at the method detection limit
PHA = Provisional Health Advisory. EPA Memorandum, October 2009.

Table 10 Perfluorinated Chemicals Detected in Soil from South Side of Hangars 630 & 647 (Site 3)

		Sample Number	PFB03-SB-001-001		PFB03-SB-001-005		PFB03-SB-002-001		PFB03-SB-002-005		PFB03-SB-003-005		PFB03-SB-004-005	
Analyte	**CAS Number**	**EPA RSSL (µg/kg)**	**Result (µg/kg)**	**Reporting Limit (µg/kg)**	**Result (µg/kg)**	**Reporting Limit (µg/kg)**	**Result (µg/kg)**	**Reporting Limit (µg/kg)**	**Result (µg/kg)**	**Reporting Limit (µg/kg)**	**Result (µg/kg)**	**Reporting Limit (µg/L)**	**Result (µg/kg)**	**Reporting Limit (µg/kg)**
Perfluorobutanoic acid (PFBA)	375-22-4	NL	0.54 J	0.12	0.62 U	0.12	1.1 J	0.11	0.65 U	0.13	0.62 U	0.12	0.69 U	0.14
Perfluorodecanoic acid (PFDA)	335-76-2	NL	0.38 J	0.27	0.62 U	0.28	0.98 J	0.26	0.65 U	0.29	0.62 U	0.28	0.69 UJ	0.31
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	0.41 J	0.12	0.22 J	0.12	0.79	0.11	0.25 J	0.13	0.16 J	0.12	0.69 U	0.14
Perfluorohexane Sulfonate (PFHxS)	108427-53-8	NL	0.53 J	0.28	0.62 U	0.29	0.57 U	0.27	0.65 UJ	0.3	0.62 U	0.29	0.69 U	0.32
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	1.5	0.15	0.18 J	0.16	4.1	0.14	0.22 J	0.16	0.62 U	0.15	0.22 J	0.17
Perfluorooctane Sulfonate (PFOS)	**1763-23-1**	**6,000**	6.5	0.14	0.69 J	0.15	3.2	0.13	0.91	0.15	1	0.14	0.8 J	0.16
Perfluorooctanoic acid (PFOA)	**335-67-1**	**16,000**	0.55 J	0.23	0.62 U	0.24	0.41 J	0.22	0.65 U	0.25	0.62 U	0.24	0.69 U	0.26
Perfluoropentanoic acid (PFPA)	2706-90-3	NL	1.2	0.24	0.62 U	0.25	3.2 J	0.23	0.33 J	0.26	0.62 U	0.25	0.69 U	0.28
Perfluoroundecanoic acid (PFUnA)	2058-94-8	NL	0.61 U	0.32	0.62 U	0.33	0.84	0.3	0.65 U	0.35	0.62 U	0.33	0.69 UJ	0.37

Note: Shaded values indicate analyte not detected at the method detection limit.
µg/kg = micrograms per kilogram
EPA = United States Environmental Protection Agency
NL = not listed. An EPA RSSL value has not been established for this analyte
U = Analyte not detected at the method detection limit

CAS = Chemical Abstract Service
J = Estimated value. The analyte was positively identified, but the value is an estimate because of quantification factors.
RSSL = Residential Soil Screening Level. EPA Memorandum, November 2009.

Table 11 Environmental Samples Collected at Building 810 (Site 4)

Sample Identifier	Matrix	Sample Interval (feet/bgs)	Purpose/Location
PFB04-GW-001-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point on the east side of the storage building.
PFB04-GW-002-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point on the west side of the storage building.
PFB04-GW-003-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point in the west portion of the south grassy area.
PFB04-GW-004-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point in the east portion of the south grassy area.
PFB04-SB-001-001	Soil	0-0.5	Determine if PFCs remain in the surface soil. Sample collected from surface soil at location on the east side of the storage building.
PFB04-SB-001-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in the soil boring on the east side of the storage building.
PFB04-SB-002-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in the soil boring on the west side of the storage building.
PFB04-SB-003-003	Soil	2-3	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in a soil boring in the west portion of the south grassy area.
PFB04-SB-004-001	Soil	0-0.5	Determine if PFCs remain in the surface soil. Sample collected from surface soil in the east portion of the south grassy area.
PFB04-SB-004-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in a soil boring in the east portion of the south grassy area.

bgs = below ground surface
PFC = perfluorinated chemical or compound

Table 12 Perfluorinated Chemicals Detected in Groundwater at Building 810 (Site 4)

Sample Number			PFB04-GW-001-000		PFB04-GW-002-000		PFB04-GW-003-000		PFB04-GW-004-000	
Analyte	**CAS Number**	**EPA PHA (µg/L)**	**Result (µg/L)**	**Reporting Limit (µg/L)**	**Result (µg/L)**	**Reporting Limit (µg/L)**	**Result (µg/L)**	**Reporting Limit (µg/L)**	**Result (µg/L)**	**Reporting Limit (µg/L)**
Perfluorobutane sulfonate (PFBS)	29420-43-3	NL	1.7 J	0.0083	1.7 J	0.0084	4.9 J	0.0083	21.0 J	0.008
Perfluorobutanoic acid (PFBA)	375-22-4	NL	2.1 J	0.0099	3.6 J	0.01	4.3 J	0.0098	2.5 J	0.0095
Perfluorodecane sulfonate (PFDS)	67906-42-7	NL	2.0 J	0.0092	0.91 J	0.0093	0.71 J	0.0092	0.0097 UJ	0.0088
Perfluorodecanoic acid (PFDA)	335-76-2	NL	0.41 J	0.0079	0.64 J	0.008	0.71	0.0079	0.17 J	0.0076
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	5.9 J	0.013	5.4 J	0.013	7.7 J	0.013	4.9 J	0.013
Perfluorohexane sulfonate (PFHxS)	108427-53-8	NL	23.0 J	0.007	30.0 J	0.0071	50.0 J	0.007	290 J	0.0067
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	12.0 J	0.0029	16.0 J	0.003	16.0 J	0.0029	23.0 J	0.0028
Perfluorononanoic acid (PFNA)	375-95-1	NL	0.47 J	0.018	0.64 J	0.018	3.0 J	0.017	0.54 J	0.017
Perfluorooctane sulfonamide (FOSA)	754-91-6	NL	12.0 J	0.0059	7.2 J	0.0056	9.3 J	0.0057	0.39	0.0055
Perfluorooctane sulfonate (PFOS)	1763-23-1	0.2	**930 J**	0.013	**55.0 J**	0.014	**620 J**	0.013	**420 J**	0.013
Perfluorooctanoic acid (PFOA)	335-67-1	0.4	**10.0 J**	0.0098	**8.0 J**	0.01	**13.0 J**	0.0098	**11.0 J**	0.0095
Perfluoropentanoic acid (PFPA)	2706-90-3	NL	6.0 J	0.011	9.9 J	0.011	9.8 J	0.011	9.6 J	0.011
Perfluoroundecanoic acid (PFUnA)	2058-94-8	NL	0.01 U	0.0069	0.086 J	0.007	0.010 U	0.0069	0.029 J	0.0067

Note: Shaded values indicate analyte not detected at the method detection limit. BOLD values exceed EPA PHA.
µg/L = micrograms per liter
CAS = Chemical Abstract Service
EPA = United States Environmental Protection Agency
J = Estimated value. The analyte was positively identified, but the value is an estimate because of quantification factors.
NL = not listed. An EPA PHA value has not been established for this analyte.
U = Analyte not detected at the method detection limit
PHA = Provisional Health Advisory. EPA Memorandum, October 2009.

Table 13 Perfluorinated Chemicals Detected in Soil at Building 810 (Site 4)

		Sample Number	PFB04-SB-001-001		PFB04-SB-001-005		PFB04-SB-002-005		PFB04-SB-003-003		PFB04-SB-004-001		PFB04-SB-004-003	
Analyte	**CAS Number**	**EPA RSSL (µg/kg)**	**Result (µg/kg)**	**Reporting Limit (µg/kg)**	**Result (µg/kg)**	**Reporting Limit (µg/kg)**	**Result (µg/kg)**	**Reporting Limit (µg/kg)**	**Result (µg/kg)**	**Reporting Limit (µg/kg)**	**Result (µg/kg)**	**Reporting Limit (µg/kg)**	**Result (µg/kg)**	**Reporting Limit (µg/kg)**
Perfluorobutane Sulfonate (PFBS)	29420-43-3	NL	1.2	0.13	0.62 J	0.17	0.8 J	0.17	1.4	0.17	1.9	0.13	0.15 J	0.15
Perfluorobutanoic acid (PFBA)	375-22-4	NL	1.3	0.11	2.2 J	0.14	1.3	0.15	0.82 J	0.14	0.57 U	0.11	0.19 J	0.13
Perfluorodecane sulfonate (PFDS)	67906-42-7	NL	71	0.29	23 J	0.36	56	0.37	29	0.36	5.1	0.28	0.72 J	0.33
Perfluorodecanoic acid (PFDA)	335-76-2	NL	1.1	0.26	1.4 J	0.32	0.81 J	0.33	0.7 J	0.33	1.1	0.26	0.66 U	0.29
Perfluorododecanoic acid (PFDoA)	307-55-1	NL	4.5	0.54	0.72 U	0.68	1.5 J	0.7	0.72 U	0.69	0.57 U	0.54	0.66 U	0.62
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	1.9	0.11	3.9	0.14	1.9	0.15	2.4	0.14	0.73 J	0.11	0.28 J	0.13
Perfluorohexane Sulfonate (PFHxS)	108427-53-8	NL	27	0.27	21	0.34	18	0.34	28	0.34	9.7	0.27	9.4	0.31
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	7	0.14	11	0.18	6.7	0.18	4.1	0.18	2.2	0.14	0.5 J	0.16
Perfluorononanoic acid (PFNA)	375-95-1	NL	0.29 J	0.21	0.27 J	0.26	0.73 U	0.27	0.32 J	0.27	0.44 J	0.21	0.66 U	0.24
Perfluorooctane Sulfonamide (FOSA)	754-91-6	NL	120	0.093	160	0.12	35	0.12	14	0.12	2.6	0.093	0.91	0.11
Perfluorooctane Sulfonate (PFOS)	1763-23-1	6,000	180	0.13	95	0.17	130	0.17	39	0.17	31	0.13	190	0.15
Perfluorooctanoic acid (PFOA)	335-67-1	16,000	9.6	0.22	11	0.28	5.6	0.28	2.7	0.28	0.83	0.22	0.54 J	0.25
Perfluoropentanoic acid (PFPA)	2706-90-3	NL	1.9	0.23	5.3 J	0.29	3.6	0.29	2	0.29	0.77	0.23	0.28 J	0.26
Perfluorotetradecanoic acid (PFTeA)	376-06-7	NL	0.9 J	0.66	1.7 UJ	0.83	1.7 UJ	0.83	1.7 U	0.83	1.3 U	0.65	1.5 U	0.75
Perfluorotridecanoic Acid (PFTriA)	72629-94-8	NL	1.4	0.31	0.72 U	0.38	0.46 J	0.39	0.72 U	0.39	0.57 U	0.3	0.66 U	0.35
Perfluoroundecanoic acid (PFUnA)	2058-94-8	NL	5	0.31	1.2	0.38	0.77 J	0.39	1.1	0.39	1.4	0.3	0.66 U	0.35

Note: Shaded values indicate analyte not detected at the method detection limit.
µg/kg =micrograms per kilogram
EPA = United States Environmental Protection Agency
NL = Not listed. An EPA RSSL value has not been established for this analyte
U = Analyte not detected at the method detection limit

CAS = Chemical Abstract Service
J = Estimated value. The analyte was positively identified, but the value is an estimate because of quantification factors.
RSSL = Residential Soil Screening Level. EPA Memorandum, November 2009.

Table 14 Environmental Samples Collected at Hangar 630, North Side (Site 5)

Sample Identifier	Matrix	Sample Interval (feet/bgs)	Purpose/Location
PFB05-GW-001-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point on the east side of the hangar ramp.
PFB05-GW-002-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point on the west side of the hangar ramp.
PFB05-GW-003-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point on the west side of the site at the collection point for the surface water drainage.
PFB05-SB-001-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in the soil boring on the east side of the hangar ramp.
PFB05-SB-002-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in the soil boring on the west side of the hangar ramp.
PFB05-SB-003-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in a soil boring on the west side of the site at the collection point for the surface water drainage.
PFB05-SB-004-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in a soil boring in the east side of the site at the tarmac, in the surface drainage path from the hangar.
PFB05-SD-001-001	Sediment	0-1	Determine if PFCs are in the sediment of the surface drainage system. Sample collected from the pond west of the hangar area at the head wall of the drainage culvert. Sample co-located with surface water sample.
PFB05-SW-001-000	Surface Water	NA	Determine if PFCs are in the surface water downstream of the hangar area. Sample collected from the collection pond west of the hangar area at the head wall of the drainage culvert. Sample co-located with sediment sample.
PFB05-SD-002-001	Sediment	0-1	Determine if PFCs are in the sediment of the surface drainage system. Sample collected at the inlet to the surface water drainage culvert west of the hangar.

bgs = below ground surface

PFC = perfluorinated chemical or compound

Table 15 Perfluorinated Chemicals Detected in Groundwater at Hangar 630, North Side (Site 5)

		Sample Number	PFB05-GW-001-000		PFB05-GW-002-000		PFB05-GW-003-000	
Analyte	**CAS Number**	**EPA PHA (µg/L)**	**Result (µg/L)**	**Reporting Limit (µg/L)**	**Result (µg/L)**	**Reporting Limit (µg/L)**	**Result (µg/L)**	**Reporting Limit (µg/L)**
Perfluorobutane sulfonate (PFBS)	29420-43-3	NL	0.058	0.0087	0.0096 U	0.0088	0.017 J	0.0089
Perfluorobutanoic acid (PFBA)	375-22-4	NL	1.2	0.01	0.48	0.01	1.1	0.011
Perfluorodecanoic acid (PFDA)	335-76-2	NL	0.17 J	0.0083	0.64 J	0.0083	0.11	0.0085
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	2.0	0.014	1.5	0.014	1.3	0.014
Perfluorohexane sulfonate (PFHxS)	108427-53-8	NL	0.65	0.0074	0.047	0.0074	0.13	0.0075
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	2.4	0.0031	1.8	0.0031	2.8 J	0.0031
Perfluorononanoic acid (PFNA)	375-95-1	NL	0.6	0.018	0.22	0.018	0.37	0.019
Perfluorooctane sulfonate (PFOS)	1763-23-1	0.2	**3.8 J**	0.014	**0.38**	0.014	**2.3**	0.014
Perfluorooctanoic acid (PFOA)	335-67-1	0.4	**1.7**	0.01	**0.67**	0.010	**0.99**	0.011
Perfluoropentanoic acid (PFPA)	2706-90-3	NL	2.5	0.012	1.6	0.012	2.8	0.012
Perfluoroundecanoic acid (PFUnA)	2058-94-8	NL	0.011 U	0.0073	0.011 J	0.0073	0.011 U	0.0075

Note: Shaded values indicate analyte not detected at the method detection limit. BOLD values exceed EPA PHA.
µg/L = micrograms per liter
CAS = Chemical Abstract Service
EPA = United States Environmental Protection Agency
J = Estimated value. The analyte was positively identified, but the value is an estimate due to quantification factors.
NL = not listed. An EPA PHA value has not been established for this analyte.
U = Analyte not detected at the method detection limit
PHA = Provisional Health Advisory. EPA Memorandum, October 2009.

Table 16 Perfluorinated Chemicals Detected in Soil at Hangar 630, North Side (Site 5)

Sample Number			PFB05-SB-001-005		PFB05-SB-002-005		PFB05-SB-003-004		PFB05-SB-004-005	
Analyte	**CAS Number**	**EPA RSSL (µg/kg)**	**Result (µg/kg)**	**Reporting Limit (µg/kg)**	**Result (µg/kg)**	**Reporting Limit (µg/kg)**	**Result (µg/kg)**	**Reporting Limit (µg/kg)**	**Result (µg/kg)**	**Reporting Limit (µg/kg)**
Perfluorobutanoic acid (PFBA)	375-22-4	NL	1.1	0.13	0.66 U	0.13	0.77 U	0.15	0.52 J	0.14
Perfluorodecane sulfonate (PFDS)	67906-42-7	NL	0.65 U	0.32	0.36 J	0.33	0.77 U	0.38	0.71 U	0.36
Perfluorodecanoic acid (PFDA)	335-76-2	NL	0.65 U	0.29	9.4	0.3	0.77 U	0.35	0.71 J	0.32
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	1.1	0.13	1.7	0.13	0.23 J	0.15	0.6 J	0.14
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	1.6	0.16	1.2	0.17	1.1	0.19	0.79 J	0.18
Perfluorononanoic acid (PFNA)	375-95-1	NL	0.65 U	0.24	2.2	0.24	0.77 U	0.28	0.71 U	0.26
Perfluorooctane Sulfonate (PFOS)	1763-23-1	6,000	1.2	0.15	6.9	0.15	0.34 J	0.18	0.71 U	0.17
Perfluorooctanoic acid (PFOA)	335-67-1	16,000	0.65 J	0.25	0.92	0.25	0.77 U	0.3	0.71 U	0.27
Perfluoropentanoic acid (PFPA)	2706-90-3	NL	1.6	0.26	0.85 J	0.26	0.92 J	0.31	0.81 J	0.28
Perfluoroundecanoic acid (PFUnA)	2058-94-8	NL	0.65 U	0.34	0.66 J	0.35	0.77 U	0.41	0.71 U	0.38

Note: Shaded values indicate analyte not detected at the method detection limit.
µg/kg = micrograms per kilogram
CAS = Chemical Abstract Service
EPA = United States Environmental Protection Agency
J = Estimated value. The analyte was positively identified, but the value is an estimate because of quantification factors.
NL = Not listed. An EPA RSSL value has not been established for this analyte
RSSL = Residential Soil Screening Level. EPA Memorandum, November 2009.
U = Analyte not detected at the method detection limit

Table 17 Perfluorinated Chemicals Detected in Surface Water at Hangar 630, North Side (Site 5)

Sample Number			PFB05-SW-001-000		PFB05-SW-001-900 (Field Duplicate)	
Analyte	**CAS Number**	**EPA PHA (µg/L)**	**Result (µg/L)**	**Reporting Limit (µg/L)**	**Result (µg/L)**	**Reporting Limit (µg/L)**
Perfluorobutane sulfonate (PFBS)	29420-43-3	NL	0.019 J	0.0082	0.022	0.0081
Perfluorobutanoic acid (PFBA)	375-22-4	NL	0.077	0.0097	0.084	0.0097
Perfluorodecanoic acid (PFDA)	335-76-2	NL	0.05 J	0.0078	0.04 J	0.0077
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	0.22 J	0.013	0.22	0.013
Perfluorohexane sulfonate (PFHxS)	108427-53-8	NL	0.24	0.0069	0.26	0.0069
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	0.35	0.0029	0.33	0.0029
Perfluorononanoic acid (PFNA)	375-95-1	NL	0.045 J	0.017	0.036 J	0.017
Perfluorooctane sulfonate (PFOS)	1763-23-1	0.2	**1.3 J**	0.013	**1.3**	0.013
Perfluorooctanoic acid (PFOA)	335-67-1	0.4	0.17	0.0097	0.17	0.0097
Perfluoropentanoic acid (PFPA)	2706-90-3	NL	0.27	0.011	0.27	0.011

Note: Shaded values indicate analyte not detected at the method detection limit. BOLD values exceed EPA PHA.
µg/L = micrograms per liter CAS = Chemical Abstract Service
EPA = United States Environmental Protection Agency
J = Estimated value. The analyte was positively identified, but the value is an estimate because of quantification factors.
NL = Not listed. An EPA PHA value has not been established for this analyte.
U = Analyte not detected at the method detection limit
PHA = Provisional Health Advisory. EPA Memorandum, October 2009.

Table 18 Perfluorinated Chemicals Detected in Sediment at Hangar 630, North Side (Site 5)

Sample Number			PFB05-SD-001-001		PFB05-SD-001-901 (Field Duplicate)		PFB05-SD-002-001	
Analyte	CAS Number	EPA RSSL (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)
Perfluorobutanoic acid (PFBA)	375-22-4	NL	1.7 J	0.2	0.72 U	0.14	1.2	0.12
Perfluorodecane sulfonate (PFDS)	67906-42-7	NL	2.1 J	0.51	0.72 U	0.36	0.62 U	0.31
Perfluorodecanoic acid (PFDA)	335-76-2	NL	1.0 UJ	0.46	0.72 U	0.33	0.29 J	0.28
Perfluorododecanoic acid (PFDoA)	307-55-1	NL	3.4 J	0.96	0.72 U	0.69	0.62 U	0.59
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	0.48 J	0.2	0.72 U	0.14	1.2	0.12
Perfluorohexane sulfonate (PFHxS)	108427-53-8	NL	1.3 J	0.47	0.72 U	0.34	0.62 U	0.29
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	6.7 J	0.25	0.72 U	0.18	14.0	0.16
Perfluorooctane sulfonate (PFOS)	1763-23-1	6,000	22.0 J	0.24	3.3	0.17	0.39 J	0.14
Perfluorooctanoic acid (PFOA)	335-67-1	16,000	1.3 J	0.39	0.72 U	0.28	1.9	0.24
Perfluoropentanoic acid (PFPA)	2706-90-3	NL	0.62 J	0.41	0.72 U	0.29	1.7	0.25
Perfluorotridecanoic acid (PFTriA)	72629-94-8	NL	0.99 J	0.54	0.72 U	0.39	0.62 U	0.33
Perfluoroundecanoic acid (PFUnA)	2058-94-8	NL	0.78 J	0.54	0.72 U	0.39	0.62 U	0.33

Note: Shaded values indicate analyte not detected at the method detection limit.
µg/kg = micrograms per kilogram
CAS = Chemical Abstract Service
EPA = United States Environmental Protection Agency
J = Estimated value. The analyte was positively identified, but the value is an estimate because of quantification factors.
NL = Not listed. An EPA RSSL value has not been established for this analyte
RSSL = Residential Soil Screening Level. EPA Memorandum, November 2009.
U = Analyte not detected at the method detection limit

Table 19 Environmental Samples Collected at Hangar 647, North Side (Site 6)

Sample Identifier	Matrix	Sample Interval (feet/bgs)	Purpose/Location
PFB06-GW-001-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point on the east side of the hangar ramp.
PFB06-GW-002-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point on the west side of the hangar ramp.
PFB06-GW-003-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point on the west side of the site between Hangars 647 and 630.
PFB06-SB-001-004	Soil	3-4	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in the soil boring on the east side of the hangar ramp.
PFB06-SB-002-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in the soil boring on the west side of the hangar ramp.
PFB06-SB-003-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in a soil boring on the west side of the site between Hangars 647 and 630.
PFB06-SB-004-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in a soil boring on the west side of the site at the tarmac, in the surface drainage path from the hangar.
PFB06-SD-001-001	Sediment	0-1	Determine if PFCs are in the sediment of the surface drainage system. Sample collected from the drainage canal west of the hangar area at the outfall to the Banana River. Sample co-located with surface water sample.
PFB06-SW-001-000	Surface Water	NA	Determine if PFCs are in the surface water downstream of the hangar area. Sample collected from the drainage canal west of the hangar area at the outfall to the Banana River. Sample co-located with sediment sample.
PFB06-SD-002-001	Sediment	0-1	Determine if PFCs are in the sediment of the surface drainage system. Sample collected in the drainage canal west of the hangar area.

bgs = below ground surface

PFC = perfluorinated chemical or compound

Table 20 Perfluorinated Chemicals Detected in Groundwater at Hangar 647, North Side (Site 6)

	Sample Number		PFB06-GW-001-000		PFB06-GW-002-000		PFB06-GW-003-000	
Analyte	**CAS Number**	**EPA PHA (µg/L)**	**Result (µg/L)**	**Reporting Limit (µg/L)**	**Result (µg/L)**	**Reporting Limit (µg/L)**	**Result (µg/L)**	**Reporting Limit (µg/L)**
Perfluorobutane sulfonate (PFBS)	29420-43-3	NL	0.0098 U	0.0090	0.0095 U	0.0087	0.017 J	0.0089
Perfluorobutanoic acid (PFBA)	375-22-4	NL	0.17	0.011	1.8	0.010	0.94	0.011
Perfluorodecanoic acid (PFDA)	335-76-2	NL	0.19 J	0.0085	0.031 J	0.0082	0.045 J	0.0085
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	0.59	0.014	3.4 J	0.014	2.2 J	0.014
Perfluorohexane sulfonate (PFHxS)	108427-53-8	NL	0.020 J	0.0076	0.052	0.0073	0.021 J	0.0075
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	0.47	0.0032	4.6 J	0.0031	2.9 J	0.0031
Perfluorononanoic acid (PFNA)	375-95-1	NL	1.9	0.019	0.63	0.018	0.86	0.019
Perfluorooctane sulfonamide (FOSA)	754-91-6	NL	0.0095 J	0.0058	0.0073 J	0.0059	0.015 U	0.0058
Perfluorooctane sulfonate (PFOS)	1763-23-1	0.2	**1.1**	0.014	0.19	0.014	0.17	0.014
Perfluorooctanoic acid (PFOA)	335-67-1	0.4	**0.95**	0.011	**3.3** J	0.010	**6.3 J**	0.011
Perfluoropentanoic acid (PFPA)	2706-90-3	NL	0.43	0.012	4.3 J	0.011	2.4	0.012
Perfluorotetradecanoic acid (PFTeA)	376-06-7	NL	0.022 UJ	0.016	0.015 J	0.015	0.022 UJ	0.016
Perfluoroundecanoic acid (PFUnA)	2058-94-8	NL	0.033 J	0.0075	0.011 UJ	0.0072	0.011 UJ	0.0074

Note: Shaded values indicate analyte not detected at the method detection limit. BOLD values exceed EPA PHA.
µg/L = micrograms per Liter CAS = Chemical Abstract Service
EPA = United States Environmental Protection Agency
J = Estimated value. The analyte was positively identified, but the value is an estimate because of quantification factors.
NL = Not listed. An EPA PHA value has not been established for this analyte. U = Analyte not detected at the method detection limit
PHA = Provisional Health Advisory. EPA Memorandum, October 2009.

Table 21 Perfluorinated Chemicals Detected in Soil at Hangar 647, North Side (Site 6)

Sample Number			PFB06-SB-001-004		PFB06-SB-002-005		PFB06-SB-003-005		PFB06-SB-004-005	
Analyte	**CAS**	**EPA RSSL (µg/kg)**	**Result (µg/kg)**	**Reporting Limit (µg/kg)**	**Result (µg/kg)**	**Reporting Limit (µg/kg)**	**Result (µg/kg)**	**Reporting Limit (µg/kg)**	**Result (µg/kg)**	**Reporting Limit (µg/kg)**
Perfluorobutanoic acid (PFBA)	375-22-4	NL	0.66 UJ	0.13	0.65 U	0.13	2.1	0.13	0.15 J	0.13
Perfluorodecanoic acid (PFDA)	335-76-2	NL	1.4 J	0.30	5.1	0.29	4.4	0.29	0.63 U	0.28
Perfluorododecanoic acid (PFDoA)	307-55-1	NL	1.1 J	0.63	0.65 U	0.61	0.65 U	0.62	0.63 U	0.59
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	0.28 J	0.13	0.66 J	0.13	1.3	0.13	0.30 J	0.13
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	0.62 J	0.16	0.90	0.16	3.1	0.16	0.88	0.16
Perfluorononanoic acid (PFNA)	375-95-1	NL	3.1	0.24	3.7	0.24	3.8	0.24	2.3	0.23
Perfluorooctane sulfonate (PFOS)	1763-23-1	6,000	6.7 J	0.15	8.4	0.15	9.1	0.15	0.56 J	0.15
Perfluorooctanoic acid (PFOA)	335-67-1	16,000	1.4 J	0.25	5.9	0.25	4.0	0.25	0.94	0.24
Perfluoropentanoic acid (PFPA)	2706-90-3	NL	0.66 UJ	0.26	0.44 J	0.26	3.1	0.26	1.0	0.25
Perfluorotetradecanoic acid (PFTeA)	376-06-7	NL	1.5 U	0.76	1.5 U	0.74	1.5 U	0.75	1.2 J	0.72
Perfluorotridecanoic acid (PFTriA)	72629-94-8	NL	0.66 U	0.35	0.65 U	0.34	0.65 U	0.35	0.88	0.33
Perfluoroundecanoic acid (PFUnA)	2058-94-8	NL	2.0	0.35	1.5	0.34	1.2	0.35	0.63 U	0.33

Note: Shaded values indicate analyte not detected at the method detection limit.
µg/kg = micrograms per kilogram
CAS = Chemical Abstract Service
EPA = United States Environmental Protection Agency
J = Estimated value. The analyte was positively identified, but the value is an estimate because of quantification factors.
NL = Not listed. An EPA RSSL value has not been established for this analyte
RSSL = Residential Soil Screening Level. EPA Memorandum, November 2009.
U = Analyte not detected at the method detection limit

Table 22 Perfluorinated Chemicals Detected in Surface Water at Hangar 647, North Side (Site 6)

		Sample Number	PFB06-SW-001-000	
Analyte	**CAS Number**	**EPA PHA (µg/L)**	**Result (µg/L)**	**Reporting Limit (µg/L)**
Perfluorobutane sulfonate (PFBS)	29420-43-3	NL	0.015 J	0.0083
Perfluorobutanoic acid (PFBA)	375-22-4	NL	0.042	0.0099
Perfluorodecanoic acid (PFDA)	335-76-2	NL	0.0085 J	0.0079
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	0.080	0.013
Perfluorohexane sulfonate (PFHxS)	108427-53-8	NL	0.24	0.0071
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	0.19	0.0029
Perfluorononanoic acid (PFNA)	375-95-1	NL	0.022 J	0.018
Perfluorooctane sulfonate (PFOS)	1763-23-1	0.2	**1.4**	0.013
Perfluorooctanoic acid (PFOA)	335-67-1	0.4	0.076	0.0099
Perfluoropentanoic acid (PFPA)	2706-90-3	NL	0.11	0.011

Note: Shaded values indicate analyte not detected at the method detection limit. BOLD values exceed EPA PHA.
µg/L = micrograms per liter CAS = Chemical Abstract Service
EPA = United States Environmental Protection Agency
J = Estimated value. The analyte was positively identified, but the value is an estimate because of quantification factors.
NL = Not listed. An EPA PHA value has not been established for this analyte.
U = Analyte not detected at the method detection limit
PHA = Provisional Health Advisory. EPA Memorandum, October 2009.

Table 23 Perfluorinated Chemicals Detected in Sediment at Hangar 647, North Side (Site 6)

		Sample Number	PFB06-SD-001-001		PFB06-SD-002-001	
Analyte	**CAS**	**EPA RSSL (µg/kg)**	**Result (µg/kg)**	**Reporting Limit (µg/kg)**	**Result (µg/kg)**	**Reporting Limit (µg/kg)**
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	0.72 U	0.18	0.30 J	0.18
Perfluorooctane sulfonate (PFOS)	1763-23-1	6,000	0.96	0.17	2.8	0.17
Perfluorotridecanoic acid (PFTriA)	72629-94-8	NL	0.98	0.38	0.73 U	0.39

Note: Shaded values indicate analyte not detected at the method detection limit.
µg/kg = Micrograms per kilogram
CAS = Chemical Abstract Service
EPA = United States Environmental Protection Agency
J = Estimated value. The analyte was positively identified, but the value is an estimate due to quantification factors.
NL = Not listed. An EPA RSSL value has not been established for this analyte
RSSL = Residential Soil Screening Level. EPA Memorandum, November 2009.
U = Analyte not detected at the method detection limit

Table 24 Perfluorinated Chemicals Detected in Groundwater at Building 313 (Site 7)

			Sample Number		PFB07-GW-S03-000		PFB07-GW-S03-900 (Field Duplicate)		PFB07-GW-S04-000		PFB07-GW-S11-000		PFB07-GW-S17-000	
Analyte	**CAS Number**	**EPA PHA (µg/L)**	**Result (µg/L)**	**Reporting Limit (µg/L)**	**Result (µg/L)**	**Reporting Limit (µg/L)**	**Result (µg/L)**	**Reporting Limit (µg/L)**	**Result (µg/L)**	**Reporting Limit (µg/L)**	**Result (µg/L)**	**Reporting Limit (µg/L)**	**Result (µg/L)**	**Reporting Limit (µg/L)**
Perfluorobutanoic acid (PFBA)	375-22-4	NL	0.011 J	0.0096	0.011 J	0.0094	0.0098 U	0.0096	0.0096 U	0.0094	0.010 J	0.0097
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	0.019 J	0.013	0.016 J	0.013	0.019 J	0.013	0.019 U	0.013	0.021 J	0.013
Perfluorohexane sulfonate (PFHxS)	108427-53-8	NL	0.024 J	0.0069	0.023 J	0.0067	0.039 J	0.0068	0.021 J	0.0067	0.035 J	0.0069
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	0.016 J	0.0029	0.019	0.0028	0.021	0.0029	0.0075 J	0.0028	0.019 J	0.0029
Perfluorooctane sulfonamide (FOSA)	754-91-6	NL	0.015 U	0.0057	0.015 U	0.0057	0.015 U	0.0058	0.014 J	0.0058	0.016 J	0.0057
Perfluorooctane sulfonate (PFOS)	1763-23-1	0.2	0.13 J	0.013	0.11 J	0.013	**0.61 J**	**0.013**	0.13 J	0.013	**0.21 J**	**0.013**
Perfluorooctanoic acid (PFOA)	335-67-1	0.4	0.027 J	0.0096	0.025 J	0.0094	0.027 J	0.0096	0.016 J	0.0094	0.033 J	0.0097
Perfluoropentanoic acid (PFPA)	2706-90-3	NL	0.012 J	0.011	0.015 J	0.010	0.020 J	0.011	0.0096 U	0.010	0.012 J	0.011

Note: Shaded values indicate analyte not detected at the method detection limit. BOLD values exceed EPA PHA.
µg/L = micrograms per liter
CAS = Chemical Abstract Service
EPA = United States Environmental Protection Agency
J = Estimated value. The analyte was positively identified, but the value is an estimate because of quantification factors.
NL = Not listed. An EPA PHA value has not been established for this analyte.
U = Analyte not detected at the method detection limit
PHA = Provisional Health Advisory. EPA Memorandum, October 2009.

APPENDIX B

PHOTOGRAPH LOGS

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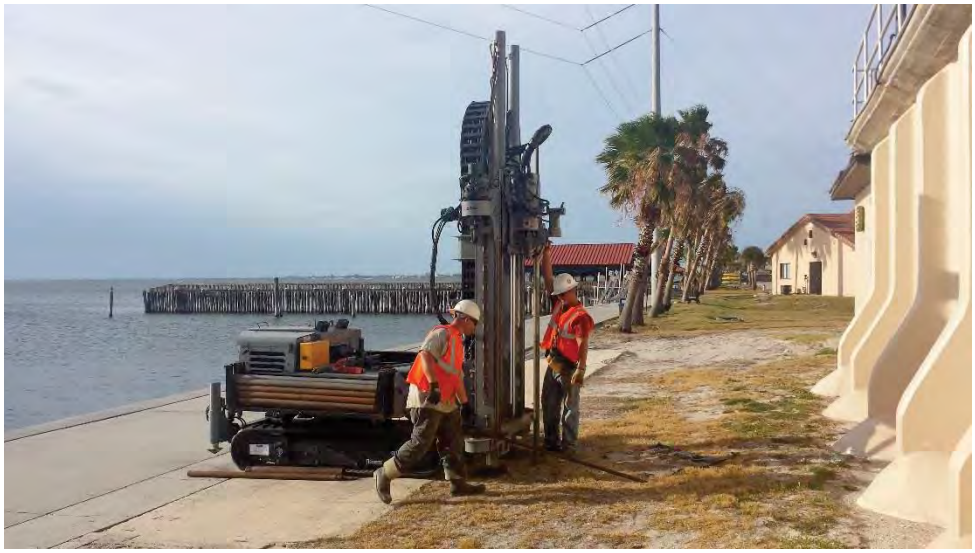

22 May 2017
1821

Photo 1:
AFFF Release Area 3 (Northern Sewage Treatment Plant); DPT drilling at MW03001

Direction of Photo:
North

23 May 2017
0900

Photo 2:
AFFF Release Area 2 (Fire Truck Rollover); Hand auger installation of MW02001

Direction of Photo:
Northwest

23 May 2017
0845

Photo 3:
AFFF Release Area 2 (Fire Truck Rollover); Well development of MW02002

Direction of Photo:
North

23 May 2017
1035

Photo 4:
AFFF Release Area 2 (Fire Truck Rollover); Groundwater sampling at MW02002

Direction of Photo:
North

	**24 May 2017** **9:21** **Photo 5:** AFFF Release Area 1 (Former FTA 2); DPT drilling at MW01006
	Direction of Photo: **Southwest**

	**24 May 2017** **10:19** **Photo 6:** FTA No. 1 Burn Pit 2; well drilling equipment decontamination
	Direction of Photo: **South**

25 May 2017
1126

Photo 7:
AFFF Release Area 3 (Northern Sewage Treatment Plant); ground surface after temporary monitoring well abandonment at MW03002

Direction of Photo:
West

25 May 2017
1515

Photo 8:
IDW drum storage area

Direction of Photo:
Northwest

APPENDIX C

FIELD FORMS

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APPENDIX C-1

FIELD ACTIVITY DAILY LOGS

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FIELD ACTIVITY DAILY LOG

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Investigation Area:**	AFFF Release Area 3
Weather:	Cloudy, 10-15 mph winds, upper 80s	**Date and Time:**	05/22/17 2249
Technician(s):	Jason Hayes, Jason Drizd		

Description of Daily Activities and Events:

1630-arrived at Patrick AFB and traveled to AFFF Area 3., 1730-AmDrill arrives onsite after inspection., 1750-started hand augering at MW03001, 1750-took sample PTRCK03-SO-001, 1800-took sample PTRCK03-SO-002, 1830-completed MW03001, set up to develop well. AmDrill set up to decon all tooling., 1910-finished development of MW03001., 1930-all personnel left site for the day.

List Samples Collected:

PTRCK03-SO-001, PTRCK03-SO-002

Deviation from Plans:

None

Visitors on Site:	**Important Telephone Calls / Photos Taken:**	**Signature:**
None	None	**Name** (print)**:** Jason Hayes

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/14/2017**

FIELD ACTIVITY DAILY LOG

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Investigation Area:**	AFFF Release Areas 1, 2, and 3
Weather:	Partly cloudy, 5-10 mph, upper 80s	**Date and Time:**	05/23/17 20:37
Technician(s):	Jason Hayes, Jason Drizd		

Description of Daily Activities and Events:

0800-arrived onsite with surveyors and AmDrill personnel to complete airfield driving training., 0810-notified that we just be escorted, no formal training needed., 0815-traveled with John Langett to show us drum storage area., 0845-conducted tailgate safety meeting with all personnel as well as pfc protocol checklist., 0850-surveyors left for Cape Canaveral to survey in wells installed yesterday., 0855-AmDrill and AmecFW personnel escorted out to AFFF Area 2., 0900-started hand augering at MW02002, 0905-took sample PTRCK02-SO-003, 0910-took sample PTRCK02-SO-004, 0915-took sample PTRCK-FD-SO-001, 0920-completed installation of MW02002. Set up to develop the well. Started hand augering at MW02003., 0925-took sample PTRCK02-SO-005, 0930-took sample PTRCK02-SO-006, 0945-completed development of MW02002. Started development of MW02003., 0950-completed installation of MW02002. Started hand augering at MW02001., 1000-took sample PTRCK02-SO-001, 1005-took sample PTRCK02-SO-002, 1015-completed development of MW02003. Started development of MW02001., 1040-completed development of MW02001. Started sampling of MW02002., 1103-took sample PTRCK02-GW-002 and PTRCK-FD-GW-001, 1110-completed sampling of MW02002. Started sampling of MW02003., 1135-completed sampling of MW02003. Had to mobilize out of the area for a plane landing., 1150-started setup for sampling at MW02001., 1214-completed sampling of MW02001., 1230-off airfield with drillers., 1400-Gary Kihn and surveyors went back to airfield to survey. AmDrill came over afterward to abandon the wells., 1405-The rest of the AmecFW personnel and AmDrill mobilizedto MW03002 and started hand augering., 1420-took sample PTRCK03-SO-003, 1425-took sample PTRCK03-SO-004, 1445-completed installation of MW03002. Setup to develop well., 1515-finished development of MW03002. Started loading up equipment to mobilize to the next area., 1530-all activities on the airfield were completed, surveyors left for the day., 1545-mobilized to MW01001., 1620-started hand augering at MW01001. Encountered a liner material at about 1 foot. Soils collected below the liner had PID reading increasing all the way to the groundwater table, due to some hydrocarbon contamination. Highest PID reading was 345 ppm. John Langett was notified of the possible contamination., 1720-took sample PTRCK01-SO-001, 1725-took sample PTRCK01-SO-002, 1745-Completed well installation at MW01001. , 1800-Completed decon of equipment and took sample PTRCK-EB-001., 1830-left site for the day.

List Samples Collected:

PTRCK02-SO-003, PTRCK02-SO-004, PTRCK-FD-GW-001, PTRCK02-SO-005, PTRCK02-SO-006, PTRCK02-SO-001, PTRCK02-SO-002, PTRCK01-SO-001, PTRCK01-SO-002, PTRCK02-GW-002, PTRCK02-GW-003, PTRCK02-GW-001, PTRCK03-SO-003, PTRCK03-SO-004, PTRCK-EB-001

Deviation from Plans:

None

Visitors on Site:	**Important Telephone Calls / Photos Taken:**	**Signature:**
John Langett	None	**Name** (print)**:** Jason Hayes

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/14/2017**

FIELD ACTIVITY DAILY LOG

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Investigation Area:**	AFFF Release Areas 1, 2, and 3
Weather:	Cloudy, windy, upper 80s	**Date and Time:**	05/24/17 1828
Technician(s):	Jason Hayes, Jason Drizd		

Description of Daily Activities and Events:

0645-arrived onsite with AmDrill., 0700-conducted tailgate safety meeting. , 0705-Jason Drizd (JD) left for cape canaveral to conduct groundwater sampling, the rest of the AmecFW personnel and AmDrill went to MW01002., 0710-took sample PTRCK01-SO-003, 0715-took sample PTRCK01-SO-004, 0815-finalized installation of MW01002. Mobilized to MW01003. MW01003 will not have any soil samples, only lithologic logging per the ISWP., 0900-finalized installation of MW01003. Mobilized to MW01006., 0905-took sample PTRCK01-SO-009., 0910-took sample PTRCK01-SO-010. A MS/MSD was taken at this location., 0935-finalized installation of MW01006. Mobilized to MW01004., 0940-took sample PTRCK01-SO-005., 0945-took sample PTRCK01-SO-006., 1005-finalized installation of MW01004. Mobilized to MW01005., 1010-took sample PTRCK01-SO-007., 1015-took sample PTRCK01-SO-008., 1050-finalized installation of MW01004. Mobilized back to Cape Canaveral AFS to start abandonment of temporary wells installed on 5/22., 1400-Arrived back at Patrick AFB., 1450-JD completed groundwater sampling at MW03002. A FD was taken at this location with sample id PTRCK-FD-SO-002. Mobilized to existing well 610-MW17., 1520- AmecFW and AmDrill started development at MW01002., 1545-completed development of MW01002. Mobilized to MW01003., 1551-JD completed groundwater sampling at existing well 610-MW17. , 1605-completed development of MW01003. Mobilized to MW01004., 1625-completed development of MW01004. Mobilized to MW01005., 1645-completed development of MW01005. Mobilized to MW01006., 1715-completed all development and all personnel left site for the day.

List Samples Collected:

PTRCK01-SO-003, PTRCK01-SO-004, PTRCK01-SO-009, PTRCK01-SO-010, PTRCK01-SO-005, PTRCK01-SO-006, PTRCK01-SO-007, PTRCK01-SO-008, PTRCK03-GW-001, PTRCK03-GW-002, PTRCK03-GW-610-MW17, PTRCK-EB-002, PTRCK-FB-001

Deviation from Plans:

None

Visitors on Site:	**Important Telephone Calls / Photos Taken:**	**Signature:**
John Langett	None	**Name** (print)**:** Jason Hayes

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/14/2017**

FIELD ACTIVITY DAILY LOG

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Investigation Area:**	AFFF Release Area 1
Weather:	Clear calm, mid 80s	**Date and Time:**	05/25/17 1746
Technician(s):	Jason Hayes, Jason Drizd		

Description of Daily Activities and Events:

0745-arrived onsite with all AmecFW and AmDrill personnel., 0800-conducted tailgate safety meeting and completed pfc protocol checklist., 0805-Jason Drizd (JD) setup on MW01001 to start groundwater sampling. AmDrill started abandonment of wells at AFFF Area 3 after AmecFW surveyors finished surveying each well., 0840-took sample PTRCK01-GW-001, 0845-left MW01001, setup on MW01002, 0932-took sample PTRCK01-GW-002., 0935-left MW01002, setup on MW01003., 1026-took sample PTRCK01-GW-003, 1030-left MW01003, setup on MW01006., 1045-collected Solid IDW sample from Patrick AFB (PTRCK-Solid IDW), 1122-took sample PTRCK01-GW-006, 1125-left MW01006, setup on MW01004., 1216-took sample PTRCK01-GW-004, 1220-left MW01004, setup on MW01005., 1316-took sample PTRCK01-GW-005, 1320-left MW01005. , 1330-Gary Kihn and Jason Hayes traveled to cape Canaveral to get base specific labels for IDW., 1330-surveyors started to get points in AFFF Area 1, will drillers abandoning the location after survey completion., 1410-Gary Kihn left site to travel back home. Jason Hayes (JH) traveled back to Patrick AFB., 1430-surveyors have completed survey of all temp wells. All well have been abandoned with cement grout mix. , 1530-finalized mobilization of IDW to staging area at Patrick., 1545-collected Liquid IDW sample from Patrick AFB (PTRCK-Liquid IDW), 1615-verified all drums were labeled properly with base specific labels and covered in secondary containment storage containers. A total of 8 drums of IDW were left at Patrick AFB, 1 was drill cuttings, 7 were liquid waste from purge water and decon water., 1630-left Patrick AFB. AmDrill left site to travel back home. JH and JD traveled to cape canaveral to take liquid IDW sample., 1715-verified all drums were labeled properly with base specific labels. A total of 4 drums of IDW were left at Patrick AFB, 1 was drill cuttings, 3 were liquid waste from purge water and decon water., 1720-both JD and JH left site to travel home.

List Samples Collected:

PTRCK01-GW-001, PTRCK01-GW-002, PTRCK01-GW-003, PTRCK01-GW-006, PTRCK01-GW-004, PTRCK01-GW-005, PTRCK-Solid IDW, PTRCK-Liquid IDW

Deviation from Plans:

None

Visitors on Site:	**Important Telephone Calls / Photos Taken:**	**Signature:**
None	None	**Name** (print)**:** Jason Hayes

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/16/2017**

APPENDIX C-2

DAILY PFAS PROTOCOL CHECKLISTS

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DAILY PFAS PROTOCOL CHECKLIST

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Weather (temp./precipitation):**	Cloudy, 10-15 mph winds, upper 90s
Site/Area Name:	AFFF Release Area 3		
Field Manager:	Jason Hayes	**Date and Time:**	05/22/17 1740

Field Clothing and PPE (as applicable):

- ☑ Field crew in compliance with Tables 1 and 2, SOP AFW-01
- ☑ Field crew has not used fabric softener on clothing
- ☐ Field crew has not used cosmetics, moisturizers, hand cream, or other related products or exposed body parts this morning
- ☑ Field crew has not applied unacceptable sunscreen or insect repellant

Field Equipment:

- ☐ No Teflon® containing materials on-site
- ☑ All sample materials made from stainless steel, HDPE, acetate, silicon, or polypropylene
- ☑ No waterproof field books on-site other than Rite-in-the-Rain® Products
- ☑ No plastic clipboards, binders, or spiral hard cover notebooks on-site
- ☑ No adhesives (Post-it® Notes) on-site
- ☑ Coolers filled with regular ice only. No chemical (blue) ice packs in possession

Sample Containers:

- ☑ All sample containers made of HDPE or polypropylene. Samples are not stored in containers made of LDPE
- ☑ Caps are lined or unlined and made of HDPE or polypropylene

Wet Weather (as applicable):

- ☑ For personnel in direct contact with samples and/or sampling equipment, wet weather gear made of Vinyl, polyurethane, PVC, latex or rubber-coated materials only

Equipment Decontamination:

- ☑ "PFAS-free" water on-site for decontamination of sample equipment
- ☑ Alconox and Liquinox to be used as decontamination materials

Food Considerations:

- ☑ No food or drink on-site with exception of bottled water and/or hydration drinks (i.e., Gatorade and Powerade) that is available for consumption only in the staging area

If any applicable boxes cannot be checked, the Field Manager shall describe the noncompliance issues below and work with field personnel to address noncompliance issues prior to commencement of that day's work. Corrective action shall include removal of noncompliance items from the investigation area or removal of worker offsite until in compliance. Repeated failure to comply with PFAS sample protocols will result in the permanent removal of worker(s) from the investigation area.

Describe the noncompliance issues (include personnel not in compliance) and action/outcome of noncompliance:

None

Signature:

Name (print):

Jason Hayes

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/14/2017**

DAILY PFAS PROTOCOL CHECKLIST

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Weather (temp./precipitation):**	Partly cloudy, 5-10 mph winds, upper 80s
Site/Area Name:	AFFF Release Area 2		
Field Manager:	Jason Hayes	**Date and Time:**	05/23/17 0856

Field Clothing and PPE (as applicable):

- ☑ Field crew in compliance with Tables 1 and 2, SOP AFW-01
- ☑ Field crew has not used fabric softener on clothing
- ☐ Field crew has not used cosmetics, moisturizers, hand cream, or other related products or exposed body parts this morning
- ☑ Field crew has not applied unacceptable sunscreen or insect repellant

Field Equipment:

- ☐ No Teflon® containing materials on-site
- ☑ All sample materials made from stainless steel, HDPE, acetate, silicon, or polypropylene
- ☑ No waterproof field books on-site other than Rite-in-the-Rain® Products
- ☑ No plastic clipboards, binders, or spiral hard cover notebooks on-site
- ☑ No adhesives (Post-it® Notes) on-site
- ☑ Coolers filled with regular ice only. No chemical (blue) ice packs in possession

Sample Containers:

- ☑ All sample containers made of HDPE or polypropylene. Samples are not stored in containers made of LDPE
- ☑ Caps are lined or unlined and made of HDPE or polypropylene

Wet Weather (as applicable):

- ☑ For personnel in direct contact with samples and/or sampling equipment, wet weather gear made of Vinyl, polyurethane, PVC, latex or rubber-coated materials only

Equipment Decontamination:

- ☑ "PFAS-free" water on-site for decontamination of sample equipment
- ☑ Alconox and Liquinox to be used as decontamination materials

Food Considerations:

- ☑ No food or drink on-site with exception of bottled water and/or hydration drinks (i.e., Gatorade and Powerade) that is available for consumption only in the staging area

If any applicable boxes cannot be checked, the Field Manager shall describe the noncompliance issues below and work with field personnel to address noncompliance issues prior to commencement of that day's work. Corrective action shall include removal of noncompliance items from the investigation area or removal of worker offsite until in compliance. Repeated failure to comply with PFAS sample protocols will result in the permanent removal of worker(s) from the investigation area.

Describe the noncompliance issues (include personnel not in compliance) and action/outcome of noncompliance:

None

Signature:

Name (print):

Jason Hayes

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/14/2017**

DAILY PFAS PROTOCOL CHECKLIST

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Weather (temp./precipitation):**	Cloudy, windy, mid 80s, chance of rain in the afternoon
Site/Area Name:	AFFF Release Area 1		
Field Manager:	Jason Hayes	**Date and Time:**	05/24/17 0700

Field Clothing and PPE (as applicable):

- ☑ Field crew in compliance with Tables 1 and 2, SOP AFW-01
- ☑ Field crew has not used fabric softener on clothing
- ☐ Field crew has not used cosmetics, moisturizers, hand cream, or other related products or exposed body parts this morning
- ☑ Field crew has not applied unacceptable sunscreen or insect repellant

Field Equipment:

- ☐ No Teflon® containing materials on-site
- ☑ All sample materials made from stainless steel, HDPE, acetate, silicon, or polypropylene
- ☑ No waterproof field books on-site other than Rite-in-the-Rain® Products
- ☑ No plastic clipboards, binders, or spiral hard cover notebooks on-site
- ☑ No adhesives (Post-it® Notes) on-site
- ☑ Coolers filled with regular ice only. No chemical (blue) ice packs in possession

Sample Containers:

- ☑ All sample containers made of HDPE or polypropylene. Samples are not stored in containers made of LDPE
- ☑ Caps are lined or unlined and made of HDPE or polypropylene

Wet Weather (as applicable):

- ☑ For personnel in direct contact with samples and/or sampling equipment, wet weather gear made of Vinyl, polyurethane, PVC, latex or rubber-coated materials only

Equipment Decontamination:

- ☑ "PFAS-free" water on-site for decontamination of sample equipment
- ☑ Alconox and Liquinox to be used as decontamination materials

Food Considerations:

- ☑ No food or drink on-site with exception of bottled water and/or hydration drinks (i.e., Gatorade and Powerade) that is available for consumption only in the staging area

If any applicable boxes cannot be checked, the Field Manager shall describe the noncompliance issues below and work with field personnel to address noncompliance issues prior to commencement of that day's work. Corrective action shall include removal of noncompliance items from the investigation area or removal of worker offsite until in compliance. Repeated failure to comply with PFAS sample protocols will result in the permanent removal of worker(s) from the investigation area.

Describe the noncompliance issues (include personnel not in compliance) and action/outcome of noncompliance:

None

Signature:

Name (print):

Jason Hayes

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/15/2017**

DAILY PFAS PROTOCOL CHECKLIST

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Weather (temp./precipitation):**	Cloudy calm mid 80s
Site/Area Name:	AFFF Release Area 1		
Field Manager:	Jason Hayes	**Date and Time:**	05/25/17 0800

Field Clothing and PPE (as applicable):

- ☑ Field crew in compliance with Tables 1 and 2, SOP AFW-01
- ☑ Field crew has not used fabric softener on clothing
- ☐ Field crew has not used cosmetics, moisturizers, hand cream, or other related products or exposed body parts this morning
- ☑ Field crew has not applied unacceptable sunscreen or insect repellant

Field Equipment:

- ☐ No Teflon® containing materials on-site
- ☑ All sample materials made from stainless steel, HDPE, acetate, silicon, or polypropylene
- ☑ No waterproof field books on-site other than Rite-in-the-Rain® Products
- ☑ No plastic clipboards, binders, or spiral hard cover notebooks on-site
- ☑ No adhesives (Post-it® Notes) on-site
- ☑ Coolers filled with regular ice only. No chemical (blue) ice packs in possession

Sample Containers:

- ☑ All sample containers made of HDPE or polypropylene. Samples are not stored in containers made of LDPE
- ☑ Caps are lined or unlined and made of HDPE or polypropylene

Wet Weather (as applicable):

- ☑ For personnel in direct contact with samples and/or sampling equipment, wet weather gear made of Vinyl, polyurethane, PVC, latex or rubber-coated materials only

Equipment Decontamination:

- ☑ "PFAS-free" water on-site for decontamination of sample equipment
- ☑ Alconox and Liquinox to be used as decontamination materials

Food Considerations:

- ☑ No food or drink on-site with exception of bottled water and/or hydration drinks (i.e., Gatorade and Powerade) that is available for consumption only in the staging area

If any applicable boxes cannot be checked, the Field Manager shall describe the noncompliance issues below and work with field personnel to address noncompliance issues prior to commencement of that day's work. Corrective action shall include removal of noncompliance items from the investigation area or removal of worker offsite until in compliance. Repeated failure to comply with PFAS sample protocols will result in the permanent removal of worker(s) from the investigation area.

Describe the noncompliance issues (include personnel not in compliance) and action/outcome of noncompliance:

None

Signature:

Name (print):

Jason Hayes

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/15/2017**

APPENDIX C-3

TAILGATE SAFETY MEETING REPORTS

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TAILGATE SAFETY MEETING REPORT

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Date and Time:**	05/22/17 1735
Field Manager Name:	Jason Hayes	**Site Health and Safety Officer (HSO):**	Jason Hayes
Safety Meeting Type:	Initial Kickoff Tailgate Safety Meeting		

Order of Business

Topics Discussed (check all that apply):

- ☑ Site History/Site Layout
- ☑ Scope of Work
- ☑ Personnel Responsibilities
- ☑ Medical Surveillance Requirements
- ☑ Training Requirements
- ☑ Safe Work Practices
- ☑ Logs, Reports, Recordkeeping
- ☑ Sanitation and Illumination
- ☑ Air Surveillance Type and Frequency
- ☑ Monitoring Instruments and Personal Monitoring
- ☑ Action Levels
- ☑ Accident Reporting Procedures
- ☑ Site Control (visitor access, buddy system, work zones, security, communications)
- ☑ Discussion of previous "near misses" including work crew suggestions to correct work practices to avoid similar occurrences
- ☑ Engineering Controls
- ☑ PPE Required/PPE Used
- ☑ Define PPE Levels, Donning, Doffing Procedures
- ☑ Physical Hazards and Controls (e.g., overhead utility lines)
- ☑ Decontamination Procedures for Personnel and Equipment
- ☑ General Emergency Procedures (e.g., locations of air horns and what 1 or 2 blasts indicate)
- ☑ Site/Regional Emergency Procedures (e.g. earthquake response, typhoon response, etc.)
- ☑ Medical Emergency Response Procedures (e.g., exposure control precautions, location of first aid kit, etc.)
- ☑ Hazardous Materials Spill Procedures
- ☑ Applicable SOPs (e.g., Hearing Conservation Program, Safe Driving, etc.)
- ☑ Injury/Illness Reporting Procedures
- ☑ Route to Hospital and Medical Care Provider Visit Guidelines
- ☑ Hazard Analysis of Work Tasks (chemical, physical, biological and energy health hazards and effects)
- ☑ Review AHAs with all parties engaged in the activity (EM-385 1-1, para 01.A.13.b)

Safety suggestions by site workers:	Watch work around rig
Action taken on previous suggestions:	Communicate with drillers before approaching rig
Injuries/accidents/personnel changes since previous meeting:	NA
Observations of unsafe work practices/conditions that have developed since previous meeting:	None
Location of (or changes in the locations of) evacuation routes/safe refuge areas:	Equipment lay-down yard
Other Safety Topics Discussed:	None
Additional comments:	None

Attendee signatures below indicate acknowledgment of the information and willingness to abide by the procedures discussed during this safety meeting.

Attendee Name (print)	Company	Signature	Attendee Name (print)	Company	Signature
Jason Hayes	Amec FW				
Jason Drizd	Amec FW				
Gary Kihn	Amec FW				
Todd Ives	AmDrill, Inc.				
Keith Anderson	AmDrill, Inc.				

Meeting Conducted By (print):	**Company and Title**	**Signature**
Jason Hayes	Amec FW - Field Manager	

QA/QC'd by: Thomas W. Hensel **QA/QC Date: 6/14/2017**

TAILGATE SAFETY MEETING REPORT

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Date and Time:**	05/23/17 0845
Field Manager Name:	Jason Hayes	**Site Health and Safety Officer (HSO):**	Jason Hayes
Safety Meeting Type:	Regular/Daily Tailgate Safety Meeting		

Order of Business

Topics Discussed (check all that apply):

- ☑ Site History/Site Layout
- ☑ Scope of Work
- ☑ Personnel Responsibilities
- ☑ Medical Surveillance Requirements
- ☑ Training Requirements
- ☑ Safe Work Practices
- ☑ Logs, Reports, Recordkeeping
- ☑ Sanitation and Illumination
- ☑ Air Surveillance Type and Frequency
- ☑ Monitoring Instruments and Personal Monitoring
- ☑ Action Levels
- ☑ Accident Reporting Procedures
- ☑ Site Control (visitor access, buddy system, work zones, security, communications)
- ☑ Discussion of previous "near misses" including work crew suggestions to correct work practices to avoid similar occurrences
- ☑ Engineering Controls
- ☑ PPE Required/PPE Used
- ☑ Define PPE Levels, Donning, Doffing Procedures
- ☑ Physical Hazards and Controls (e.g., overhead utility lines)
- ☑ Decontamination Procedures for Personnel and Equipment
- ☑ General Emergency Procedures (e.g., locations of air horns and what 1 or 2 blasts indicate)
- ☑ Site/Regional Emergency Procedures (e.g. earthquake response, typhoon response, etc.)
- ☑ Medical Emergency Response Procedures (e.g., exposure control precautions, location of first aid kit, etc.)
- ☑ Hazardous Materials Spill Procedures
- ☑ Applicable SOPs (e.g., Hearing Conservation Program, Safe Driving, etc.)
- ☑ Injury/Illness Reporting Procedures
- ☑ Route to Hospital and Medical Care Provider Visit Guidelines
- ☑ Hazard Analysis of Work Tasks (chemical, physical, biological and energy health hazards and effects)
- ☑ Review AHAs with all parties engaged in the activity (EM-385 1-1, para 01.A.13.b)

Safety suggestions by site workers:	Airfield worker safety
Action taken on previous suggestions:	Coordinate with escort before all movement.
Injuries/accidents/personnel changes since previous meeting:	None
Observations of unsafe work practices/conditions that have developed since previous meeting:	None
Location of (or changes in the locations of) evacuation routes/safe refuge areas:	Equipment lay-down yard
Other Safety Topics Discussed:	None
Additional comments:	None

Attendee signatures below indicate acknowledgment of the information and willingness to abide by the procedures discussed during this safety meeting.

Attendee Name (print)	Company	Signature	Attendee Name (print)	Company	Signature
Jason Hayes	Amec FW				
Jason Drizd	Amec FW				
Gary Kihn	Amec FW				
Todd Ives	AmDrill, Inc.				
Keith Anderson	AmDrill, Inc.				

Meeting Conducted By (print):	**Company and Title**	**Signature**
Jason Hayes	Amec FW - Field Manager	

QA/QC'd by: Thomas W. Hensel **QA/QC Date: 6/14/2017**

TAILGATE SAFETY MEETING REPORT

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Date and Time:**	05/24/17 0700
Field Manager Name:	Jason Hayes	**Site Health and Safety Officer (HSO):**	Jason Hayes
Safety Meeting Type:		Regular/Daily Tailgate Safety Meeting	

Order of Business

Topics Discussed (check all that apply):

- ☑ Site History/Site Layout
- ☑ Scope of Work
- ☑ Personnel Responsibilities
- ☑ Medical Surveillance Requirements
- ☑ Training Requirements
- ☑ Safe Work Practices
- ☑ Logs, Reports, Recordkeeping
- ☑ Sanitation and Illumination
- ☑ Air Surveillance Type and Frequency
- ☑ Monitoring Instruments and Personal Monitoring
- ☑ Action Levels
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- ☑ PPE Required/PPE Used
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- ☑ Decontamination Procedures for Personnel and Equipment
- ☑ General Emergency Procedures (e.g., locations of air horns and what 1 or 2 blasts indicate)
- ☑ Site/Regional Emergency Procedures (e.g. earthquake response, typhoon response, etc.)
- ☑ Medical Emergency Response Procedures (e.g., exposure control precautions, location of first aid kit, etc.)
- ☑ Hazardous Materials Spill Procedures
- ☑ Applicable SOPs (e.g., Hearing Conservation Program, Safe Driving, etc.)
- ☑ Injury/Illness Reporting Procedures
- ☑ Route to Hospital and Medical Care Provider Visit Guidelines
- ☑ Hazard Analysis of Work Tasks (chemical, physical, biological and energy health hazards and effects)
- ☑ Review AHAs with all parties engaged in the activity (EM-385 1-1, para 01.A.13.b)

Safety suggestions by site workers:	Bad weather may be in the area
Action taken on previous suggestions:	Listen for warning calls from the base
Injuries/accidents/personnel changes since previous meeting:	None
Observations of unsafe work practices/conditions that have developed since previous meeting:	None
Location of (or changes in the locations of) evacuation routes/safe refuge areas:	Equipment lay-down yard
Other Safety Topics Discussed:	None
Additional comments:	None

Attendee signatures below indicate acknowledgment of the information and willingness to abide by the procedures discussed during this safety meeting.

Attendee Name (print)	Company	Signature	Attendee Name (print)	Company	Signature
Jason Hayes	Amec FW				
Jason Drizd	Amec FW				
Gary Kihn	Amec FW				
Todd Ives	AmDrill, Inc.				
Keith Anderson	AmDrill, Inc.				

Meeting Conducted By (print):	**Company and Title**	**Signature**
Jason Hayes	Amec FW - Field Manager	

QA/QC'd by: Thomas W. Hensel **QA/QC Date: 6/15/2017**

TAILGATE SAFETY MEETING REPORT

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Date and Time:**	05/25/17 0800
Field Manager Name:	Jason Hayes	**Site Health and Safety Officer (HSO):**	Jason Hayes
Safety Meeting Type:	Regular/Daily Tailgate Safety Meeting		

Order of Business

Topics Discussed (check all that apply):

- ☑ Site History/Site Layout
- ☑ Scope of Work
- ☑ Personnel Responsibilities
- ☑ Medical Surveillance Requirements
- ☑ Training Requirements
- ☑ Safe Work Practices
- ☑ Logs, Reports, Recordkeeping
- ☑ Sanitation and Illumination
- ☑ Air Surveillance Type and Frequency
- ☑ Monitoring Instruments and Personal Monitoring
- ☑ Action Levels
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- ☑ Site/Regional Emergency Procedures (e.g. earthquake response, typhoon response, etc.)
- ☑ Medical Emergency Response Procedures (e.g., exposure control precautions, location of first aid kit, etc.)
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- ☑ Applicable SOPs (e.g., Hearing Conservation Program, Safe Driving, etc.)
- ☑ Injury/Illness Reporting Procedures
- ☑ Route to Hospital and Medical Care Provider Visit Guidelines
- ☑ Hazard Analysis of Work Tasks (chemical, physical, biological and energy health hazards and effects)
- ☑ Review AHAs with all parties engaged in the activity (EM-385 1-1, para 01.A.13.b)

Safety suggestions by site workers:	Be aware of hazards
Action taken on previous suggestions:	Notify all personnel of potential hazards noticed onsite
Injuries/accidents/personnel changes since previous meeting:	None
Observations of unsafe work practices/conditions that have developed since previous meeting:	None
Location of (or changes in the locations of) evacuation routes/safe refuge areas:	Equipment lay-down yard
Other Safety Topics Discussed:	None
Additional comments:	None

Attendee signatures below indicate acknowledgment of the information and willingness to abide by the procedures discussed during this safety meeting.

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Jason Drizd	Amec FW				
Gary Kihn	Amec FW				
Todd Ives	AmDrill, Inc.				
Keith Anderson	AmDrill, Inc.				

Meeting Conducted By (print):	**Company and Title**	**Signature**
Jason Hayes	Amec FW - Field Manager	

QA/QC'd by: Thomas W. Hensel **QA/QC Date: 6/15/2017**

APPENDIX C-4

SOIL BORING/MONITORING WELL RECORDS

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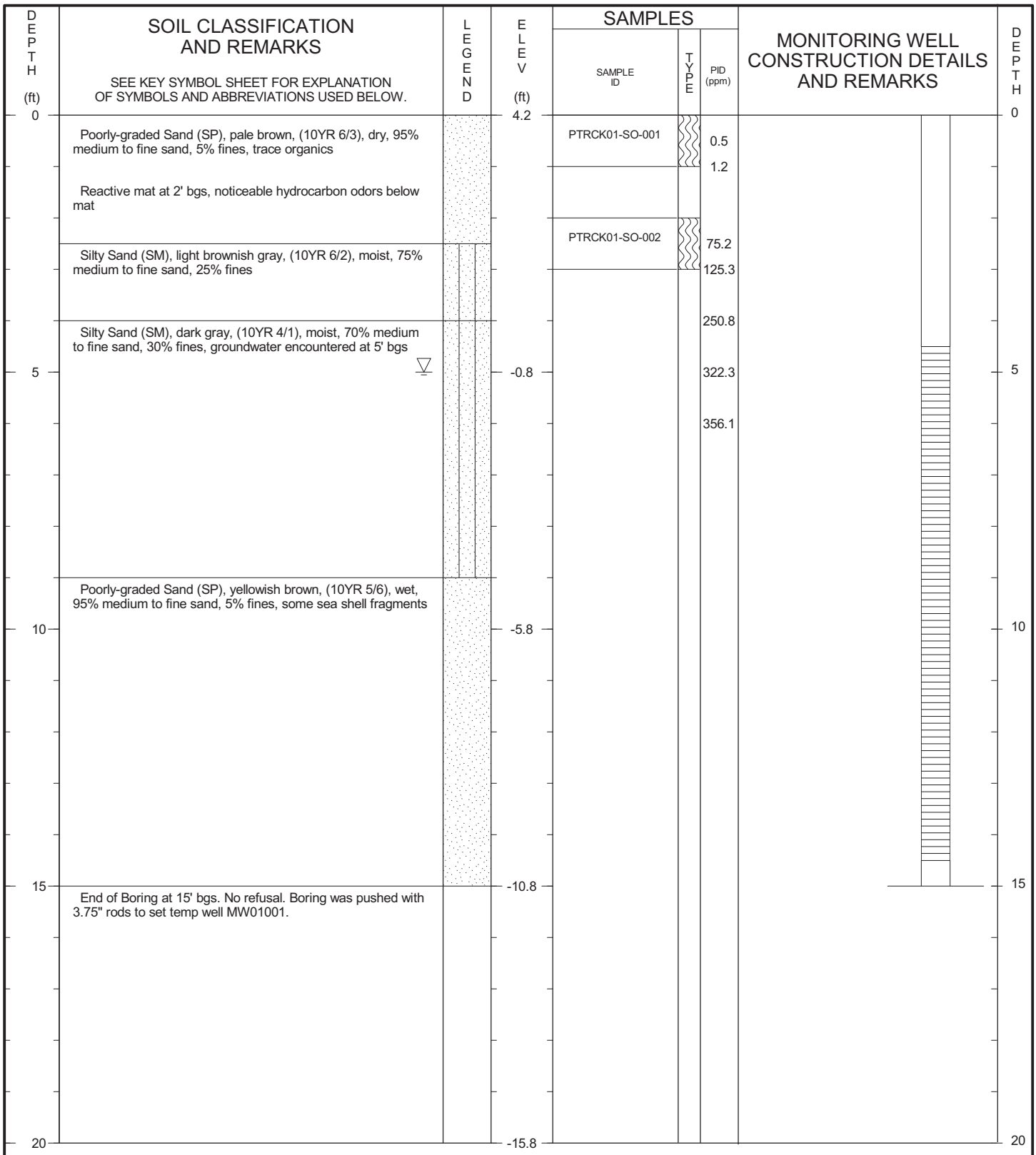


START DATE:	5/23/2017	TOC ELEVATION:	4.69 ft.
END DATE:	5/23/2017	GROUND ELEVATION:	4.2 ft.
DRILLER:	AmDrill	VERTICAL DATUM:	NAVD88
EQUIPMENT:	Geoprobe 6625CPT	NORTHING:	1422262.48 ft.
METHOD:	Geoprobe Direct Push	EASTING:	779695.76 ft.
HOLE DIA.:	4-inch	HORIZONTAL DATUM:	FL State Plane
SITE:	Patrick AFB Area 1		
LOGGED BY:	J. Hayes		

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL BORING / MONITORING WELL RECORD

Project: PFAS Release Area Site Investigation

Project No: 775303101.0025.0400

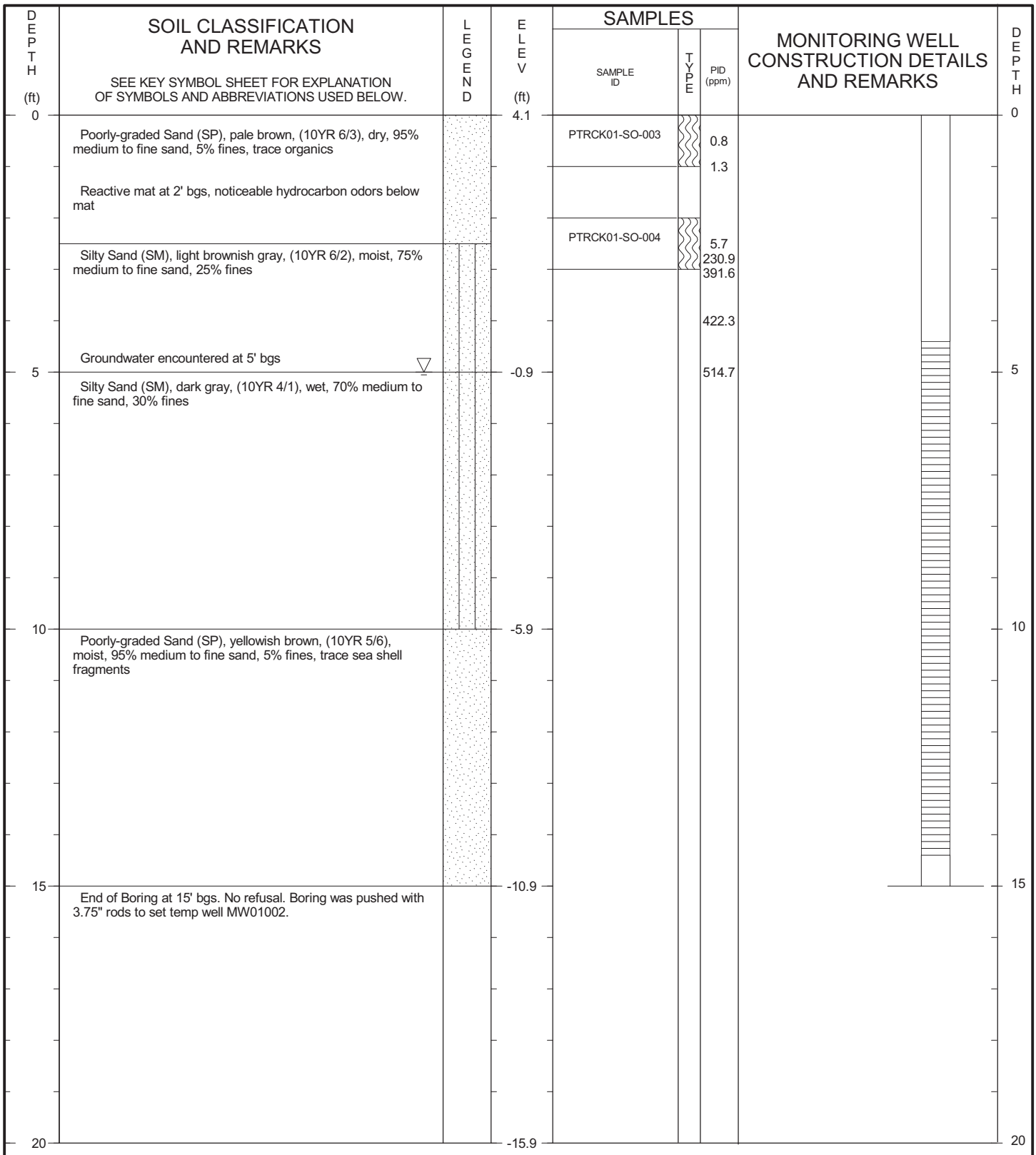
Checked By: T. Hensel

Well No. MW01001

amec foster wheeler

2030 Falling Waters Road
Suite 300
Knoxville, TN 37922

AMEC SOIL-ROCK-MWELL ENVI 02 PATRICK TO 0004.GPJ AMECFW TEMPLATE.GDT 9/19/17



START DATE:	5/24/2017	TOC ELEVATION:	4.70 ft.
END DATE:	5/24/2017	GROUND ELEVATION:	4.1 ft.
DRILLER:	AmDrill	VERTICAL DATUM:	NAVD88
EQUIPMENT:	Geoprobe 6625CPT	NORTHING:	1422215.61 ft.
METHOD:	Geoprobe Direct Push	EASTING:	779688.9 ft.
HOLE DIA.:	4-inch	HORIZONTAL DATUM:	FL State Plane
SITE:	Patrick AFB Area 1		
LOGGED BY:	J. Hayes		

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL BORING / MONITORING WELL RECORD

Project: PFAS Release Area Site Investigation

Project No: 775303101.0025.0400

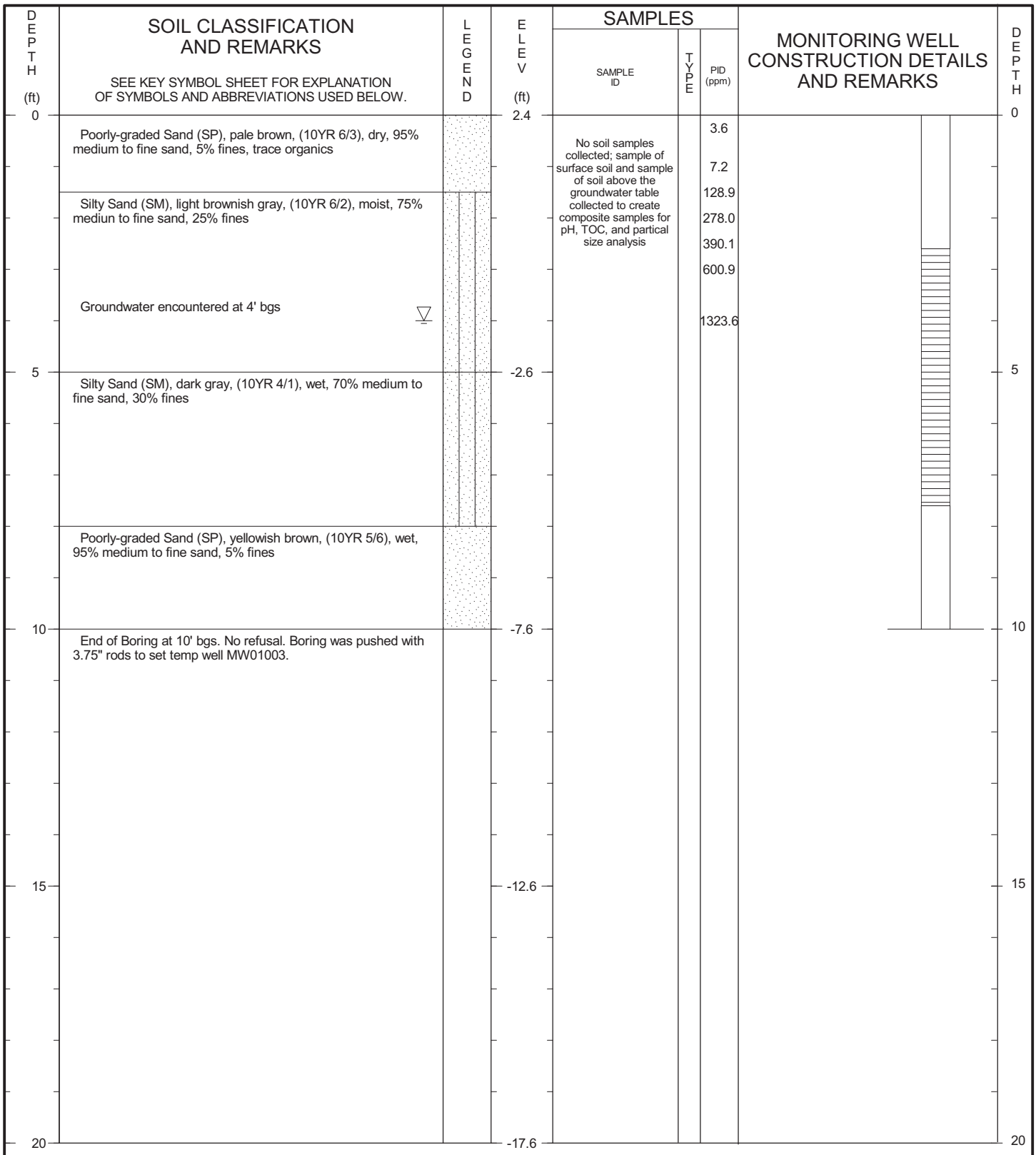
Checked By: T. Hensel

Well No. MW01002

amec foster wheeler

2030 Falling Waters Road
Suite 300
Knoxville, TN 37922

AMEC SOIL-ROCK-MWELL ENVI 02 PATRICK TO 0004.GPJ AMECFW TEMPLATE.GDT 9/19/17



START DATE:	5/24/2017	TOC ELEVATION:	4.82 ft.
END DATE:	5/24/2017	GROUND ELEVATION:	2.4 ft.
DRILLER:	AmDrill	VERTICAL DATUM:	NAVD88
EQUIPMENT:	Geoprobe 6625CPT	NORTHING:	1422207.81 ft.
METHOD:	Geoprobe Direct Push	EASTING:	779754.07 ft.
HOLE DIA.:	4-inch	HORIZONTAL DATUM:	FL State Plane
SITE:	Patrick AFB Area 1		
LOGGED BY:	J. Hayes		

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL BORING / MONITORING WELL RECORD

Project: PFAS Release Area Site Investigation

Project No: 775303101.0025.0400

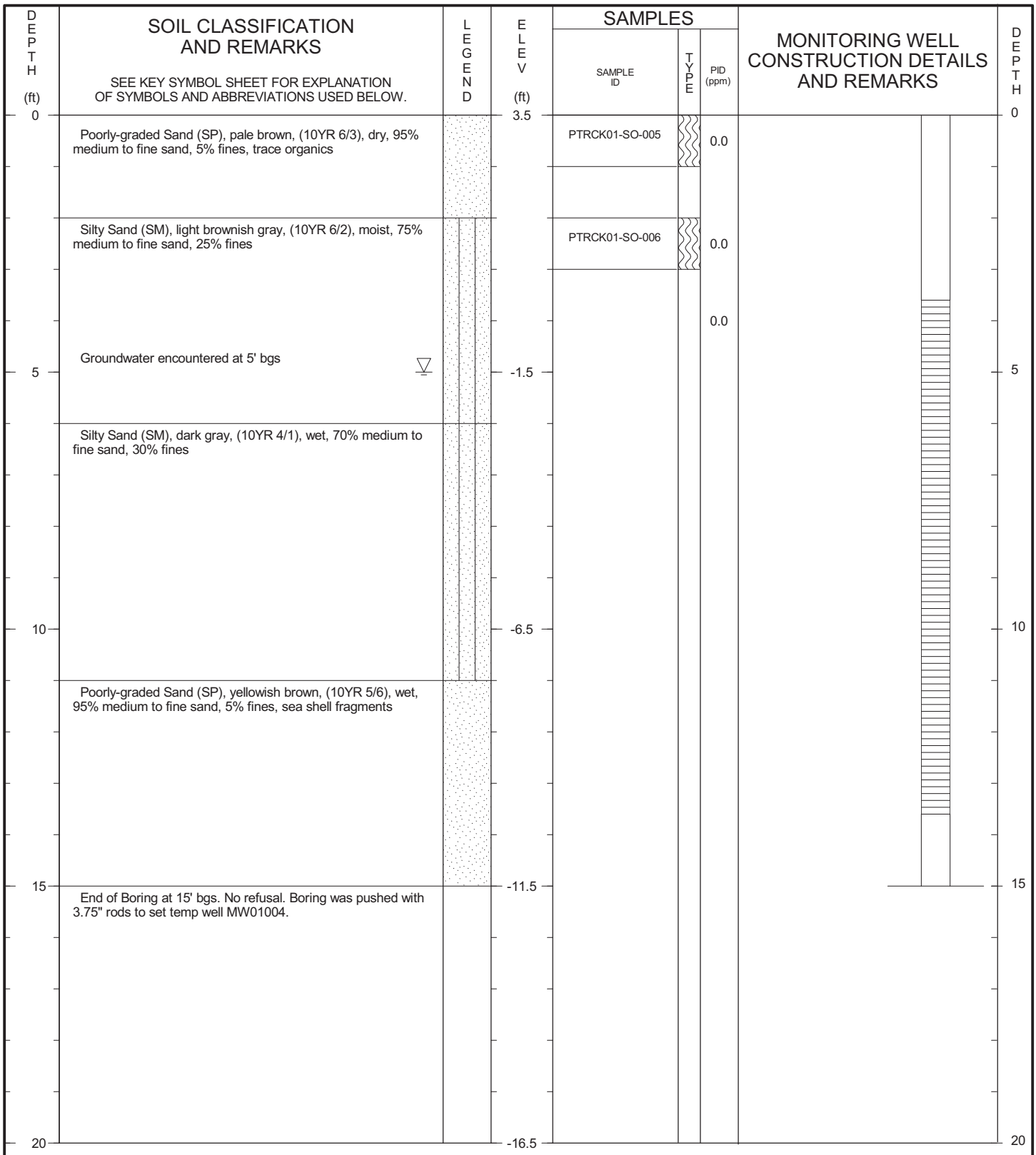
Checked By: T. Hensel

Well No. MW01003

amec foster wheeler

2030 Falling Waters Road
Suite 300
Knoxville, TN 37922

AMEC SOIL-ROCK-MWELL ENVI 02 PATRICK TO 0004.GPJ AMECFW TEMPLATE.GDT 9/19/17



START DATE:	5/24/2017	TOC ELEVATION:	4.86 ft.
END DATE:	5/24/2017	GROUND ELEVATION:	3.5 ft.
DRILLER:	AmDrill	VERTICAL DATUM:	NAVD88
EQUIPMENT:	Geoprobe 6625CPT	NORTHING:	1421911.45 ft.
METHOD:	Geoprobe Direct Push	EASTING:	779972.12 ft.
HOLE DIA.:	4-inch	HORIZONTAL DATUM:	FL State Plane
SITE:	Patrick AFB Area 1		
LOGGED BY:	J. Hayes		

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL BORING / MONITORING WELL RECORD

Project: PFAS Release Area Site Investigation

Project No: 775303101.0025.0400

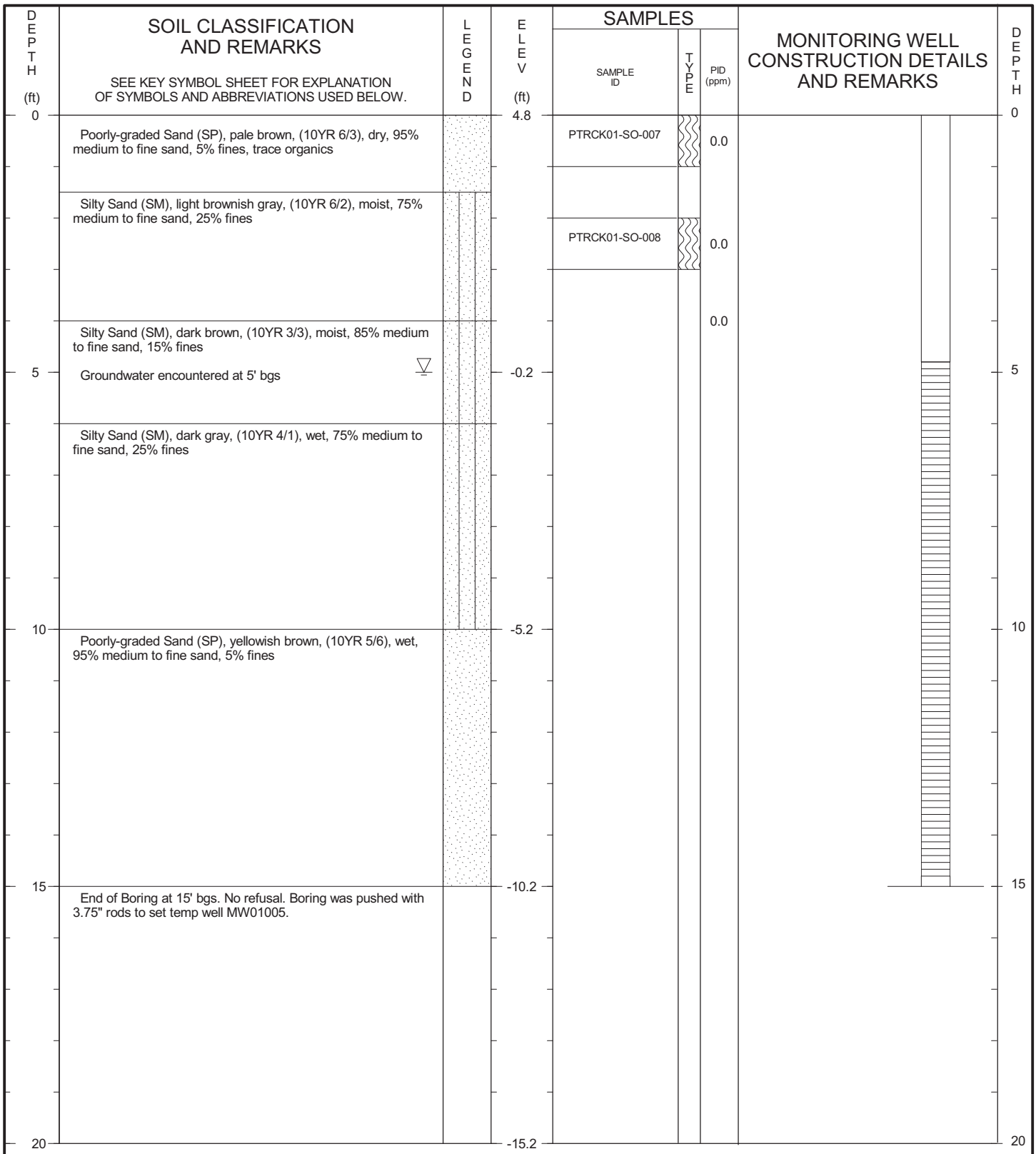
Checked By: T. Hensel

Well No. MW01004

amec foster wheeler

2030 Falling Waters Road
Suite 300
Knoxville, TN 37922

AMEC SOIL-ROCK-MWELL ENVI 02 PATRICK TO 0004.GPJ AMECFW TEMPLATE.GDT 9/19/17



START DATE:	5/24/2017	TOC ELEVATION:	5.04 ft.
END DATE:	5/24/2017	GROUND ELEVATION:	4.8 ft.
DRILLER:	AmDrill	VERTICAL DATUM:	NAVD88
EQUIPMENT:	Geoprobe 6625CPT	NORTHING:	1421813.11 ft.
METHOD:	Geoprobe Direct Push	EASTING:	780093.55 ft.
HOLE DIA.:	4-inch	HORIZONTAL DATUM:	FL State Plane
SITE:	Patrick AFB Area 1		
LOGGED BY:	J. Hayes		

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL BORING / MONITORING WELL RECORD

Project: PFAS Release Area Site Investigation

Project No: 775303101.0025.0400

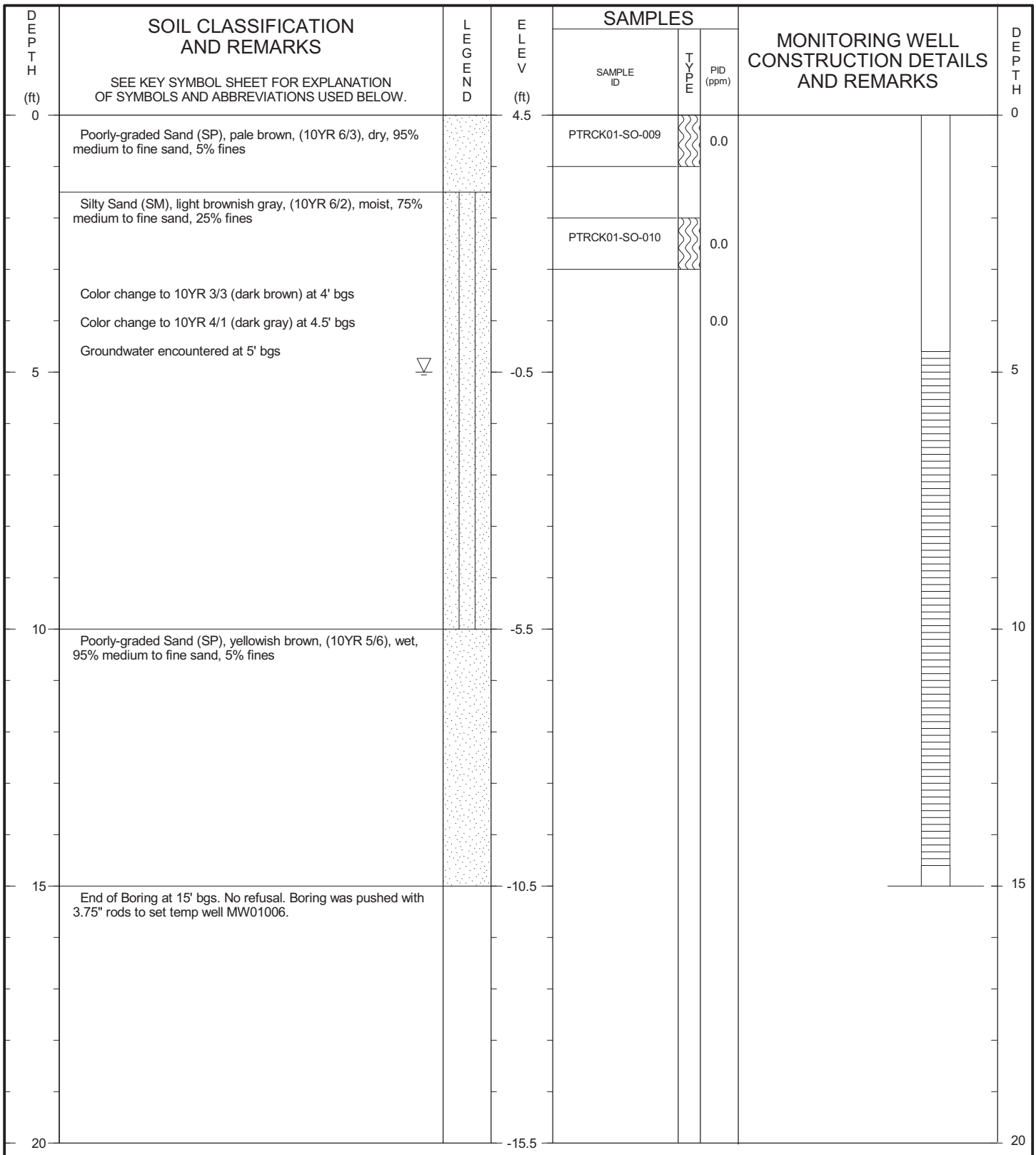
Checked By: T. Hensel

Well No. MW01005

amec foster wheeler

2030 Falling Waters Road
Suite 300
Knoxville, TN 37922

AMEC SOIL-ROCK-MWELL ENVI 02 PATRICK TO 0004.GPJ AMECFW TEMPLATE.GDT 9/19/17



START DATE:	5/24/2017	TOC ELEVATION:	4.91 ft.
END DATE:	5/24/2017	GROUND ELEVATION:	4.5 ft.
DRILLER:	AmDrill	VERTICAL DATUM:	NAVD88
EQUIPMENT:	Geoprobe 6625CPT	NORTHING:	1421781.11 ft.
METHOD:	Geoprobe Direct Push	EASTING:	779967.08 ft.
HOLE DIA.:	4-inch	HORIZONTAL DATUM:	FL State Plane
SITE:	Patrick AFB Area 1		
LOGGED BY:	J. Hayes		

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL BORING / MONITORING WELL RECORD

Project: PFAS Release Area Site Investigation

Project No: 775303101.0025.0400

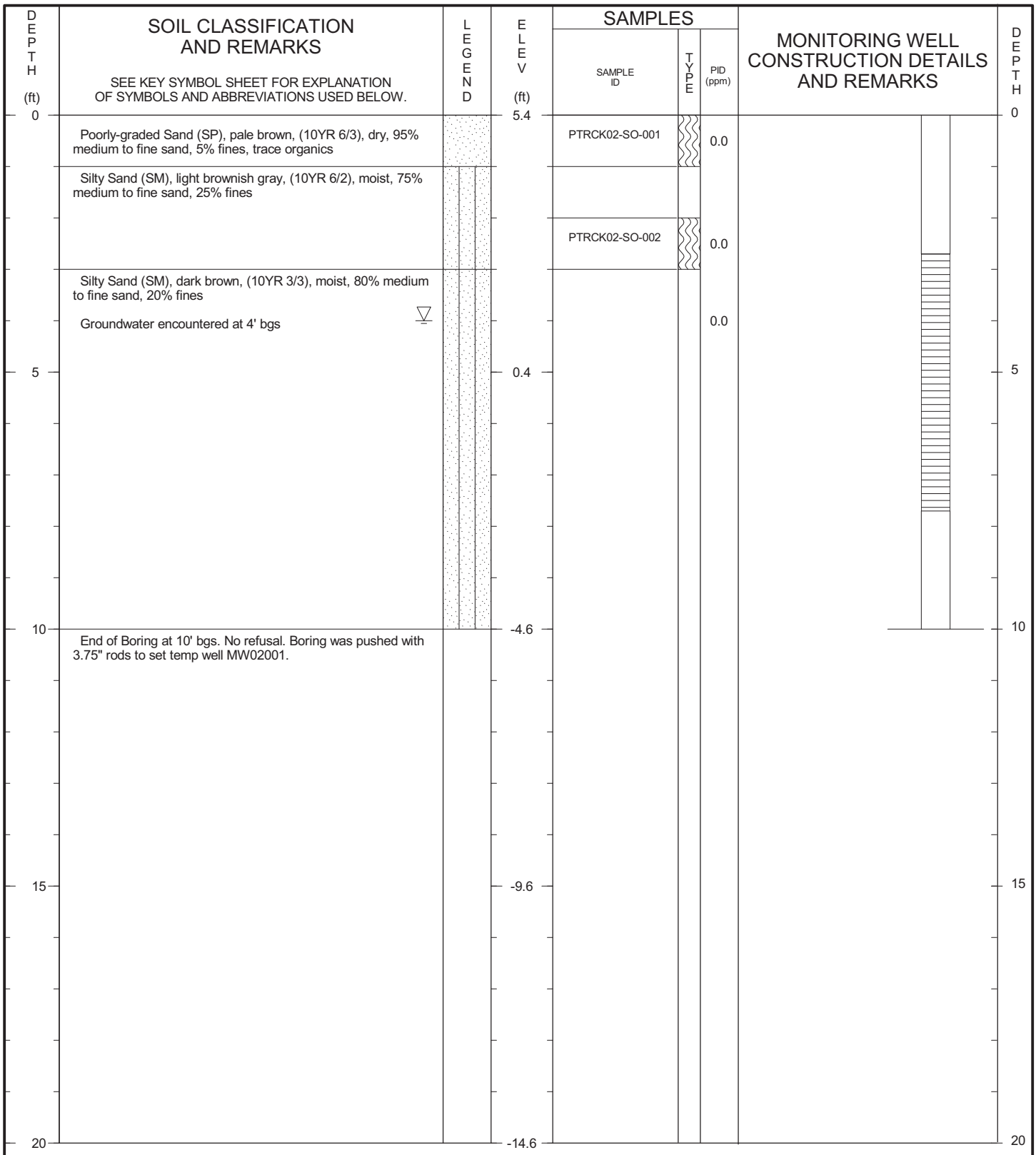
Checked By: T. Hensel

Well No. MW01006

amec foster wheeler

2030 Falling Waters Road
Suite 300
Knoxville, TN 37922

AMEC SOIL-ROCK-MWELL ENVI 02 PATRICK TO 0004.GPJ AMECFW TEMPLATE.GDT 9/19/17



START DATE:	5/23/2017	TOC ELEVATION:	7.70 ft.
END DATE:	5/23/2017	GROUND ELEVATION:	5.4 ft.
DRILLER:	AmDrill	VERTICAL DATUM:	NAVD88
EQUIPMENT:	Geoprobe 6625CPT	NORTHING:	1419067.35 ft.
METHOD:	Geoprobe Direct Push	EASTING:	782924.48 ft.
HOLE DIA.:	4-inch	HORIZONTAL DATUM:	FL State Plane
SITE:	Patrick AFB Area 2		
LOGGED BY:	J. Hayes		

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL BORING / MONITORING WELL RECORD

Project: PFAS Release Area Site Investigation

Project No: 775303101.0025.0400

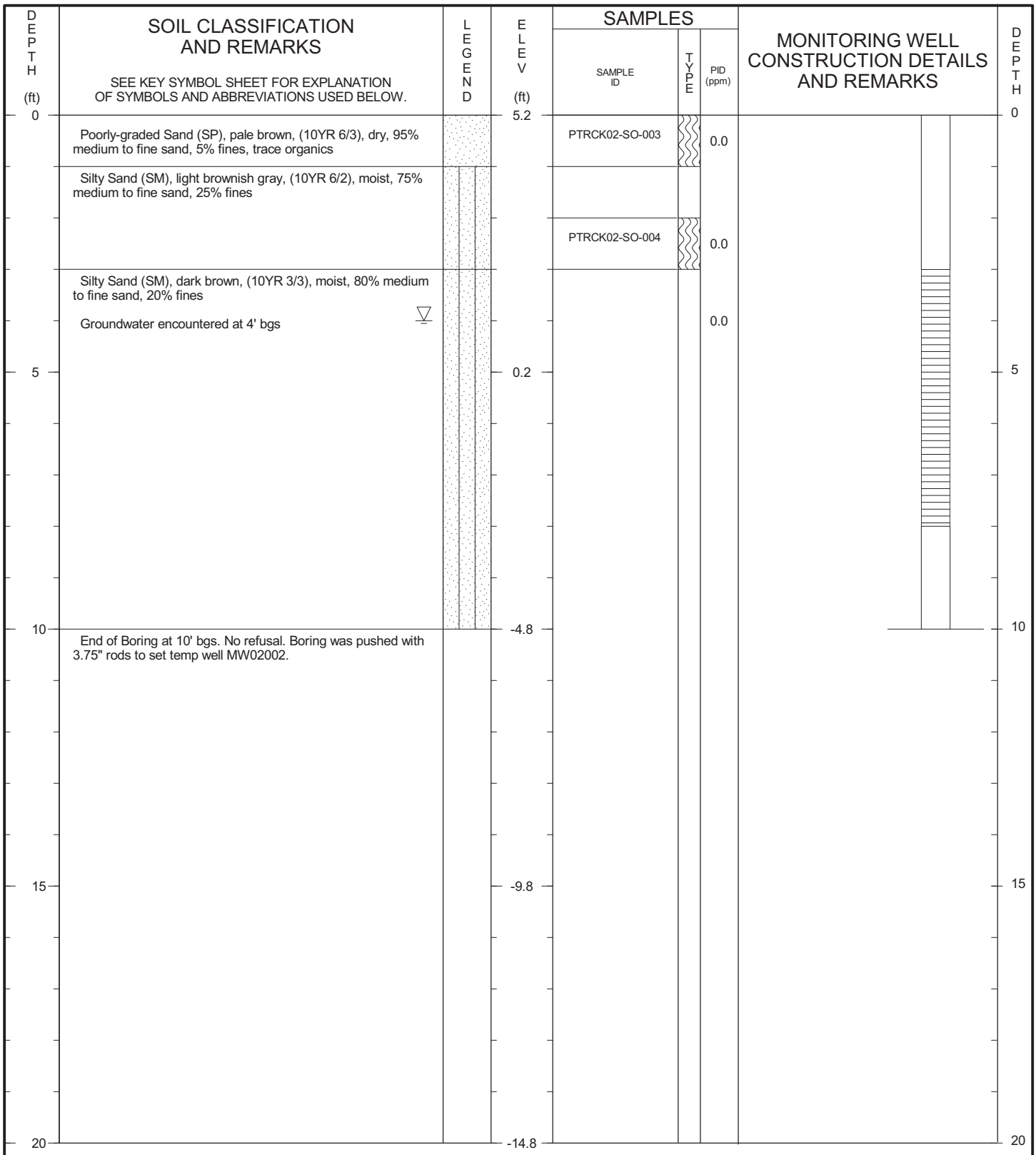
Checked By: T. Hensel

Well No. MW02001

amec foster wheeler

2030 Falling Waters Road
Suite 300
Knoxville, TN 37922

AMEC SOIL-ROCK-MWELL ENVI 02 PATRICK TO 0004.GPJ AMECFW TEMPLATE.GDT 9/19/17



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END DATE:	5/23/2017	GROUND ELEVATION:	5.2 ft.
DRILLER:	AmDrill	VERTICAL DATUM:	NAVD88
EQUIPMENT:	Geoprobe 6625CPT	NORTHING:	1418942.39 ft.
METHOD:	Geoprobe Direct Push	EASTING:	782939.44 ft.
HOLE DIA.:	4-inch	HORIZONTAL DATUM:	FL State Plane
SITE:	Patrick AFB Area 2		
LOGGED BY:	J. Hayes		

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL BORING / MONITORING WELL RECORD

Project: PFAS Release Area Site Investigation

Project No: 775303101.0025.0400

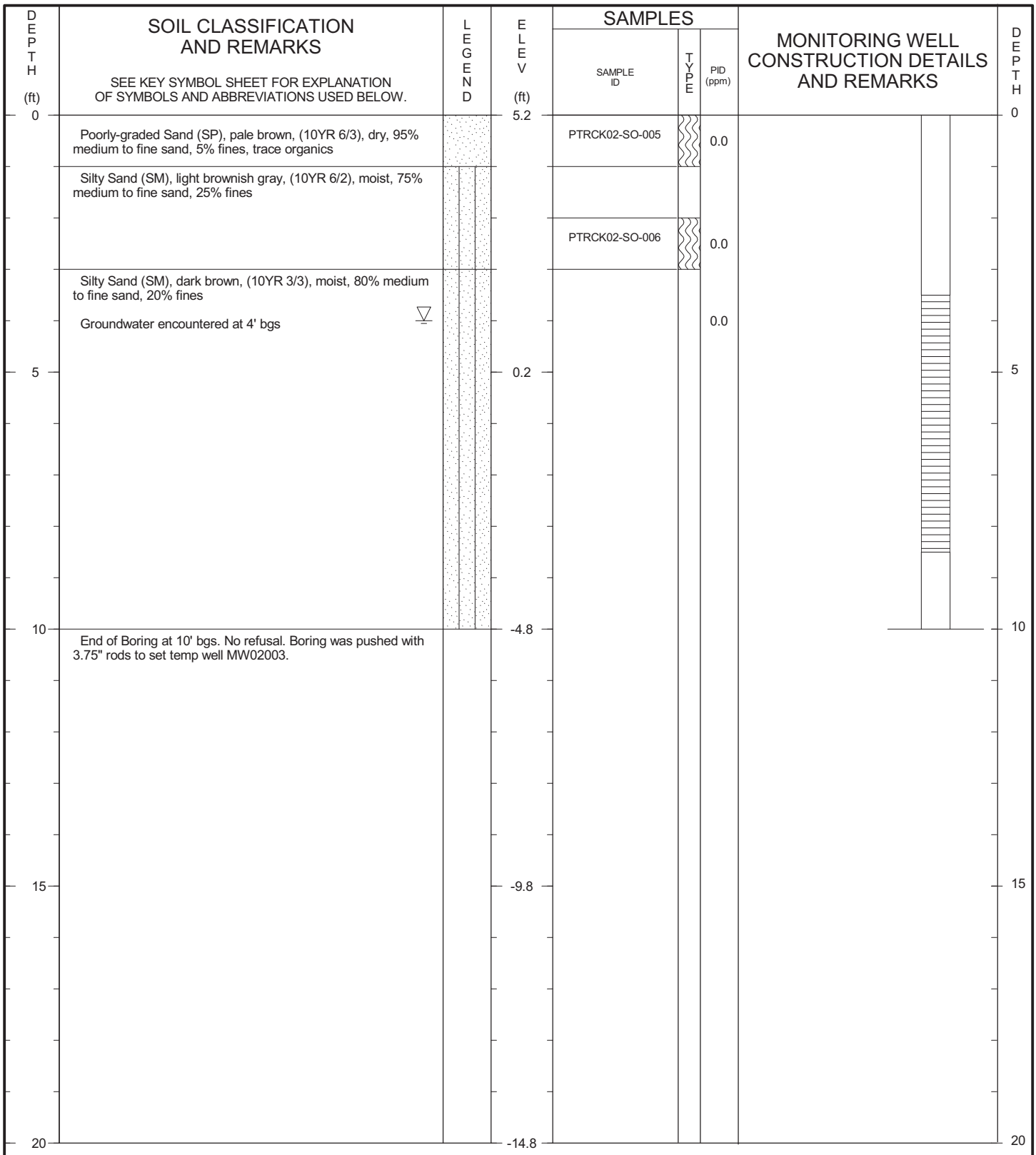
Checked By: T. Hensel

Well No. MW02002

amec foster wheeler

2030 Falling Waters Road
Suite 300
Knoxville, TN 37922

AMEC SOIL-ROCK-MWELL ENVI 02 PATRICK TO 0004.GPJ AMECFW TEMPLATE.GDT 9/19/17



START DATE:	5/23/2017	TOC ELEVATION:	6.72 ft.
END DATE:	5/23/2017	GROUND ELEVATION:	5.2 ft.
DRILLER:	AmDrill	VERTICAL DATUM:	NAVD88
EQUIPMENT:	Geoprobe 6625CPT	NORTHING:	1418872.37 ft.
METHOD:	Geoprobe Direct Push	EASTING:	783047.43 ft.
HOLE DIA.:	4-inch	HORIZONTAL DATUM:	FL State Plane
SITE:	Patrick AFB Area 2		
LOGGED BY:	J. Hayes		

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL BORING / MONITORING WELL RECORD

Project: PFAS Release Area Site Investigation

Project No: 775303101.0025.0400

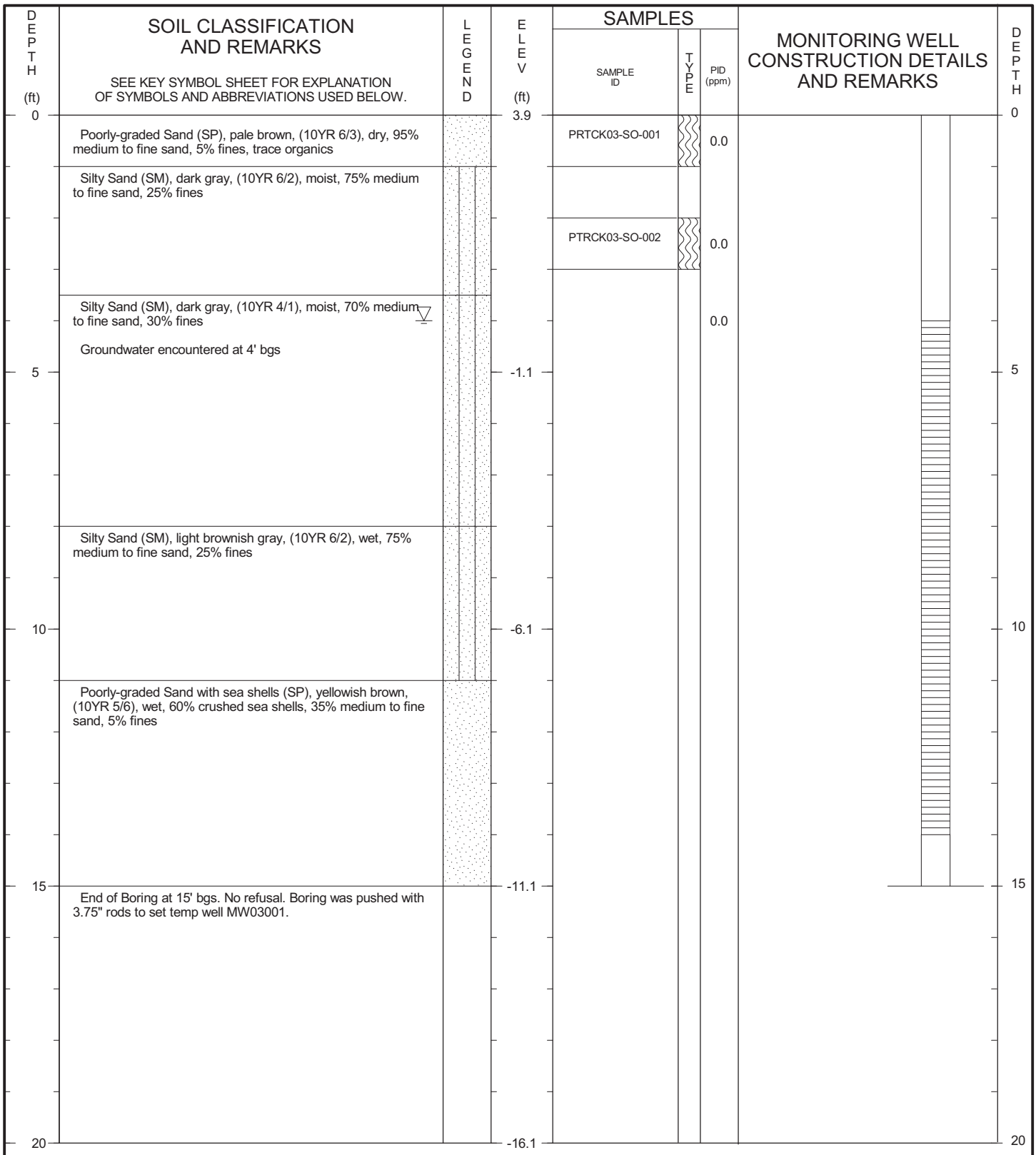
Checked By: T. Hensel

Well No. MW02003

amec foster wheeler

2030 Falling Waters Road
Suite 300
Knoxville, TN 37922

AMEC SOIL-ROCK-MWELL ENVI 02 PATRICK TO 0004.GPJ AMECFW TEMPLATE.GDT 9/19/17



START DATE:	5/22/2017	TOC ELEVATION:	4.90 ft.
END DATE:	5/22/2017	GROUND ELEVATION:	3.9 ft.
DRILLER:	AmDrill	VERTICAL DATUM:	NAVD88
EQUIPMENT:	Geoprobe 6625CPT	NORTHING:	1424539.24 ft.
METHOD:	Geoprobe Direct Push	EASTING:	780970.68 ft.
HOLE DIA.:	4-inch	HORIZONTAL DATUM:	FL State Plane
SITE:	Patrick AFB Area 3		
LOGGED BY:	J. Hayes		

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL BORING / MONITORING WELL RECORD

Project: PFAS Release Area Site Investigation

Project No: 775303101.0025.0400

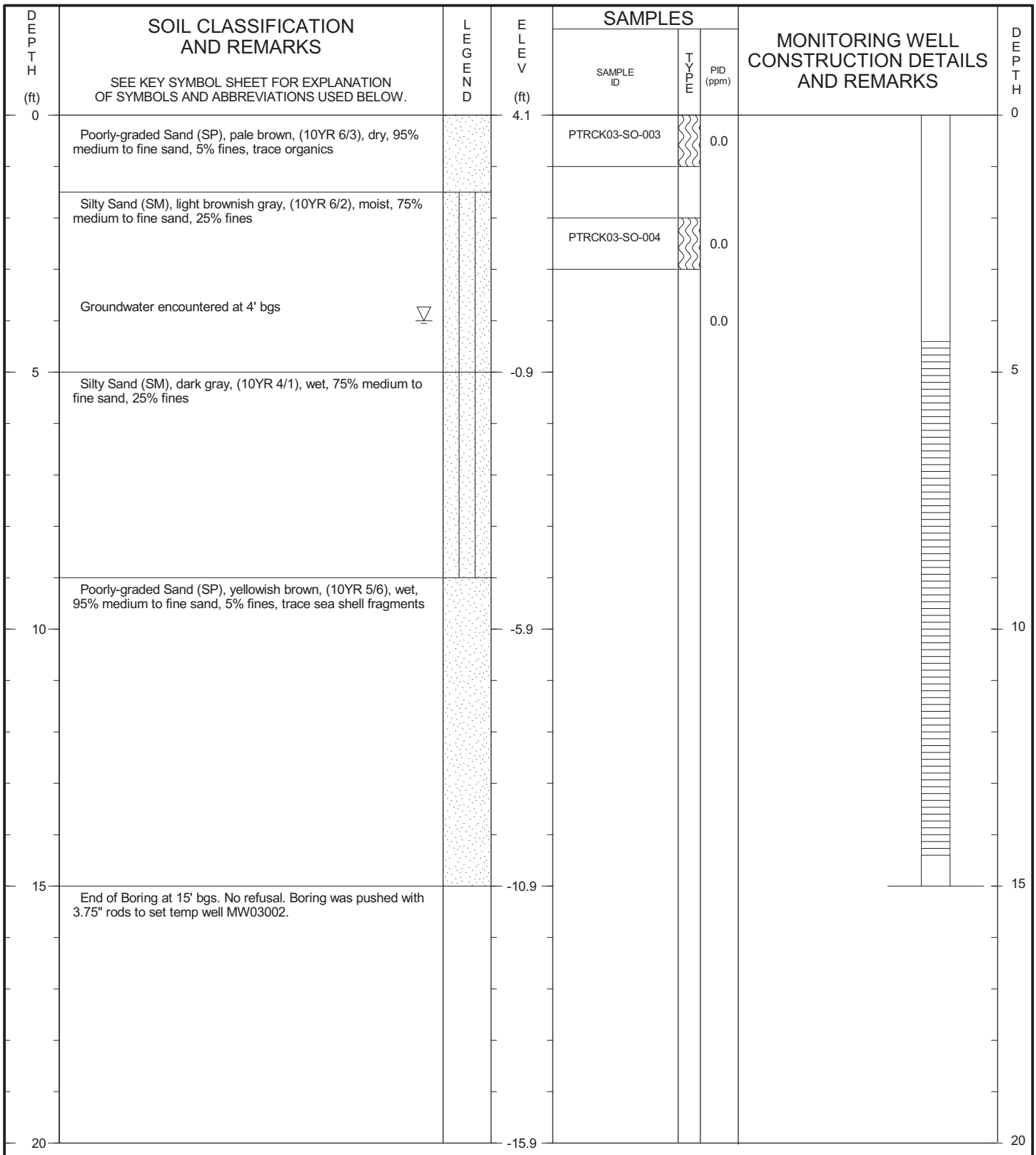
Checked By: T. Hensel

Well No. MW03001

amec foster wheeler

2030 Falling Waters Road
Suite 300
Knoxville, TN 37922

AMEC SOIL-ROCK-MWELL ENVI 02 PATRICK TO 0004.GPJ AMECFW TEMPLATE.GDT 9/19/17



START DATE:	5/23/2017	TOC ELEVATION:	4.68 ft.
END DATE:	5/23/2017	GROUND ELEVATION:	4.1 ft.
DRILLER:	AmDrill	VERTICAL DATUM:	NAVD88
EQUIPMENT:	Geoprobe 6625CPT	NORTHING:	1424516.9 ft.
METHOD:	Geoprobe Direct Push	EASTING:	781028.18 ft.
HOLE DIA.:	4-inch	HORIZONTAL DATUM:	FL State Plane
SITE:	Patrick AFB Area 3		
LOGGED BY:	J. Hayes		

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL BORING / MONITORING WELL RECORD

Project: PFAS Release Area Site Investigation

Project No: 775303101.0025.0400

Checked By: T. Hensel

Well No. MW03002

amec foster wheeler

2030 Falling Waters Road
Suite 300
Knoxville, TN 37922

AMEC SOIL-ROCK-MWELL ENVI 02 PATRICK TO 0004.GPJ AMECFW TEMPLATE.GDT 9/19/17

APPENDIX C-5

SOIL SAMPLE COLLECTION LOGS

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SOIL SAMPLE COLLECTION LOG

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Start Date:**	05/23/17
Location ID:	MW01001	**End Date:**	05/23/17
Technician(s):	Jason Hayes, Jason Drizd		

Sample ID	Sample Date/Time	Sample Depth (ft)	USCS Symbol	Comments/Observations
PTRCK01-SO-001	05/23/17 1720	0 - 1	SP	None
PTRCK01-SO-002	05/23/17 1725	2 - 3	SM	None

Sample Collection Method:	Grab	**Analysis/Method(s):**	PFCs (EPA 537), TOC (EPA 9060), VOCs (EPA 8260)
Sample Container Type(s):	4 oz HDPE	**Preservative(s):**	Ice (4 °C)

Associated Blank Samples:

None

Signature:

Notes:

Strong hydrocarbon odor from 1 ft bgs to water table at about 5 ft bgs.

Name (print):

Jason Hayes

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/14/2017**

SOIL SAMPLE COLLECTION LOG

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Start Date:**	05/24/17
Location ID:	MW01002	**End Date:**	05/24/17
Technician(s):	Jason Hayes, Jason Drizd		

Sample ID	Sample Date/Time	Sample Depth (ft)	USCS Symbol	Comments/Observations
PTRCK01-SO-003	05/24/17 0710	0 - 1	SP	None
PTRCK01-SO-004	05/24/17 0715	2 - 3	SM	None

Sample Collection Method:	Grab	**Analysis/Method(s):**	PFCs (EPA 537), TOC (EPA 9060), VOCs (EPA 8260)
Sample Container Type(s):	4 oz HDPE	**Preservative(s):**	Ice (4 °C)

Associated Blank Samples:

None

Signature:

Notes:

Strong hydrocarbon odor present at 1-5 ft bgs.

Name (print):

Jason Hayes

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/15/2017**

SOIL SAMPLE COLLECTION LOG

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Start Date:**	05/24/17
Location ID:	MW01004	**End Date:**	05/24/17
Technician(s):	Jason Hayes, Jason Drizd		

Sample ID	Sample Date/Time	Sample Depth (ft)	USCS Symbol	Comments/Observations
PTRCK01-SO-007	05/24/17 0940	0 - 1	SP	None
PTRCK01-SO-008	05/24/17 0945	2 - 3	SM	None

Sample Collection Method:	Grab	**Analysis/Method(s):**	PFCs (EPA 537), TOC (EPA 9060), VOCs (EPA 8260)
Sample Container Type(s):	4 oz HDPE	**Preservative(s):**	Ice (4 °C)

Associated Blank Samples:

None

Signature:

Notes:

None

Name (print):

Jason Hayes

QA/QC'd by: Thomas W. Hensel **QA/QC Date:** 6/15/2017

SOIL SAMPLE COLLECTION LOG

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Start Date:**	05/24/17
Location ID:	MW01005	**End Date:**	05/24/17
Technician(s):	Jason Hayes, Jason Drizd		

Sample ID	Sample Date/Time	Sample Depth (ft)	USCS Symbol	Comments/Observations
PTRCK01-SO-009	05/24/17 1010	0 - 1	SP	None
PTRCK01-SO-010	05/24/17 1015	2 - 3	SM	None

Sample Collection Method:	Grab	**Analysis/Method(s):**	PFCs (EPA 537), TOC (EPA 9060), VOCs (EPA 8260)
Sample Container Type(s):	4 oz HDPE	**Preservative(s):**	Ice (4 °C)

Associated Blank Samples:

None

Signature:

Notes:

None

Name (print):

Jason Hayes

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/15/2017**

SOIL SAMPLE COLLECTION LOG

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Start Date:**	05/24/17
Location ID:	MW01006	**End Date:**	05/24/17
Technician(s):	Jason Hayes, Jason Drizd		

Sample ID	Sample Date/Time	Sample Depth (ft)	USCS Symbol	Comments/Observations
PTRCK01-SO-011	05/24/17 0905	0 - 1	SP	None
PTRCK01-SO-012	05/24/17 0910	2 - 3	SM	None

Sample Collection Method:	Grab	**Analysis/Method(s):**	PFCs (EPA 537), TOC (EPA 9060), VOCs (EPA 8260)
Sample Container Type(s):	4 oz HDPE	**Preservative(s):**	Ice (4 °C)

Associated Blank Samples:

MS/MSD

Signature:

Notes:

None

Name (print):

Jason Hayes

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/15/2017**

SOIL SAMPLE COLLECTION LOG

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Start Date:**	05/23/17
Location ID:	MW02001	**End Date:**	05/23/17
Technician(s):	Jason Hayes, Jason Drizd		

Sample ID	Sample Date/Time	Sample Depth (ft)	USCS Symbol	Comments/Observations
PTRCK02-SO-001	05/23/17 1000	0 - 1	SP	None
PTRCK02-SO-002	05/23/17 1005	2 - 3	SM	None

Sample Collection Method:	Grab	**Analysis/Method(s):**	PFCs (EPA 537), TOC (EPA 9060), VOCs (EPA 8260)
Sample Container Type(s):	4 oz HDPE	**Preservative(s):**	Ice (4 °C)

Associated Blank Samples:

None

Signature:

Notes:

None

Name (print):

Jason Hayes

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/14/2017**

SOIL SAMPLE COLLECTION LOG

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Start Date:**	05/23/17
Location ID:	MW02002	**End Date:**	05/23/17
Technician(s):	Jason Hayes, Jason Drizd		

Sample ID	Sample Date/Time	Sample Depth (ft)	USCS Symbol	Comments/Observations
PTRCK02-SO-003	05/23/17 0905	0 - 1	SP	None
PTRCK02-SO-004	05/23/17 0910	2 - 3	SM	None

Sample Collection Method:	Grab	**Analysis/Method(s):**	PFCs (EPA 537), TOC (EPA 9060), VOCs (EPA 8260)
Sample Container Type(s):	4 oz HDPE	**Preservative(s):**	Ice (4 °C)

Associated Blank Samples:

PTRCK-FD-SO-001

Signature:

Notes:

None

Name (print):

Jason Hayes

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/14/2017**

SOIL SAMPLE COLLECTION LOG

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Start Date:**	05/23/17
Location ID:	MW02003	**End Date:**	05/23/17
Technician(s):	Jason Hayes, Jason Drizd		

Sample ID	Sample Date/Time	Sample Depth (ft)	USCS Symbol	Comments/Observations
PTRCK02-SO-005	05/23/17 0925	0 - 1	SP	None
PTRCK02-SO-006	05/23/17 0930	2 - 3	SM	None

Sample Collection Method:	Grab	**Analysis/Method(s):**	PFCs (EPA 537), TOC (EPA 9060), VOCs (EPA 8260)
Sample Container Type(s):	4 oz HDPE	**Preservative(s):**	Ice (4 °C)

Associated Blank Samples:

None

Signature:

Notes:

None

Name (print):

Jason Hayes

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/14/2017**

SOIL SAMPLE COLLECTION LOG

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Start Date:**	05/22/17
Location ID:	MW03001	**End Date:**	05/22/17
Technician(s):	Jason Hayes, Jason Drizd		

Sample ID	Sample Date/Time	Sample Depth (ft)	USCS Symbol	Comments/Observations
PTRCK03-SO-001	05/22/17 17:50	0 - 1	SP	None
PTRCK03-SO-002	05/22/17 18:00	2 - 3	SM	None

Sample Collection Method:	Grab	**Analysis/Method(s):**	PFCs (EPA 537), TOC (EPA 9060), VOCs (EPA 8260)
Sample Container Type(s):	4 oz HDPE	**Preservative(s):**	Ice (4 °C)

Associated Blank Samples:

None

Signature:

Notes:

None

Name (print):

Jason Hayes

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/14/2017**

SOIL SAMPLE COLLECTION LOG

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Start Date:**	05/23/17
Location ID:	MW03002	**End Date:**	05/23/17
Technician(s):	Jason Hayes, Jason Drizd		

Sample ID	Sample Date/Time	Sample Depth (ft)	USCS Symbol	Comments/Observations
PTRCK03-SO-003	05/23/17 1420	0 - 1	SP	None
PTRCK03-SO-004	05/23/17 1425	2 - 3	SM	None

Sample Collection Method:	Grab	**Analysis/Method(s):**	PFCs (EPA 537), TOC (EPA 9060), VOCs (EPA 8260)
Sample Container Type(s):	4 oz HDPE	**Preservative(s):**	Ice (4 °C)

Associated Blank Samples:

None

Signature:

Notes:

None

Name (print)**:**

Jason Hayes

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/14/2017**

APPENDIX C-6

SCREENED WELL CONSTRUCTION FORMS

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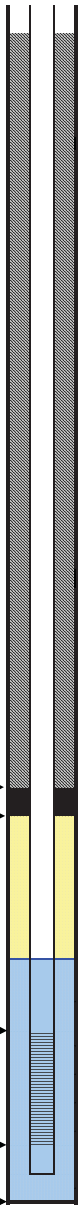
SCREENED WELL CONSTRUCTION FORM

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract Number:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Location ID:**	AFFF Release Area 1
Drilling Subcontractor:	AmDrill, Inc.	**Well ID:**	MW01001
Drilling Personnel:	Todd Ives, Keith Anderson	**Start Date:**	05/23/17
Drilling Method:	DPT	**End Date:**	05/23/17
Technician(s)	Jason Hayes, Jason Drizd		

Type of Well:	Stick Up
Measuring Point:	Top of Riser (TOR)
TOC/TOR Difference (in):	See survey data
Approximate Diameter of Borehole (in):	4
Depth to Water (ft):	4.5
During Drilling:	4.5
Date:	05/23/17
Post Development:	See development log
Date:	05/23/17
Hydrologic Unit:	W
Water added during drilling (gal):	None
Water removed during development (gal):	None
Top of Bentonite Seal (ft):	0
Top of Filter Pack (ft):	0
Top of Screen Interval (ft):	4.5
Bottom of Screened Interval (ft):	14.5
Bottom of Filter Pack (ft):	14.5
Bottom of Borehole (ft):	14.7



Protective Casing:

Type:	SLS
Dimensions (in):	NA
Stickup (ft):	NA
Length (ft):	NA
Guard Post:	NA

Surface Pad:

Type:	None
Length (ft):	NA
Width (ft):	NA
Thickness (in):	NA

Annular Seal (grout above well seal):

Material:	NA
Installation Method:	NA

Bentonite Seal:

Manufacturer:	NA
Material:	NA
Type:	NA
Installation Method:	NA
Hydration time (hrs):	NA

Filter Pack Material:

Manufacturer:	Prepack
Material:	1S
Size (Sieve Size):	20/40
Installation Method:	Gravity
Surging time:	None

Well Casing (Solid Riser Above Screen):

Manufacturer:	Silver-Line Enviro-Pure
Type/Material:	PVC
Length (ft):	5.0
Diameter (in):	2.0

Well Screen:

Manufacturer:	Silver-Line Enviro-Pure
Type/Material:	PVS
Diameter (in):	2.0
Length (ft):	10.0
Slot Size (in):	0.01
Slot Type:	Factory Slot
Sump/End Cap:	End cap

Notes:

Pre-packed temporary well, no sand or bentonite added.
PVS = PVC Upper/Stainless Steel Lower.

Signature:

Depths and heights are referenced to ground surface unless specified TOC.
All elevations are referenced to MSL (NAVD 88).

Name (print): Jason Hayes

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/14/2017**

SCREENED WELL CONSTRUCTION FORM

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract Number:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Location ID:**	AFFF Release Area 1
Drilling Subcontractor:	AmDrill, Inc.	**Well ID:**	MW01002
Drilling Personnel:	Todd Ives, Keith Anderson	**Start Date:**	05/24/17
Drilling Method:	DPT	**End Date:**	05/24/17
Technician(s)	Jason Hayes, Jason Drizd		

Type of Well: Stick Up
Measuring Point: Top of Riser (TOR)
TOC/TOR Difference (in): See survey data

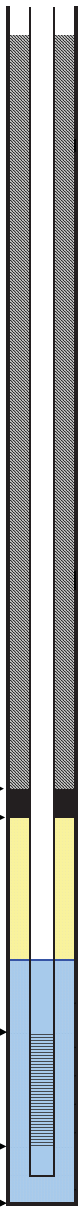
Approximate Diameter of Borehole (in): 4

Depth to Water (ft):
- **During Drilling:** 4.5
- **Date:** 05/24/17
- **Post Development:** See development log
- **Date:** 05/24/17

Hydrologic Unit: W

Water added during drilling (gal): None
Water removed during development (gal): None

Top of Bentonite Seal (ft): 0
Top of Filter Pack (ft): 0
Top of Screen Interval (ft): 4.4
Bottom of Screened Interval (ft): 14.4
Bottom of Filter Pack (ft): 14.4
Bottom of Borehole (ft): 14.6



Protective Casing:
- **Type:** SLS
- **Dimensions (in):** NA
- **Stickup (ft):** NA
- **Length (ft):** NA
- **Guard Post:** NA

Surface Pad:
- **Type:** None
- **Length (ft):** NA
- **Width (ft):** NA
- **Thickness (in):** NA

Annular Seal (grout above well seal):
- **Material:** NA
- **Installation Method:** NA

Bentonite Seal:
- **Manufacturer:** NA
- **Material:** NA
- **Type:** NA
- **Installation Method:** NA
- **Hydration time (hrs):** NA

Filter Pack Material:
- **Manufacturer:** Prepack
- **Material:** 1S
- **Size (Sieve Size):** 20/40
- **Installation Method:** Gravity
- **Surging time:** None

Well Casing (Solid Riser Above Screen):
- **Manufacturer:** Silver-Line Enviro-Pure
- **Type/Material:** PVC
- **Length (ft):** 5.0
- **Diameter (in):** 2.0

Well Screen:
- **Manufacturer:** Silver-Line Enviro-Pure
- **Type/Material:** PVS
- **Diameter (in):** 2.0
- **Length (ft):** 10.0
- **Slot Size (in):** 0.01
- **Slot Type:** Factory Slot

Sump/End Cap: End cap

Notes:
Pre-packed temporary well, no sand or bentonite added.
PVS = PVC Upper/Stainless Steel Lower

Signature:

Depths and heights are referenced to ground surface unless specified TOC.
All elevations are referenced to MSL (NAVD 88).

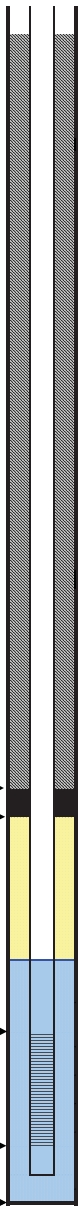
Name (print): Jason Hayes

QA/QC'd by: Thomas W. Hensel **QA/QC Date:** 6/15/2017

SCREENED WELL CONSTRUCTION FORM

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract Number:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Location ID:**	AFFF Release Area 1
Drilling Subcontractor:	AmDrill, Inc.	**Well ID:**	MW01003
Drilling Personnel:	Todd Ives, Keith Anderson	**Start Date:**	05/24/17
Drilling Method:	DPT	**End Date:**	05/24/17
Technician(s)	Jason Hayes, Jason Drizd		

Type of Well:	Stick Up
Measuring Point:	Top of Riser (TOR)
TOC/TOR Difference (in):	See survey data
Approximate Diameter of Borehole (in):	4
Depth to Water (ft):	3.5
During Drilling:	3.5
Date:	05/24/17
Post Development:	See development log
Date:	05/24/17
Hydrologic Unit:	W
Water added during drilling (gal):	None
Water removed during development (gal):	None
Top of Bentonite Seal (ft):	0
Top of Filter Pack (ft):	0
Top of Screen Interval (ft):	2.6
Bottom of Screened Interval (ft):	7.6
Bottom of Filter Pack (ft):	7.6
Bottom of Borehole (ft):	7.8



Protective Casing:

Type:	SLS
Dimensions (in):	NA
Stickup (ft):	NA
Length (ft):	NA
Guard Post:	NA

Surface Pad:

Type:	None
Length (ft):	NA
Width (ft):	NA
Thickness (in):	NA

Annular Seal (grout above well seal):

Material:	NA
Installation Method:	NA

Bentonite Seal:

Manufacturer:	NA
Material:	NA
Type:	NA
Installation Method:	NA
Hydration time (hrs):	NA

Filter Pack Material:

Manufacturer:	Prepack
Material:	1S
Size (Sieve Size):	20/40
Installation Method:	Gravity
Surging time:	None

Well Casing (Solid Riser Above Screen):

Manufacturer:	Silver-Line Enviro-Pure
Type/Material:	PVC
Length (ft):	5.0
Diameter (in):	2.0

Well Screen:

Manufacturer:	Silver-Line Enviro-Pure
Type/Material:	PVS
Diameter (in):	2.0
Length (ft):	5.0
Slot Size (in):	0.01
Slot Type:	Factory Slot
Sump/End Cap:	End cap

Notes:

Pre-packed temporary well, no sand or bentonite added.
PVS = PVC Upper/Stainless Steel Lower

Depths and heights are referenced to ground surface unless specified TOC.
All elevations are referenced to MSL (NAVD 88).

Signature:

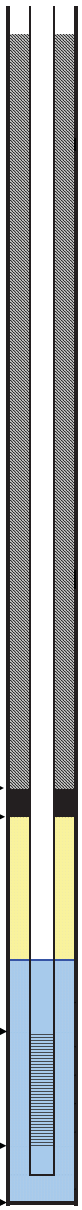
Name (print): Jason Hayes

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/15/2017**

SCREENED WELL CONSTRUCTION FORM

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract Number:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Location ID:**	AFFF Release Area 1
Drilling Subcontractor:	AmDrill, Inc.	**Well ID:**	MW01004
Drilling Personnel:	Todd Ives, Keith Anderson	**Start Date:**	05/24/17
Drilling Method:	DPT	**End Date:**	05/24/17
Technician(s)	Jason Hayes, Jason Drizd		

Type of Well:	Stick Up
Measuring Point:	Top of Riser (TOR)
TOC/TOR Difference (in):	See survey data
Approximate Diameter of Borehole (in):	4
Depth to Water (ft):	5
During Drilling:	5
Date:	05/24/17
Post Development:	See development log
Date:	05/24/17
Hydrologic Unit:	W
Water added during drilling (gal):	None
Water removed during development (gal):	None
Top of Bentonite Seal (ft):	0
Top of Filter Pack (ft):	0
Top of Screen Interval (ft):	3.6
Bottom of Screened Interval (ft):	13.6
Bottom of Filter Pack (ft):	13.6
Bottom of Borehole (ft):	13.8



Protective Casing:

Type:	SLS
Dimensions (in):	NA
Stickup (ft):	NA
Length (ft):	NA
Guard Post:	NA

Surface Pad:

Type:	None
Length (ft):	NA
Width (ft):	NA
Thickness (in):	NA

Annular Seal (grout above well seal):

Material:	NA
Installation Method:	NA

Bentonite Seal:

Manufacturer:	NA
Material:	NA
Type:	NA
Installation Method:	NA
Hydration time (hrs):	NA

Filter Pack Material:

Manufacturer:	Prepack
Material:	1S
Size (Sieve Size):	20/40
Installation Method:	Gravity
Surging time:	None

Well Casing (Solid Riser Above Screen):

Manufacturer:	Silver-Line Enviro-Pure
Type/Material:	PVC
Length (ft):	5.0
Diameter (in):	2.0

Well Screen:

Manufacturer:	Silver-Line Enviro-Pure
Type/Material:	PVS
Diameter (in):	2.0
Length (ft):	10.0
Slot Size (in):	0.01
Slot Type:	Factory Slot

Sump/End Cap: End cap

Notes:

Pre-packed temporary well, no sand or bentonite added.
PVS = PVC Upper/Stainless Steel Lower

Signature:

Depths and heights are referenced to ground surface unless specified TOC.
All elevations are referenced to MSL (NAVD 88).

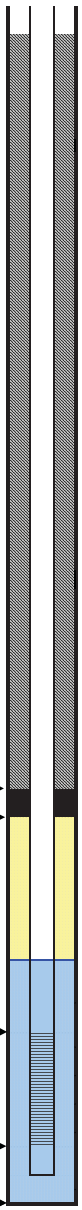
Name (print): Jason Hayes

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/15/2017**

SCREENED WELL CONSTRUCTION FORM

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract Number:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Location ID:**	AFFF Release Area 1
Drilling Subcontractor:	AmDrill, Inc.	**Well ID:**	MW01005
Drilling Personnel:	Todd Ives, Keith Anderson	**Start Date:**	05/24/17
Drilling Method:	DPT	**End Date:**	05/24/17
Technician(s)	Jason Hayes, Jason Drizd		

Type of Well:	Stick Up
Measuring Point:	Top of Riser (TOR)
TOC/TOR Difference (in):	See survey data
Approximate Diameter of Borehole (in):	4
Depth to Water (ft):	5
During Drilling:	5
Date:	05/24/17
Post Development:	See development log
Date:	05/24/17
Hydrologic Unit:	W
Water added during drilling (gal):	None
Water removed during development (gal):	None
Top of Bentonite Seal (ft):	0
Top of Filter Pack (ft):	0
Top of Screen Interval (ft):	4.8
Bottom of Screened Interval (ft):	14.8
Bottom of Filter Pack (ft):	14.8
Bottom of Borehole (ft):	15.0



Protective Casing:

Type:	SLS
Dimensions (in):	NA
Stickup (ft):	NA
Length (ft):	NA
Guard Post:	NA

Surface Pad:

Type:	None
Length (ft):	NA
Width (ft):	NA
Thickness (in):	NA

Annular Seal (grout above well seal):

Material:	NA
Installation Method:	NA

Bentonite Seal:

Manufacturer:	NA
Material:	NA
Type:	NA
Installation Method:	NA
Hydration time (hrs):	NA

Filter Pack Material:

Manufacturer:	Prepack
Material:	1S
Size (Sieve Size):	20/40
Installation Method:	Gravity
Surging time:	None

Well Casing (Solid Riser Above Screen):

Manufacturer:	Silver-Line Enviro-Pure
Type/Material:	PVC
Length (ft):	5.0
Diameter (in):	2.0

Well Screen:

Manufacturer:	Silver-Line Enviro-Pure
Type/Material:	PVS
Diameter (in):	2.0
Length (ft):	10.0
Slot Size (in):	0.01
Slot Type:	Factory Slot

Sump/End Cap: End cap

Notes:

Pre-packed temporary well, no sand or bentonite added.
PVS = PVC Upper/Stainless Steel Lower

Depths and heights are referenced to ground surface unless specified TOC.
All elevations are referenced to MSL (NAVD 88).

Signature:

Name (print): Jason Hayes

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/15/2017**

SCREENED WELL CONSTRUCTION FORM

Project Name: Site Inspection of AFFF Release Areas Environmental Programs Worldwide

Project Number: 775303101.0025

Contract Number: FA8903-16-D-0027

Task Order: 0004

Installation: Patrick AFB (PTRCK)

Location ID: AFFF Release Area 1

Drilling Subcontractor: AmDrill, Inc.

Well ID: MW01006

Drilling Personnel: Todd Ives, Keith Anderson

Start Date: 05/24/17

Drilling Method: DPT

End Date: 05/24/17

Technician(s) Jason Hayes, Jason Drizd

Type of Well: Stick Up

Measuring Point: Top of Riser (TOR)

TOC/TOR Difference (in): See survey data

Approximate Diameter of Borehole (in): 4

Depth to Water (ft): 5

During Drilling: 5

Date: 05/24/17

Post Development: See development log

Date: 05/24/17

Hydrologic Unit: W

Water added during drilling (gal): None

Water removed during development (gal): None

Top of Bentonite Seal (ft): 0

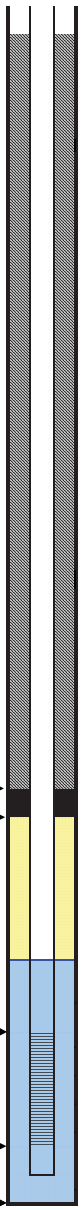
Top of Filter Pack (ft): 0

Top of Screen Interval (ft): 4.6

Bottom of Screened Interval (ft): 14.6

Bottom of Filter Pack (ft): 14.6

Bottom of Borehole (ft): 14.8



Protective Casing:

- **Type:** SLS
- **Dimensions (in):** NA
- **Stickup (ft):** NA
- **Length (ft):** NA
- **Guard Post:** NA

Surface Pad:

- **Type:** None
- **Length (ft):** NA
- **Width (ft):** NA
- **Thickness (in):** NA

Annular Seal (grout above well seal):

- **Material:** NA
- **Installation Method:** NA

Bentonite Seal:

- **Manufacturer:** NA
- **Material:** NA
- **Type:** NA
- **Installation Method:** NA
- **Hydration time (hrs):** NA

Filter Pack Material:

- **Manufacturer:** Prepack
- **Material:** 1S
- **Size (Sieve Size):** 20/40
- **Installation Method:** Gravity
- **Surging time:** None

Well Casing (Solid Riser Above Screen):

- **Manufacturer:** Silver-Line Enviro-Pure
- **Type/Material:** PVC
- **Length (ft):** 5.0
- **Diameter (in):** 2.0

Well Screen:

- **Manufacturer:** Silver-Line Enviro-Pure
- **Type/Material:** PVS
- **Diameter (in):** 2.0
- **Length (ft):** 10.0
- **Slot Size (in):** 0.01
- **Slot Type:** Factory Slot

Sump/End Cap: End cap

Notes:

Pre-packed temporary well, no sand or bentonite added.
PVS = PVC Upper/Stainless Steel Lower

Signature:

Depths and heights are referenced to ground surface unless specified TOC.
All elevations are referenced to MSL (NAVD 88).

Name (print): Jason Hayes

QA/QC'd by: Thomas W. Hensel

QA/QC Date: 6/15/2017

SCREENED WELL CONSTRUCTION FORM

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract Number:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Location ID:**	AFFF Release Area 2
Drilling Subcontractor:	AmDrill, Inc.	**Well ID:**	MW02001
Drilling Personnel:	Todd Ives, Keith Anderson	**Start Date:**	05/23/17
Drilling Method:	Hand Auger	**End Date:**	05/23/17
Technician(s)	Jason Hayes, Jason Drizd		

Type of Well: Flush Mount
Measuring Point: Top of Riser (TOR)
TOC/TOR Difference (in): See survey data

Approximate Diameter of Borehole (in): 2

Depth to Water (ft): 4
During Drilling: 4
Date: 05/23/17
Post Development: See development log
Date: 05/23/17

Hydrologic Unit: W

Water added during drilling (gal): None
Water removed during development (gal): None

Top of Bentonite Seal (ft): 0

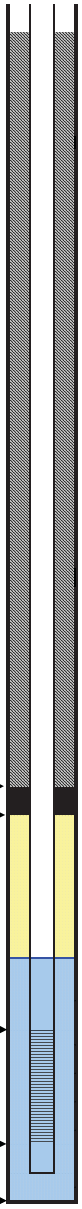
Top of Filter Pack (ft): 0

Top of Screen Interval (ft): 2.7

Bottom of Screened Interval (ft): 7.7

Bottom of Filter Pack (ft): 7.7

Bottom of Borehole (ft): 7.9



Protective Casing:
- **Type:** SLS
- **Dimensions (in):** NA
- **Stickup (ft):** NA
- **Length (ft):** NA
- **Guard Post:** NA

Surface Pad:
- **Type:** None
- **Length (ft):** NA
- **Width (ft):** NA
- **Thickness (in):** NA

Annular Seal (grout above well seal):
- **Material:** NA
- **Installation Method:** NA

Bentonite Seal:
- **Manufacturer:** NA
- **Material:** NA
- **Type:** NA
- **Installation Method:** NA
- **Hydration time (hrs):** NA

Filter Pack Material:
- **Manufacturer:** Prepack
- **Material:** 1S
- **Size (Sieve Size):** 20/40
- **Installation Method:** Gravity
- **Surging time:** None

Well Casing (Solid Riser Above Screen):
- **Manufacturer:** Silver-Line Enviro-Pure
- **Type/Material:** PVC
- **Length (ft):** 5.0
- **Diameter (in):** 1.0

Well Screen:
- **Manufacturer:** Silver-Line Enviro-Pure
- **Type/Material:** PVS
- **Diameter (in):** 2.0
- **Length (ft):** 5.0
- **Slot Size (in):** 0.01
- **Slot Type:** Factory Slot

Sump/End Cap: End cap

Notes:
Pre-packed temporary well, no sand or bentonite added.
PVS = PVC Upper/Stainless Steel Lower.

Signature:

Depths and heights are referenced to ground surface unless specified TOC.
All elevations are referenced to MSL (NAVD 88).

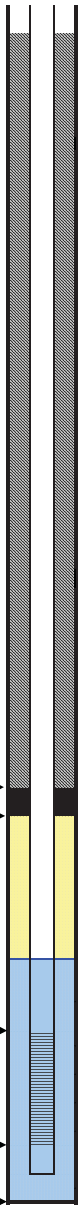
Name (print): Jason Hayes

QA/QC'd by: Thomas W. Hensel **QA/QC Date:** 6/14/2017

SCREENED WELL CONSTRUCTION FORM

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract Number:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Location ID:**	AFFF Release Area 2
Drilling Subcontractor:	AmDrill, Inc.	**Well ID:**	MW02002
Drilling Personnel:	Todd Ives, Keith Anderson	**Start Date:**	05/23/17
Drilling Method:	Hand Auger	**End Date:**	05/23/17
Technician(s)	Jason Hayes, Jason Drizd		

Type of Well:	Flush Mount
Measuring Point:	Top of Riser (TOR)
TOC/TOR Difference (in):	See survey data
Approximate Diameter of Borehole (in):	2
Depth to Water (ft):	4
During Drilling:	4
Date:	05/23/17
Post Development:	See development log
Date:	05/23/17
Hydrologic Unit:	W
Water added during drilling (gal):	None
Water removed during development (gal):	None
Top of Bentonite Seal (ft):	0
Top of Filter Pack (ft):	0
Top of Screen Interval (ft):	3.0
Bottom of Screened Interval (ft):	8.0
Bottom of Filter Pack (ft):	8.0
Bottom of Borehole (ft):	8.2



Protective Casing:	
Type:	SLS
Dimensions (in):	NA
Stickup (ft):	NA
Length (ft):	NA
Guard Post:	NA
Surface Pad:	
Type:	None
Length (ft):	NA
Width (ft):	NA
Thickness (in):	NA
Annular Seal (grout above well seal):	
Material:	NA
Installation Method:	NA
Bentonite Seal:	
Manufacturer:	NA
Material:	NA
Type:	NA
Installation Method:	NA
Hydration time (hrs):	NA
Filter Pack Material:	
Manufacturer:	Prepack
Material:	1S
Size (Sieve Size):	20/40
Installation Method:	Gravity
Surging time:	None
Well Casing (Solid Riser Above Screen):	
Manufacturer:	Silver-Line Enviro-Pure
Type/Material:	PVC
Length (ft):	5.0
Diameter (in):	1.0
Well Screen:	
Manufacturer:	Silver-Line Enviro-Pure
Type/Material:	PVS
Diameter (in):	1.0
Length (ft):	5.0
Slot Size (in):	0.01
Slot Type:	Factory Slot
Sump/End Cap:	End cap

Notes:

Pre-packed temporary well, no sand or bentonite added.
PVS = PVC Upper/Stainless Steel Lower.

Signature:

Depths and heights are referenced to ground surface unless specified TOC.
All elevations are referenced to MSL (NAVD 88).

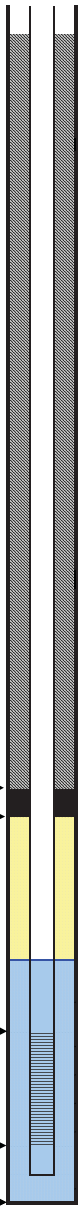
Name (print): Jason Hayes

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/14/2017**

SCREENED WELL CONSTRUCTION FORM

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract Number:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Location ID:**	AFFF Release Area 2
Drilling Subcontractor:	AmDrill, Inc.	**Well ID:**	MW02003
Drilling Personnel:	Todd Ives, Keith Anderson	**Start Date:**	05/23/17
Drilling Method:	Hand Auger	**End Date:**	05/23/17
Technician(s)	Jason Hayes, Jason Drizd		

Type of Well:	Flush Mount
Measuring Point:	Top of Riser (TOR)
TOC/TOR Difference (in):	See survey data
Approximate Diameter of Borehole (in):	2
Depth to Water (ft):	4
During Drilling:	4
Date:	05/23/17
Post Development:	See development log
Date:	05/23/17
Hydrologic Unit:	W
Water added during drilling (gal):	None
Water removed during development (gal):	None
Top of Bentonite Seal (ft):	0
Top of Filter Pack (ft):	0
Top of Screen Interval (ft):	3.5
Bottom of Screened Interval (ft):	8.5
Bottom of Filter Pack (ft):	8.5
Bottom of Borehole (ft):	8.7



Protective Casing:

Type:	SLS
Dimensions (in):	NA
Stickup (ft):	NA
Length (ft):	NA
Guard Post:	NA

Surface Pad:

Type:	None
Length (ft):	NA
Width (ft):	NA
Thickness (in):	NA

Annular Seal (grout above well seal):

Material:	NA
Installation Method:	NA

Bentonite Seal:

Manufacturer:	NA
Material:	NA
Type:	NA
Installation Method:	NA
Hydration time (hrs):	NA

Filter Pack Material:

Manufacturer:	Prepack
Material:	1S
Size (Sieve Size):	20/40
Installation Method:	Gravity
Surging time:	None

Well Casing (Solid Riser Above Screen):

Manufacturer:	Silver-Line Enviro-Pure
Type/Material:	PVC
Length (ft):	5.0
Diameter (in):	1.0

Well Screen:

Manufacturer:	Silver-Line Enviro-Pure
Type/Material:	PVS
Diameter (in):	1.0
Length (ft):	5.0
Slot Size (in):	0.01
Slot Type:	Factory Slot
Sump/End Cap:	End cap

Notes:

Pre-packed temporary well, no sand or bentonite added.
PVS = PVC Upper/Stainless Steel Lower.

Signature:

Depths and heights are referenced to ground surface unless specified TOC.
All elevations are referenced to MSL (NAVD 88).

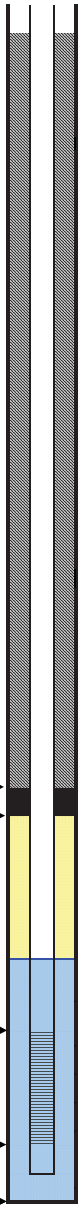
Name (print): Jason Hayes

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/14/2017**

SCREENED WELL CONSTRUCTION FORM

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract Number:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Location ID:**	MW03001
Drilling Subcontractor:	AmDrill, Inc.	**Well ID:**	AFFF Release Area 3
Drilling Personnel:	Todd Ives, Keith Anderson	**Start Date:**	05/22/17
Drilling Method:	DPT	**End Date:**	05/22/17
Technician(s)	Jason Hayes, Jason Drizd		

Type of Well:	Flush Mount
Measuring Point:	Top of Riser (TOR)
TOC/TOR Difference (in):	See survey data
Approximate Diameter of Borehole (in):	4
Depth to Water (ft):	4
During Drilling:	4
Date:	05/22/17
Post Development:	See development log
Date:	05/22/17
Hydrologic Unit:	W
Water added during drilling (gal):	None
Water removed during development (gal):	None
Top of Bentonite Seal (ft):	0
Top of Filter Pack (ft):	0
Top of Screen Interval (ft):	4.0
Bottom of Screened Interval (ft):	14.0
Bottom of Filter Pack (ft):	14.0
Bottom of Borehole (ft):	14.2



Protective Casing:

Type:	SLS
Dimensions (in):	NA
Stickup (ft):	NA
Length (ft):	NA
Guard Post:	NA

Surface Pad:

Type:	None
Length (ft):	NA
Width (ft):	NA
Thickness (in):	NA

Annular Seal (grout above well seal):

Material:	NA
Installation Method:	NA

Bentonite Seal:

Manufacturer:	NA
Material:	NA
Type:	NA
Installation Method:	NA
Hydration time (hrs):	NA

Filter Pack Material:

Manufacturer:	Prepack
Material:	1S
Size (Sieve Size):	20/40
Installation Method:	Gravity
Surging time:	None

Well Casing (Solid Riser Above Screen):

Manufacturer:	Silver-Line Enviro-Pure
Type/Material:	PVC
Length (ft):	5.0
Diameter (in):	2.0

Well Screen:

Manufacturer:	Silver-Line Enviro-Pure
Type/Material:	PVS
Diameter (in):	2.0
Length (ft):	10.0
Slot Size (in):	0.01
Slot Type:	Factory Slot
Sump/End Cap:	End cap

Notes:

Pre-packed temporary well, no sand or bentonite added.
PVS = PVC Upper/Stainless Steel Lower.

Signature:

Depths and heights are referenced to ground surface unless specified TOC.
All elevations are referenced to MSL (NAVD 88).

Name (print): Jason Hayes

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/14/2017**

SCREENED WELL CONSTRUCTION FORM

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract Number:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Location ID:**	AFFF Release Area 3
Drilling Subcontractor:	AmDrill, Inc.	**Well ID:**	MW03002
Drilling Personnel:	Todd Ives, Keith Anderson	**Start Date:**	05/23/17
Drilling Method:	DPT	**End Date:**	05/23/17
Technician(s)	Jason Hayes, Jason Drizd		

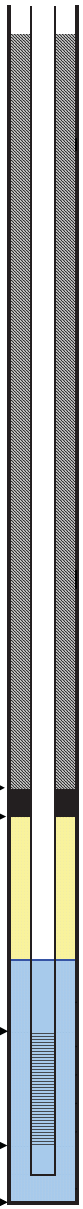
Type of Well: Flush Mount
Measuring Point: Top of Riser (TOR)
TOC/TOR Difference (in): See survey data

Approximate Diameter of Borehole (in): 4

Depth to Water (ft): 5
During Drilling: 5
Date: 05/23/17
Post Development: See development log
Date: 05/23/17

Hydrologic Unit: W

Water added during drilling (gal): None
Water removed during development (gal): None



Top of Bentonite Seal (ft): 0
Top of Filter Pack (ft): 0
Top of Screen Interval (ft): 4.4
Bottom of Screened Interval (ft): 14.4
Bottom of Filter Pack (ft): 14.4
Bottom of Borehole (ft): 14.6

Protective Casing:
- **Type:** SLS
- **Dimensions (in):** NA
- **Stickup (ft):** NA
- **Length (ft):** NA
- **Guard Post:** NA

Surface Pad:
- **Type:** None
- **Length (ft):** NA
- **Width (ft):** NA
- **Thickness (in):** NA

Annular Seal (grout above well seal):
- **Material:** NA
- **Installation Method:** NA

Bentonite Seal:
- **Manufacturer:** NA
- **Material:** NA
- **Type:** NA
- **Installation Method:** NA
- **Hydration time (hrs):** NA

Filter Pack Material:
- **Manufacturer:** Prepack
- **Material:** 1S
- **Size (Sieve Size):** 20/40
- **Installation Method:** Gravity
- **Surging time:** None

Well Casing (Solid Riser Above Screen):
- **Manufacturer:** Silver-Line Enviro-Pure
- **Type/Material:** PVC
- **Length (ft):** 5.0
- **Diameter (in):** 2.0

Well Screen:
- **Manufacturer:** Silver-Line Enviro-Pure
- **Type/Material:** PVS
- **Diameter (in):** 2.0
- **Length (ft):** 10.0
- **Slot Size (in):** 0.01
- **Slot Type:** Factory Slot

Sump/End Cap: End cap

Notes:
Pre-packed temporary well, no sand or bentonite added.
PVS = PVC Upper/Stainless Steel Lower.

Signature:

Depths and heights are referenced to ground surface unless specified TOC.
All elevations are referenced to MSL (NAVD 88).

Name (print): Jason Hayes

QA/QC'd by: Thomas W. Hensel **QA/QC Date:** 6/14/2017

APPENDIX C-7

WELL DEVELOPMENT LOGS

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WELL DEVELOPMENT LOG

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Date Started/Date Completed:**	5/23/2017
Well ID:	MW01001	**Initial Depth to Water (ft):**	5.4
Measuring Point:	Top of Casing	**Total Depth of Well (ft):**	15.0
Development Method:	PUMPED	**Depth to Water After Purging (ft):**	5.4
Total Volume Purged (gal):	37.5	**1 Casing Volume (gal):**	1.6
Technician(s):	Jason Drizd	**3 Casing Volumes (gal):**	4.7

Date/Time	Intake Depth (feet)	Water Level (feet)	Rate (GPM)	Temp. (°C)	pH (units)	Specific Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)
05/23/17 1710			2.5								Pumping Started
05/23/17 1715	15	5.40	2.5	27.39	7.51	3.631	0.23	-160.4	30.4	12.5	Clear
05/23/17 1720	15	5.40	2.5	27.05	7.29	3.699	0.41	-197.4	8.20	25.0	Clear
05/23/17 1725	15	5.40	2.5	27.01	7.17	3.753	0.12	-234.2	5.63	37.5	Clear

Instruments (Manufacturer, Model, and Serial No.):

Equipment Calibrated (Y/N): Yes — Calibrated Within Criteria (Y/N): Yes

Turbidity Meter, Water Quality Meter, Water Level Meter, Geosubmersible Pump
Hach 2100Q 15060C041690,
YSI 556 MPS 06K1082AL

Calculations:

Saturated well casing volume: V= Π(R^2)H*7.48 gal/ft^3

V = Volume (gal/ft)
Π = 3.14
R = well radius (ft) = (well diameter (in)/12 (in/ft))/2)
H = height of water column (ft)

V= Π(R^2)H*7.48 gal/ft^3
=Π * (2.0 (in)/12 (in/ft))/2)^2 * 9.60 * 7.48 gal/ft^3
= 1.6 gal.

Signature:

Notes:

Sheen on surface of water, possible petroleum product. Noticeable odor.

Name (print)**:** Jason Drizd

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/14/2017**

WELL DEVELOPMENT LOG

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Date Started/Date Completed:**	5/24/2017
Well ID:	MW01002	**Initial Depth to Water (ft):**	5.42
Measuring Point:	Top of Riser	**Total Depth of Well (ft):**	15.0
Development Method:	PUMPED	**Depth to Water After Purging (ft):**	5.42
Total Volume Purged (gal):	44	**1 Casing Volume (gal):**	1.6
Technician(s):	Jason Hayes	**3 Casing Volumes (gal):**	4.7

Date/Time	Intake Depth (feet)	Water Level (feet)	Rate (GPM)	Temp. (°C)	pH (units)	Specific Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)
05/24/17 1523			2								Pumping Started
05/24/17 1535	15	5.92	2	28.25	7.61	2.632	0.91	-171.3	11.2	24	Hydrocarbon odor
05/24/17 1541	15	5.92	2	27.51	7.49	2.682	1.05	-179.4	2.91	36	Hydrocarbon odor
05/24/17 1545	15	5.92	2	27.18	7.45	2.657	1.09	-182.7	2.5	44	Hydrocarbon odor

Instruments (Manufacturer, Model, and Serial No.):

Equipment Calibrated (Y/N): Yes — Calibrated Within Criteria (Y/N): Yes

Turbidity Meter, Water Quality Meter, Water Level Meter, Geosubmersible Pump
Hach 2100Q 14070C033883,
YSI 556 MPS 13D102082

Calculations:

Saturated well casing volume: V= Π(R^2)H*7.48 gal/ft^3

V = Volume (gal/ft)
Π = 3.14
R = well radius (ft) = (well diameter (in)/12 (in/ft))/2)
H = height of water column (ft)

V= Π(R^2)H*7.48 gal/ft^3
=Π * (2.0 (in)/12 (in/ft))/2)^2 * 9.58 * 7.48 gal/ft^3
= 1.6 gal.

Signature:

Notes:

Strong hydrocarbon odor

Name (print):

Jason Hayes

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/15/2017**

WELL DEVELOPMENT LOG

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Date Started/Date Completed:**	5/24/2017
Well ID:	MW01003	**Initial Depth to Water (ft):**	5.51
Measuring Point:	Top of Riser	**Total Depth of Well (ft):**	10.0
Development Method:	PUMPED	**Depth to Water After Purging (ft):**	5.92
Total Volume Purged (gal):	40	**1 Casing Volume (gal):**	0.7
Technician(s):	Jason Hayes	**3 Casing Volumes (gal):**	2.2

Date/Time	Intake Depth (feet)	Water Level (feet)	Rate (Gpm)	Temp. (°C)	pH (units)	Specific Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)
05/24/17 1550			2								Pumping Started
05/24/17 1601	8.5	5.92	2	28.29	7.54	3.203	2.11	-253.9	23.9	22	Hydrocarbon odor
05/24/17 1605	8.5	5.92	2	28.12	7.51	3.210	0.57	-258.4	3.32	30	Hydrocarbon odor
05/24/17 1610	8.5	5.92	2	28.15	7.49	3.225	0.60	-265.6	0.74	40	Hydrocarbon odor

Instruments (Manufacturer, Model, and Serial No.):

Equipment Calibrated (Y/N): Yes — Calibrated Within Criteria (Y/N): Yes

Turbidity Meter, Water Quality Meter, Water Level Meter, Geosubmersible Pump
Hach 2100Q 14070C033883,
YSI 556 MPS 13D102082

Calculations:

Saturated well casing volume: V= Π(R^2)H*7.48 gal/ft^3

V = Volume (gal/ft)
Π = 3.14
R = well radius (ft) = (well diameter (in)/12 (in/ft))/2)
H = height of water column (ft)

V= Π(R^2)H*7.48 gal/ft^3
=Π * (2.0 (in)/12 (in/ft))/2)^2 * 4.49 * 7.48 gal/ft^3
= 0.7 gal.

Signature:

Notes:

Hydrocarbon odor present

Name (print):

Jason Hayes

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/15/2017**

WELL DEVELOPMENT LOG

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Date Started/Date Completed:**	5/24/2017
Well ID:	MW01004	**Initial Depth to Water (ft):**	5.39
Measuring Point:	Top of Riser	**Total Depth of Well (ft):**	15.0
Development Method:	PUMPED	**Depth to Water After Purging (ft):**	5.69
Total Volume Purged (gal):	40	**1 Casing Volume (gal):**	1.6
Technician(s):	Jason Hayes	**3 Casing Volumes (gal):**	4.7

Date/Time	Intake Depth (feet)	Water Level (feet)	Rate (GPM)	Temp. (°C)	pH (units)	Specific Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)
05/24/17 1608			2								Pumping Started
05/24/17 1618	15	5.69	2	27.25	7.77	0.455	0.69	-177.7	43	20	
05/24/17 1623	15	5.69	2	26.97	7.92	0.425	0.98	-172.1	9.82	30	
05/24/17 1628	15	5.69	2	26.82	7.87	0.491	0.84	-163.6	4.11	40	

Instruments (Manufacturer, Model, and Serial No.):

Equipment Calibrated (Y/N): Yes — Calibrated Within Criteria (Y/N): Yes

Turbidity Meter, Water Quality Meter, Water Level Meter, Geosubmersible Pump
Hach 2100Q 14070C033883,
YSI 556 MPS 13D102082

Calculations:

Saturated well casing volume: V= Π(R^2)H*7.48 gal/ft^3

V = Volume (gal/ft)
Π = 3.14
R = well radius (ft) = (well diameter (in)/12 (in/ft))/2)
H = height of water column (ft)

V= Π(R^2)H*7.48 gal/ft^3
=Π * (2.0 (in)/12 (in/ft))/2)^2 * 9.61 * 7.48 gal/ft^3
= 1.6 gal.

Signature:

Notes:

None

Name (print):

Jason Hayes

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/15/2017**

WELL DEVELOPMENT LOG

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Date Started/Date Completed:**	5/24/2017
Well ID:	MW01005	**Initial Depth to Water (ft):**	5.44
Measuring Point:	Top of Riser	**Total Depth of Well (ft):**	15.0
Development Method:	PUMPED	**Depth to Water After Purging (ft):**	5.83
Total Volume Purged (gal):	32	**1 Casing Volume (gal):**	1.6
Technician(s):	Jason Hayes	**3 Casing Volumes (gal):**	4.7

Date/Time	Intake Depth (feet)	Water Level (feet)	Rate (GPM)	Temp. (°C)	pH (units)	Specific Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)
05/24/17 1625			2								Pumping Started
05/24/17 1631	15	5.83	2	27.76	7.90	0.756	0.71	-220.8	5.03	12	
05/24/17 1636	15	5.83	2	27.85	7.60	0.787	0.45	-199.4	4.32	22	
05/24/17 1541	15	5.83	2	27.56	7.65	0.689	0.82	-196.8	2.52	32	

Instruments (Manufacturer, Model, and Serial No.):

Equipment Calibrated (Y/N): Yes — Calibrated Within Criteria (Y/N): Yes

Turbidity Meter, Water Quality Meter, Water Level Meter, Geosubmersible Pump
Hach 2100Q 14070C033883,
YSI 556 MPS 13D102082

Calculations:

Saturated well casing volume: V= Π(R^2)H*7.48 gal/ft^3

V = Volume (gal/ft)
Π = 3.14
R = well radius (ft) = (well diameter (in)/12 (in/ft))/2)
H = height of water column (ft)

V= Π(R^2)H*7.48 gal/ft^3
=Π * (2.0 (in)/12 (in/ft))/2)^2 * 9.56 * 7.48 gal/ft^3
= 1.6 gal.

Signature:

Notes:

None

Name (print):

Jason Hayes

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/15/2017**

WELL DEVELOPMENT LOG

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	PTRCK	**Date Started/Date Completed:**	5/24/2017
Well ID:	MW01006	**Initial Depth to Water (ft):**	5.52
Measuring Point:	Top of Riser	**Total Depth of Well (ft):**	15.0
Development Method:	PUMPED	**Depth to Water After Purging (ft):**	5.76
Total Volume Purged (gal):	40	**1 Casing Volume (gal):**	1.6
Technician(s):	Jason Hayes, Audrey Yorke	**3 Casing Volumes (gal):**	4.7

Date/Time	Intake Depth (feet)	Water Level (feet)	Rate (GPM)	Temp. (°C)	pH (units)	Specific Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)
05/24/17 16:49			2								Pumping Started
05/24/17 17:00	15	5.76	2	27.35	8.01	0.342	0.93	-176.0	49.8	20	
05/24/17 17:05	15	5.76	2	27.22	7.97	0.346	0.98	-196.6	15.3	30	
05/24/17 17:10	15	5.76	2	27.12	7.92	0.345	0.91	-187.6	9.45	40	

Instruments (Manufacturer, Model, and Serial No.):

Equipment Calibrated (Y/N): Yes — Calibrated Within Criteria (Y/N): Yes

Turbidity Meter, Water Quality Meter, Water Level Meter, Geosubmersible Pump
Hach 2100Q 14070C033883,
YSI 556 MPS 13D102082

Calculations:

Saturated well casing volume: V= Π(R^2)H*7.48 gal/ft^3

V = Volume (gal/ft)
Π = 3.14
R = well radius (ft) = (well diameter (in)/12 (in/ft))/2)
H = height of water column (ft)

V= Π(R^2)H*7.48 gal/ft^3
=Π * (2.0 (in)/12 (in/ft))/2)^2 * 9.48 * 7.48 gal/ft^3
= 1.6 gal.

Signature:

Notes:

None

Name (print):

Jason Hayes

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/15/2017**

WELL DEVELOPMENT LOG

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Date Started/Date Completed:**	5/23/2017
Well ID:	MW02001	**Initial Depth to Water (ft):**	7.65
Measuring Point:	Top of Casing	**Total Depth of Well (ft):**	10.0
Development Method:	PUMPED	**Depth to Water After Purging (ft):**	7.65
Total Volume Purged (gal):	6	**1 Casing Volume (gal):**	0.1
Technician(s):	Jason Drizd	**3 Casing Volumes (gal):**	0.3

Date/Time	Intake Depth (feet)	Water Level (feet)	Rate (GPM)	Temp. (°C)	pH (units)	Specific Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)
05/23/17 0909			0.5								Pumping Started
05/23/17 0920	10	7.65	0.5	28.33	7.26	0.579	1.32	-10.9	45.2	2	Clear
05/23/17 0924	10	7.65	0.5	27.92	6.95	0.574	1.28	-18.4	8.86	4	Clear
05/23/17 0928	10	7.65	0.5	28.09	6.96	0.573	1.40	-23.6	5.64	6	Clear

Instruments (Manufacturer, Model, and Serial No.):

Equipment Calibrated (Y/N): Yes — Calibrated Within Criteria (Y/N): Yes

Turbidity Meter, Water Quality Meter, Water Level Meter, Peristaltic Pump
Hach 2100Q 15060C041690,
YSI 556 MPS 06K1082AL

Calculations:

Saturated well casing volume: V= Π(R^2)H*7.48 gal/ft^3

V = Volume (gal/ft)
Π = 3.14
R = well radius (ft) = (well diameter (in)/12 (in/ft))/2)
H = height of water column (ft)

V= Π(R^2)H*7.48 gal/ft^3
=Π * (1.0 (in)/12 (in/ft))/2)^2 * 2.35 * 7.48 gal/ft^3
= 0.1 gal.

Signature:

Notes:

None

Name (print):

Jason Drizd

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/14/2017**

WELL DEVELOPMENT LOG

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Date Started/Date Completed:**	5/23/2017
Well ID:	MW02002	**Initial Depth to Water (ft):**	7.18
Measuring Point:	Top of Riser	**Total Depth of Well (ft):**	10.0
Development Method:	PUMPED	**Depth to Water After Purging (ft):**	7.18
Total Volume Purged (gal):	14	**1 Casing Volume (gal):**	0.1
Technician(s):	Jason Drizd	**3 Casing Volumes (gal):**	0.3

Date/Time	Intake Depth (feet)	Water Level (feet)	Rate (GPM)	Temp. (°C)	pH (units)	Specific Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)
05/23/17 0828			0.5								Pumping Started
05/23/17 0839	10	7.18	0.5	28.54	7.75	0.795	0.94	72.4	315	2	Cloudy
05/23/17 0843	10	7.18	0.5	28.28	7.43	0.764	7.78	62.9	127	4	Cloudy
05/23/17 0847	10	7.18	0.5	28.22	7.03	0.773	1.28	69.7	153	6	Cloudy
05/23/17 0851	10	7.18	0.5	27.91	6.93	0.778	1.17	65.5	50.2	8	Cloudy
05/23/17 0855	10	7.18	0.5	27.97	7.00	0.776	1.26	58.3	25.7	10	Clear
05/23/17 0859	10	7.18	0.5	27.92	7.06	0.773	1.28	51.7	15.5	12	Clear
05/23/17 0903	10	7.18	0.5	28.18	7.02	0.770	1.25	47.7	9.87	14	Clear

Instruments (Manufacturer, Model, and Serial No.):

Equipment Calibrated (Y/N): Yes — Calibrated Within Criteria (Y/N): Yes

Turbidity Meter, Water Quality Meter, Water Level Meter, Peristaltic Pump
Hach 2100Q 15060C041690,
YSI 556 MPS 06K1082AL

Calculations:

Saturated well casing volume: V= Π(R^2)H*7.48 gal/ft^3

V = Volume (gal/ft)
Π = 3.14
R = well radius (ft) = (well diameter (in)/12 (in/ft))/2)
H = height of water column (ft)

V= Π(R^2)H*7.48 gal/ft^3
=Π * (1.0 (in)/12 (in/ft))/2)^2 * 2.82 * 7.48 gal/ft^3
= 0.1 gal.

Signature:

Notes:

None

Name (print):

Jason Drizd

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/14/2017**

WELL DEVELOPMENT LOG

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Date Started/Date Completed:**	5/23/2017
Well ID:	MW02003	**Initial Depth to Water (ft):**	6.69
Measuring Point:	Top of Casing	**Total Depth of Well (ft):**	10.0
Development Method:	PUMPED	**Depth to Water After Purging (ft):**	6.69
Total Volume Purged (gal):	12	**1 Casing Volume (gal):**	0.1
Technician(s):	Jason Drizd	**3 Casing Volumes (gal):**	0.4

Date/Time	Intake Depth (feet)	Water Level (feet)	Rate (GPM)	Temp. (°C)	pH (units)	Specific Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)
05/23/17 0935			0.5								Pumping Started
05/23/17 0947	10	6.69	0.5	28.39	7.62	0.541	1.44	10.0	112	3	Cloudy
05/23/17 0953	10	6.69	0.5	27.86	7.52	0.534	1.40	19.0	26.4	6	Clear
05/23/17 0959	10	6.69	0.5	27.91	7.33	0.535	1.61	20.0	14.3	9	Clear
05/23/17 1005	10	6.69	0.5	27.91	7.33	0.533	1.59	21.3	9.7	12	Clear

Instruments (Manufacturer, Model, and Serial No.):

Equipment Calibrated (Y/N): Yes — Calibrated Within Criteria (Y/N): Yes

Turbidity Meter, Water Quality Meter, Water Level Meter, Peristaltic Pump
Hach 2100Q 15060C041690,
YSI 556 MPS 06K1082AL

Calculations:

Saturated well casing volume: V= Π(R^2)H*7.48 gal/ft^3

V = Volume (gal/ft)
Π = 3.14
R = well radius (ft) = (well diameter (in)/12 (in/ft))/2)
H = height of water column (ft)

V= Π(R^2)H*7.48 gal/ft^3
=Π * (1.0 (in)/12 (in/ft))/2)^2 * 3.31 * 7.48 gal/ft^3
= 0.1 gal.

Signature:

Notes:

None

Name (print):

Jason Drizd

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/14/2017**

WELL DEVELOPMENT LOG

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Date Started/Date Completed:**	5/22/2017
Well ID:	MW03001	**Initial Depth to Water (ft):**	5.6
Measuring Point:	Top of Riser	**Total Depth of Well (ft):**	15.0
Development Method:	PUMPED	**Depth to Water After Purging (ft):**	5.6
Total Volume Purged (gal):	55	**1 Casing Volume (gal):**	1.5
Technician(s):	Jason Drizd	**3 Casing Volumes (gal):**	4.6

Date/Time	Intake Depth (feet)	Water Level (feet)	Rate (GPM)	Temp. (°C)	pH (units)	Specific Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)
05/22/17 1758			2.5								Pumping Started
05/22/17 1808	15	5.80	2.5	26.95	7.74	18.81	0.87	-175.1	160	25	Clear
05/22/17 1817	15	5.78	2.5	26.48	7.39	18.93	1.52	-171.9	10.4	37.5	Clear
05/22/17 1822	15	5.76	2.5	26.49	7.45	18.92	1.53	-177.6	7.57	50	Clear
05/22/17 1825	15	5.64	2.5	26.44	7.47	19.18	1.49	-184.2	5.29	55	Clear

Instruments (Manufacturer, Model, and Serial No.):

Equipment Calibrated (Y/N): Yes — Calibrated Within Criteria (Y/N): Yes

Turbidity Meter, Water Quality Meter, PID, Geosubmersible Pump
Hach 2100Q 15060C041690,
YSI 556 MPS 06K1082AL

Calculations:

Saturated well casing volume: V= Π(R^2)H*7.48 gal/ft^3

V = Volume (gal/ft)
Π = 3.14
R = well radius (ft) = (well diameter (in)/12 (in/ft))/2)
H = height of water column (ft)

V= Π(R^2)H*7.48 gal/ft^3
=Π * (2.0 (in)/12 (in/ft))/2)^2 * 9.40 * 7.48 gal/ft^3
= 1.5 gal.

Signature:

Notes:

None

Name (print):

Jason Drizd

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/14/2017**

WELL DEVELOPMENT LOG

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027	**Task Order:**	0004
Installation:	Patrick AFB (PTRCK)	**Date Started/Date Completed:**	5/23/2017
Well ID:	MW03002	**Initial Depth to Water (ft):**	5.25
Measuring Point:	Top of Casing	**Total Depth of Well (ft):**	15.0
Development Method:	PUMPED	**Depth to Water After Purging (ft):**	5.25
Total Volume Purged (gal):	50	**1 Casing Volume (gal):**	1.6
Technician(s):	Jason Drizd	**3 Casing Volumes (gal):**	4.8

Date/Time	Intake Depth (feet)	Water Level (feet)	Rate (GPM)	Temp. (°C)	pH (units)	Specific Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)
05/23/17 1412			3								Pumping Started
05/23/17 1420	15	5.61	3	27.93	7.93	0.984	1.54	-59.0	56.1	24	Cloudy
05/23/17 1424	15	5.61	3	27.02	7.05	0.969	1.11	-62.2	8.57	36	Clear
05/23/17 1428	15	5.61	3	26.88	7.05	0.961	1.15	-82.8	6.20	48	Clear

Instruments (Manufacturer, Model, and Serial No.):

Equipment Calibrated (Y/N): Yes — Calibrated Within Criteria (Y/N): Yes

Turbidity Meter, Water Quality Meter, Water Level Meter, Geosubmersible Pump
Hach 2100Q 15060C041690,
YSI 556 MPS 06K1082AL

Calculations:

Saturated well casing volume: V= Π(R^2)H*7.48 gal/ft^3

V = Volume (gal/ft)
Π = 3.14
R = well radius (ft) = (well diameter (in)/12 (in/ft))/2)
H = height of water column (ft)

V= Π(R^2)H*7.48 gal/ft^3
=Π * (2.0 (in)/12 (in/ft))/2)^2 * 9.75 * 7.48 gal/ft^3
= 1.6 gal.

Signature:

Notes:

None

Name (print):

Jason Drizd

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/14/2017**

APPENDIX C-8

WATER QUALITY SAMPLING INSTRUMENT CALIBRATION FORMS

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WATER QUALITY SAMPLING INSTRUMENT CALIBRATION FORM

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027 **Task Order:** 0004	**Date:**	05/22/17
Installation:	Patrick AFB (PTRCK)	**Calibration Start Time:**	10:15
Sample Technician(s):	Jason Drizd	**Calibration End Time:**	10:54

Readings Before Calibration

Date	Time (24hr)	Temperature (°C)	pH (SU)	Turbidity (NTUs)	Specific Electrical Conductance (mS/cm)	D.O. (mg/L)	Salinity (%)	ORP/Eh (mV)	Barometric Pressure (mm Hg)	Comments
05/22/17	1015	N/A	4.00	N/A	1.12	N/A	N/A	185.8	N/A	None
			6.80	N/A						
			9.62	N/A						

Readings After Calibration

Date	Time (24hr)	Temperature (°C)	pH (SU)	Turbidity (NTUs)	Specific Electrical Conductance (mS/cm)	D.O. (mg/L)	Salinity (%)	ORP/Eh (mV)	Barometric Pressure (mm Hg)	Comments
05/22/17	1054	N/A	4.00	9.58	1.00	8.21	N/A	200.0	N/A	None
			7.01	20.2						
			9.93	99.4						
				792						

Calibration Materials Record:

pH Calibration Standards

Standard	Cal. Standard Lot #	Expiration Date
pH (4)	7GB162	02/28/19
pH (7)	7GB164	02/28/19
pH (10)	7GB166	02/28/19

Specific Electrical Conductance, Salinity, Dissolved Oxygen (DO) and Oxidation Reduction Potential (ORP) Calibration Standards

Standard	Cal. Standard Lot #	Expiration Date
Spec. Conductance	7GB161	02/28/18
Salinity	N/A	05/22/17
D.O.	N/A	05/22/17
ORP	7GC226	12/31/17

Turbidity Standards

Standard	Cal. Standard Lot #	Expiration Date
10	N/A	09/30/17
20	N/A	09/30/17
100	N/A	08/31/17
800	N/A	09/30/17

Instruments (Manufacturer, Model, and Serial No.):

	Manufacturer/Model	Serial No
Water Quality Meter:	YSI 556 MPS	06K1082AL
Turbidity Meter:	Hach 2100Q	14070C033883

Calibrated Within Acceptance Criteria (Y/N): Yes

If No, Provide Explanation: NA

Notes: N/A

Signature:

Name (print)**:** Jason Drizd

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/14/2017**

WATER QUALITY SAMPLING INSTRUMENT CALIBRATION FORM

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027 **Task Order:** 0004	**Date:**	05/23/17
Installation:	Patrick AFB (PTRCK)	**Calibration Start Time:**	0737
Sample Technician(s):	Jason Drizd	**Calibration End Time:**	0818

Readings Before Calibration

Date	Time (24hr)	Temperature (°C)	pH (SU)	Turbidity (NTUs)	Specific Electrical Conductance (mS/cm)	D.O. (mg/L)	Salinity (%)	ORP/Eh (mV)	Barometric Pressure (mm Hg)	Comments
05/23/17	0800	N/A	3.98	N/A	0.956	N/A	N/A	197	N/A	None
			6.83	N/A						
			10.33	N/A						

Readings After Calibration

Date	Time (24hr)	Temperature (°C)	pH (SU)	Turbidity (NTUs)	Specific Electrical Conductance (mS/cm)	D.O. (mg/L)	Salinity (%)	ORP/Eh (mV)	Barometric Pressure (mm Hg)	Comments
05/23/17	0818	N/A	4.00	9.9	1.000	8.21	N/A	200	N/A	None
			7.00	20.2						
			10.05	100						
				799						

Calibration Materials Record:

pH Calibration Standards

Standard	Cal. Standard Lot #	Expiration Date
pH (4)	7GB162	02/28/19
pH (7)	7GB164	02/28/19
pH (10)	7GB166	02/28/19

Specific Electrical Conductance, Salinity, Dissolved Oxygen (DO) and Oxidation Reduction Potential (ORP) Calibration Standards

Standard	Cal. Standard Lot #	Expiration Date
Spec. Conductance	7GB161	02/28/18
Salinity	N/A	05/04/17
D.O.	N/A	05/04/17
ORP	7GC226	12/31/17

Turbidity Standards

Standard	Cal. Standard Lot #	Expiration Date
10	N/A	09/30/17
20	N/A	09/30/17
100	N/A	08/31/17
800	N/A	09/30/17

Instruments (Manufacturer, Model, and Serial No.):

	Manufacturer/Model	Serial No
Water Quality Meter:	YSI 556 MPS	06K1082AL
Turbidity Meter:	Hach 2100Q	15060C041690

Calibrated Within Acceptance Criteria (Y/N): Yes

If No, Provide Explanation: NA

Notes: None

Signature:

Name (print): Jason Drizd

QA/QC'd by: Thomas W. Hensel **QA/QC Date:** 6/14/2017

WATER QUALITY SAMPLING INSTRUMENT CALIBRATION FORM

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027 **Task Order:** 0004	**Date:**	05/24/17
Installation:	Patrick AFB (PTRCK)	**Calibration Start Time:**	0641
Sample Technician(s):	Jason Drizd	**Calibration End Time:**	0656

Readings Before Calibration

Date	Time (24hr)	Temperature (°C)	pH (SU)	Turbidity (NTUs)	Specific Electrical Conductance (mS/cm)	D.O. (mg/L)	Salinity (%)	ORP/Eh (mV)	Barometric Pressure (mm Hg)	Comments
05/24/17	0641	N/A	4.18	N/A	0.992	N/A	N/A	190.1	N/A	None
			6.78	N/A						
			10.35	N/A						

Readings After Calibration

Date	Time (24hr)	Temperature (°C)	pH (SU)	Turbidity (NTUs)	Specific Electrical Conductance (mS/cm)	D.O. (mg/L)	Salinity (%)	ORP/Eh (mV)	Barometric Pressure (mm Hg)	Comments
05/24/17	0655	N/A	4.00	9.98	1.000	8.22	N/A	200.0	N/A	None
			7.00	20.2						
			10.06	101						
				799						

Calibration Materials Record:

pH Calibration Standards

Standard	Cal. Standard Lot #	Expiration Date
pH (4)	7GB162	02/28/19
pH (7)	7GB164	02/28/19
pH (10)	7GB166	02/28/19

Specific Electrical Conductance, Salinity, Dissolved Oxygen (DO) and Oxidation Reduction Potential (ORP) Calibration Standards

Standard	Cal. Standard Lot #	Expiration Date
Spec. Conductance	7GB161	02/28/18
Salinity	N/A	05/24/17
D.O.	N/A	05/24/17
ORP	7GC226	12/31/17

Turbidity Standards

Standard	Cal. Standard Lot #	Expiration Date
10	NA	09/30/17
20	NA	09/30/17
100	NA	08/31/17
800	NA	09/30/17

Instruments (Manufacturer, Model, and Serial No.):

	Manufacturer/Model	Serial No
Water Quality Meter:	YSI 556 MPS	06K1082AL
Turbidity Meter:	Hach 2100Q	15060C041690

Calibrated Within Acceptance Criteria (Y/N): Yes

If No, Provide Explanation: NA

Notes:

None

Signature:

Name (print)**:** Jason Drizd

QA/QC'd by: **Thomas W. Hensel** **QA/QC Date:** **6/14/2017**

WATER QUALITY SAMPLING INSTRUMENT CALIBRATION FORM

Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	**Project Number:**	775303101.0025
Contract:	FA8903-16-D-0027 **Task Order:** 0004	**Date:**	05/25/17
Installation:	Patrick AFB (PTRCK)	**Calibration Start Time:**	0726
Sample Technician(s):	Jason Drizd	**Calibration End Time:**	0745

Readings Before Calibration

Date	Time (24hr)	Temperature (°C)	pH (SU)	Turbidity (NTUs)	Specific Electrical Conductance (mS/cm)	D.O. (mg/L)	Salinity (%)	ORP/Eh (mV)	Barometric Pressure (mm Hg)	Comments
05/25/17	0727	N/A	4.00	N/A	0.989	N/A	N/A	203.9	N/A	None
			6.95	N/A						
			10.25	N/A						

Readings After Calibration

Date	Time (24hr)	Temperature (°C)	pH (SU)	Turbidity (NTUs)	Specific Electrical Conductance (mS/cm)	D.O. (mg/L)	Salinity (%)	ORP/Eh (mV)	Barometric Pressure (mm Hg)	Comments
05/25/17	0741	N/A	4.00	10.3	1.000	8.22	N/A	200	N/A	None
			7.00	20.4						
			10.04	103						
				799						

Calibration Materials Record:

pH Calibration Standards

Standard	Cal. Standard Lot #	Expiration Date
pH (4)	7GB162	02/28/19
pH (7)	7GB164	02/28/19
pH (10)	7GB166	02/28/19

Specific Electrical Conductance, Salinity, Dissolved Oxygen (DO) and Oxidation Reduction Potential (ORP) Calibration Standards

Standard	Cal. Standard Lot #	Expiration Date
Spec. Conductance	7GB161	02/28/18
Salinity	N/A	05/25/17
D.O.	N/A	05/25/17
ORP	7GC226	12/31/17

Turbidity Standards

Standard	Cal. Standard Lot #	Expiration Date
10	NA	09/30/17
20	NA	09/30/17
100	NA	08/31/17
800	NA	09/30/17

Instruments (Manufacturer, Model, and Serial No.):

	Manufacturer/Model	Serial No
Water Quality Meter:	YSI 556 MPS	06K1082AL
Turbidity Meter:	Hach 2100Q	15060C041690

Calibrated Within Acceptance Criteria (Y/N): Yes

If No, Provide Explanation: NA

Notes: None

Signature:

Name (print): Jason Drizd

QA/QC'd by: Thomas W. Hensel **QA/QC Date:** 6/15/2017

APPENDIX C-9

GROUNDWATER SAMPLING LOGS

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DEP Form FD 9000-24: GROUNDWATER SAMPLING LOG

SITE NAME:	Patrick AFB (PTRCK)	SITE LOCATION:	AFFF Release Area 1
WELL NO:	MW01001	SAMPLE ID:	PTRCK01-GW-001
DATE:	05/25/17		

PURGING DATA

WELL DIAMETER (inches):	TUBING DIAMETER (inches):	WELL SCREEN INTERVAL DEPTH:	STATIC WATER DEPTH (feet):	PURGE PUMP TYPE OR BAILER:
2	1/4	5 to 15	5.33	PP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)
= (15.0 feet – 5.33 feet) X 0.082 gallons/foot X 3.785 liters/gallon = 6.0 liters

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= gallons + (gallons/foot X feet) + gallons = gallons

INITIAL PUMP OR TUBING DEPTH IN WELL	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	PURGING NITIATED AT:	PURGING ENDED AT:	TOTAL VOLUME PURGED (liters):
7	7	0758	0840	21

TIME	VOLUME PURGED ({Purging-Volume})	CUMUL. VOLUME PURGED (liters)	PURGE RATE (mL/min)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (mS/cm)	DISSOLVED OXYGEN (mg/L)	ORP (mV)	TURBIDITY (NTUs)	COLOR	ODOR
0806	4	4	500	5.33	7.67	26.14	7.470	0.23	-245.5	3.22	Clear	Salty
0814	8	12	500	5.33	7.54	26.20	6.982	0.36	-272.7	1.69	Clear	
0822	12	24	500	5.33	7.45	26.25	6.910	1.41	-287.7	1.37	Clear	
0830	16	40	500	5.33	7.39	26.23	7.255	1.49	-292.8	1.19	Clear	
0838	20	60	500	5.33	7.37	26.27	7.278	1.21	-294.6	1.60	Clear	
				Final Values	7.37	26.27	7.278	1.21	-294.6	1.60		

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88

TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
Jason Drizd Amec Foster Wheeler		0840	0842

PUMP OR TUBING DEPTH IN WELL (feet):	TUBING MATERIAL CODE:	FIELD-FILTERED:	FILTER SIZE (µm):
7	HDPE	No	NA
		Filtration Equipment Type:	NA

FIELD DECONTAMINATION: PUMP: No TUBING: No DUPLICATE: None Collected

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
SAMPLE ID CODE	# CONTAINERS	MAT. CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH			
MW01001	2	HDPE	125	Ice (4 °C)	NA	Not Recorded	PFAS (EPA 537)	APP	250

REMARKS:
None

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; HDPE = High Density Polyethylene; LDPE = Low Density Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After (Through) Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: **1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.**

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)
pH: + 0.2 units **Temperature:** + 0.2 oC **Specific Conductance:** + 5% **Dissolved Oxygen:** all readings < 20% saturation (see Table FS 2200-2); optionally, + 0.2 mg/L or + 10% (whichever is greater) **Turbidity:** all readings < 20 NTU; optionally + 5 NTU or + 10% (whichever is greater)

QA/QC'd by: Thomas W. Hensel **QA/QC Date: 6/15/2017**

DEP Form FD 9000-24: GROUNDWATER SAMPLING LOG

SITE NAME:	Patrick AFB (PTRCK)	SITE LOCATION:	AFFF Release Area 1
WELL NO:	MW01002	SAMPLE ID:	PTRCK01-GW-002
DATE:	05/25/17		

PURGING DATA

WELL DIAMETER (inches):	TUBING DIAMETER (inches):	WELL SCREEN INTERVAL DEPTH:	STATIC WATER DEPTH (feet):	PURGE PUMP TYPE OR BAILER:
2	1/4	5 to 15	5.31	PP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)
= (15.0 feet – 5.31 feet) X 0.082 gallons/foot X 3.785 liters/gallon = 6.0 liters

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= gallons + (gallons/foot X feet) + gallons = gallons

INITIAL PUMP OR TUBING DEPTH IN WELL	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	PURGING NITIATED AT:	PURGING ENDED AT:	TOTAL VOLUME PURGED (liters):
7	7	0848	0930	21

TIME	VOLUME PURGED ({Purging-Volume})	CUMUL. VOLUME PURGED (liters)	PURGE RATE (mL/min)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (mS/cm)	DISSOLVED OXYGEN (mg/L)	ORP (mV)	TURBIDITY (NTUs)	COLOR	ODOR
08:56	4	4	500	5.31	7.37	26.45	4.445	0.24	-293.2	1.74	Clear	None
09:04	8	12	500	5.31	7.29	26.41	4.548	1.18	-292.2	1.47	Clear	None
09:12	12	24	500	5.31	7.27	26.40	4.611	1.16	-294.9	1.96	Clear	None
09:20	16	40	500	5.31	7.26	26.40	4.761	0.87	-294.9	1.37	Clear	None
09:28	20	60	500	5.31	7.26	26.50	4.866	0.81	-296.6	1.29	Clear	None
				Final Values	7.26	26.50	4.866	0.81	-296.6	1.29		

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88

TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
Jason Drizd Amec Foster Wheeler		0932	0934

PUMP OR TUBING DEPTH IN WELL (feet):	TUBING MATERIAL CODE:	FIELD-FILTERED:	FILTER SIZE (µm):
7	HDPE	No	NA
		Filtration Equipment Type:	NA

FIELD DECONTAMINATION: PUMP: No TUBING: No DUPLICATE: None Collected

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION					
SAMPLE ID CODE	# CONTAINERS	MAT. CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
MW01002	2	HDPE	125	Ice (4 °C)	NA	Not Recorded	PFAS (EPA 537)	APP	500

REMARKS:
None

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; HDPE = High Density Polyethylene; LDPE = Low Density Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After (Through) Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: **1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.**

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)
pH: + 0.2 units **Temperature:** + 0.2 oC **Specific Conductance:** + 5% **Dissolved Oxygen:** all readings < 20% saturation (see Table FS 2200-2); optionally, + 0.2 mg/L or + 10% (whichever is greater) **Turbidity:** all readings < 20 NTU; optionally + 5 NTU or + 10% (whichever is greater)

QA/QC'd by: Thomas W. Hensel **QA/QC Date: 6/15/2017**

DEP Form FD 9000-24: GROUNDWATER SAMPLING LOG

SITE NAME:	Patrick AFB (PTRCK)	SITE LOCATION:	AFFF Release Area 1
WELL NO:	MW01003	SAMPLE ID:	PTRCK01-GW-003
DATE:	05/25/17		

PURGING DATA

WELL DIAMETER (inches):	TUBING DIAMETER (inches):	WELL SCREEN INTERVAL DEPTH:	STATIC WATER DEPTH (feet):	PURGE PUMP TYPE OR BAILER:
2	1/4	5 to 15	5.42	PP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)
= (15.0 feet – 5.42 feet) X 0.082 gallons/foot X 3.785 liters/gallon = 5.9 liters

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= gallons + (gallons/foot X feet) + gallons = gallons

INITIAL PUMP OR TUBING DEPTH IN WELL	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	PURGING NITIATED AT:	PURGING ENDED AT:	TOTAL VOLUME PURGED (liters):
7	7	0944	1026	21

TIME	VOLUME PURGED ({Purging-Volume})	CUMUL. VOLUME PURGED (liters)	PURGE RATE (mL/min)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (mS/cm)	DISSOLVED OXYGEN (mg/L)	ORP (mV)	TURBIDITY (NTUs)	COLOR	ODOR
0952	4	4	500	5.43	7.64	27.41	2.032	0.07	-297.8	5.68	Clear	None
1000	8	12	500	5.43	7.51	27.51	2.038	0.09	-306.3	3.44	Clear	None
1008	12	24	500	5.43	7.46	27.55	2.069	0.19	-310.4	2.11	Clear	None
1016	16	40	500	5.43	7.45	27.55	2.097	0.21	-311.2	2.05	Clear	None
1024	20	60	500	5.43	7.44	27.59	2.106	0.23	-310.5	2.05	Clear	None
				Final Values	7.44	27.59	2.106	0.23	-310.5	2.05		

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88

TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
Jason Drizd Amec Foster Wheeler		1026	1028

PUMP OR TUBING DEPTH IN WELL (feet):	TUBING MATERIAL CODE:	FIELD-FILTERED:	FILTER SIZE (µm):
7	HDPE	No	NA
		Filtration Equipment Type:	NA

FIELD DECONTAMINATION: PUMP: No TUBING: No DUPLICATE: None Collected

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION					
SAMPLE ID CODE	# CONTAINERS	MAT. CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
MW01003	2	HDPE	125	Ice (4 °C)	NA	Not Recorded	PFAS (EPA 537)	APP	500

REMARKS:
None

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; HDPE = High Density Polyethylene; LDPE = Low Density Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After (Through) Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: **1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.**

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)
pH: + 0.2 units **Temperature:** + 0.2 oC **Specific Conductance:** + 5% **Dissolved Oxygen:** all readings < 20% saturation (see Table FS 2200-2); optionally, + 0.2 mg/L or + 10% (whichever is greater) **Turbidity:** all readings < 20 NTU; optionally + 5 NTU or + 10% (whichever is greater)

QA/QC'd by: Thomas W. Hensel **QA/QC Date: 6/15/2017**

DEP Form FD 9000-24: GROUNDWATER SAMPLING LOG

SITE NAME:	Patrick AFB (PTRCK)	SITE LOCATION:	AFFF Release Area 1
WELL NO:	MW01004	SAMPLE ID:	PTRCK01-GW-004
DATE:	05/25/17		

PURGING DATA

WELL DIAMETER (inches):	TUBING DIAMETER (inches):	WELL SCREEN INTERVAL DEPTH:	STATIC WATER DEPTH (feet):	PURGE PUMP TYPE OR BAILER:
2	1/4	5 to 15	5.35	PP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)
= (15.0 feet – 5.35 feet) X 0.082 gallons/foot X 3.785 liters/gallon = 6.0 liters

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= gallons + (gallons/foot X feet) + gallons = gallons

INITIAL PUMP OR TUBING DEPTH IN WELL	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	PURGING NITIATED AT:	PURGING ENDED AT:	TOTAL VOLUME PURGED (liters):
7	7	1134	1216	21

TIME	VOLUME PURGED ({Purging-Volume})	CUMUL. VOLUME PURGED (liters)	PURGE RATE (mL/min)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (mS/cm)	DISSOLVED OXYGEN (mg/L)	ORP (mV)	TURBIDITY (NTUs)	COLOR	ODOR
1142	4	4	500	5.35	7.50	26.90	0.548	0.13	-232.4	59.1	Clear	None
1150	8	12	500	5.35	7.38	26.83	0.545	0.18	-241.9	9.34	Clear	None
1158	12	24	500	5.35	7.46	26.98	0.543	0.25	-263.1	7.25	Clear	None
1206	16	40	500	5.35	7.47	27.18	0.542	0.65	-276.5	3.72	Clear	None
1214	20	60	500	5.35	7.48	27.19	0.541	0.68	-283.9	3.49	Clear	None
				Final Values	7.48	27.19	0.541	0.68	-283.9	3.49		

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88

TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
Jason Drizd Amec Foster Wheeler		1216	1218

PUMP OR TUBING DEPTH IN WELL (feet):	TUBING MATERIAL CODE:	FIELD-FILTERED:	FILTER SIZE (µm):
7	HDPE	No Filtration Equipment Type:	NA NA

FIELD DECONTAMINATION: PUMP: No TUBING: No DUPLICATE: PTRCK-FD-GW-03

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION					
SAMPLE ID CODE	# CONTAINERS	MAT. CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
MW01004	2	HDPE	125	Ice (4 °C)	NA	Not Recorded	PFAS (EPA 537)	APP	500

REMARKS:
None

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; HDPE = High Density Polyethylene; LDPE = Low Density Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After (Through) Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: **1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.**

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)
pH: + 0.2 units **Temperature:** + 0.2 oC **Specific Conductance:** + 5% **Dissolved Oxygen:** all readings < 20% saturation (see Table FS 2200-2); optionally, + 0.2 mg/L or + 10% (whichever is greater) **Turbidity:** all readings < 20 NTU; optionally + 5 NTU or + 10% (whichever is greater)

QA/QC'd by: Thomas W. Hensel **QA/QC Date: 6/15/2017**

DEP Form FD 9000-24: GROUNDWATER SAMPLING LOG

SITE NAME:	Patrick AFB (PTRCK)	SITE LOCATION:	AFFF Release Area 1
WELL NO:	MW01005	SAMPLE ID:	PTRCK01-GW-005
DATE:	05/25/17		

PURGING DATA

WELL DIAMETER (inches):	TUBING DIAMETER (inches):	WELL SCREEN INTERVAL DEPTH:	STATIC WATER DEPTH (feet):	PURGE PUMP TYPE OR BAILER:
2	1/4	5 to 15	5.52	PP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)
= (15.0 feet – 5.52 feet) X 0.082 gallons/foot X 3.785 liters/gallon = 5.9 liters

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= gallons + (gallons/foot X feet) + gallons = gallons

INITIAL PUMP OR TUBING DEPTH IN WELL	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	PURGING NITIATED AT:	PURGING ENDED AT:	TOTAL VOLUME PURGED (liters):
7	7	1234	1316	21

TIME	VOLUME PURGED ({Purging-Volume})	CUMUL. VOLUME PURGED (liters)	PURGE RATE (mL/min)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (mS/cm)	DISSOLVED OXYGEN (mg/L)	ORP (mV)	TURBIDITY (NTUs)	COLOR	ODOR
1242	4	4	500	5.52	7.61	26.80	0.292	0.17	-179.4	28.6	Clear	None
1250	8	12	500	5.52	7.70	26.94	0.293	0.19	-214.5	20.2	Clear	None
1258	12	24	500	5.52	7.81	27.29	0.294	0.24	-229.4	7.73	Clear	None
1306	16	40	500	5.52	7.84	27.31	0.294	0.26	-233.8	5.97	Clear	None
1314	20	60	500	5.52	7.82	27.27	0.294	0.28	-235.1	6.87	Clear	None
				Final Values	7.82	27.27	0.294	0.28	-235.1	6.87		

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88

TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
Jason Drizd Amec Foster Wheeler		1316	1318

PUMP OR TUBING DEPTH IN WELL (feet):	TUBING MATERIAL CODE:	FIELD-FILTERED:	FILTER SIZE (µm):
7	HDPE	No	NA
		Filtration Equipment Type:	NA

FIELD DECONTAMINATION: PUMP: No TUBING: No DUPLICATE: None Collected

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION					
SAMPLE ID CODE	# CONTAINERS	MAT. CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
MW01005	2	HDPE	125	Ice (4 °C)	NA	Not Recorded	PFAS (EPA 537)	APP	500

REMARKS:
None

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; HDPE = High Density Polyethylene; LDPE = Low Density Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After (Through) Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: **1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.**

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)
pH: + 0.2 units **Temperature:** + 0.2 oC **Specific Conductance:** + 5% **Dissolved Oxygen:** all readings < 20% saturation (see Table FS 2200-2); optionally, + 0.2 mg/L or + 10% (whichever is greater) **Turbidity:** all readings < 20 NTU; optionally + 5 NTU or + 10% (whichever is greater)

QA/QC'd by: Thomas W. Hensel **QA/QC Date: 6/15/2017**

DEP Form FD 9000-24: GROUNDWATER SAMPLING LOG

SITE NAME:	Patrick AFB (PTRCK)	SITE LOCATION:	AFFF Release Area 1
WELL NO:	MW01006	SAMPLE ID:	PTRCK01-GW-006
DATE:	05/25/17		

PURGING DATA

WELL DIAMETER (inches):	TUBING DIAMETER (inches):	WELL SCREEN INTERVAL DEPTH:	STATIC WATER DEPTH (feet):	PURGE PUMP TYPE OR BAILER:
2	1/4	5 to 15	5.42	PP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)
= (15.0 feet – 5.42 feet) X 0.082 gallons/foot X 3.785 liters/gallon = 5.9 liters

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= gallons + (gallons/foot X feet) + gallons = gallons

INITIAL PUMP OR TUBING DEPTH IN WELL	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	PURGING NITIATED AT:	PURGING ENDED AT:	TOTAL VOLUME PURGED (liters):
7	7	1040	1122	21

TIME	VOLUME PURGED ({Purging-Volume})	CUMUL. VOLUME PURGED (liters)	PURGE RATE (mL/min)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (mS/cm)	DISSOLVED OXYGEN (mg/L)	ORP (mV)	TURBIDITY (NTUs)	COLOR	ODOR
10:48	4	4	500	5.42	7.73	26.90	0.553	0.15	-242.0	9.17	Clear	None
10:56	8	12	500	5.42	7.53	26.84	0.592	0.18	-258.3	6.06	Clear	None
11:04	12	24	500	5.42	7.59	27.07	0.595	0.28	-261.1	4.26	Clear	None
11:12	16	40	500	5.42	7.61	27.17	0.605	0.55	-263.3	3.05	Clear	None
11:20	20	60	500	5.42	7.58	27.06	0.607	0.57	-263.9	3.51	Clear	None
				Final Values	7.58	27.06	0.607	0.57	-263.9	3.51		

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88

TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
Jason Drizd Amec Foster Wheeler		1122	1124

PUMP OR TUBING DEPTH IN WELL (feet):	TUBING MATERIAL CODE:	FIELD-FILTERED:	FILTER SIZE (µm):
7	HDPE	No	NA
		Filtration Equipment Type:	NA

FIELD DECONTAMINATION: PUMP: No TUBING: No DUPLICATE: None Collected

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION					
SAMPLE ID CODE	# CONTAINERS	MAT. CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
MW01006	2	HDPE	125	Ice (4 °C)	NA	Not Recorded	PFAS (EPA 537)	APP	500

REMARKS:
None

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; HDPE = High Density Polyethylene; LDPE = Low Density Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After (Through) Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: **1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.**

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)
pH: + 0.2 units **Temperature:** + 0.2 oC **Specific Conductance:** + 5% **Dissolved Oxygen:** all readings < 20% saturation (see Table FS 2200-2); optionally, + 0.2 mg/L or + 10% (whichever is greater) **Turbidity:** all readings < 20 NTU; optionally + 5 NTU or + 10% (whichever is greater)

QA/QC'd by: Thomas W. Hensel **QA/QC Date: 6/15/2017**

DEP Form FD 9000-24: GROUNDWATER SAMPLING LOG

SITE NAME:	Patrick AFB (PTRCK)	SITE LOCATION:	AFFF Release Area 2
WELL NO:	MW02001	SAMPLE ID:	PTRCK02-GW-001
DATE:	05/23/17		

PURGING DATA

WELL DIAMETER (inches):	TUBING DIAMETER (inches):	WELL SCREEN INTERVAL DEPTH:	STATIC WATER DEPTH (feet):	PURGE PUMP TYPE OR BAILER:
1	1/4	5 to 10	6.69	PP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)
= (10.0 feet – 6.69 feet) X 0.041 gallons/foot X 3.785 liters/gallon = 0.5 liters

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= gallons + (gallons/foot X feet) + gallons = gallons

INITIAL PUMP OR TUBING DEPTH IN WELL	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	PURGING NITIATED AT:	PURGING ENDED AT:	TOTAL VOLUME PURGED (liters):
8.5	8.5	1203	1214	5.5

TIME	VOLUME PURGED ({Purging-Volume})	CUMUL. VOLUME PURGED (liters)	PURGE RATE (mL/min)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (mS/cm)	DISSOLVED OXYGEN (mg/L)	ORP (mV)	TURBIDITY (NTUs)	COLOR	ODOR
1205	1	1	500	6.69	6.92	27.97	0.535	0.53	40.6	9.10	Clear	NA
1207	2	3	500	6.69	6.72	28.00	0.538	0.42	39.5	9.98	Clear	NA
1209	3	6	500	6.69	6.68	27.97	0.537	0.38	37.1	7.05	Clear	NA
1211	4	10	500	6.69	6.69	28.00	0.537	0.36	34.0	6.60	Clear	NA
				Final Values	6.69	28.00	0.537	0.36	34.0	6.60		

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88

TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
Jason Drizd Amec Foster Wheeler		1214	1216

PUMP OR TUBING DEPTH IN WELL (feet):	TUBING MATERIAL CODE:	FIELD-FILTERED:	FILTER SIZE (µm):
8.5	HDPE	No Filtration Equipment Type: NA	NA

FIELD DECONTAMINATION: PUMP: No TUBING: No DUPLICATE: None Collected

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION					
SAMPLE ID CODE	# CONTAINERS	MAT. CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
MW02001	2	HDPE	125	Ice (4 °C)	NA	Not Recorded	PFAS (EPA 537)	APP	500

REMARKS:
None

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; HDPE = High Density Polyethylene; LDPE = Low Density Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After (Through) Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: **1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.**

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)
pH: + 0.2 units **Temperature:** + 0.2 oC **Specific Conductance:** + 5% **Dissolved Oxygen:** all readings < 20% saturation (see Table FS 2200-2); optionally, + 0.2 mg/L or + 10% (whichever is greater) **Turbidity:** all readings < 20 NTU; optionally + 5 NTU or + 10% (whichever is greater)

QA/QC'd by: Thomas W. Hensel **QA/QC Date: 6/14/2017**

DEP Form FD 9000-24: GROUNDWATER SAMPLING LOG

SITE NAME:	Patrick AFB (PTRCK)	SITE LOCATION:	AFFF Release Area 2
WELL NO:	MW02002	SAMPLE ID:	PTRCK02-GW-002
DATE:	05/23/17		

PURGING DATA

WELL DIAMETER (inches):	TUBING DIAMETER (inches):	WELL SCREEN INTERVAL DEPTH:	STATIC WATER DEPTH (feet):	PURGE PUMP TYPE OR BAILER:
1	1/4	5 to 10	7.18	PP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)
= (10.0 feet – 7.18 feet) X 0.041 gallons/foot X 3.785 liters/gallon = 0.4 liters

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= gallons + (gallons/foot X feet) + gallons = gallons

INITIAL PUMP OR TUBING DEPTH IN WELL	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	PURGING NITIATED AT:	PURGING ENDED AT:	TOTAL VOLUME PURGED (liters):
9	9	1025	1044	7.5

TIME	VOLUME PURGED ({Purging-Volume])	CUMUL. VOLUME PURGED (liters)	PURGE RATE (mL/min)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (mS/cm)	DISSOLVED OXYGEN (mg/L)	ORP (mV)	TURBIDITY (NTUs)	COLOR	ODOR
1030	2.5	2.5	500	7.18	7.01	28.50	0.771	0.33	2.3	12.5	Clear	NA
1035	5	7.5	500	7.18	6.88	28.37	0.769	0.44	1.7	7.11	Clear	NA
1040	7.5	15	500	7.18	6.83	28.39	0.769	0.59	1.4	5.10	Clear	NA
				Final Values	6.83	28.39	0.769	0.59	1.4	5.10		

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88

TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
Jason Drizd Amec Foster Wheeler		1103	1107

PUMP OR TUBING DEPTH IN WELL (feet):	TUBING MATERIAL CODE:	FIELD-FILTERED:	FILTER SIZE (µm):
9	HDPE	No	NA
		Filtration Equipment Type:	NA

FIELD DECONTAMINATION: PUMP: No TUBING: No DUPLICATE: PTRCK-FD-GW-001

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION					
SAMPLE ID CODE	# CONTAINERS	MAT. CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
MW02002	2	HDPE	125	Ice (4 °C)	NA	Not Recorded	PFAS (EPA 537)	APP	250

REMARKS:

None

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; HDPE = High Density Polyethylene; LDPE = Low Density Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After (Through) Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: **1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.**

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)
pH: + 0.2 units **Temperature:** + 0.2 oC **Specific Conductance:** + 5% **Dissolved Oxygen:** all readings < 20% saturation (see Table FS 2200-2); optionally, + 0.2 mg/L or + 10% (whichever is greater) **Turbidity:** all readings < 20 NTU; optionally + 5 NTU or + 10% (whichever is greater)

QA/QC'd by: Thomas W. Hensel **QA/QC Date: 6/14/2017**

DEP Form FD 9000-24: GROUNDWATER SAMPLING LOG

SITE NAME:	Patrick AFB (PTRCK)	SITE LOCATION:	AFFF Release Area 2
WELL NO:	MW02003	SAMPLE ID:	PTRCK02-GW-003
DATE:	05/23/17		

PURGING DATA

WELL DIAMETER (inches):	TUBING DIAMETER (inches):	WELL SCREEN INTERVAL DEPTH:	STATIC WATER DEPTH (feet):	PURGE PUMP TYPE OR BAILER:
1	1/4	5 to 10	7.65	PP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)
= (10.0 feet – 7.65 feet) X 0.041 gallons/foot X 3.785 liters/gallon = 0.4 liters

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= gallons + (gallons/foot X feet) + gallons = gallons

INITIAL PUMP OR TUBING DEPTH IN WELL	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	PURGING NITIATED AT:	PURGING ENDED AT:	TOTAL VOLUME PURGED (liters):
9	9	1116	1135	5

TIME	VOLUME PURGED ({Purging-Volume])	CUMUL. VOLUME PURGED (liters)	PURGE RATE (mL/min)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (mS/cm)	DISSOLVED OXYGEN (mg/L)	ORP (mV)	TURBIDITY (NTUs)	COLOR	ODOR
1127	1	1	500	7.65	7.03	28.63	0.580	0.54	-28.1	8.76	Clear	NA
1129	2	3	500	7.65	6.86	28.58	0.578	0.54	-26.1	5.67	Clear	NA
1131	3	6	500	7.65	6.76	28.51	0.576	0.46	-25.1	4.29	Clear	NA
1133	4	10	500	7.65	6.68	28.48	0.575	0.44	-24.8	3.10	Clear	NA
				Final Values	6.68	28.48	0.575	0.44	-24.8	3.10		

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88

TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
Jason Drizd Amec Foster Wheeler		1135	1137

PUMP OR TUBING DEPTH IN WELL (feet):	TUBING MATERIAL CODE:	FIELD-FILTERED:	FILTER SIZE (µm):
9	HDPE	No Filtration Equipment Type:	NA NA

FIELD DECONTAMINATION: PUMP: No TUBING: No DUPLICATE: None Collected

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION					
SAMPLE ID CODE	# CONTAINERS	MAT. CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
MW02003	2	HDPE	125	Ice (4 °C)	NA	Not Recorded	PFAS (EPA 537)	APP	500

REMARKS:
None

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; HDPE = High Density Polyethylene; LDPE = Low Density Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After (Through) Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: **1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.**

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)
pH: + 0.2 units **Temperature:** + 0.2 oC **Specific Conductance:** + 5% **Dissolved Oxygen:** all readings < 20% saturation (see Table FS 2200-2); optionally, + 0.2 mg/L or + 10% (whichever is greater) **Turbidity:** all readings < 20 NTU; optionally + 5 NTU or + 10% (whichever is greater)

QA/QC'd by: Thomas W. Hensel **QA/QC Date: 6/14/2017**

DEP Form FD 9000-24: GROUNDWATER SAMPLING LOG

SITE NAME:	Patrick AFB (PTRCK)	SITE LOCATION:	AFFF Release Area 3
WELL NO:	MW03001	SAMPLE ID:	PTRCK03-GW-001
DATE:	05/24/17		

PURGING DATA

WELL DIAMETER (inches):	TUBING DIAMETER (inches):	WELL SCREEN INTERVAL DEPTH:	STATIC WATER DEPTH (feet):	PURGE PUMP TYPE OR BAILER:
2	1/4	5 to 15	5.56	PP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)
= (15.0 feet – 5.56 feet) X 0.082 gallons/foot X 3.785 liters/gallon = 5.9 liters

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= gallons + (gallons/foot X feet) + gallons = gallons

INITIAL PUMP OR TUBING DEPTH IN WELL	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	PURGING NITIATED AT:	PURGING ENDED AT:	TOTAL VOLUME PURGED (liters):
7	7	1254	1316	21

TIME	VOLUME PURGED ({Purging-Volume})	CUMUL. VOLUME PURGED (liters)	PURGE RATE (mL/min)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (mS/cm)	DISSOLVED OXYGEN (mg/L)	ORP (mV)	TURBIDITY (NTUs)	COLOR	ODOR
1302	4	4	500	5.52	7.67	26.89	2.228	0.08	-257.2	84.6	Clear	None
1310	8	12	500	5.52	7.35	26.99	2.223	0.07	-270.1	18.9	Clear	None
1318	12	24	500	5.52	7.30	27.03	2.209	0.06	-279.4	13.3	Clear	None
1326	16	40	500	5.52	7.30	26.95	2.204	0.11	-289.8	7.12	Clear	None
1334	20	60	500	5.52	7.31	26.92	2.198	0.12	-293.3	6.94	Clear	None
				Final Values	7.31	26.92	2.198	0.12	-293.3	6.94		

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88

TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
Jason Drizd Amec Foster Wheeler		1336	1338

PUMP OR TUBING DEPTH IN WELL (feet):	TUBING MATERIAL CODE:	FIELD-FILTERED:	FILTER SIZE (µm):
7	HDPE	No	NA
		Filtration Equipment Type:	NA

FIELD DECONTAMINATION: PUMP: No TUBING: No DUPLICATE: None Collected

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION					
SAMPLE ID CODE	# CONTAINERS	MAT. CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
MW03001	2	HDPE	125	Ice (4 °C)	NA	Not Recorded	PFAS (EPA 537)	APP	500

REMARKS:
None

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; HDPE = High Density Polyethylene; LDPE = Low Density Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After (Through) Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: **1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.**

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)
pH: + 0.2 units **Temperature:** + 0.2 oC **Specific Conductance:** + 5% **Dissolved Oxygen:** all readings < 20% saturation (see Table FS 2200-2); optionally, + 0.2 mg/L or + 10% (whichever is greater) **Turbidity:** all readings < 20 NTU; optionally + 5 NTU or + 10% (whichever is greater)

QA/QC'd by: Thomas W. Hensel **QA/QC Date: 6/14/2017**

DEP Form FD 9000-24: GROUNDWATER SAMPLING LOG

SITE NAME:	PTRCK - Patrick AFB	SITE LOCATION:	AFFF Release Area 3
WELL NO:	MW03002	SAMPLE ID:	PTRCK03-GW-002
DATE:	05/24/17		

PURGING DATA

WELL DIAMETER (inches):	TUBING DIAMETER (inches):	WELL SCREEN INTERVAL DEPTH:	STATIC WATER DEPTH (feet):	PURGE PUMP TYPE OR BAILER:
2	1/4	5 to 15	5.25	PP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)
= (15.0 feet – 5.25 feet) X 0.082 gallons/foot X 3.785 liters/gallon = 6.1 liters

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= gallons + (gallons/foot X feet) + gallons = gallons

INITIAL PUMP OR TUBING DEPTH IN WELL	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	PURGING NITIATED AT:	PURGING ENDED AT:	TOTAL VOLUME PURGED (liters):
7	7	1402	1450	25

TIME	VOLUME PURGED ({Purging-Volume})	CUMUL. VOLUME PURGED (liters)	PURGE RATE (mL/min)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (mS/cm)	DISSOLVED OXYGEN (mg/L)	ORP (mV)	TURBIDITY (NTUs)	COLOR	ODOR
1410	4	4	500	5.25	7.30	26.54	0.935	0.27	-120.9	16.4	Clear	None
1418	8	12	500	5.25	7.48	26.90	0.925	0.26	-181.8	12.8	Clear	None
1426	12	24	500	5.25	7.53	26.92	0.929	0.47	-205.4	12.0	Clear	None
1432	16	40	500	5.25	7.51	26.55	0.927	0.91	-217.4	12.0	Clear	None
1440	20	60	500	5.25	7.51	26.58	0.932	0.91	-229.3	10.9	Clear	None
1448	24	84	500	5.25	7.51	26.49	0.928	0.89	-229.4	7.28	Clear	None
				Final Values	7.51	26.49	0.928	0.89	-229.4	7.28		

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88

TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
Jason Drizd Amec Foster Wheeler		1450	1452

PUMP OR TUBING DEPTH IN WELL (feet):	TUBING MATERIAL CODE:	FIELD-FILTERED:	FILTER SIZE (µm):
7	HDPE	No Filtration Equipment Type:	NA NA

FIELD DECONTAMINATION: PUMP: No TUBING: No DUPLICATE: PTRCK-FD-GW-002

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION					
SAMPLE ID CODE	# CONTAINERS	MAT. CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
MW03002	2	HDPE	125	Ice (4 °C)	NA	Not Recorded	PFAS (EPA 537)	APP	250

REMARKS:
None

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; HDPE = High Density Polyethylene; LDPE = Low Density Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After (Through) Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: **1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.**

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)

pH: + 0.2 units **Temperature:** + 0.2 oC **Specific Conductance:** + 5% **Dissolved Oxygen:** all readings < 20% saturation (see Table FS 2200-2); optionally, + 0.2 mg/L or + 10% (whichever is greater) **Turbidity:** all readings < 20 NTU; optionally + 5 NTU or + 10% (whichever is greater)

QA/QC'd by: Thomas W. Hensel **QA/QC Date: 6/14/2017**

DEP Form FD 9000-24: GROUNDWATER SAMPLING LOG

SITE NAME:	Patrick AFB (PTRCK)	SITE LOCATION:	AFFF Release Area 3

WELL NO:	610-MW17	SAMPLE ID:	PTRCK03-GW-610-MW17	DATE:	05/24/17

PURGING DATA

WELL DIAMETER (inches):	TUBING DIAMETER (inches):	WELL SCREEN INTERVAL DEPTH:	STATIC WATER DEPTH (feet):	PURGE PUMP TYPE OR BAILER:
2	1/4	3 to 13	4.28	PP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)
= (7.5 feet – 4.28 feet) X 0.082 gallons/foot X 3.785 liters/gallon = 2.0 liters

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= gallons + (gallons/foot X feet) + gallons = gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet):	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	PURGING NITIATED AT:	PURGING ENDED AT:	TOTAL VOLUME PURGED (liters):
6	6	1533	1551	9

TIME	VOLUME PURGED ({Purging-Volume})	CUMUL. VOLUME PURGED (liters)	PURGE RATE (mL/min)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (mS/cm)	DISSOLVED OXYGEN (mg/L)	ORP (mV)	TURBIDITY (NTUs)	COLOR	ODOR
1536	1.5	1.5	500	4.28	7.54	28.34	4.524	2.22	-103.7	35.0	Yellow	None
1539	3	4.5	500	4.28	7.36	28.03	4.864	1.79	-123.3	6.78	Yellow	None
1542	4.5	9	500	4.28	7.27	27.92	4.889	1.89	-124.1	5.84	Yellow	None
1545	6	15	500	4.28	7.24	28.29	4.837	1.60	-110.7	5.78	Yellow	None
1548	7.5	22.5	500	4.28	7.30	28.38	4.865	1.52	-126.4	5.20	Yellow	None
				Final Values	7.30	28.38	4.865	1.52	-126.4	5.20		

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88

TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
Jason Drizd Amec Foster Wheeler		1551	1555

PUMP OR TUBING DEPTH IN WELL (feet):	TUBING MATERIAL CODE:	FIELD-FILTERED:	FILTER SIZE (µm):
6	HDPE	No	NA
		Filtration Equipment Type:	NA

FIELD DECONTAMINATION:	PUMP:	TUBING:	DUPLICATE:
	No	No	None Collected

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION					
SAMPLE ID CODE	# CONTAINERS	MAT. CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
610-MW17	2	HDPE	125	Ice (4 °C)	NA	Not Recorded	PFAS (EPA 537)	APP	500

REMARKS:

The sample ID should have been PTRCK03-GW-003 (TWH), can not change as it is PTRCK03-GW-610-MW17 on the chain of costody.

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; HDPE = High Density Polyethylene; LDPE = Low Density Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After (Through) Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: **1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.**

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)

pH: + 0.2 units **Temperature:** + 0.2 oC **Specific Conductance:** + 5% **Dissolved Oxygen:** all readings < 20% saturation (see Table FS 2200-2); optionally, + 0.2 mg/L or + 10% (whichever is greater) **Turbidity:** all readings < 20 NTU; optionally + 5 NTU or + 10% (whichever is greater)

QA/QC'd by: Thomas W. Hensel **QA/QC Date: 6/14/2017**

APPENDIX D

LABORATORY ANALYTICAL REPORTS (DVD)

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APPENDIX E

DATA VALIDATION REPORT

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DATA VALIDATION REPORT

SITE INSPECTION OF AQUEOUS FILM FORMING FOAM (AFFF) RELEASE AREAS

ENVIRONMENTAL PROGRAMS WORLDWIDE

PATRICK AIR FORCE BASE

Samples Collected Between 22 and 25 May 2017

Prepared for:

Air Force Civil Engineer Center

Joint Base San Antonio – Lackland, Texas

Prepared by:

Contract FA8903-16-D-0027

Task Order 0004

July 2017

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ACRONYMS AND ABBREVIATIONS

%	percent
µg/L	micrograms per liter
6:2 FTS	6:2 Fluorotelomer sulfonate
8:2 FTS	8:2 Fluorotelomer sulfonate
Amec Foster Wheeler	Amec Foster Wheeler Environment & Infrastructure, Inc.
AFFF	Aqueous Film Forming Foam
CCV	Continuing Calibration Verification
CLP	Contract Laboratory Program
COC	Chain of Custody
DoD	Department of Defense
DL	detection limit
EPA	United States Environmental Protection Agency
EtFOSAA	Ethylperfluorooctane sulfonamidoacetic acid
ICV	Initial Calibration Verification
ID	Identification
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LOQ	Limit of Quantification
MeFOSAA	Methylperfluorooctane sulfonamidoacetic acid
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PFASs	Per- and polyfluoroalkyl substances
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
PFTeDA	Perfluorotetradecanoic acid
PFTrDA	Perfluorotridecanoic acid
PFUnA	Perfluoroundecanoic acid
QC	Quality Control
QPP	Quality Program Plan
RPD	Relative Percent Difference
SGS	SGS Accutest

1.0 INTRODUCTION

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler) collected eighteen water samples (including two field duplicates, two equipment blanks, one proficiency testing sample, and one field blank) and twenty-two soil samples (including two field duplicates) between 22 and 25 May 2017, from Patrick Air Force Base, located in Brevard County, Florida. Amec Foster Wheeler submitted the samples to SGS Accutest (SGS), located in Orlando, Florida on 26 May 2017. SGS assigned the samples to sample delivery group FA44407. SGS analyzed the samples for per- and polyfluoroalkyl substances (PFASs) by modified United States Environmental Protection Agency (EPA) Method 537. A list of these samples by field sample identification (ID), sample collection date, sample matrix, and laboratory sample ID is presented in Table 1.

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2.0 DATA VALIDATION METHODOLOGY

Amec Foster Wheeler performed EPA Stage 4 validation on 10 percent (%) of the samples and EPA Stage 2B validation on the remaining samples associated with this sampling event, as indicated on Table 1. The Stage 4 validation includes review of the quality control (QC) results in the laboratory's analytical report and reported on QC summary forms as well as recalculation checks and review of the instrument raw data outputs. The Stage 2B validation includes review of the QC results in the laboratory's analytical report and reported on QC summary forms, with no review of the associated raw data. Data from equipment and field blanks did not undergo validation because results from these samples are only used to assess data usability for field samples. This data validation has been performed in general accordance with:

- Amec Foster Wheeler, 2016. Draft, Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas, Environmental Programs Worldwide, Quality Program Plan (QPP), Contract FA8903-16-D-0027, Task Order 0004, December 2016.
- Department of Defense (DoD), 2013. DoD Quality Systems Manual for Environmental Laboratories, Version 5.0. July 2013.
- EPA, 2009. Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry, Version 1.1, September 2009. EPA Document #: EPA/600/R-08/092.
- EPA, 2014. EPA Contract Laboratory Program (CLP) National Functional Guidelines for Superfund Organic Methods Data Review, EPA/540-R-014-002.

The CLP guideline was written specifically for the CLP, and has been modified for the purposes of this data review where it differs from method-specific, QPP-specified, and laboratory-specified QC requirements.

The laboratory's certified analytical report and supporting documentation were reviewed to assess the following:

- Data package and electronic data deliverable completeness;
- Laboratory case narrative review;
- Chain of custody (COC) compliance;
- Holding time compliance;
- QC sample frequency;
- Initial calibration, initial calibration verification (ICV), and continuing calibration verification (CCV) compliance with method-specified criteria;
- Presence or absence of laboratory contamination as demonstrated by laboratory blanks;

- Accuracy and bias as demonstrated by recovery of surrogate spikes, laboratory control sample (LCS), and matrix spike (MS) samples;
- Internal standard recoveries;
- Analytical precision as relative percent difference (RPD) of analyte concentration between laboratory duplicates or MS/MS duplicate (MSD);
- Sampling and analytical precision as RPD of analyte concentration between field duplicates;
- Assessment of field contamination as demonstrated by field and equipment blanks;
- Insofar as possible, the degree of conformance to method requirements and good laboratory practices.

In general, it is important to recognize that no analytical data are guaranteed to be correct, even if all QC audits are passed. Strict QC serves to increase confidence in data, but any reported value may potentially contain error.

3.0 EXPLANATION OF DATA QUALITY INDICATORS

Summary explanations of the specific data quality indicators reviewed during this data quality review are presented below.

3.1 LABORATORY CONTROL SAMPLE RECOVERIES

LCSs and LCS duplicates (LCSDs) are aliquots of analyte-free matrices that are spiked with the analytes of interest for an analytical method, or a representative subset of those analytes. The spiked matrix is then processed through the same analytical procedures as the samples they accompany. LCS recovery is an indication of a laboratory's ability to successfully perform an analytical method in an interference-free matrix.

3.2 MATRIX SPIKE RECOVERIES

MSs and MSDs are prepared by adding known amounts of the analytes of interest for an analytical method, or a representative subset of those analytes, to an aliquot of sample. The spiked sample is then processed through the same extraction, concentration, cleanup, and analytical procedures as the unspiked samples in an analytical batch.

MS recovery and precision are an indication of a laboratory's ability to successfully recover an analyte in the matrix of a specific sample or closely related sample matrices. It is important not to apply MS results for any specific sample to other samples without understanding how the sample matrices are related.

3.3 SURROGATE SPIKE RECOVERIES

Surrogate spikes are used to evaluate accuracy, method performance, and extraction efficiency in each individual sample. Surrogate compounds are compounds not normally found in environmental samples, but which are similar to target analytes in chemical composition and behavior in the analytical process.

3.4 BLANK CONCENTRATIONS

Blank samples are aliquots of analyte free matrix that are used as negative controls to verify that the sample collection, storage, preparation, and analysis system does not produce false positive results.

Equipment blanks are prepared by passing analyte-free water through or over sample collection equipment and collecting the water in sample containers. Equipment blanks are analyzed for the analytical suite required for the project. Equipment blanks are used to monitor for possible sample contamination during the sample collection process and serve as a check on the effectiveness of field decontamination procedures.

Field blanks are prepared by pouring an aliquot of analyte-free water into a sample container in the field. Field blanks are analyzed for the analytical suite required for the project. Field blanks are used to monitor for possible sample contamination originating from the water used for equipment decontamination.

Laboratory, equipment, and field blanks are processed by the laboratory using exactly the same procedures as the field samples. Target analytes should not be found in laboratory blanks.

When target analytes are detected in blanks, analyte concentrations in the associated samples less than 10 times the concentration detected in the blank will be B qualified.

3.5 LABORATORY AND FIELD DUPLICATES

Laboratory and field duplicate analysis verifies acceptable method precision by the laboratory at the time of preparation and analysis and/or sampling precision at the time of collection.

4.0 DEFINITIONS OF QUALIFIERS THAT MAY BE USED DURING DATA VALIDATION

B The analyte was detected in the sample and an associated blank and the concentration detected in the sample was less than ten times the concentration detected in the blank.

U The analyte was analyzed for, but was not detected.

J The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

Q The analyte is both B qualified because of blank detection and J qualified because of an additional QC issue.

UJ The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R The sample result is rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

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5.0 QUALIFICATION REASON CODES

Amec Foster Wheeler applied the following reason code to the data during validation:

FDD Field duplicate imprecision

LCL Low LCS recovery. Analytical result may be biased low.

SGH High surrogate recovery. Analytical result may be biased high.

SGL Low surrogate recovery. Analytical result may be biased low.

TR Detected concentration is less than the limit of quantification (LOQ).

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6.0 CHAIN OF CUSTODY AND SAMPLE RECEIPT CONDITION DOCUMENTATION

The samples were received at the laboratory under proper COC, intact, properly preserved, and at temperatures less than the QPP-specified maximum of 10 degrees Celsius.

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7.0 SPECIFIC DATA VALIDATION FINDINGS

Results from these samples may be considered usable with the limitations and exceptions described Sections 7.1 through 0.

7.1 PER- AND POLYFLUOROALKYL SUBSTANCES BY MODIFIED EPA METHOD 537

PFAS results generated by SGS are usable with the limitations described in Sections 7.1.1 through 7.1.11.

7.1.1 Holding Times

The aqueous samples were extracted for PFASs within the QPP-specified maximum holding time of 14 days from sample collection and the extracts were analyzed within the QPP-specified maximum hold time of 28 days from extraction. The solid samples were extracted for PFASs within the method-recommended maximum holding time of 60 days from sample collection and the extracts were analyzed within the method-recommended 30 days from extraction.

7.1.2 Initial Calibrations

The ICALs associated with the analysis of these samples met the QSM-specified criteria of correlation coefficients greater than 0.99 and the calibration standards calculating to 70 to 130% of its true concentrations.

7.1.3 Initial Calibration Verification

ICV recoveries were within the QPP-specified 75% to 125% limits, with the following exceptions.

- Ethylperfluorooctane sulfonamidoacetic acid (EtFOSAA) recovery was high at 129% in the ICV associated with samples PTRK02-GW-002, PTRK-FD-GW-001, PTRK-GW-001, PTRK02-GW-001, PTRK02-GW-003, PTRK01-GW-001, PTRK01-GW-002, PTRK03-GW-001, and PTRK03-GW-002. EtFOSAA was not detected in these samples and data usability is not adversely affected by the potential high analytical bias.

7.1.4 Continuing Calibration Verification

CCV recoveries were within the QPP specified 75% to 125% limits, with the following exception.

- Perfluorohexanoic acid (PFHxA) recovery was low at 71.7% in the closing CCV associated with the diluted analysis of sample PTRK01-SO-007. Only perfluorooctanesulfonic acid (PFOS) was reported from the diluted analysis of this sample and data usability is not adversely affected.

7.1.5 Laboratory Blanks

PFASs were not detected in the laboratory blanks associated with these samples.

7.1.6 Field and Equipment Blanks

PFASs were not detected in the field and equipment blanks associated with these samples.

7.1.7 Laboratory Control Sample Accuracy

LCS recoveries were within QPP-specified 70 to 130% limits, with the following exceptions:

- Perfluorododecanoic acid (PFDoA) (64%), perfluorotridecanoic acid (PFTrDA) (62%), perfluorotetradecanoic aicd (PFTeDA) (67%), 6:2 fluorotelomer sulfonate (6:2 FTS) (140%), and 8:2 fluorotelomer sulfonate (8:2 FTS) (136%) recoveries were outside specified limits in the LCS associated with samples PTRK02-GW-002, PTRK-FD-GW-001, and PTRK-GW-001. Data limitations are summarized below.
  - Amec Foster Wheeler UJ qualified the non-detected PFDoA, PFTrDA, and PFTeDA results from samples PTRK02-GW-002 and PTRK-FD-GW-001 because of potential low analytical bias. (Qualifier and reason code: UJ-LCL)
  - 6:2 FTS and 8:2 FTS were not detected in these samples and data usability is not adversely affected by the potential high analytical bias.
  - Sample PTRK-GW-001 is a proficiency testing sample, not a field sample, and no qualifiers were applied to the sample results.
- PFDoA (68%), PFTrDA (63%), and PFTeDA (66%) recoveries were low in the LCS associated with samples PTRK02-GW-001, PTRK02-GW-003, PTRK01-GW-001, PTRK01-GW-002, PTRK03-GW-001, and PTRK03-GW-002. Amec Foster Wheeler UJ qualified the non-detected PFDoA, PFTrDA, and PFTeDA results from these samples because of the potential low analytical bias. (Qualifier and reason code: UJ-LCL)
- PFTrDA and PFTeDA recoveries were low at 64% and 68%, respectively, in the LCS associated with samples PTRK03-GW-610-MW17, PTRK-FD-GW-002, PTRK01-GW-003, PTRK01-GW-004, PTRK01-GW-005, and PTRK01-GW-006. Amec Foster Wheeler UJ qualified the non-detected PFTrDA and PFTeDA results from these samples because of the potential low analytical bias. (Qualifier and reason code: UJ-LCL)

7.1.8 Matrix Spikes/ Matrix Spike Duplicates

SGS performed MS and MSD analyses on samples PTRK01-GW-001, PTRK01-SO-010, and PTRK01-GW-006. Recoveries were within the QPP-specified 70 to 130% limits and RPDs between MS and MSD results were less than the QPP-specified maximum of 30%, with the following exceptions.

- Perfluorodecanoic acid (PFDA) recovery was high at 131% in the MS performed on sample PTRK01-GW-001. PFDA was not detected in this sample and data usability is not adversely affected by the potential high analytical bias.
- Perfluorohexanesulfonic acid (PFHxS) (182%-MSD), PFOS (230%-MSD), and 6:2 FTS (34%, 250%) recoveries were outside specified limits in the MS and/or MSD performed on sample PTRK01-SO-010. The concentrations of the spikes for PFHxS, PFOS, and 6:2 FTS in the native, unspiked sample were

greater than four times the concentration of the spike and it is not possible to evaluate data usability based on spike recoveries for these analytes.

- All PFAS analytes were outside of specified limits in the MS and MSD performed on sample PTRK01-GW-006. This sample and the MS/MSD were performed at 250 and 200-fold dilutions. At these dilutions, it is not possible to accurately resolve the added spikes of target analytes. It is not possible to evaluate data usability based on spike recoveries for this sample.

7.1.9 Surrogate Recoveries

Surrogate recoveries were within the QPP-specified 70 to 130% limits, with the following exceptions:

- Recoveries of the surrogate compound $^{13}C_2$-PFHxA were low in the analysis of samples PTRK02-SO-004 (67%), PTRK02-SO-006 (66%), and PTRK-FD-SO-001 (66%). These recoveries were within laboratory-specified limits and SGS did not re-extract or reanalyze these samples. Amec Foster Wheeler J qualified the detected and UJ qualified the non-detected 6:2 FTS, perfluorobutanesulfonic acid (PFBS), perfluoroheptanoic acid (PFHpA), PFHxA, PFHxS, PFOS, and perfluorooctanoic acid (PFOA) results from these samples because of the potential low analytical bias. (Qualifier and reason code: J/UJ-SGL)
- Recovery of the surrogate compound $^{13}C_2$-PFDA was high at 143% in the undiluted analysis of sample PTRK-FD-GW-001. Data limitations are summarized below.
  - Amec Foster Wheeler J qualified the detected perfluorononanoic acid (PFNA) result from this sample because of the potential high analytical bias. (Qualifier and reason code: J-SGH)
  - 8:2 FTS, perfluoroundecanoic acid (PFUnA), PFDoA, PFTrDA, PFTeDA, and PFDA were not detected in this sample and data usability is not adversely affected by the potential high analytical bias.
- Recoveries of the surrogate compounds $^{13}C_2$-PFHxA (152%), $^{13}C_2$-PFDA (166%), and d5-EtFOSAA (146%) were high in the 5-fold dilution performed on sample PTRK-FD-GW-001. Data limitations are summarized below.
  - Amec Foster Wheeler J qualified the detected PFOS result from this sample because of the potential high analytical bias. (Qualifier and reason code: J-SGH)
  - The remaining analytes were reported from the undiluted analysis of this sample and data usability is not adversely affected.
- Recovery of the surrogate compound $^{13}C_2$-PFHxA was low at 65% in the undiluted analysis of sample PTRK01-SO-001. This recovery was within laboratory-specified limits and SGS did not re-extract or reanalyze these samples. Data limitations are summarized below.

  - Amec Foster Wheeler J qualified the detected 6:2 FTS, PFBS, PFHpA, PFHxA, PFHxS, and PFOA results from this sample because of the potential low analytical bias. (Qualifier and reason code: J-SGL)
  - PFOS was reported from the diluted analysis of this sample and data usability is not adversely affected.

- Surrogate compounds were not recovered in the 10-fold dilution performed on sample PTRK01-SO-007, the 20-fold dilution performed on sample PTRK03-GW-001, the 25-fold dilution performed on sample PTRK01-GW-005, the 50-fold dilution performed on sample PTRK01-SO-009, and the 250-fold dilutions performed on samples PTRK01-GW-004 and PTRK01-GW-006. These samples were diluted past the instrument's ability to accurately resolve the surrogate compounds and it is not possible to evaluate data usability based on surrogate recoveries for these analyses.
- Recovery of the surrogate compound d5-EtFOSAA was high at 161% in the diluted analysis of sample PTRK01-SO-010. EtFOSAA and methylperfluorooctane sulfonamidoacetic acid (MeFOSAA) were reported from the undiluted analysis of this sample and data usability is not adversely affected.
- Recovery of the surrogate compound $^{13}C_2$-PFDA was high at 147% in the analysis of sample PTRK02-GW-001. Data limitations are summarized below.
  - Amec Foster Wheeler J qualified the detected PFNA result from this sample because of the potential high analytical bias. (Qualifier and reason code: J-SGH)
  - 8:2 FTS, PFUnA, PFDoA, PFTrDA, PFTeDA, and PFDA were not detected in this sample and data usability is not adversely affected by the potential high analytical bias.
- Recovery of the surrogate compound $^{13}C_2$-PFDA was high at 159% in the undiluted analysis of sample PTRK02-GW-003. Data limitations are summarized below.
  - Amec Foster Wheeler J qualified the detected PFNA result from this sample because of the potential high analytical bias. (Qualifier and reason code: J-SGH)
  - 8:2 FTS, PFUnA, PFDoA, PFTrDA, PFTeDA, and PFDA were not detected in this sample and data usability is not adversely affected by the potential high analytical bias.
- Recoveries of the surrogate compounds $^{13}C_2$-PFHxA (156%), $^{13}C_2$-PFDA (199%), and d5-EtFOSAA (169%) were high in the 2-fold dilution performed on sample PTRK02-GW-003. Data limitations are summarized below.
  - Amec Foster Wheeler J qualified the detected PFOS result from this sample because of the potential high analytical bias. (Qualifier and reason code: J-SGH)
  - The remaining analytes were reported from the undiluted analysis of this sample and data usability is not adversely affected.

- Recovery of the surrogate compound $^{13}C_2$-PFDA was high at 166% in the analysis of sample PTRK01-GW-001. Data limitations are summarized below.
  - Amec Foster Wheeler J qualified the detected PFNA result from this sample because of the potential high analytical bias. (Qualifier and reason code: J-SGH)
  - 8:2 FTS, PFUnA, PFDoA, PFTrDA, PFTeDA, and PFDA were not detected in this sample and data usability is not adversely affected by the potential high analytical bias.
- Recovery of the surrogate compound $^{13}C_2$-PFDA was high at 179% in the undiluted analysis of sample PTRK01-GW-002. Data limitations are summarized below.
  - Amec Foster Wheeler J qualified the detected PFNA result from this sample because of the potential high analytical bias. (Qualifier and reason code: J-SGH)
  - PFUnA, PFDoA, PFTrDA, PFTeDA, and PFDA were not detected in this sample and data usability is not adversely affected by the potential high analytical bias.
  - 8:2 FTS was reported from the diluted analysis of this sample and data usability is not adversely affected.
- Recoveries of the surrogate compounds $^{13}C_2$-PFDA and d5-EtFOSAA were high at 178% and 139%, respectively, in the 2-fold dilution of sample PTRK01-GW-002. Data limitations are summarized below.
  - Amec Foster Wheeler J qualified the detected 8:2 FTS result from this sample because of the potential high analytical bias. (Qualifier and reason code: J-SGH)
  - The remaining associated analytes were reported from the undiluted analysis of this sample and data usability is not adversely affected.
- Recovery of the surrogate compound $^{13}C_2$-PFHxA was low at 64% in the 2-fold dilution of sample PTRK01-SO-006. Data limitations are summarized below.
  - Amec Foster Wheeler J qualified the detected PFOS result from this sample because of the potential low analytical bias. (Qualifier and reason code: J-SGL)
  - The remaining analytes were reported from the undiluted analysis of this sample and data usability is not adversely affected.
- Recovery of the surrogate compound $^{13}C_2$-PFDA was high at 179% in the undiluted analysis of sample PTRK03-GW-001. Data limitations are summarized below.
  - Amec Foster Wheeler J qualified the detected PFNA result from this sample because of the potential high analytical bias. (Qualifier and reason code: J-SGH)

  - 8:2 FTS, PFUnA, PFDoA, PFTrDA, PFTeDA, and PFDA were not detected in this sample and data usability is not adversely affected by the potential high analytical bias.

- Recovery of the surrogate compound $^{13}C_2$-PFDA was high at 156% in the 2-fold dilution of sample PTRK03-GW-001. All associated analytes were reported from the undiluted analysis of this sample and data usability is not adversely affected.

- Recovery of the surrogate compound $^{13}C_2$-PFDA was high at 160% in the undiluted analysis of sample PTRK03-GW-002. Data limitations are summarized below.

  - Amec Foster Wheeler J qualified the detected PFNA result from this sample because of the potential high analytical bias. (Qualifier and reason code: J-SGH)

  - 8:2 FTS, PFUnA, PFDoA, PFTrDA, PFTeDA, and PFDA were not detected in this sample and data usability is not adversely affected by the potential high analytical bias.

- Recoveries of the surrogate compounds $^{13}C_2$-PFHxA (132%), $^{13}C_2$-PFDA (166%), and d5-EtFOSAA (150%) were high in the 5-fold dilution performed on sample PTRK03-GW-002. Data limitations are summarized below.

  - Amec Foster Wheeler J qualified the detected PFHxS and PFOS results from this sample because of the potential high analytical bias. (Qualifier and reason code: J-SGH)

  - The remaining analytes were reported from the undiluted analysis of this sample and data usability is not adversely affected.

- Recoveries of the surrogate compound d5-EtFOSAA were low in the undiluted analysis of samples PTRK-FD-GW-002 and PTRK01-GW-003 at 66% and 69%, respectively. Amec Foster Wheeler UJ qualified the non-detected EtFOSAA and MeFOSAA results from these samples because of the potential low analytical bias. (Qualifier and reason code: UJ-SGL)

7.1.10 Internal Standard Recoveries

Internal standard recoveries were within the QPP-specified limits of 50 to 150% of the average area counts measured during the initial calibration, with the following exception:

- Recoveries of the internal standard $^{13}C_2$-6:2 FTS were high in the undiluted analysis of samples PTRK01-SO-008 and PTRK01-SO-010 at 264% and 250%, respectively. 6:2 FTS and 8:2 FTS were reported from the diluted analyses of these samples and data usability is not adversely affected.

7.1.11 Data Reporting and Analytical Procedures

SGS J qualified analytes with concentrations between the detection limit (DL) and the LOQ. Amec Foster Wheeler agrees that these results are quantitatively uncertain and has J qualified these results. (Qualifier and reason code: J-TR)

Due to limitations in SGS' laboratory information management system, the laboratory reports incorrectly reference "extractables by GCMS by Method EPA 537 Mod" in the case narrative and "GC/MS semi-volatiles" in the table of contents and in section dividers. The samples were analyzed referencing EPA 537 Mod in the sample report forms using liquid chromatography/tandem mass spectroscopy, as specified in the raw analytical data forms.

SGS calibrates their instrument using linear and branched isomers, but the solution used for calibration verification and spiking contains linear isomers only. The analytical software is unable to correctly auto-integrate analytes when peaks for both linear and branched isomers are present, so the initial calibrations, CCVs, and samples containing both linear and branched isomers require manual integration. Other software limitations include not being able to print more than one chromatogram for each analyte and having the printed baselines appear high due to poor printing resolution. Since the manual integrations are performed to ensure that both linear and branched isomers are included in the analytical results, Amec Foster Wheeler's review of the manual integrations is a check to make sure both linear and branched isomer peaks are fully integrated.

A proficiency testing sample, PTRCK-GW-001, was submitted to SGS on 23 May 2017 containing 0.100 micrograms per liter (µg/L) of PFOA and 0.200 µg/L of PFOS. SGS analyzed the sample and detected 0.0977 µg/L for PFOA and 0.153 µg/L for PFOS, results which are within the established acceptance range of 60 to 140% of the spike value

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8.0 FIELD DUPLICATE RESULTS

Amec Foster Wheeler collected field duplicates with samples PTRK02-GW-002 (PTRK-FD-GW-001), PTRK02-SO-003 (PTRK-FD-SO-001), PTRK03-SO-004 (PTRK-FD-SO-002), and PTRK03-GW-002 (PTRK-FD-GW-002). Detected results and RPDs for the field duplicate are summarized in Table 2. Precision values were within the QPP-specified limits of less than 30% RPD or the difference between analytical results less than the LOQ, with the following exceptions.

- The RPD between PFOS results from sample PTRK03-SO-004 and its field duplicate PTRK-FD-SO-002 was high at 58%. Amec Foster Wheeler J qualified the detected PFOS results from these samples because of potential sampling or analytical imprecision. (Qualifier and reason code: J-FDD)
- RPDs between PFHxS and PFOS results from sample PTRK03-GW-002 and its field duplicate PTRK-FD-GW-002 were both high at 50%. Amec Foster Wheeler J qualified the detected PFHxS and PFOS results from these samples because of the potential sampling or analytical imprecision. (Qualifier and reason code: J-FDD)

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9.0 SUMMARY AND CONCLUSIONS

Amec Foster Wheeler evaluated a total of 576 data records from field samples during the validation. Amec Foster Wheeler J or UJ qualified 133 records (23%) as estimated values because of field duplicate imprecision, low LCS recoveries, high or low surrogate recoveries, and/or analyte concentrations between the DL and the LOQ. Qualified data are summarized in Table 3.

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REFERENCES

Amec Foster Wheeler, 2016. Draft, Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas, Environmental Programs Worldwide, Quality Program Plan (QPP), Contract FA8903-16-D-0027, Task Order 0004, December 2016.

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EPA, 2009. Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS), Version 1.1, September 2009. EPA Document #: EPA/600/R-08/092.

EPA, 2014. EPA Contract Laboratory Program (CLP) National Functional Guidelines for Superfund Organic Methods Data Review, EPA/540-R-014-002.

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TABLES

Table 1
Field Samples Submitted to SGS Accutest
Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Patrick Air Force Base, Florida

Sample Identification	Collection Date	Sample Matrix	Laboratory SDG	Laboratory Sample Identification	Notes
PTRK02-SO-001	23-May-17	Soil	FA44407	FA44407-1	
PTRK03-SO-001	22-May-17	Soil	FA44407	FA44407-2	
PTRK02-GW-002	23-May-17	Groundwater	FA44407	FA44407-3	
PTRK02-SO-002	23-May-17	Soil	FA44407	FA44407-4	
PTRK02-SO-003	23-May-17	Soil	FA44407	FA44407-5	
PTRK02-SO-004	23-May-17	Soil	FA44407	FA44407-6	
PTRK02-SO-005	23-May-17	Soil	FA44407	FA44407-7	Stage IV
PTRK02-SO-006	23-May-17	Soil	FA44407	FA44407-8	Stage IV
PTRK03-SO-002	22-May-17	Soil	FA44407	FA44407-9	Stage IV
PTRK-FD-GW-001	23-May-17	Groundwater	FA44407	FA44407-10	Field Duplicate of Sample PTRK02-GW-002
PTRK-FD-SO-001	23-May-17	Soil	FA44407	FA44407-11	Field Duplicate of Sample PTRK02-SO-003
PTRK-GW-001	23-May-17	Groundwater	FA44407	FA44407-12	Proficiency Testing Sample
PTRK01-SO-001	23-May-17	Soil	FA44407	FA44407-13	
PTRK01-SO-002	23-May-17	Soil	FA44407	FA44407-14	
PTRK01-SO-003	24-May-17	Soil	FA44407	FA44407-15	
PTRK01-SO-004	24-May-17	Soil	FA44407	FA44407-16	
PTRK01-SO-009	24-May-17	Soil	FA44407	FA44407-17	
PTRK01-SO-010	24-May-17	Soil	FA44407	FA44407-18	MS/MSD
PTRK02-GW-001	23-May-17	Groundwater	FA44407	FA44407-19	Stage IV
PTRK02-GW-003	23-May-17	Groundwater	FA44407	FA44407-20	Stage IV
PTRK03-SO-003	23-May-17	Soil	FA44407	FA44407-21	
PTRK03-SO-004	23-May-17	Soil	FA44407	FA44407-22	
PTRK-EB-001	23-May-17	QC Water	FA44407	FA44407-23	Equipment Blank
PTRK-FD-SO-002	23-May-17	Soil	FA44407	FA44407-24	Field Duplicate of Sample PTRK03-SO-004
PTRK01-GW-001	25-May-17	Groundwater	FA44407	FA44407-25	MS/MSD
PTRK01-GW-002	25-May-17	Groundwater	FA44407	FA44407-26	
PTRK01-SO-005	24-May-17	Soil	FA44407	FA44407-27	
PTRK01-SO-006	24-May-17	Soil	FA44407	FA44407-28	
PTRK01-SO-007	24-May-17	Soil	FA44407	FA44407-29	
PTRK01-SO-008	24-May-17	Soil	FA44407	FA44407-30	
PTRK03-GW-001	24-May-17	Groundwater	FA44407	FA44407-31	
PTRK03-GW-002	24-May-17	Groundwater	FA44407	FA44407-32	
PTRK03-GW-610-MW17	24-May-17	Groundwater	FA44407	FA44407-33	
PTRK-EB-002	24-May-17	QC Water	FA44407	FA44407-34	Equipment Blank
PTRK-FB-001	24-May-17	QC Water	FA44407	FA44407-35	Field Blank
PTRK-FD-GW-002	24-May-17	Groundwater	FA44407	FA44407-36	Field Duplicate of Sample PTRK03-GW-002
PTRK01-GW-003	25-May-17	Groundwater	FA44407	FA44407-37	
PTRK01-GW-004	25-May-17	Groundwater	FA44407	FA44407-38	
PTRK01-GW-005	25-May-17	Groundwater	FA44407	FA44407-39	
PTRK01-GW-006	25-May-17	Groundwater	FA44407	FA44407-40	MS/MSD

Notes:
MS/MSD = Matrix Spike / Matrix Spike Duplicate
SDG = Sample Delivery Group

Table 2
Field Duplicate Detections
Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Patrick Air Force Base, Florida

Analyte	LOQ	Primary Sample	Field Duplicate	Units	RPD	Notes
Samples PTRK02-GW-002 and PTRK-FD-GW-001						
PFHxA	0.015	0.0996	0.0969	µg/L	2.7%	
PFHpA	0.015	0.0776	0.0771	µg/L	0.65%	
PFOA	0.015	0.0482	0.0481	µg/L	0.21%	
PFNA	0.015	0.0253	0.0269	µg/L	6.1%	
PFBS	0.015	0.0245	0.0248	µg/L	1.2%	
PFHxS	0.015	0.618	0.637	µg/L	3.0%	
PFOS	0.077	0.950	1.17	µg/L	21%	
Samples PTRK02-SO-003 and PTRK-FD-SO-001						
PFOS	0.0019	0.00144 J	0.00097 U	mg/kg	NC	± LOQ
Samples PTRK03-SO-004 and PTRK-FD-SO-002						
PFHxA	0.0020	0.00099 U	0.000292 J	mg/kg	NC	± LOQ
PFOS	0.0020	0.00797	0.00439	mg/kg	58%	J-FDD
Samples PTRK03-GW-002 and PTRK-FD-GW-002						
PFHxA	0.015	0.279	0.324	µg/L	15%	
PFHpA	0.015	0.0707	0.0825	µg/L	15%	
PFOA	0.015	0.155	0.151	µg/L	2.6%	
PFNA	0.015	0.0115 J	0.00984 J	µg/L	16%	
PFBS	0.015	0.396	0.411	µg/L	3.7%	
PFHxS	0.077	1.91	1.14	µg/L	50%	J-FDD
PFOS	0.077	3.07	1.84	µg/L	50%	J-FDD
6:2 FTS	0.038	0.0300 J	0.0289 J	µg/L	3.7%	

Notes:
µg/L = micrograms per liter
6:2 FTS = 6:2 fluorotelomer sulfonate
LOQ = limit of quantification
NC = not calculable
PFBS = perfluorobutanesulfonic acid
PFHpA = perfluoroheptanoic acid
PFHxA = perfluorohexanoic acid
PFHxS = perfluorohexanesulfonic acid
PFNA = perfluorononanoic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctanesulfonic acid
RPD = relative percent difference

Qualifier Definitions:
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
U = The analyte was analyzed for, but was not detected above the reported limit of detection.

Reason Codes:
± LOQ = The difference between analyte concentrations is less than the LOQ, indicating acceptable sampling and analytical precision.
FDD = Field duplicate imprecision.

Table 3
Qualifiers Added During Validation
Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Patrick Air Force Base, Florida

Sample Identification	Analyte	Results	Validation Qualifiers and Reason Codes
PTRK01-GW-001	6:2 FTS	0.0254 µg/L	J TR
PTRK01-GW-001	PFDoA	0.012 µg/L	UJ LCL
PTRK01-GW-001	PFNA	0.00806 µg/L	J SGH, TR
PTRK01-GW-001	PFTeDA	0.012 µg/L	UJ LCL
PTRK01-GW-001	PFTrDA	0.012 µg/L	UJ LCL
PTRK01-GW-002	8:2 FTS	0.489 µg/L	J SGH
PTRK01-GW-002	PFDoA	0.012 µg/L	UJ LCL
PTRK01-GW-002	PFNA	0.0271 µg/L	J SGH
PTRK01-GW-002	PFTeDA	0.012 µg/L	UJ LCL
PTRK01-GW-002	PFTrDA	0.012 µg/L	UJ LCL
PTRK01-GW-003	EtFOSAA	0.032 µg/L	UJ SGL
PTRK01-GW-003	MeFOSAA	0.032 µg/L	UJ SGL
PTRK01-GW-003	PFDA	0.0101 µg/L	J TR
PTRK01-GW-003	PFTeDA	0.012 µg/L	UJ LCL
PTRK01-GW-003	PFTrDA	0.012 µg/L	UJ LCL
PTRK01-GW-004	PFNA	2.81 µg/L	J TR
PTRK01-GW-004	PFTeDA	3 µg/L	UJ LCL
PTRK01-GW-004	PFTrDA	3 µg/L	UJ LCL
PTRK01-GW-005	PFTeDA	0.012 µg/L	UJ LCL
PTRK01-GW-005	PFTrDA	0.012 µg/L	UJ LCL
PTRK01-GW-006	PFBS	2.37 µg/L	J TR
PTRK01-GW-006	PFHpA	2.44 µg/L	J TR
PTRK01-GW-006	PFNA	1.18 µg/L	J TR
PTRK01-GW-006	PFTeDA	2.9 µg/L	UJ LCL
PTRK01-GW-006	PFTrDA	2.9 µg/L	UJ LCL
PTRK01-SO-001	6:2 FTS	0.00294 mg/kg	J SGL, TR
PTRK01-SO-001	PFBS	0.000803 mg/kg	J SGL, TR
PTRK01-SO-001	PFDoA	0.00119 mg/kg	J TR
PTRK01-SO-001	PFHpA	0.0016 mg/kg	J SGL, TR
PTRK01-SO-001	PFHxA	0.00462 mg/kg	J SGL
PTRK01-SO-001	PFHxS	0.0473 mg/kg	J SGL
PTRK01-SO-001	PFOA	0.0129 mg/kg	J SGL
PTRK01-SO-001	PFUnA	0.00179 mg/kg	J TR
PTRK01-SO-002	PFBS	0.00126 mg/kg	J TR
PTRK01-SO-002	PFDA	0.000976 mg/kg	J TR
PTRK01-SO-002	PFNA	0.0019 mg/kg	J TR
PTRK01-SO-002	PFUnA	0.000732 mg/kg	J TR
PTRK01-SO-003	MeFOSAA	0.00371 mg/kg	J TR
PTRK01-SO-003	PFDA	0.00149 mg/kg	J TR
PTRK01-SO-003	PFHpA	0.00191 mg/kg	J TR
PTRK01-SO-003	PFNA	0.00099 mg/kg	J TR
PTRK01-SO-004	6:2 FTS	0.00393 mg/kg	J TR
PTRK01-SO-004	PFHpA	0.00154 mg/kg	J TR
PTRK01-SO-004	PFHxA	0.00145 mg/kg	J TR
PTRK01-SO-005	PFDA	0.000672 mg/kg	J TR
PTRK01-SO-005	PFHxA	0.000742 mg/kg	J TR
PTRK01-SO-005	PFHxS	0.0012 mg/kg	J TR
PTRK01-SO-006	PFHxA	0.000336 mg/kg	J TR

Table 3
Qualifiers Added During Validation
Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Patrick Air Force Base, Florida

Sample Identification	Analyte	Results	Validation Qualifiers and Reason Codes
PTRK01-SO-006	PFHxS	0.000707 mg/kg	J TR
PTRK01-SO-006	PFOS	0.115 mg/kg	J SGL
PTRK01-SO-007	PFHpA	0.000609 mg/kg	J TR
PTRK01-SO-007	PFNA	0.000645 mg/kg	J TR
PTRK01-SO-007	PFOA	0.00178 mg/kg	J TR
PTRK01-SO-008	PFBS	0.000965 mg/kg	J TR
PTRK01-SO-008	PFNA	0.000961 mg/kg	J TR
PTRK01-SO-009	PFDA	0.000555 mg/kg	J TR
PTRK01-SO-009	PFHpA	0.00117 mg/kg	J TR
PTRK01-SO-009	PFNA	0.00185 mg/kg	J TR
PTRK01-SO-009	PFOA	0.0011 mg/kg	J TR
PTRK01-SO-010	PFHpA	0.00195 mg/kg	J TR
PTRK02-GW-001	PFDoA	0.012 µg/L	UJ LCL
PTRK02-GW-001	PFHpA	0.00859 µg/L	J TR
PTRK02-GW-001	PFHxA	0.0099 µg/L	J TR
PTRK02-GW-001	PFNA	0.00449 µg/L	J SGH, TR
PTRK02-GW-001	PFOA	0.00968 µg/L	J TR
PTRK02-GW-001	PFTeDA	0.012 µg/L	UJ LCL
PTRK02-GW-001	PFTrDA	0.012 µg/L	UJ LCL
PTRK02-GW-002	PFDoA	0.012 µg/L	UJ LCL
PTRK02-GW-002	PFTeDA	0.012 µg/L	UJ LCL
PTRK02-GW-002	PFTrDA	0.012 µg/L	UJ LCL
PTRK02-GW-003	PFBS	0.0127 µg/L	J TR
PTRK02-GW-003	PFDoA	0.012 µg/L	UJ LCL
PTRK02-GW-003	PFHpA	0.0121 µg/L	J TR
PTRK02-GW-003	PFNA	0.0133 µg/L	J SGH, TR
PTRK02-GW-003	PFOS	1.33 µg/L	J SGH
PTRK02-GW-003	PFTeDA	0.012 µg/L	UJ LCL
PTRK02-GW-003	PFTrDA	0.012 µg/L	UJ LCL
PTRK02-SO-001	PFOS	0.000593 mg/kg	J TR
PTRK02-SO-003	PFOS	0.00144 mg/kg	J TR
PTRK02-SO-004	6:2 FTS	0.0038 mg/kg	UJ SGL
PTRK02-SO-004	PFBS	0.00096 mg/kg	UJ SGL
PTRK02-SO-004	PFHpA	0.00096 mg/kg	UJ SGL
PTRK02-SO-004	PFHxA	0.00096 mg/kg	UJ SGL
PTRK02-SO-004	PFHxS	0.00096 mg/kg	UJ SGL
PTRK02-SO-004	PFOA	0.00096 mg/kg	UJ SGL
PTRK02-SO-004	PFOS	0.000651 mg/kg	J SGL, TR
PTRK02-SO-006	6:2 FTS	0.0038 mg/kg	UJ SGL
PTRK02-SO-006	PFBS	0.00095 mg/kg	UJ SGL
PTRK02-SO-006	PFHpA	0.00095 mg/kg	UJ SGL
PTRK02-SO-006	PFHxA	0.00095 mg/kg	UJ SGL
PTRK02-SO-006	PFHxS	0.00095 mg/kg	UJ SGL
PTRK02-SO-006	PFOA	0.00095 mg/kg	UJ SGL
PTRK02-SO-006	PFOS	0.00381 mg/kg	J SGL
PTRK03-GW-001	PFDoA	0.012 µg/L	UJ LCL
PTRK03-GW-001	PFNA	0.0195 µg/L	J SGH
PTRK03-GW-001	PFTeDA	0.012 µg/L	UJ LCL

Table 3
Qualifiers Added During Validation
Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Patrick Air Force Base, Florida

Sample Identification	Analyte	Results	Validation Qualifiers and Reason Codes
PTRK03-GW-001	PFTrDA	0.012 µg/L	UJ LCL
PTRK03-GW-002	6:2 FTS	0.03 µg/L	J TR
PTRK03-GW-002	PFDoA	0.012 µg/L	UJ LCL
PTRK03-GW-002	PFHxS	1.91 µg/L	J SGH, FDD
PTRK03-GW-002	PFNA	0.0115 µg/L	J SGH, TR
PTRK03-GW-002	PFOS	3.07 µg/L	J SGH, FDD
PTRK03-GW-002	PFTeDA	0.012 µg/L	UJ LCL
PTRK03-GW-002	PFTrDA	0.012 µg/L	UJ LCL
PTRK03-GW-610-MW17	EtFOSAA	0.0161 µg/L	J TR
PTRK03-GW-610-MW17	PFTeDA	0.012 µg/L	UJ LCL
PTRK03-GW-610-MW17	PFTrDA	0.012 µg/L	UJ LCL
PTRK03-SO-001	PFHxA	0.000341 mg/kg	J TR
PTRK03-SO-001	PFOS	0.00181 mg/kg	J TR
PTRK03-SO-002	PFOS	0.00124 mg/kg	J TR
PTRK03-SO-004	PFOS	0.00797 mg/kg	J FDD
PTRK-FD-GW-001	PFDoA	0.012 µg/L	UJ LCL
PTRK-FD-GW-001	PFNA	0.0269 µg/L	J SGH
PTRK-FD-GW-001	PFOS	1.17 µg/L	J SGH
PTRK-FD-GW-001	PFTeDA	0.012 µg/L	UJ LCL
PTRK-FD-GW-001	PFTrDA	0.012 µg/L	UJ LCL
PTRK-FD-GW-002	6:2 FTS	0.0289 µg/L	J TR
PTRK-FD-GW-002	EtFOSAA	0.032 µg/L	UJ SGL
PTRK-FD-GW-002	MeFOSAA	0.032 µg/L	UJ SGL
PTRK-FD-GW-002	PFHxS	1.14 µg/L	J FDD
PTRK-FD-GW-002	PFNA	0.00984 µg/L	J TR
PTRK-FD-GW-002	PFOS	1.84 µg/L	J FDD
PTRK-FD-GW-002	PFTeDA	0.012 µg/L	UJ LCL
PTRK-FD-GW-002	PFTrDA	0.012 µg/L	UJ LCL
PTRK-FD-SO-001	6:2 FTS	0.0039 mg/kg	UJ SGL
PTRK-FD-SO-001	PFBS	0.00097 mg/kg	UJ SGL
PTRK-FD-SO-001	PFHpA	0.00097 mg/kg	UJ SGL
PTRK-FD-SO-001	PFHxA	0.00097 mg/kg	UJ SGL
PTRK-FD-SO-001	PFHxS	0.00097 mg/kg	UJ SGL
PTRK-FD-SO-001	PFOA	0.00097 mg/kg	UJ SGL
PTRK-FD-SO-001	PFOS	0.00097 mg/kg	UJ SGL

Table 3
Qualifiers Added During Validation
Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Patrick Air Force Base, Florida

Sample Identification	Analyte	Results	Validation Qualifiers and Reason Codes
PTRK-FD-SO-002	PFHxA	0.000292 mg/kg	J TR
PTRK-FD-SO-002	PFOS	0.00439 mg/kg	J FDD

Notes:
µg/L = micrograms per liter
6:2 FTS = 6:2 fluorotelomer sulfonate
8:2 FTS = 8:2 fluorotelomer sulfonate
EtFOSAA = ethylperfluorooctane sulfonamidoacetic acid
MeFOSAA = methylperfluorooctane sulfonamidoacetic 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
PFTeDA = perfluorotetradecanoic acid
PFTrDA = perfluorotridecanoic acid
PFUnA = perfluoroundecanoic acid

Validation Qualifiers
J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
UJ = The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

Reason Codes
FDD = Field duplicate imprecision.
LCL = Low laboratory control sample recovery. Analytical result may be biased low.
SGH = High surrogate recovery. Analytical result may be biased high.
SGL = Low surrogate recovery. Analytical result may be biased low.
TR = Detected concentration is less than the limit of quantification.

APPENDIX F

IDW NON-HAZARDOUS WASTE MANIFEST

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NON-HAZARDOUS WASTE MANIFEST

NON-HAZARDOUS MANIFEST	1. Generator's US EPA ID No.	Manifest Doc No. 10192	2. Page 1 of 1

3. Generator's Name and Mailing Address: Patrick Air Force Base
1224 Jupiter Street, Patrick AFB FL 32925

4. Generator's Phone: Michael K Bowers 321-853-4289

A. Manifest Number

B. State Generator's ID

5. Transporter 1 Company Name EVERGREEN WASTE LLC	**6. US EPA ID Number** GAR 000 034 710	C. State Transporter's ID D. Transporter's Phone 7707395600
7. Transporter 2 Company Name	**8. US EPA ID Number**	E. State Transporter's ID F. Transporter's Phone
9. Designated Facility Name and Site Address Covanta 3920 Goshen Industrial Blvd Augusta GA 30906	**10. US EPA ID Number**	G. State Facility ID H. State Facility Phone 706-771-9100

GENERATOR

11. Description of Waste Materials	12. Containers No.	12. Containers Type	13. Total Quantity	14. Unit Wt./Vol.	I. Misc. Comments
A NONREGULATED MATERIAL, NONHAZARDOUS	7	DM	~~385~~ 35,25	P	
B NONREGULATED MATERIAL, NONHAZARDOUS	1	DM	~~350~~ 665	P	
C					
D					

J. Additional Descriptions for Materials Listed Above
11A: IDW Water
11 B: IDW Soils

K. Disposal Location
Cell | Level
Grid

15. Special Handling Instructions and Additional Information
WASTE FOR INCINERATON ONLY
-B TRK # 17-052

Purchase Order # EMERGENCY CONTACT / PHONE NO.: 256-759-3922 DANIELLE WASKE

16. GENERATOR'S CERTIFICATE:
I hereby certify that the above-described materials are not hazardous wastes as defined by CFR Part 261 or any applicable state law, have been fully and accurately described, classified and packaged and are in proper condition for transportation according to applicable regulations.

Printed Name [redacted] Month Day Year

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed Name [redacted] Month Day Year

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed Name | Signature | Month Day Year

19. Certificate of Final Treatment/Disposal
I certify, on behalf of the above listed treatment facility, that to the best of my knowledge, the above described waste was managed in compliance with all applicable laws, regulations, permits and licenses on the dates listed above.

20. Facility Owner or Operator: Certification of receipt of non-hazardous materials covered by this manifest.
Printed Name | Signature | Month Day Year

White- TREATMENT, STORAGE, DISPOSAL FACILITY COPY
Pink- FACILITY USE ONLY
Blue- GENERATOR #2 COPY
Gold- TRANSPORTER #1 COPY
Yellow- GENERATOR #1 COPY