

**DRAFT REPORT
FY16 PHASE 1 REGIONAL SITE INSPECTIONS
FOR PERFLUORINATED COMPOUNDS**



**TRUAX FIELD AIR NATIONAL GUARD BASE
MADISON, WISCONSIN**

Contract #: W9133L-14-D-0002
Delivery Order 0006

Amec Foster Wheeler Project #: 2-9133-0006

March 27, 2018

FY16 Phase 1 Regional Site Inspections For Perfluorinated Compounds

Wisconsin Air National Guard Truax Air National Guard Base Madison, WI

Prepared for:
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ACRONYMS & ABBREVIATIONS

A4OR	Operations Restoration Branch
AFFF	Aqueous Film Forming Foam
Amec Foster Wheeler	Amec Foster Wheeler Environment & Infrastructure, Inc.
ANG	Air National Guard
BB&E	BB&E Inc.
bgs	Below ground surface
BRAC	Base Realignment and Closure
°C	degrees Celsius
DCRA	Dane County Regional Airport
DO	Dissolved Oxygen
DoD	Department of Defense
DPT	Direct Push Technology
°F	degrees Fahrenheit
ft.	Feet/foot
FSP	Field Sampling Plan
FTA	Fire Training Area
FW	Fighter Wing
Gal	Gallons
HA	Health Advisory
HEF	High Expansion Foam
IRP	Installation Restoration Program
MS	Matrix Spike
MSD	Matrix Spike Duplicate
µg/kg	Micrograms per Kilogram
mg/kg	Milligrams per Kilogram
µg/L	Micrograms per Liter
mL/min	Milliliter per Minute
mV	Millivolts
NFA	No Further Action
NGB	National Guard Bureau
NTU	Nephelometric Turbidity Units
OWS	Oil-Water Separator
ORP	Oxidation Reduction Potential
PA	Preliminary Assessment
PFBS	Perfluorobutanesulfonic Acid
PFC	Perfluorinated Compound
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctanesulfonic Acid
POC	Point of Contact
PRL	Potential Release Location
PVC	Polyvinyl Chloride
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RSL	Regional Screening Level

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SB	Soil Boring (designation)
SD	Sediment (sample designation)
SHSP	Site Health and Safety Plan
SI	Site Inspection
SOP	Standard Operating Procedure
SW	Surface Water (sample designation)
TOC	Top of Casing
TW	Temporary Well (sample designation)
UCMR3	Third Unregulated Contaminant Monitoring Rule
USAF	United States Air Force
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UST	Underground Storage Tank
WDNR	Wisconsin Department of Natural Resources
WP	Work Plan

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EXECUTIVE SUMMARY

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler) was contracted by the National Guard Bureau (NGB) Operations Restoration Branch (A4OR) under Contract # W9133L-14-D-0002, Delivery Order (DO) 0006 to conduct Phase 1 Regional Site Inspections (SIs) for Perfluorinated Compounds (PFCs) at multiple Air National Guard (ANG) Installations. This report has been prepared for SIs conducted at on-Base Potential Release Locations (PRLs) identified on the Truax Field Air National Guard Base, Wisconsin Air National Guard (WIANG), Madison, WI. This Report presents the results and recommendations from the 2017 SI field activities conducted in November 2017 at Truax Field. The objectives of the SI were to determine the presence or absence of PFCs at each PRL and the Base boundary, and based on the findings:

- 1) Determine if PRL is eligible for a decision of No Further Action (NFA);
- 2) Assess if PFCs are migrating off-Base; and
- 3) Provide data which can be used for developing Data Quality Objectives if further investigations are recommended.

To meet the objectives, Amec Foster Wheeler performed SIs at the following nine PRLs:

- PRL 1: Building 430 (Current Fire Station)
- PRL 2: Building 430 Nozzle Test Area 1
- PRL 3: Building 430 Nozzle Test Area 2
- PRL 4: Former Building 403 (Former Fire Station)
- PRL 5: Hangar 400
- PRL 6: Hangar 406
- PRL 7: Hangar 414
- PRL 8: Fuel Spill Ditch
- PRL 9: Building 503 Parking Lot

Based on recommendations from the Preliminary Assessment (PA) conducted by BB&E, Inc. (BB&E) in February 2016, soil, groundwater, and sediment samples were collected and analyzed for the PFCs listed on the United States Environmental Protection Agency's (USEPA) Third Unregulated Contaminant Monitoring Rule (UCMR3) list (USEPA, 2012). The detected PFC concentrations were compared against screening criteria for perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), and perfluorobutane sulfonate (PFBS) including: the

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USEPA lifetime drinking water Health Advisory (HA) for PFOS (USEPA, 2016a) and HA for PFOA (USEPA, 2016b); the USEPA Regional Screening Level (RSL) table for PFBS in residential soil (USEPA, 2017); the USEPA RSL for PFBS in tap water; and calculated screening levels using the USEPA screening level calculator for PFOA and PFBS in soil and sediment. These screening criteria are presented in **Table ES-1** below.

Table ES-1: USEPA and USAF SI Screening Criteria

Parameter	Chemical Abstract Number	USEPA Regional Screening Level Table (June 2017) ^a		Air Force Guidance for Soils and Sediments ^b (µg/kg)	USEPA Health Advisory Drinking Water (Surface Water or Groundwater) (µg/L) ^c
		Residential Soil (µg/kg)	Tap Water (µg/L)		
Perfluorobutane sulfonate (PFBS)	375-73-5	1,300,000 ^d	400	NL	NL
Perfluorooctanoic acid (PFOA)	335-67-1	NL	NL	1,260	0.07 ^e
Perfluorooctane sulfonate (PFOS)	1763-23-1	NL	NL	1,260	

^a USEPA Regional Screening Levels (USEPA, 2017).

^b Screening levels calculated using the USEPA Regional Screening Level calculator [https://epa-prgs.onrl.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/day derived by USEPA in their Drinking Water Health Advisories for both PFOS (USEPA, 2016a) and PFOA (USEPA, 2016b).

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

^d PFBS RSL for Residential Soil concentration presented in WP was 1,600,000 µg/kg based on the May 2016 RSL values. This table has been updated to include the more recent RSL values published in June 2017.

^e Note: When PFOA and PFOS are both present, the combined detected concentrations of the compounds are compared with the 0.07 µg/L health advisory value. Only groundwater was sampled during the SI, but analytical results have been compared to the tap water screening levels.

USEPA = United States Environmental Protection Agency

µg/kg = Micrograms per Kilogram

µg/L = Micrograms per Liter

NL = not listed

Based on comparison of analytical data to the screening criteria in **Table ES-1** above, Amec Foster Wheeler recommends further investigations of the nine PRLs as a result of groundwater and/or soil exceedances. An overview of conclusions from SI activities and recommendations for future investigations are presented on **Table ES-2**.

Table ES-2: Screening Criteria Exceedances and Recommendations

PRL	Screening Criteria Exceedance		Recommendations
	Soil	GW	
1	X	X	Soil investigation to determine the extent of PFC contamination within the footprint of the PRL. GW investigation to determine the nature and extent of the confirmed PFC release.
2	X	X	Soil investigation to determine the extent of PFC contamination within the footprint of the PRL. GW investigation to determine the nature and extent of the confirmed PFC release.
3		X	GW investigation to determine the nature and extent of the confirmed PFC release. Soil investigation to determine if the soil may be a contributing source to the GW.
4		X	GW investigation to determine the nature and extent of the confirmed PFC release. Soil investigation to determine if the soil may be a contributing source to the GW.
5		X	GW investigation to determine the nature and extent of the confirmed PFC release. Soil investigation to determine if the soil may be a contributing source to the GW.
6		X	GW investigation to determine the nature and extent of the confirmed PFC release. Soil investigation to determine if the soil may be a contributing source to the GW.
7		X	GW investigation to determine the nature and extent of the confirmed PFC release. Soil investigation to determine if the soil may be a contributing source to the GW.
8		X	GW investigation to determine the nature and extent of the confirmed PFC release. Soil investigation to determine if the soil may be a contributing source to the GW.
9		X	GW investigation to determine the nature and extent of the confirmed PFC release. Soil investigation to determine if the soil may be a contributing source to the GW.

Notes:

GW = Groundwater

Inc. - Inconclusive based on results of SI

X – Screening criteria exceedance

PFC - Perfluorinated Compound

A review of groundwater data compared to screening criteria indicates exceedances of the USEPA Drinking Water HA in two of the three Base boundary wells installed to assess the conditions of groundwater migrating across the Base boundary. This determination was made based on concentrations observed in TWBB01 and TWBB02. Given that groundwater flow is to the east/southeast and that samples at the Base boundary have exceedances, groundwater with PFC concentrations above applicable screening criteria is very likely present off-Base to the south and east.

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1.0 INTRODUCTION

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler) was contracted by the National Guard Bureau (NGB) under Contract # W9133L-14-D-0002, Delivery Order (DO) 0006 to conduct Phase 1 Regional Site Inspections (SIs) for Perfluorinated Compounds (PFCs) at multiple Air National Guard (ANG) Installations. The scope of the delivery order includes preparation of this Work Plan (WP) to conduct SIs at potential release locations (PRLs) identified at the Wisconsin Air National Guard (WIANG), in Madison, Wisconsin. This SI Report describes the objectives, procedures, and activities which were completed, and presents Amec Foster Wheeler's findings and recommendations. The Base location is shown in **Figure 1**, and the Base and area features are shown on **Figure 2**.

The SI was conducted in general accordance with the standards and practices prescribed by the *Interim AF Guidance on Sampling and Response Actions for Perfluorinated Compounds at Active and Base Realignment and Closure (BRAC) Installations* (United States Air Force [USAF], August 2012).

1.1 Background

The Department of Defense (DoD) began investigations at military bases under the Installation Restoration Program (IRP) with the goal of identifying, evaluating, and remediating areas of contamination (the program is now referred to as the Environmental Restoration Program). The WIANG is located at Truax Field at the Dane County Regional Airport (DCRA) in south-central Wisconsin approximately 6 miles northeast of the city of Madison (**Figures 1 and 2**), and is the home of the 115th Fighter Wing (FW).

BB&E conducted a Preliminary Assessment (PA) site visit for the ANG at WIANG during August 10-11, 2015 to identify potential locations of historic environmental releases of PFOA/PFOS/PFBS (i.e. Potential Release Locations [PRLs]), specifically from Aqueous Film Forming Foam (AFFF) usage and storage (BB&E, 2015). The PA site visit process included a review of any documented Fire Training Areas (FTAs) in operation since 1970, and any other use or release of AFFF, and the completion of a site reconnaissance. The goal of the PA site visit was to determine if a site poses a potential threat to human health and the environment and requires additional inspection.

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Based on past use and storage of AFFF at WIANG, the PA identified nine PRLs where releases of PFCs might have occurred, including hangars, fire stations, storage areas, firefighting equipment testing areas, etc. No former or current FTAs were identified on the Base. The findings of AFFF use and storage at each of the PRLs are documented in BB&E's December 2015, PA Site Visit Report. **Table 1** presents the identified PRLs and associated recommendations based on the PA completed by BB&E.

1.2 Purpose and Scope

The purpose of the SI is to determine the presence/absence of constituents of concern (COCs i.e. perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), and perfluorobutane sulfonate (PFBS) in soil and groundwater at each of the PRLs and in groundwater at the base boundary. Samples were analyzed for the PFCs listed on the United States Environmental Protection Agencies (USEPA's) Third Unregulated Contaminant Monitoring Rule (UCMR3) list (USEPA, 2012); however, the SI focus is primarily on evaluation and discussion of PFOA, PFOS, and PFBS. This data has been used to develop recommendations for appropriate paths forward to either provide a No Further Action (NFA) conclusion or recommendations for remedial investigation phases.

The SI activities planned in accordance with NGB Environmental Restoration Program Guidance document (USANG 2009), including the following:

- Advance up to 27 soil borings to a maximum depth of 15 feet (ft.) below ground surface (bgs), or first encountered groundwater, at the PRLs using direct-push technology (DPT) methods and collect up to 2 soil samples from each boring
- Install up to 12 temporary monitoring wells hydraulically downgradient of the PRL areas and at the downgradient Base boundary using DPT methods for the installation of temporary monitoring wells to collect a groundwater sample at each location

BB&E identified ten PRLs based on locations where AFFF was potentially discharged or stored. One PRL (PRL 10, Building 510 [Supply]) warranted NFA based on the findings of no known AFFF release and is not included in the scope of this SI. The PRLs are illustrated on **Figure 3** and **Table 1** presents each identified PRL and associated recommendations based on the PA completed by BB&E.

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Field activities were conducted in accordance with the Final SI Work Plan, Quality Assurance Project Plan (QAPP), Field Sampling Plan (FSP), and Site Health and Safety Plan (SHSP) (Amec, 2017). The scope of the SI is outlined in the following sections.

2.0 INSTALLATION DESCRIPTION

Section 2.1 describes the location and environs of WIANGB. A brief history of WIANG is provided in **Section 2.2**.

2.1 Location

The WIANG is located at Truax Field at the DCRA in south-central Wisconsin approximately 6 miles northeast of the city of Madison (**Figure 1** and **Figure 2**). WIANG is the home of the 115th FW. The PRLs that were evaluated during this SI are in the southeast portion of the WIANG (**Figure 3**). The WIANG is zoned for airport district usage and is surrounded by properties zoned for industrial, residential, and business use.

2.2 Organization and History

The installation was originally constructed in 1942 as an Army Air Base, and occupied 2,050 acres. At the end of World War II, the City of Madison assumed control of the facility from the War Assets Administration. Truax Field was reactivated in 1951 and occupied by the USAF through 1968, and subsequently by the WIANG. In 1981, the WIANG installation at Truax Field became the 128th Tactical FW, and later the 128th FW. In October 1995, the unit at Truax Field was re-designated the 115th FW with no change in mission or aircraft. Since its inception in 1942, aircraft housed at Truax Field have varied but have predominantly been fighter/attack aircraft. The WIANG Base has stored petroleum and various types of hazardous materials throughout its history in support of its missions. Although some of the Base's historical operations have resulted in the storage and use of petroleum and hazardous materials, not all of these operations relate to PRL Sites 1 through 9. The USAF leases the 115th FW property from Dane County. The lease expires on October 3, 2050.

3.0 ENVIRONMENTAL SETTING

The following sections provide information on the environmental setting at WIANG. This information is summarized from the Compliance Restoration Program Preliminary Assessment/Site Investigation prepared by Leidos in February 2015 (Leidos, 2015).

3.1 Climate

Truax Field has a humid continental climate, which is characterized by variable weather patterns and a large seasonal temperature variance. Winter temperatures can be well below freezing, with moderate to occasionally heavy snowfall and temperatures reaching 0°F (-18°C). High temperatures in summer average in the lower 80s°F (27 to 28°C), often accompanied by high humidity levels. The mean annual rainfall is 34.42 inches (87.43 centimeters) (National Oceanic and Atmospheric Administration, 2013).

3.2 Topography

Truax Field is located in south-central Wisconsin approximately 6 miles northeast of the city of Madison. The Base is predominantly located on level ground near the western margin of the Great Lakes Section of the Central Lowlands Physiographic Province. This section is characterized by numerous lakes with associated lacustrine plains, prominent end moraines, poorly integrated drainage, and a still-partially exposed cuestaform topography (PEER, 1988). Three lakes are located near Truax Field: Lake Mendota to the southwest and Lakes Monona and Waubesa to the south. Truax Field is located at an elevation of approximately 890 ft. (271 meters) above mean sea level.

3.3 Geology

Truax Field is located in the Central Lowlands Physiographic Province, which is characterized by mostly Paleozoic bedrock with some cretaceous rocks underlying the western boundary. Much of this province also exhibits flat to gently inclined rock strata and widespread topographic effects of glaciation. Structurally, regional dips are controlled by numerous domes and uplifts. With the exception of the southern border, the entire province is bordered by topography that is higher in elevation (PEER, 1988). Glacial drift in southern Wisconsin ranges in thickness from only a few ft. to several hundred ft. Truax Field is located directly above a thick (approximately 300 ft.)

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section of glacial drift; thus, several geologic layers encountered elsewhere in the region do not occur beneath Truax Field. Instead, directly beneath the glacial till lies approximately 350 ft. of Mt. Simon Sandstone bedrock.

3.4 Soil

At the time of the PA site visit, no documentation was available showing that soils at the Base have been tested for COCs; therefore, it is unknown whether COCs are present in the soil. However, based on historical practices, they may be present in the soil due to known or potential AFFF use at the following locations:

- Area surrounding Building 430 (Current Fire Station);
- Grassy areas northwest and southwest of Building 430 where Fire Department vehicles have conducted AFFF system nozzle testing every six months;
- Area surrounding former Building 403 (Former Fire Station);
- Area surrounding Hangars 400, 406, and 414;
- Ditch between Hangar 414 and Hangar 400 where foam was used as a precaution during a fuel spill in 1981; and
- Area surrounding parking lot west of Building 503, where runoff may have occurred from the soil excavated from the 1981 fuel spill.

3.5 Surface Water Hydrology

Surface water drainage from the Base ultimately drains west into Starkweather Creek, which surrounds the Base on the north, west, and south sides. Starkweather Creek empties into Lake Monona approximately 2 miles to the south. Surface water flow around the Base is directed by man-made ditches and culverts which connect to Starkweather Creek. Because much of the Base is paved, infiltration and evapotranspiration of surface water are negligible.

3.6 Hydrogeology

Regionally, groundwater is found in the unconsolidated glacial deposits and underlying bedrock formations including sandstone of the Trempealeau Group, the deeper Tunnel City Group, and the underlying Elk Mound Group. These bedrock aquifers comprise the principal water supply aquifers in Dane County. The Mt. Simon Sandstone underlying the glacial deposits in the vicinity of the Base is the lowermost formation of the Elk Mound Group.

Based on information collected during investigation activities at the IRP sites, monitoring wells within the water table zone indicate shallow groundwater flow is generally toward the south and southeast. The water table at the Base is generally encountered at depths of 5 to 10 ft. bgs. The groundwater flow gradients calculated from IRP investigations indicate groundwater flow velocities of 0.5 to 0.9 ft. per day.

There are currently no known drinking water supply wells at the Base and the shallow groundwater system in the area of the Base is not used as a source of drinking water. The City of Madison obtains its public water supply from the Mt. Simon Sandstone from a network of pumping wells. The Base is provided water via the municipal water distribution system operated by the City of Madison. The nearest municipal water supply wells are located approximately 1.5 miles southwest of the Base. Based on information obtain during the IRP investigations, four private wells may have been located in the immediate vicinity of the Base prior to initial construction activities in 1942. However, in light of the extensive development in the area, the four private wells are believed to be abandoned or not in use.

3.7 Critical Habitat and Threatened/Endangered Species

According to the United States Fish and Wildlife Service (USFWS), as of December 2013, the following animals and plants are federally endangered, threatened, proposed, and/or listed as candidate species in Dane County, Wisconsin (USFWS, 2013):

- *Myotis septentrionalis* (Northern Long-eared Bat) – Proposed Endangered
- *Grus americanus* (Whooping Crane) – Non-essential Experimental Population
- *Lampsilis higginsii* (Higgins eye pearly mussel) – Endangered
- *Plethobasus cyphus* (Sheepnose) – Endangered
- *Bombus affinis* (Rusty patched bumblebee) - Endangered
- *Platanthera leucophaea* (Eastern prairie fringed orchid) – Threatened
- *Asclepias meadii* (Mead's milkweed) – Threatened
- *Lespedeza leptostachya* (Prairie bush-clover) – Threatened

None of these species are known to reside or have been sighted at Truax Field.

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3.8 City of Madison Water Supply

Drinking water is supplied to the WIANGB and surrounding residential population by the City of Madison. The City of Madison obtains its public water supply from the Mt. Simon Sandstone from a network of pumping wells. The Base is provided water via the municipal water distribution system operated by the City of Madison. The nearest municipal water supply wells are located approximately 1.5 miles southwest of the Base.

4.0 PRELIMINARY ASSESSMENT

BB&E conducted a PA site visit for the ANG at WIANG during August 10-11, 2015 to identify potential locations of historic environmental releases of PFOA/PFOS/PFBS (i.e. PRLs), specifically from AFFF usage and storage (BB&E, 2015). The PA site visit process included a review of any documented FTAs in operation since 1970, and any other use or release of AFFF, and the completion of a site reconnaissance. The goal of the PA site visit was to determine if a site poses a potential threat to human health and the environment and requires additional inspection.

Based on past use and storage of AFFF at WIANG, the PA identified nine PRLs where releases of PFASs might have occurred, including hangars, fire stations, storage areas, firefighting equipment testing areas, etc. No former or current FTAs were identified on the Base. The findings of AFFF use and storage at each of the PRLs are documented in BB&E's December 2015, PA Site Visit Report.

The findings of AFFF use and storage at each of the 9 PRLs recommended for inclusion in the SI, as documented in the PA Site Visit Report, are summarized below. The PRLs are illustrated on **Figure 3** and **Table 1** presents the identified PRL and associated recommendations based on the PA completed by BB&E.

4.1 PRL 1: Building 430 (Current Fire Station)

AFFF has been used by the WIANG Fire Department for at least 20 years, and has been stored in Building 430 since it was built, circa 1995. Currently, there are approximately 471 gallons (gal) of AFFF carried in Fire Department trucks and approximately 821 gal of AFFF serving as a backup supply, stored in the fire station. AFFF is transferred to vehicles within the fire station via overhead fill. Fire Department vehicles are washed within the fire station or the outside truck bays when necessary. Trench drains are in the fire station and downgradient of the truck bays; therefore, AFFF releases due to vehicle washing would be captured by the trench drains, which discharge into the sanitary sewer system.

4.2 PRL 2: Building 430 Nozzle Test Area 1

The AFFF nozzle systems on Fire Department vehicles have been tested every six months in the grassy areas near Building 430. Nozzle Test Area 1 is located northwest of Building 430. AFFF

released in porous green spaces has the potential to seep into the subsurface and groundwater.

4.3 PRL 3: Building 430 Nozzle Test Area 2

The AFFF nozzle systems on Fire Department vehicles have been tested every six months in the grassy areas near Building 430. Nozzle Test Area 2 is located southwest of Building 430. AFFF released in porous green spaces has the potential to seep into the subsurface and groundwater.

4.4 PRL 4: Former Building 403 (Former Fire Station)

Prior to relocation to Building 430, the Fire Department was stationed in Building 403, which was demolished in 1995/1996. According to Base personnel, AFFF had been in use since at least 1988 and was stored in Former Building 403. There are no records of AFFF nozzle testing from this time period. It is assumed that similar to the current fire station AFFF was transferred into fire trucks through an overhead fill. Fire Department vehicles were likely washed within the fire station or outside when necessary. An oil-water separator (OWS) and associated underground storage tank (UST) were removed during demolition; no contamination was reported during removal (Leidos, 2015).

4.5 PRL 5: Hangar 400

Hangar 400 was equipped with an AFFF fire suppression system until approximately 2009, when the system was retrofitted for use of high expansion foam (HEF); the installation date of the AFFF fire suppression system is unknown. According to Base personnel, hangar fire suppression systems have been tested annually; foam is discharged every other year during testing. No records of accidental AFFF releases exist. AFFF releases during testing or accidental release within the hangar would have been routed to the trench drains that historically led to an OWS which then discharged into the sanitary sewer system. However, it is possible that AFFF could have been released into the environment during testing through cracks in the floor or through doorways. The OWS was removed in 2009; no contamination was observed during removal (Leidos, 2015).

HEF is currently stored in the mechanical room of Hangar 400. According to Base personnel, AFFF may have been stored in the mechanical room prior to the switch to HEF. Floor drains were present which likely discharge to the sanitary sewer system.

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4.6 PRL 6: Hangar 406

Hangar 406 was equipped with an AFFF fire suppression system until approximately 2006, when the system was retrofitted for use of HEF. According to Base personnel, hangar fire suppression systems have been tested annually; foam is discharged every other year during testing. No records of accidental AFFF releases exist. AFFF releases during testing or accidental release within the hangar would have been routed to the trench drains which then discharged into the sanitary sewer system. However, it is possible that AFFF could have been released into the environment during testing through cracks in the floor or through doorways. There were no records available for AFFF fire suppression system testing at Hangar 406.

HEF is currently stored in the mechanical room of Hangar 406. According to Base personnel, AFFF may have been stored in the mechanical room prior to the switch to HEF. Floor drains were present which likely discharge to the sanitary sewer system.

4.7 PRL 7: Hangar 414

Building 836 was formerly used as the fuel cell maintenance hangar and previously had an AFFF suppression system that was removed from service in approximately 1995. Prior to that time, the system was tested according to the AFFF suppression system maintenance procedure. Base personnel believe the suppression system was not tested more than twice. The building utilizes a trench drain which until approximately 2014 discharged to sanitary through an OWS. Currently the trench drains discharge directly to sanitary.

4.8 PRL 8: Fuel Spill Ditch

On March 6, 1981, approximately 2,000 gal of JP-4 jet fuel spilled due to an overflow during refilling at the petroleum, oil, and lubricant (POL) pump house (Building 405). In response to the spill an existing drainage ditch (approximately 100 ft. long) next to the spill was dammed off (ditch located between Hangars 400 and 414). The fire department foamed the fuel and flushed it toward the ditch, where it soaked into the ground and was covered with straw. By April 9, 1981, as directed by the Wisconsin Department of Natural Resources (WDNR), the affected soil in the bottom of the ditch was removed to a depth of approximately 6 ft. and to the limit of odor detection on side slopes (WDNR, 2013).

The type of foam used during the 1981 fuel spill is not specified on the incident report but may have been AFFF based on its historic use. As PFOA/PFOS/PFBS sampling was not conducted

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during soil excavation, PFOA/PFOS/PFBS from the foam may still be present in this area, particularly the ditch sidewalls, which were excavated based on odor detection.

4.9 PRL 9: Building 503 Parking Lot

The soil removed from the 1981 POL spill area, as discussed above, was relocated to what is now the parking lot west of Building 503. The soil was placed on four concrete pads, spread at a depth of 6 to 10 inches, and was turned throughout the summer of 1981 to enhance volatilization. In the summer of 1982, the contaminated soil was removed, the area was excavated to a depth of 3 ft. and the materials were transported off-site for disposal. The area was paved the same year (PEER, 1988).

AFFF runoff from this area could have impacted the soil and may have impacted the groundwater. Although the soil beneath the concrete pads was excavated and disposed off-site, there has not been sampling to confirm the SI COCs are not present.

5.0 FIELD PROGRAM METHODS

The following subsections summarize utility clearance and permitting activities; soil boring installation, sampling, and abandonment; and temporary groundwater monitoring well construction, development, and sampling. SI activities were conducted in accordance with the Work Plan and the *ANG Investigation Guidance* (ANG, 2009). The SI field activities were conducted during 06 through 09 November 2017.

5.1 Utility Location and Clearance

Prior to commencement of SI activities, the drilling contractor (Mateco Drilling) provided details of the proposed borehole locations to the Wisconsin Diggers Hotline and drilling locations were pre-marked. Diggers Hotline assigned ticket Nos. 20174409013, 20174409064, 20174409084, 20174409118, 20174409166, and 20174409200 on 01 November 2017. Mateco Drilling cleared the drilling locations using ground-penetrating radar on 06 November 2017 prior to initiating subsurface activities. Utility clearance activities were performed at the direction and oversight of Amec Foster Wheeler.

5.2 Permits

As described in **Section 5.1**, Amec Foster Wheeler obtained utility clearance permits for the SI activities, including Diggers Hotline clearance. It was determined by WIANG Point of Contact (POC) that Federal Aviation Administration permits were not required for performance of SI activities. No other permits were required or obtained.

5.3 Soil Boring Installation

Between 06 and 09 November 2017, 30 soil borings were advanced with 12 temporary monitoring wells installed to investigate potential PFC impacts in soil and groundwater at WIANG. The borings were advanced by Mateco Drilling using direct push technology (DPT) drilling techniques. Soil borings were advanced from 10 to 15 ft. bgs depending on when groundwater was encountered. Individual borehole depths are provided in the soil boring logs included in **Appendix A**.

Soil boring locations were selected based on PRL use and physical characteristics to target the most probable AFFF release areas. Twenty-seven soil borings were advanced in and around nine PRLs and three borings were advanced as Base boundaries using DPT drilling methods (18

borings for soil sampling only, three boring for temporary monitoring well installation only, and nine borings for combined temporary monitoring well installation and soil sampling). Soil cores were collected continuously for field screening at 4 to 5-ft. intervals in new, dedicated acetate liners. Drilling rods/tools were decontaminated between borings in accordance with protocol described in the Work Plan.

5.4 Soil Sampling

Fifty-nine soil samples (including five duplicates) were collected at the nine PRLs identified on the Base. Shallow soil samples (0.5 to 5.0 ft. bgs or directly beneath asphalt or pavement where present) were collected directly from a decontaminated hand auger. Deep soil samples (4.0 to 9.5 ft. bgs) were collected from the acetate sleeves from within the DPT core barrel. Each sleeve was opened lengthwise and the soil was examined. Soil characteristics were logged in accordance with the Unified Soil Classification System. Soil was visually inspected for potential impacts.

5.5 Soil Boring Abandonment

Following the completion of drilling activities, each boring was backfilled with cuttings (and hydrated bentonite chips as necessary). Surface completions were patched with like materials (topsoil/seed, asphalt, or concrete) in accordance with WIANG specifications.

5.6 Temporary Monitoring Well Installation and Development

Twelve temporary monitoring wells were installed to investigate potential groundwater impacts at the nine PRLs and at locations along the Base boundaries. The primary purpose of installing the temporary monitoring wells was to assess groundwater quality downgradient of the PRLs. Although well elevation surveys were not part of this project scope, temporary well locations were determined based on historical groundwater data and topographic contours, historical indications of possible impact, and Base features such as buildings and the Base boundary. In general, temporary monitoring wells were installed at locations with the greatest potential to intercept PFCs dissolved in groundwater based on available data, and might not represent the highest concentrations at each PRL.

Soil cores were collected continuously to verify soil lithology, then inspected, logged, and field screened in accordance with the FSP. Temporary monitoring wells were installed in accordance with Amec Foster Wheeler's PFC-specific Standard Operating Procedure (SOP) for installation of

monitoring wells (AFW-04).

The temporary monitoring well borings were advanced with DPT tools. Temporary monitoring wells were constructed within borings using a one-inch diameter, schedule 40 polyvinyl chloride (PVC) riser with a 5-ft., 0.010-inch slot screened interval with the water table bisecting the well screen. New dedicated well materials were used at each temporary well location. The annulus surrounding each well screen and riser was backfilled with No.1 filter sand, which was placed from the bottom of the borehole to the ground surface. No annular seals were installed.

The temporary monitoring wells were developed using a pump to purge the screened interval and remove fine particles that had accumulated. Water quality parameters were monitored and recorded at periodic intervals. Monitoring wells were considered adequately developed when water quality parameters had stabilized and turbidity was low (i.e., <50 Nephelometric Turbidity Units (ntu) where feasible).

Well development water was containerized, labeled, and secured in steel 55-gallon drums. Drums remained on-site in an area designated by the WIANG POC pending the results of laboratory testing. Equipment and pumps inserted into the well were decontaminated following each use.

5.7 Water Level Measurements

Prior to well purging, static water levels measurements were collected with an electronic water level meter. Water levels were measured as a distance below the top of the PVC riser and recorded on field data sheets.

5.8 Groundwater Sampling

Twelve groundwater samples were collected from twelve temporary monitoring wells. Wells were purged with a peristaltic pump, and USEPA sampling methodology was followed to collect groundwater samples. The initial water level was recorded using an electronic water level meter prior to purging and sampling activities. The tubing was inserted into the monitoring well to the depth recorded in the sampling logs above the bottom of the well to prevent disturbances and re-suspension of sediment present in the bottom of the well. In general, the pump intake was placed in the middle of the saturated interval. The pump discharge tubing was connected to a flow-through cell containing a multi-parameter Sonde Instrument to record water parameters. The pump rate during purging was between 100 and 300 milliliters per minute (mL/min) with a steady

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flow rate maintained, such that drawdown of the water level within the well did not exceed a maximum allowable drawdown of 0.3 ft. The following parameters were monitored during purging: temperature, pH, oxidation-reduction potential (ORP), dissolved oxygen (DO), turbidity, temperature, and specific conductivity on approximately five-minute intervals. The water level was monitored during this same time interval.

The well was considered stabilized after three consecutive readings as follows:

- +/-0.1 for pH,
- +/-3% for specific conductance (conductivity),
- +/-10 millivolts (mV) for ORP,
- +/-10% for DO, and
- +/-10% for turbidity.

Groundwater sampling logs are included in **Appendix B**.

5.9 Temporary Monitoring Well Abandonment

Following the completion of sampling activities, each temporary well was pulled from the ground allowing the formation to collapse into the borehole with subsequent infill using bentonite chips and sand. Surface completions were patched with like materials (topsoil/seed, asphalt, or concrete) in accordance with WIANC specifications.

5.10 Decontamination

Field sampling equipment (e.g. water level indicators, pumps, bowls, trowels, shovels, and other downhole equipment) was decontaminated prior to initial use, and between samples. Liquinox® soap diluted with PFC-free bottled water was used to wash sampling equipment with a clean HDPE brush used to remove debris and particulates. PFC-free bottled water was used to rinse soapy water from the sampling equipment. Prior to use, a sample of the water was submitted to Vista for analysis of the six PFC compounds on the UCMR 3 list. Concentrations were reviewed to ensure Amec Foster Wheeler's internal PFC-free criteria were met.

5.11 Investigation Derived Waste Management

Following examination and sampling, soil from borings were discarded into 55-gallon drums. Purge water generated during monitoring well development and groundwater sampling activities and rinse water were also captured in 55-gallon drums. Drums were kept on-site in an area

designated by the WIANG POC pending the results of laboratory testing. Investigation derived waste manifests are provided in **Appendix C**.

5.12 Laboratory

PFC samples were submitted to Vista Analytical Laboratories, Inc. (Vista), in El Dorado Hills, California. Vista is accredited under the DOD Environmental Laboratory Accreditation Program and maintains a National Environmental Laboratory Accreditation Program certification.

5.13 Field Quality Assurance/Quality Control Sample Results

Quality Assurance and Quality Control (QA/QC) samples, including field duplicates and matrix spike/matrix spike duplicates (MS/MSD) samples were analyzed for the same PFC parameters as the associated project samples. The analytical results for the field duplicates are presented in **Table 2** for the soil samples and **Table 3** for the groundwater samples.

5.14 Data Validation and Usability

Amec Foster Wheeler performed a data quality review of samples collected during field activities and submitted to Vista for analysis of PFCs, consisting of: 54 soil samples (including five field duplicates), 12 groundwater samples (including one duplicate), and one equipment blank.

The laboratory analytical data generated during the SI were reviewed by a qualified analytical chemist for conformance with the project Data Quality Objectives specified in the QAPP (Amec, 2017). Amec Foster Wheeler performed USEPA Stage 4 validation on 10 percent (%) of the field samples and USEPA Stage 2B validation on the remaining field samples associated with this sampling event. 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. The validation was performed in general accordance with: Amec Foster Wheeler Final QAPP (Amec, 2017); DoD Quality Systems Manual for Environmental Laboratories (DoD, 2017); and USEPA Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (USEPA, 2009).

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Amec Foster Wheeler evaluated 432 data records from field samples during the validation. Amec Foster Wheeler J 119 records (27.5%) as estimated values because of low MS/MSD recoveries, imprecision between MS and MSD results, high internal standard recoveries, field duplicate imprecision, and/or analyte concentrations outside the instrument's calibration range. The Data Validation Report, including qualified data, is included as **Appendix D**. Laboratory analytical reports and chains of custody forms are provided in **Appendix E**.

6.0 SITE INVESTIGATIONS

This SI field program was designed to collect data needed to evaluate the presence/absence of PFC compounds at each of the nine PRLs. The scope of the SI was designed using recommendations presented in the PA prepared by BB&E. The following sections describe the investigation approach that was used to fulfill the objectives of the SI. The work was conducted in accordance with the QAPP, SHSP, and FSP presented in the approved Work Plan.

6.1 Field Activities Summary

Completed SI field activities are summarized in **Table 4**.

Table 4: Summary of Site Inspection Activities

PRL Name	Analyzed Parameters	Soil Borings	Soil Samples	Groundwater Samples/ Temporary Wells
1. Building 430 (Current Fire Station)	PFCs	3	6	1
2. Building 430 Nozzle Test Area 1	PFCs	3	6	1
3. Building 430 Nozzle Test Area 2	PFCs	3	6	1
4. Former Building 403 (Former Fire Station)	PFCs	3	6	1
5. Hangar 400	PFCs	3	6	1
6. Hangar 406	PFCs	3	6	1
7. Hangar 414	PFCs	3	6	1
8. Fuel Spill Ditch	PFCs	3	6	1
9. Building 503 Parking Lot	PFCs	3	6	1
10. Base Boundary Wells	PFCs	3	0	3

Individual sampling locations are shown on **Figures 4 through 9**. Soil boring and monitoring well construction and groundwater sampling logs are included in **Appendices A and B** respectively.

6.2 General Work Plan Deviations

Deviations from the general work plan included one or more of the following conditions:

- The June 2017 USEPA residential soil RSL value for PFBS (1,300,000 µg/kg) was used as the screening value in place of the May 2016 USEPA residential soil RSL value for PFBS (1,600,000 µg/kg). The updated RSL value was not published at the time the Work Plan was finalized.

Work Plan deviations specific to an individual PRL are discussed in the following sub sections.

6.3 PRL 1: Building 430 (Current Fire Station)

6.3.1 PRL Deviations

One deviation from the Work Plan occurred at this PRL. Three consecutive readings within 10% were not obtained for DO or ORP. In the last three readings for DO and ORP were not within 10%. No other deviations, apart from the general Work Plan deviations (see **Section 6.2**), occurred at this PRL.

6.3.2 Soil Sampling

Three soil borings (01SB01, 01SB02, and 01SB03) were advanced at PRL 1 on 08 November 2017, with shallow (0.5 to 1.0 ft. bgs) and deep (4.0 to 5.0 ft. bgs) soil samples collected from each boring. A total of seven soil samples (including 1 duplicate) were collected at this PRL.

Soil boring locations are illustrated on **Figure 4**.

6.3.3 Groundwater Sampling

Temporary well TW01 (co-located with 01SB01) was drilled to a depth of 10 ft. bgs on 08 November 2017, and a well screen was installed from 5 to 10 ft. bgs. Groundwater was encountered at 8.0 ft. bgs prior to purging and sampling. One groundwater sample was collected from TW01.

The temporary monitoring well location is illustrated on **Figure 4**.

6.4 PRL 2: Building 430 Nozzle Test Area 1

6.4.1 PRL Deviations

One deviation occurred at this PRL. Three consecutive readings within 10% were not obtained for DO or ORP. In the last three readings DO ranged from 0.20-0.23 mg/L and ORP ranged from

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-74.5 to -66.4 mV. No other deviations, apart from the general Work Plan deviations (see **Section 6.2**), occurred at this PRL.

6.4.2 Soil Sampling

Three borings (02SB01, 02SB02, and 02SB03) were advanced at PRL 2 on 08 November 2017, with shallow (0.5 to 1.0 ft. bgs) and deep (5.0 to 6.5 ft. bgs) soil samples collected from each boring. A total of seven soil samples (including 1 duplicate) were collected at this PRL.

Soil boring locations are illustrated on **Figure 4**.

6.4.3 Groundwater Sampling

Temporary well TW02 (co-located with 02SB01) was drilled to a depth of 10 ft. bgs on 08 November 2017, and a well screen was installed from 5 to 10 ft. bgs. Groundwater was encountered at 7.17 ft. bgs prior to purging and sampling. One groundwater sample was collected from TW02.

The temporary monitoring well location is illustrated on **Figure 4**.

6.5 PRL 3: Building 430 Nozzle Test Area 2

6.5.1 PRL Deviations

One deviation occurred at this PRL. Three consecutive readings within 10% were not obtained for DO. In the last three readings DO ranged from 0.13-0.15 mg/L. No other deviations, apart from the general Work Plan deviations (see **Section 6.2**), occurred at this PRL.

6.5.2 Soil Sampling

Three soil borings (03SB01, 03SB02, and 03SB03) were advanced at the PRL 3 on 08 November 2017, with shallow (0.5 to 1.0 ft. bgs) and deep (4.0 to 6.5 ft. bgs) soil samples collected from each boring. A total of six sediment samples were collected at this PRL.

Soil boring locations are illustrated on **Figure 4**.

6.5.3 Groundwater Sampling

Temporary well TW03 (co-located with 03SB01) was drilled to a depth of 10 ft. bgs on 08 November 2017, and a well screen was installed from 5.0 to 10.0 ft. bgs. Groundwater was encountered at 7.1 ft. bgs prior to purging and sampling. One groundwater sample was collected from TW02.

The temporary monitoring well location is illustrated on **Figure 4**.

6.6 PRL 4: Former Building 403 (Former Fire Station)

6.6.1 PRL Deviations

One deviation from the Work Plan occurred at this PRL. Three consecutive readings within 10% were not obtained for DO or turbidity. In the last three readings DO ranged from 0.13-0.15 mg/L and turbidity ranged from 36.3-82.0 NTU. No other deviations, apart from the general Work Plan deviations (see **Section 6.2**), occurred at this PRL.

6.6.2 Soil Sampling

Three soil borings (04SB01, 04SB02, and 04SB03) were advanced on 09 November 2017, with shallow (0.5 to 2.0 ft. bgs) and deep (4.5 to 5.5 ft. bgs) soil samples collected from each boring. A total of six soil samples were collected from this PRL.

Soil boring locations are illustrated on **Figure 5**.

6.6.3 Groundwater Sampling

Temporary well TW04 (co-located with 04SB01) was drilled to a depth of 10 ft. bgs on 09 November 2017, and a well screen was installed from 5 to 10 ft. bgs. Groundwater was measured at 6.5 ft. bgs prior to purging and sampling. One groundwater sample was collected from TW04.

The temporary monitoring well location is illustrated on **Figure 5**.

6.7 PRL 5: Hangar 400

6.7.1 PRL Deviations

One deviation from the Work Plan occurred at this PRL. Three consecutive readings within 10% were not obtained for DO or turbidity. In the last three readings DO ranged from 0.11-0.13 mg/L and turbidity ranged from 7.16-18.9 NTU. No other deviations, apart from the general Work Plan deviations (see **Section 6.2**), occurred at this PRL.

6.7.2 Soil Sampling

Three soil borings (05SB01, 05SB02, and 05SB03) were advanced on 09 November 2017, with shallow (0.5 to 1.0 ft. bgs) and deep (6.0 to 7.5 ft. bgs) soil samples collected from each boring. A total of six soil samples were collected from this PRL.

Soil boring locations are illustrated on **Figure 5**.

6.7.3 Groundwater Sampling

Temporary well TW05 (co-located with 05SB01) was drilled to a depth of 10 ft. bgs on 09 November 2017, and a well screen was installed from 5.0 to 10.0 ft. bgs. Groundwater was measured at 7.4 ft. bgs prior to purging and sampling. One groundwater sample was collected from TW05.

The temporary monitoring well location is illustrated on **Figure 5**.

6.8 PRL 6: Hangar 406

6.8.1 PRL Deviations

One deviation from the Work Plan occurred at this PRL. Three consecutive readings within 10% were not obtained for DO, ORP, or turbidity. In the last three readings DO ranged from 0.18-0.28 mg/L, ORP ranged from -30.0 to -36.7 mV, and turbidity ranged from 49.1-227 NTU. Additionally, three consecutive readings within 3% were not obtained for specific electrical conductance. In the last three readings conductance ranged from 0.81-0.85 mS/cm. No other deviations, apart from the general Work Plan deviations (see **Section 6.2**), occurred at this PRL.

6.8.2 Soil Sampling

Three soil borings (06SB01, 06SB02, and 06SB03) were advanced between 06 and 07 November 2017, with shallow (0.5 to 5.0 ft. bgs) and deep (4.5 to 7.5 ft. bgs) soil samples collected from each boring. A total of seven soil samples (including 1 duplicate) were collected from this PRL.

Soil boring locations are illustrated on **Figure 6**.

6.8.3 Groundwater Sampling

Temporary well TW06 (co-located with 06SB01) was drilled to a depth of 10 ft. bgs on 06 November 2017, and a well screen was installed from 5.0 to 10.0 ft. bgs. Groundwater was encountered at 6.3 ft. bgs prior to purging and sampling. One groundwater sample was collected from TW06

The temporary monitoring well location is illustrated on **Figure 6**.

6.9 PRL 7: Hangar 414

6.9.1 PRL Deviations

One deviation from the Work Plan occurred at this PRL. Three consecutive readings within 10%

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were not obtained for DO or turbidity. In the last three readings DO ranged from 0.14-0.16 mg/L and turbidity ranged from 24.5-36.0 NTU. No other deviations, apart from the general Work Plan deviations (see **Section 6.2**), occurred at this PRL.

6.9.2 Soil Sampling

Three soil borings (07SB01, 07SB02, and 07SB03) were advanced on 07 November 2017, with shallow (0.5 to 1.0 ft. bgs) and deep (4.5 to 5.5 ft. bgs) soil samples collected from each boring. A total of seven soil samples (including 1 duplicate) were collected from this PRL.

Soil boring locations are illustrated on **Figure 7**.

6.9.3 Groundwater Sampling

Temporary well TW07 (co-located with 07SB01) was drilled to a depth of 10.0 ft. bgs on 07 November 2017, and a well screen was installed from 5.0 to 10.5 ft. bgs. Groundwater was measured at 6.0 ft. bgs prior to purging and sampling. One groundwater sample was collected from TW07.

The temporary monitoring well location is illustrated on **Figure 7**.

6.10 PRL 8: Fuel Spill Ditch

6.10.1 PRL Deviations

One deviation from the Work Plan occurred at this PRL. Three consecutive readings within 10% were not obtained for DO, ORP, or turbidity. In the last three readings DO ranged from 0.14-0.19 mg/L, ORP ranged from -103.0 to -89.2 mV, and turbidity ranged from 13.8-22.5 NTU. No other deviations, apart from the general Work Plan deviations (see **Section 6.2**), occurred at this PRL.

6.10.2 Soil Sampling

Three soil borings (08SB01, 08SB02, and 08SB03) were advanced on 07 November 2017, with shallow (0.5 to 1.0 ft. bgs) and deep (4.5 to 5.5 ft. bgs) soil samples collected from each boring. A total of seven soil samples (including 1 duplicate) were collected from this PRL.

Soil boring locations are illustrated on **Figure 7**

6.10.3 Groundwater Sampling

Temporary well TW08 (co-located with 08SB01) was drilled to a depth of 10 ft. bgs on 07 November 2017, and a well screen was installed from 5.0 to 10.0 ft. bgs. Groundwater was

encountered at 6.5 ft. bgs prior to purging and sampling. One groundwater sample was collected from TW07.

The temporary monitoring well location is illustrated on **Figure 7**.

6.11 PRL 9: Building 503 Parking Lot

6.11.1 PRL Deviations

One deviation from the Work Plan occurred at this PRL. Three consecutive readings within 10% were not obtained for DO, ORP, or turbidity. In the last three readings DO ranged from 1.45-1.71 mg/L, ORP ranged from -84.6 to -57.8 mV, and turbidity ranged from 5.33-19.3 NTU. No other deviations, apart from the general Work Plan deviations (see **Section 6.2**), occurred at this PRL.

6.11.2 Soil Sampling

Three soil borings (09SB01, 09SB02, and 09SB03) were advanced between 07 and 09 November 2017, with shallow (1.0 to 4.0 ft. bgs) and deep (6.5 to 9.5 ft. bgs) soil samples collected from each boring. A total of six soil samples were collected from this PRL.

Soil boring locations are illustrated on **Figure 8**.

6.11.3 Groundwater Sampling

Temporary well TW09 (co-located with 09SB01) was drilled to a depth of 15 ft. bgs on 09 November 2017, and a well screen was installed from 10.0-15.0 ft. bgs. Groundwater was encountered at 11.5 ft. bgs prior to purging and sampling. One groundwater sample was collected from TW07.

The temporary monitoring well locations is illustrated on **Figure 8**.

6.12 Base Boundary Wells: TWBB1-TWBB5

6.12.1 Deviations

Deviations occurred at the three Base boundary wells. Three consecutive readings within 10% were not obtained for Do, ORP, or turbidity in temporary well TWBB01. In the last three readings DO ranged from 0.23-0.31 mg/L, ORP ranged from -100.7 to -80.5 mV, and turbidity ranged from 19.2-26.0 NTU. Temporary well TWBB02 ran dry during purging and therefore a grab sample was collected on 09 November 2017. Temporary well TWBB03 had a very slow recharge after well completion, so a grab sample was collected on 09 November 2017. No other deviations, apart

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from the general Work Plan deviations (see **Section 6.2**), occurred at the Base boundary wells.

6.12.2 Groundwater Sampling

Between 11/08/2017 and 11/09/2017, four samples (including one duplicate) were collected from Base boundary wells TWBB01-TWBB03. Two samples (including one duplicate) were collected from TWBB01 and one sample was collected at both TWBB02 and TWBB03. These temporary wells were completed to depths of 10.2, 15.2, and 15.2 ft. for TWBB01, TWBB02, and TWBB03, respectively. Wells TWBB02 and TWBB03 were completed with a screened interval of 10.2-15.2 ft., while TWBB01 was completed with a screened interval of 5.2-10.2 ft. Depth to water was found to be 6.22, 9.40, and 11.10 ft. for TWBB01-TWBB03, respectively. The Base boundary well locations are illustrated on **Figure 9**.

7.0 SOIL AND GROUNDWATER STANDARDS

A soil or groundwater standard is an environmental and/or public health statute or rule used in identifying Base contamination that may pose a risk to human health or the environment. Soil and groundwater standards are federal and state human health and environment-based regulations used to:

- Determine the appropriate levels of Base clean-up;
- Define and formulate remedial action alternatives; and,
- Govern implementation and operation of the selected remedial action.

Currently no promulgated Standards exist for these compounds.

In accordance with *Interim Air Force Guidance on Sampling and Response Actions for Perfluorinated Compounds at Active and Base Realignment and Closure (BRAC) Installations* (USAF, 2012) and USEPA lifetime drinking water Health Advisories (HAs) for PFOS (USEPA, 2016a) and PFOA (USEPA, 2016b), a release is considered confirmed if the following concentrations are exceeded:

PFOS:

- 0.07 micrograms per liter ($\mu\text{g/L}$) in groundwater/surface water that is used as or contributes to a drinking water source (combined with PFOA value).
- 1,260 micrograms per kilogram ($\mu\text{g/kg}$) in soil (calculated in the absence of RSL values¹).
- 1,260 $\mu\text{g/kg}$ in sediment (calculated in the absence of RSL values).

PFOA:

- 0.07 $\mu\text{g/L}$ in groundwater/surface water (combined with PFOS value).
- 1,260 $\mu\text{g/kg}$ in soil (calculated in the absence of RSL values).
- 1,260 $\mu\text{g/kg}$ in sediment (calculated in the absence of RSL values).

USEPA has also derived RSL values for PFBS, for which there is a Tier 2 toxicity value (USEPA, 2017). The USAF will also consider a release to be confirmed if the following concentrations are exceeded:

¹ Air Force Guidance screening levels calculated using the USEPA Regional Screening Level 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/day derived by USEPA in their Drinking Water Health Advisories for both PFOS (USEPA, 2016a) and PFOA (USEPA, 2016b).

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PFBS:

- 400 µg/L in groundwater/surface water.
- 1,300,000 µg/kg in soil/sediment.

The HA, RSLs and USAF Guidance values are collectively referred to as screening criteria in this Report. **Table 5** presents the screening criteria for comparing the analytical results for PFBS, PFOA, and PFOS.

Table 5: USEPA and USAF SI Screening Criteria

Parameter	Chemical Abstract Number	USEPA Regional Screening Level Table (June 2017) ^a		Air Force Guidance for Soils and Sediments ^b (µg/kg)	USEPA Health Advisory Drinking Water (Surface Water or Groundwater) (µg/L) ^c
		Residential Soil (µg/kg)	Tap Water (µg/L)		
Perfluorobutane sulfonate (PFBS)	375-73-5	1,300,000 ^d	400	NL	NL
Perfluorooctanoic acid (PFOA)	335-67-1	NL	NL	1,260	0.07 ^e
Perfluorooctane sulfonate (PFOS)	1763-23-1	NL	NL	1,260	

^a USEPA Regional Screening Levels (USEPA, 2017).

^b Screening levels calculated using the USEPA Regional Screening Level 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/day derived by USEPA in their Drinking Water Health Advisories for both PFOS (USEPA, 2016a) and PFOA (USEPA, 2016b).

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

^d PFBS RSL for Residential Soil concentration presented in WP was 1,600,000 µg/kg based on the May 2016 RSL values. This table has been updated to include the more recent RSL values published in June 2017.

^e Note: When PFOA and PFOS are both present, the combined detected concentrations of the compounds are compared with the 0.07 µg/L health advisory value. Only groundwater was sampled during the SI, but analytical results have been compared to the tap water screening levels.

USEPA = United States Environmental Protection Agency

µg/kg = Micrograms per Kilogram

µg/L = Micrograms per Liter

NL = not listed

8.0 SITE INVESTIGATION RESULTS

This section presents the soil and groundwater data collected during the SI activities and a comparison of detections. Detections of PFBS, PFOA and PFOS are compared to the screening criteria as defined in the Work Plan and as presented in **Section 7.0**. Locations of detected analytes are shown on **Figures 4 through 9**.

8.1 PRL 1: Building 430 (Current Fire Station)

8.1.1 PRL 1 Soil Analytical Results

Seven soil samples (including one duplicate) were collected and analyzed from three borings as described in **Section 6.3.2**: 01SB01 from 0.5-1.0 and 4.5 to 5.5 ft. bgs; 01SB02 from 0.5 to 1.0 and 4.5 to 5.5 ft. bgs; 01SB03 from 0.5 to 1.0 and 4.0 to 4.5 ft. bgs. Analytical results from soil samples indicate PFCs were detected above the laboratory reporting limit, with the shallow sample in 01SB01 exceeding HA criteria for PFOS. PFOS was detected at a concentration of 1.32 mg/kg and PFOA was detected at a concentration of 0.00241 mg/kg.

Comparison of soil analytical results to applicable screening criteria are presented on **Table 2**. The soil boring locations showing detected compounds are depicted on **Figure 4**.

8.1.2 PRL 1 Groundwater Analytical Results

One groundwater sample was collected from TW-01 and analyzed as described in **Section 6.3.3**. Analytical results from the groundwater sample indicates that six PFCs were detected at concentrations above the laboratory detection limit, with two compounds exceeding USEPA Drinking Water HA. PFOS was detected at a concentration of 39.0 µg/L and PFOA was detected at a concentration of 0.841 µg/L. The combined PFOS and PFOA is 39.841 µg/L.

Comparison of groundwater analytical results to applicable criteria are presented on **Table 3**. The temporary monitoring well location showing detected compounds is illustrated on **Figure 4**.

8.2 PRL 2: Building 430 Nozzle Test Area 1

8.2.1 PRL 2 Soil Analytical Results

Seven soil samples (including one duplicate) were collected and analyzed from three borings as described in **Section 6.4.2**: 02SB01 from 0.5 to 1.0 and 6.0 to 6.5 ft. bgs; 02SB02 from 0.5 to 1.0 and 5.0 to 5.5 ft. bgs; 02SB03 from 0.5 to 1.0 and 6.0 to 6.5 ft. bgs. Analytical results from soil

samples indicate PFCs were detected above the laboratory reporting limit, with three samples having PFOS concentrations exceeding HA criteria. Sample 02SB02-0.5-1.0 was found to have a PFOS concentration of 3.33 mg/kg and a PFAS concentration of 0.0141 mg/kg. Sample 02SB03-0.5-1.0 was found to have a PFOS concentration of 30.1 mg/kg and a PFAS concentration of 0.118 mg/kg. The duplicate to sample 02SB02-0.5-1.0 was found to have a PFOS concentration of 36.8 mg/kg and a PFAS concentration of 0.151 mg/kg.

Comparison of soil analytical results to applicable screening criteria are presented on **Table 2**. The soil boring locations showing detected compounds are depicted on **Figure 4**.

8.2.2 PRL 2 Groundwater Analytical Results

One groundwater sample was collected from TW-02 and analyzed as described in **Section 6.4.3**. Analytical results from the groundwater sample indicates that six PFCs were detected at concentrations above the laboratory detection limit, with two compounds exceeding USEPA Drinking Water HA. PFOS was detected at a concentration of 28.4 µg/L and PFOA was detected at a concentration of 0.349 µg/L. The combined PFOS and PFOA is 28.749 µg/L.

Comparison of groundwater analytical results to applicable criteria are presented on **Table 3**. The temporary monitoring well location showing detected compounds is illustrated on **Figure 4**.

8.3 PRL 3: Building 430 Nozzle Test Area 2

8.3.1 PRL 3 Soil Analytical Results

Six soil samples were collected and analyzed from three soil borings as described in **Section 6.5.2**: 03SB01 from 0.5 to 1.0 and 6.0 to 6.5 ft. bgs; 03SB02 from 0.5 to 1.0 and 4.0 to 4.5 ft. bgs; and 03SB03 from 0.5 to 1.0 and 5.0 to 5.5 ft. bgs. Analytical results from soil samples indicate PFCs were detected above the laboratory reporting limit. There were no exceedances of the screening criteria in the soil samples collected from PRL 3.

Comparison of soil analytical results to applicable screening criteria are presented on **Table 2**. The soil boring locations showing detected compounds are depicted on **Figure 4**.

8.3.2 PRL 3 Groundwater Analytical Results

One groundwater sample was collected from TW-03 and analyzed as described in **Section 6.5.3**. Analytical results from the groundwater sample indicates that six PFCs were detected at

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concentrations above the laboratory detection limit, with two compounds exceeding USEPA Drinking Water HA. PFOS was detected at a concentration of 13.8 µg/L and PFOA was detected at a concentration of 0.528 µg/L. The combined PFOS and PFOA is 14.328 µg/L.

Comparison of groundwater analytical results to applicable criteria are presented on **Table 3**. The temporary monitoring well location showing detected compounds is illustrated on **Figure 4**.

8.4 PRL 4: Former Building 403 (Former Fire Station)

8.4.1 PRL 4 Soil Analytical Results

Six soil samples were collected and analyzed from 3 soil borings as described in **Section 6.6.2**: 04SB01 from 0.5 to 1.0 and 4.5 to 5.0 ft. bgs; 04SB02 from 1.0 to 2.0 and 5.0 to 5.5 ft. bgs; and 04SB03 from 1.0 to 2.0 and 5.0 to 5.5 ft. bgs. Analytical results from soil samples indicate PFCs were detected above the laboratory reporting limit; however, no compounds exceeded the screening criteria in any of the soil samples collected from PRL 4.

Comparison of soil analytical results to applicable screening criteria are presented on **Table 2**. The soil boring locations showing detected compounds are depicted on **Figure 5**.

8.4.2 PRL 4 Groundwater Analytical Results

One groundwater sample was collected from TW-04 and analyzed as described in **Section 6.6.3**. Analytical results from the groundwater sample indicates that six PFCs were detected at concentrations above the laboratory detection limit, with two compounds exceeding USEPA Drinking Water HA. PFOS was detected at a concentration of 0.149 µg/L and PFOA was detected at a concentration of 0.0849 µg/L. The combined PFOS and PFOA is 0.2339 µg/L.

Comparison of groundwater analytical results to applicable criteria are presented on **Table 3**. The temporary monitoring well location showing detected compounds is illustrated on **Figure 5**.

8.5 PRL 5: Hangar 400

8.5.1 PRL 5 Soil Analytical Results

Six soil samples were collected and analyzed from three soil borings as described in **Section 6.7.2**: 05SB01 from 0.5 to 1.0 and 6.0 to 6.5 ft. bgs; 05SB02 from 0.5 to 1.0 and 7.0 to 7.5 ft. bgs; and 05SB03 from 0.5 to 1.0 and 6.0 to 6.5 ft. bgs. Analytical results from soil samples indicate PFCs were detected above the laboratory reporting limit; however, no compounds exceeded the

screening criteria in any of the soil samples collected from PRL 5.

Comparison of soil analytical results to applicable screening criteria are presented on **Table 2**. The soil boring locations showing detected compounds are depicted on **Figure 5**.

8.5.2 PRL 5 Groundwater Analytical Results

One groundwater sample was collected from TW-05 and analyzed as described in **Section 6.7.3**. Analytical results from the groundwater sample indicates that six PFCs were detected at concentrations above the laboratory detection limit, with one compound exceeding USEPA Drinking Water HA. PFOS was detected at a concentration of 0.174 µg/L. The combined PFOS and PFOA is 0.2389 µg/L.

Comparison of groundwater analytical results to applicable criteria are presented on **Table 3**. The temporary monitoring well location showing detected compounds is illustrated on **Figure 5**.

8.6 PRL 6: Hangar 406

8.6.1 PRL 6 Soil Analytical Results

Seven soil samples (including one duplicate) were collected and analyzed from three soil borings as described in **Section 6.8.2**: 06SB01 from 0.5 to 1.0 and 6.5 to 7.0 ft. bgs; 06SB02 from 0.5 to 1.0 and 4.5 to 5.0 ft. bgs; and 06SB03 from 4.5 to 5.0 and 7.0 to 7.5 ft. bgs. Analytical results from soil samples indicate PFCs were detected above the laboratory reporting limit; however, no compounds exceeded the screening criteria in any of the soil samples collected from PRL 6.

Comparison of analytical results to applicable screening criteria are presented on **Table 2**. The soil boring locations showing detected compounds are depicted on **Figure 6**.

8.6.2 PRL 6 Groundwater Analytical Results

One groundwater sample was collected from TW-06 and analyzed as described in **Section 6.8.3**. Analytical results from the groundwater sample indicates that six PFCs were detected at concentrations above the laboratory detection limit, with one compound exceeding USEPA Drinking Water HA. PFOS was detected at a concentration of 0.121 µg/L. The combined PFOS and PFOA is 0.1412 µg/L.

Comparison of groundwater analytical results to applicable criteria are presented on **Table 3**. The temporary monitoring well location showing detected compounds is illustrated on **Figure 6**.

8.7 PRL 7: Hangar 414

8.7.1 PRL 7 Soil Analytical Results

Seven soil samples (including one duplicate) were collected and analyzed from three soil borings as described in **Section 6.9.2**: 07SB01 from 0.5 to 1.0 and 4.5 to 5.0 ft. bgs; 07SB02 from 0.5 to 1.0 and 4.5 to 5.0 ft. bgs; and 07SB03 from 0.5 to 1.0 and 5.0 to 5.5 ft. bgs. Analytical results from soil samples indicate some compounds were detected above the laboratory reporting limit; however, no compounds exceeded the screening criteria in any of the soil samples collected from PRL 7.

Comparison of soil analytical results to applicable screening criteria are presented on **Table 2**. The soil boring locations showing detected compounds are depicted on **Figure 7**.

8.7.2 PRL 7 Groundwater Analytical Results

One groundwater sample was collected from TW-07 and analyzed as described in **Section 6.9.3**. Analytical results from the groundwater sample indicates that six PFCs were detected at concentrations above the laboratory detection limit, with two compounds exceeding USEPA Drinking Water HA. PFOS was detected at a concentration of 3.56 µg/L and PFAS was detected at a concentration of 0.116 µg/L. The combined PFOS and PFOA is 3.676 µg/L.

Comparison of groundwater analytical results to applicable criteria are presented on **Table 3**. The temporary monitoring well location showing detected compounds is illustrated on **Figure 7**.

8.8 PRL 8: Fuel Spill Ditch

8.8.1 PRL 8 Soil Analytical Results

Seven soil samples (including one duplicate) were collected and analyzed from 3 soil borings as described in **Section 6.10.2**: 08SB01 from 0.5 to 1.0 and 5.0 to 5.5 ft. bgs; 08SB02 from 0.5 to 1.0 and 5.0 to 5.5 ft. bgs; and 08SB03 from 0.5 to 1.0 and 4.5 to 5.0 ft. bgs. Analytical results from soil samples indicate some compounds were detected above the laboratory reporting limit; however, no compounds exceeded the screening criteria in any of the soil samples collected from PRL 8.

Comparison of soil analytical results to applicable screening criteria are presented on **Table 2**. The soil boring locations showing detected compounds are depicted on **Figure 7**.

8.8.2 PRL 8 Groundwater Analytical Results

One groundwater sample was collected from TW-08 and analyzed as described in **Section 6.10.3**. Analytical results from the groundwater sample indicates that six PFCs were detected at concentrations above the laboratory detection limit, with two compounds exceeding USEPA Drinking Water HA. PFOS was detected at a concentration of 7.98 µg/L and PFOA was detected at a concentration of 0.0898 µg/L. The combined PFOS and PFOA is 8.0698 µg/L.

Comparison of groundwater analytical results to applicable criteria are presented on **Table 3**. The temporary monitoring well location showing detected compounds is illustrated on **Figure 7**.

8.9 PRL 9: Building 503 Parking Lot

8.9.1 PRL 9 Soil Analytical Results

Six soil samples were collected and analyzed from three soil borings as described in **Section 6.11.2**: 05SB01 from 1.0 to 2.0 and 9.0 to 9.5 ft. bgs; 05SB02 from 2.0 to 3.0 and 8.0 to 9.0 ft. bgs; and 05SB03 from 3.5 to 4.0 and 6.5 to 7.0 ft. bgs. Analytical results from soil samples indicate PFCs were detected above the laboratory reporting limit; however, no compounds exceeded the screening criteria in any of the soil samples collected from PRL 9.

Comparison of soil analytical results to applicable screening criteria are presented on **Table 2**. The soil boring locations showing detected compounds are depicted on **Figure 8**.

8.9.2 PRL 9 Groundwater Analytical Results

One groundwater sample was collected from TW-09 and analyzed as described in **Section 6.11.3**. Analytical results from the groundwater sample indicates that six PFCs were detected at concentrations above the laboratory detection limit, with one compound exceeding USEPA Drinking Water HA. PFOS was detected at a concentration of 0.300 µg/L. The combined PFOS and PFOA is 0.3164 µg/L.

Comparison of groundwater analytical results to applicable criteria are presented on **Table 3**. The temporary monitoring well location showing detected compounds is illustrated on **Figure 8**.

8.10 Base Boundary Wells: TWBB01-TWBB05

8.10.1 Groundwater Analytical Results

Four groundwater samples (including one duplicate) were collected from three Base boundary

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wells. Analytical results from these samples indicate that six PFCs were detected at concentrations above the laboratory detection limits in TWBB-01 and TWBB-02, and three PFCs were detected at concentrations above the laboratory detection limit for TWBB-03. PFC concentrations exceeding USEPA Drinking Water HA standards were found for two compounds in TWBB-01 and TWBB-02; however, no PFC concentrations exceeding HA standards were found in TWBB-03. In TWBB-01 PFOS was detected at a concentration of 0.569 µg/L and PFOA was detected at concentrations of 0.0953 µg/L. In TWBB-02 PFOS was detected at a concentration of 0.509 µg/L and PFOA was detected at concentrations of 0.126 µg/L. Combined PFOS and PFOA were detected at a concentration of 0.6643, 0.635, and 0.404 µg/L for TWBB-01, TWBB-02, and TWBB-03 respectively.

Comparisons of analytical results to applicable criteria are presented on **Table 3**. The temporary monitoring well locations showing detected compounds are illustrated on **Figure 9**.

9.0 CONCLUSIONS/RECOMMENDATIONS

This section presents the SI conclusions and recommendations at each PRL. Recommendations are based upon data collected by Amec Foster Wheeler during this SI, and an evaluation of results compared to applicable screening criteria.

9.1 PRL 1: Building 430 (Current Fire Station)

A review of soil analytical data compared to screening criteria indicates there are no USEPA RSL exceedances for PFBS, and no USAF Guidance screening level exceedances for PFOA at on-Base locations near PRL 1. One USAF Guidance screening level exceedance of for PFOS in the shallow soil sample was observed from 01SB01 at PRL 1.

A review of groundwater data compared to screening criteria indicates exceedances of the USEPA Drinking Water HA exist downgradient from PRL 1. This determination was made based on concentrations observed in TW-01, which was installed to assess groundwater conditions downgradient from both PRL 1. Given that groundwater flows to the east/southeast, groundwater with PFC concentrations above applicable screening criteria is potentially present off-Base to the east/south of PRL 1.

Based on the SI results, the following are recommended for PRL 1:

- Additional investigations to evaluate concentrations of PFC in soil within the footprint of the equipment test area
- Installation of a permanent monitoring well downgradient of PRL 1 to further evaluate the possible presence of PFCs at concentrations at or exceeding screening criteria levels.

9.2 PRL 2: Building 430 Nozzle Test Area 1

A review of soil analytical data compared to screening criteria indicates no exceedances of USEPA RSL for PFSB and no exceedance of the USAF Guidance screening level for PFOA. PFOS in the shallow soil samples from 02SB02 and 02SB03 as well as in the duplicate of 02SB03 exceeded the USAF Guidance screening level.

A review of groundwater data compared to screening criteria indicates exceedances of the USEPA Drinking Water HA exist downgradient from PRL 2. This determination was made based on concentrations observed in TW-02, which was installed to assess groundwater conditions downgradient from both PRL 2. Given that groundwater flows to the east/southeast, groundwater

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with PFC concentrations above applicable screening criteria is potentially present off-Base to the east/south of PRL 2.

Based on the SI results, the following are recommended for PRL 2:

- Additional investigations to evaluate concentrations of PFC in soil within the footprint of the equipment test area
- Installation of a permanent monitoring well downgradient of PRL 2 to further evaluate the possible presence of PFCs at concentrations at or exceeding screening criteria levels.

9.3 PRL 3: Building 430 Nozzle Test Area 2

A review of soil analytical data compared to soil screening criteria indicates there are no USEPA RSL exceedances for PFBS, and no USAF Guidance screening level exceedances for PFOS or PFOA at on-Base locations near PRL 3.

A review of groundwater data compared to screening criteria indicates exceedances of the USEPA Drinking Water HA exist downgradient from PRL 3. This determination was made based on concentrations observed in TW-03, which was installed to assess groundwater conditions downgradient from both PRL 3. Given that groundwater flows to the east/southeast, groundwater with PFC concentrations above applicable screening criteria is potentially present off-Base to the east/south of PRL 3.

Based on the SI results, the following is recommended for PRL 3:

- Additional investigations to further evaluate concentrations of PFC in groundwater. This should include a source evaluation and delineation to determine the nature and extent of the release.

9.4 PRL 4: Former Building 403 (Former Fire Station)

A review of soil analytical data compared to soil screening criteria indicates there are no USEPA RSL exceedances for PFBS, and no USAF Guidance screening level exceedances for PFOS or PFOA at on-Base locations near PRL 4.

A review of groundwater data compared to screening criteria indicates exceedances of the USEPA Drinking Water HA exist downgradient from PRL 4. This determination was made based on concentrations observed in TW-04, which was installed to assess groundwater conditions downgradient from both PRL 4. Given that groundwater flows to the east/southeast, groundwater

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with PFC concentrations above applicable screening criteria is potentially present off-Base to the east/south of PRL 4.

Based on the SI results, the following is recommended for PRL 4:

- Additional investigations to further evaluate concentrations of PFC in groundwater. This should include a source evaluation and delineation to determine the nature and extent of the release.

9.5 PRL 5: Hangar 400

A review of soil analytical data compared to soil screening criteria indicates there are no USEPA RSL exceedances for PFBS, and no USAF Guidance screening level exceedances for PFOS or PFOA at on-Base locations near PRL 5.

A review of groundwater data compared to screening criteria indicates an exceedance of the USEPA Drinking Water HA exists downgradient from PRL 5. This determination was made based on concentrations observed in TW-05, which was installed to assess groundwater conditions downgradient from both PRL 5. Given that groundwater flows to the east/southeast, groundwater with PFC concentrations above applicable screening criteria is potentially present off-Base to the east/south of PRL 5.

Based on the SI results, the following is recommended for PRL 5:

- Additional investigations to further evaluate concentrations of PFC in groundwater. This should include a source evaluation and delineation to determine the nature and extent of the release.

9.6 PRL 6: Hangar 406

A review of soil analytical data compared to soil screening criteria indicates there are no USEPA RSL exceedances for PFBS, and no USAF Guidance screening level exceedances for PFOS or PFOA at on-Base locations near PRL 6.

A review of groundwater data compared to screening criteria indicates an exceedance of the USEPA Drinking Water HA exists downgradient from PRL 6. This determination was made based on concentrations observed in TW-06, which was installed to assess groundwater conditions downgradient from both PRL 6. Given that groundwater flows to the east/southeast, groundwater with PFC concentrations above applicable screening criteria is potentially present off-Base to the

east/south of PRL 6.

Based on the SI results, the following is recommended for PRL 6:

- Additional investigations to further evaluate concentrations of PFC in groundwater. This should include a source evaluation and delineation to determine the nature and extent of the release.

9.7 PRL 7: Hangar 414

A review of soil analytical data compared to soil screening criteria indicates there are no USEPA RSL exceedances for PFBS, and no USAF Guidance screening level exceedances for PFOS or PFOA at on-Base locations near PRL 7.

A review of groundwater data compared to screening criteria indicates exceedances of the USEPA Drinking Water HA exist downgradient from PRL 7. This determination was made based on concentrations observed in TW-07, which was installed to assess groundwater conditions downgradient from both PRL 7. Given that groundwater flows to the east/southeast, groundwater with PFC concentrations above applicable screening criteria is potentially present off-Base to the east/south of PRL 7.

Based on the SI results, the following is recommended for PRL 7:

- Additional investigations to further evaluate concentrations of PFC in groundwater. This should include a source evaluation and delineation to determine the nature and extent of the release.

9.8 PRL 8: Fuel Spill Ditch

A review of soil analytical data compared to soil screening criteria indicates there are no USEPA RSL exceedances for PFBS, and no USAF Guidance screening level exceedances for PFOS or PFOA at on-Base locations near PRL 8.

A review of groundwater data compared to screening criteria indicates exceedances of the USEPA Drinking Water HA exist downgradient from PRL 8. This determination was made based on concentrations observed in TW-08, which was installed to assess groundwater conditions downgradient from both PRL 8. Given that groundwater flows to the east/southeast, groundwater with PFC concentrations above applicable screening criteria is potentially present off-Base to the east/south of PRL 8.

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Based on the SI results, the following is recommended for PRL 8:

- Additional investigations to further evaluate concentrations of PFC in groundwater. This should include a source evaluation and delineation to determine the nature and extent of the release.

9.9 PRL 9: Building 503 Parking Lot

A review of soil analytical data compared to soil screening criteria indicates there are no USEPA RSL exceedances for PFBS, and no USAF Guidance screening level exceedances for PFOS or PFOA at on-Base locations near PRL 9.

A review of groundwater data compared to screening criteria indicates an exceedance of the USEPA Drinking Water HA exists downgradient from PRL 9. This determination was made based on concentrations observed in TW-09, which was installed to assess groundwater conditions downgradient from both PRL 9. Given that groundwater flows to the east/southeast, groundwater with PFC concentrations above applicable screening criteria is potentially present off-Base to the east/south of PRL 9.

Based on the SI results, the following is recommended for PRL 9:

- Additional investigations to further evaluate concentrations of PFC in groundwater. This should include a source evaluation and delineation to determine the nature and extent of the release.

9.10 Base Boundary Wells

A review of groundwater data compared to screening criteria indicates exceedances of the USEPA Drinking Water HA in two of the three Base boundary wells installed to assess the conditions of groundwater crossing the Base boundary. This determination was made based on concentrations observed in TWBB01 and TWBB02. Given that groundwater flows to the east/southeast and that samples at the Base boundary have exceedances, groundwater with PFC concentrations above applicable screening criteria is very likely present off-Base to the east/south.

9.11 PRL Sites Summary

In summary, analytical data for soil samples indicate USEPA RSL exceedances for PFOS at two PRLs (1 and 2). Additionally, groundwater samples from the nine PRLs and two Base-boundary

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locations show exceedances of USEPA Drinking Water HA screening levels. Therefore, Amec Foster Wheeler recommends additional investigations at the nine PRLs to further evaluate PFC concentrations in groundwater and to delineate the contamination to determine the nature and extent of the confirmed releases. Furthermore, Amec Foster Wheeler recommends additional investigations at PRLs 1 and 2 to further evaluate the PFC concentrations in soil and to delineate the contamination to determine the nature and extent of the confirmed releases, as well as determining if the soil contamination may be a contributing source to groundwater.

These recommendations are summarized in the **Table 6** below.

Table 6: Screening Criteria Exceedances and Recommendations

PRL	Screening Criteria Exceedance		Recommendations
	Soil	GW	
1	X	X	Soil investigation to determine the extent of PFC contamination within the footprint of the PRL. GW investigation to determine the nature and extent of the confirmed PFC release.
2	X	X	Soil investigation to determine the extent of PFC contamination within the footprint of the PRL. GW investigation to determine the nature and extent of the confirmed PFC release.
3		X	GW investigation to determine the nature and extent of the confirmed PFC release. Soil investigation to determine if the soil may be a contributing source to the GW.
4		X	GW investigation to determine the nature and extent of the confirmed PFC release. Soil investigation to determine if the soil may be a contributing source to the GW.
5		X	GW investigation to determine the nature and extent of the confirmed PFC release. Soil investigation to determine if the soil may be a contributing source to the GW.
6		X	GW investigation to determine the nature and extent of the confirmed PFC release. Soil investigation to determine if the soil may be a contributing source to the GW.
7		X	GW investigation to determine the nature and extent of the confirmed PFC release. Soil investigation to determine if the soil may be a contributing source to the GW.
8		X	GW investigation to determine the nature and extent of the confirmed PFC release. Soil investigation to determine if the soil may be a contributing source to the GW.
9		X	GW investigation to determine the nature and extent of the confirmed PFC release. Soil investigation to determine if the soil may be a contributing source to the GW.

Notes:

GW = Groundwater

Inc. - Inconclusive based on results of SI

X – Screening criteria exceedance

PFC - Perfluorinated Compound

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TABLES

Table 1: Summary of Site Inspection Activities

PRL Name	Analyzed Parameters	Soil Borings	Soil Samples	Groundwater Samples Temporary Wells
1. Building 430 (Current Fire Station)	Perflourinated Compounds (PFCs)	3	6	1
2. Building 430 Nozzle Test Area 1	PFCs	3	6	1
3. Building 430 Nozzle Test Area 2	PFCs	3	6	1
4. Former Building 403 (Former Fire Station)	PFCs	3	6	1
5. Hangar 400	PFCs	3	6	1
6. Hangar 406	PFCs	3	6	1
7. Hangar 414	PFCs	3	6	1
8. Fuel Spill Ditch	PFCs	3	6	1
9. Building 503 Parking Lot	PFCs	3	6	1
10. Base Boundary Wells	PFCs	3	0	3

Table 2
Summary of Soil Analytical Testing Results
 FY16 Phase I Regional Site Inspections for Perfluorinated Compounds
 Wisconsin Air National Guard, Truax Field, Wisconsin

Analyte:						Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluorobutanesulfonic acid (PFBS)	Perfluorooheptanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorononanoic acid (PFNA)
						Screening Level:	1.26 ¹	1.26 ¹	1300 ²	NA	NA
	TRUAX-03-SB03	TRUAX-03-SB03-0.5-1	08-Nov-17	0.5-1.0	N	0.169	0.00257	0.00096 U	0.000855 J	0.0076	0.00254
		TRUAX-03-SB03-110817-5-5.5	08-Nov-17	5.0-5.5	N	0.0177	0.000358 J	0.000998 U	0.000998 U	0.00184 J	0.000289 J
4	TRUAX-04-SB01	TRUAX-04-SB01-110917-0.5-1	09-Nov-17	0.5-1.0	N	0.0124	0.00037 J	0.00103 U	0.00103 U	0.0011 J	0.00103 U
		TRUAX-04-SB01-110917-4.5-5	09-Nov-17	4.5-5.5	N	0.0176	0.000979 U	0.000979 U	0.000979 U	0.000354 J	0.000305 J
	TRUAX-04-SB02	TRUAX-04-SB02-110917-1-2	09-Nov-17	1.0-2.0	N	0.368	0.0016 J	0.00104 U	0.000448 J	0.00272	0.00104 U
		TRUAX-04-SB02-110917-5-5.5	09-Nov-17	5.0-5.5	N	0.611 J	0.00431	0.00096 U	0.000895 J	0.016 J	0.0011 J
	TRUAX-04-SB03	TRUAX-04-SB03-110917-1-2	09-Nov-17	1.0-2.0	N	0.00207	0.000972 U	0.000972 U	0.000972 U	0.000972 U	0.000972 U
		TRUAX-04-SB03-110917-5-5.5	09-Nov-17	5.0-5.5	N	0.00345	0.000975 U	0.000975 U	0.000975 U	0.000975 U	0.000975 U
5	TRUAX-05-SB01	TRUAX-05-SB01-110917-0.5-1	09-Nov-17	0.5-1.0	N	0.088	0.00458 J	0.001 U	0.00185 J	0.0388 J	0.00126 J
		TRUAX-05-SB01-110917-6-6.5	09-Nov-17	6.0-6.5	N	0.00104 U	0.00104 U	0.00104 U	0.00104 U	0.002 J	0.00104 U
	TRUAX-05-SB02	TRUAX-05-SB02-110917-0.5-1	09-Nov-17	0.5-1.0	N	0.0222	0.00181 J	0.00102 U	0.00122 J	0.00377	0.00163 J
		TRUAX-05-SB02-110917-7-7.5	09-Nov-17	7.0-7.5	N	0.00103 U	0.00103 U	0.00103 U	0.00103 U	0.00103 U	0.00103 U
	TRUAX-05-SB03	TRUAX-05-SB03-110917-0.5-1	09-Nov-17	0.5-1.0	N	0.333 J	0.00164 J	0.000968 U	0.00062 J	0.00883 J	0.00355
		TRUAX-05-SB03-110917-6-6.5	09-Nov-17	6.0-6.5	N	0.0477	0.00102 U	0.00102 U	0.00102 U	0.000693 J	0.00142 J
6	TRUAX-06-SB01	TRUAX-06-SB01-110617-0.5-1.0	06-Nov-17	0.5-1.0	N	0.00209 J	0.000818 J	0.000988 U	0.000988 U	0.000978 J	0.000988 U
		TRUAX-DUP01-110617	06-Nov-17	0.5-1.0	FD	0.00428 J	0.00101 J	0.000983 U	0.000983 U	0.00128 J	0.000983 U
		TRUAX-06-SB01-110617-6.5-7.0	06-Nov-17	6.5-7.0	N	0.000966 U	0.000966 U	0.000966 U	0.000966 U	0.000966 U	0.000966 U
	TRUAX-06-SB02	TRUAX-06-SB02-0.5-1.0	07-Nov-17	0.5-1.0	N	0.0164	0.000971 U	0.000971 U	0.000971 U	0.00287	0.000378 J
		TRUAX-06-SB02-110717-4.5-5.0	07-Nov-17	4.5-5.0	N	0.000995 J	0.000961 U	0.000961 U	0.000961 U	0.000961 U	0.000961 U

Table 2
Summary of Soil Analytical Testing Results
 FY16 Phase I Regional Site Inspections for Perfluorinated Compounds
 Wisconsin Air National Guard, Truax Field, Wisconsin

Analyte:						Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluorobutanesulfonic acid (PFBS)	Perfluorooheptanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorononanoic acid (PFNA)
						Screening Level:	1.26 ¹	1.26 ¹	1300 ²	NA	NA
TRUAX-06-SB03	TRUAX-06-SB03-4.5-5.5	07-Nov-17	4.5-5.0	N	0.00213	0.000927 U	0.000927 U	0.000927 U	0.000326 J	0.000927 U	
	TRUAX-06-SB03-7.0-7.5	07-Nov-17	7.0-7.5	N	0.000937 U	0.000937 U	0.000937 U	0.000937 U	0.000287 J	0.000937 U	
7	TRUAX-07-SB01	TRUAX-07-SB01-110717-0.5-1.0	07-Nov-17	0.5-1.0	N	0.0194	0.000337 J	0.000999 U	0.000999 U	0.00168 J	0.000999 U
		TRUAX-07-SB01-110717-4.5-5.0	07-Nov-17	4.5-5.0	N	0.022	0.000999 U	0.000999 U	0.000999 U	0.00188 J	0.000999 U
	TRUAX-07-SB02	TRUAX-07-SB02-110717-0.5-1.0	07-Nov-17	0.5-1.0	N	0.0331	0.000965 U	0.000965 U	0.000965 U	0.00293	0.000965 U
		TRUAX-07-SB02-110717-4.5-5.0	07-Nov-17	4.5-5.0	N	0.0175	0.00039 J	0.00092 U	0.00092 U	0.00336	0.000311 J
	TRUAX-07-SB03	TRUAX-07-SB03-110717-0.5-1.0	07-Nov-17	0.5-1.0	N	0.175 J	0.00125 J	0.000984 U	0.000528 J	0.0105 J	0.00133 J
		TRUAX-07-SO-DUP2-110717	07-Nov-17	0.5-1.0	FD	0.103 J	0.00103 J	0.000963 U	0.000375 J	0.00676 J	0.00104 J
TRUAX-07-SB03-110717-5.0-5.5		07-Nov-17	5.0-5.5	N	0.00823	0.000447 J	0.00094 U	0.00094 U	0.00499	0.00094 U	
8	TRUAX-08-SB01	TRUAX-08-SB01-110717-0.5-1.0	07-Nov-17	0.5-1.0	N	0.0366	0.000831 J	0.000947 U	0.000411 J	0.00314	0.000805 J
		TRUAX-08-SB01-110717-5.0-5.5	07-Nov-17	5.0-5.5	N	0.0463	0.000977 U	0.000977 U	0.000977 U	0.00125 J	0.000793 J
	TRUAX-08-SB02	TRUAX-08-SB02-110717-0.5-1.0	07-Nov-17	0.5-1.0	N	0.0199 J	0.000321 J	0.000966 U	0.000966 U	0.00371 J	0.000334 J
		TRUAX-08-SO-DUP3-110717	07-Nov-17	0.5-1.0	FD	0.0381 J	0.000714 J	0.000339 J	0.00043 J	0.00759 J	0.000443 J
		TRUAX-08-SB02-110717-5.0-5.5	07-Nov-17	5.0-5.5	N	0.0274	0.00092 J	0.000322 J	0.000587 J	0.00605	0.000582 J
	TRUAX-08-SB03	TRUAX-08-SB03-110717-0.5-1.0	07-Nov-17	0.5-1.0	N	0.0277	0.00036 J	0.000968 U	0.000968 U	0.00228	0.000355 J
TRUAX-08-SB03-110717-4.5-5.0		07-Nov-17	4.5-5.0	N	0.00108 J	0.000959 U	0.000959 U	0.000959 U	0.000814 J	0.000959 U	
TRUAX-09-SB01	TRUAX-09-SB01-110917-1-2	09-Nov-17	1.0-2.0	N	0.000601 J	0.000977 U	0.000977 U	0.000977 U	0.000392 J	0.000977 U	
	TRUAX-09-SB01-110917-9.0-9.5	09-Nov-17	9.0-9.5	N	0.00191 J	0.00102 U	0.00102 U	0.00102 U	0.00102 U	0.00102 U	

Table 2
Summary of Soil Analytical Testing Results
 FY16 Phase I Regional Site Inspections for Perfluorinated Compounds
 Wisconsin Air National Guard, Truax Field, Wisconsin

Analyte:						Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluorobutanesulfonic acid (PFBS)	Perfluorohexanoic acid (PFHxA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorononanoic acid (PFNA)
Screening Level:						1.26 ¹	1.26 ¹	1300 ²	NA	NA	NA
9	TRUAX-09-SB02	TRUAX-09-SB02-2-3	08-Nov-17	2.0-3.0	N	0.000961 U	0.000961 U	0.000961 U	0.000961 U	0.000961 U	0.000961 U
		TRUAX-09-SB02-110817-8-9	08-Nov-17	8.0-9.0	N	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
	TRUAX-09-SB03	TRUAX-09-SB03-110717-3.5-4.0	07-Nov-17	3.5-4.0	N	0.000955 U	0.000955 U	0.000955 U	0.000955 U	0.000955 U	0.000955 U
		TRUAX-09-SB03-110717-6.5-7.0	07-Nov-17	6.5-7.0	N	0.000948 U	0.000948 U	0.000948 U	0.000948 U	0.000948 U	0.000948 U

Notes:

Light blue = Exceeds 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 in the sample.

mg/kg - milligrams per kilogram

MECDC - Maine Center for Disease Control and Prevention

N - Normal Field Sample

NA - Not applicable

PRL - Potential Release Location

U - The analyte was analyzed for, but was not detected above the reported limit of detection.

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

¹ Screening levels calculated using the USEPA 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>]

Table 3
Summary of Groundwater Analytical Testing Results
 FY16 Phase I Regional Site Inspections for Perfluorinated Compounds
 Wisconsin Air National Guard, Truax Field, Wisconsin

Analyte:						Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	PFOS+PFOA	Perfluorobutanesulfonic acid (PFBS)	Perfluorohexanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorononanoic acid (PFNA)
						Health Advisory:	0.07		0.07	NA	NA	NA
EPA RSL Tapwater:						NA	NA	NA	400	NA	NA	NA
PRL	Location	Sample ID	Sample Date	Sample Depth (ft.)	Sample Type	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
1	TW-01	TRUAX-01-TW01-110817	08-Nov-17	5.0-10.0	N	39	0.841	39.841	0.357	0.294	5.49	0.0987
2	TW-02	TRUAX-02-TW02-110817	08-Nov-17	5.0-10.0	N	28.4	0.349	28.749	0.134	0.18	4.26	0.107
3	TW-03	TRUAX-03-TW03-110817	08-Nov-17	5.0-10.0	N	13.8	0.528	14.328	0.133	0.445	8.82	0.089
4	TW-04	TRUAX-04-TW04-110917	09-Nov-17	5.0-10.0	N	0.149	0.0849	0.2339	0.0163	0.035	0.593	0.0028 J
5	TW-05	TRUAX-05-TW05-110917	09-Nov-17	5.0-10.0	N	0.174	0.0649	0.2389	0.013	0.0299	0.285	0.00526 J
6	TW-06	TRUAX-06-TW06-110617	06-Nov-17	5.0-10.0	N	0.121 J	0.0202	0.1412	0.0127	0.0175	0.236 J	0.0024 J
7	TW-07	TRUAX-07-TW07-110817	08-Nov-17	5.0-10.0	N	3.56	0.116	3.676	0.0219	0.055	1.03	0.0288
8	TW-08	TRUAX-08-TW08-110817	08-Nov-17	5.0-10.0	N	7.98	0.0898	8.0698	0.0421	0.0741	0.971	0.125
9	TW-09	TRUAX-09-TW09-110917	09-Nov-17	10.0-15.0	N	0.3	0.0164	0.3164	0.00415 J	0.00924	0.0334	0.00548 U
BBW	TW-BB01	TRUAX-BB-TWBB01-110817	08-Nov-17	5.0-10.0	N	0.569	0.0953	0.6643	0.0687	0.131	1.09	0.0196
		TRUAX-BB-GW-DUP0101-110817	08-Nov-17	5.0-10.0	FD	0.51	0.0994	0.6094	0.0692	0.138	0.966	0.0222
	TW-BB02	TRUAX-BB-TWBB02-110917	09-Nov-17	10.0-15.0	N	0.509	0.126	0.635	1.05	0.137	3.01	0.00699 J
	TW-BB03	TRUAX-BB-TWBB03-110917	09-Nov-17	10.0-15.0	N	0.0404	0.0053 U	NA	0.0099	0.0053 U	0.0796	0.0053 U

Notes:

Light Shaded Blue - Exceeds Health Advisory

FD - Field Duplicate Sample

ft - feet

ID - Identification

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

N - Normal Field Sample

Table 3
Summary of Groundwater Analytical Testing Results
 FY16 Phase I Regional Site Inspections for Perfluorinated Compounds
 Wisconsin Air National Guard, Truax Field, Wisconsin

Analyte:	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	PFOS+PFOA	Perfluorobutanesulfonic acid (PFBS)	Perfluorooheptanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorononanoic acid (PFNA)
Health Advisory:	0.07	0.07	0.07	NA	NA	NA	NA
EPA RSL Tapwater¹:	NA	NA	NA	400	NA	NA	NA

NA - Not applicable

PRL - Potential Release Location

U - The analyte was analyzed for, but was not detected above the reported limit of detection.

µg/L - micrograms per liter

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 either PFOA or PFOS is detected at or above the DL and the other is below the DL, then PFOA + PFOS is reported as "NA" representing Not Applicable.
3. If neither PFOA nor PFOS is detected at or above the DL, then PFOA + PFOS is reported as "ND" representing Not Detected.

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

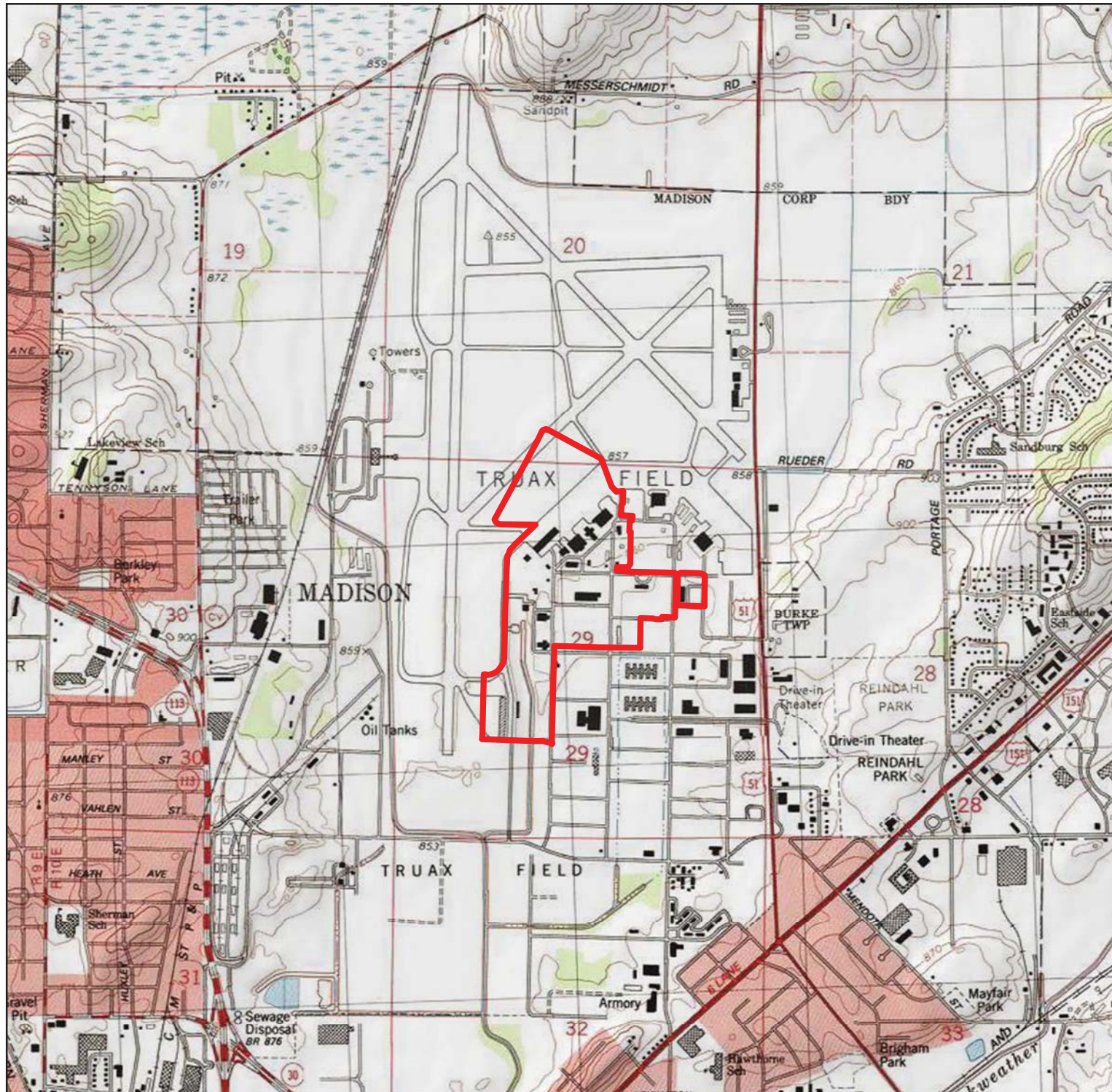
Health Advisory from USEPA Office of Water, 2016a and 2016b, Health Advisories (Has) for drinking water.

¹ USEPA Residential Screening Levels (June 2017) [<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-june-2017>]

Table 4: Preliminary Assessment Recommendations

List of Potential Release Locations (PRLs)		
PRL	Use	Recommendation
1. Building. 430 (Current Fire Station)	Current Fire Station	Soil and Groundwater Inspection
2. Building. 430	Nozzle Test Area 1	Soil and Groundwater Inspection
3. Building. 430	Nozzle Test Area 2	Soil and Groundwater Inspection
4. Former Building. 403	Former Fire Station	Soil and Groundwater Inspection
5. Hangar 400	Hangar with Aqueous Film Forming Foam (AFFF) Fire Suppression System (FSS)	Soil and Groundwater Inspection
6. Hangar 406	Hangar with AFFF FSS	Soil and Groundwater Inspection
7. Hangar 414	Hangar with AFFF FSS	Soil and Groundwater Inspection
8. Fuel Spill Ditch	Fuel Emergency Response	Soil and Groundwater Inspection
9. Building. 503 Parking Lot	Fuel Emergency Response	Groundwater Inspection
10. Building 510 (Supply)	AFFF Storage Area	No Further Action

FIGURES



SITE LOCATION MAP

Truax Field Air National Guard Base
Madison, Wisconsin

Legend

Installation Area (approximate)

Location of Site



Notes & Sources

Service Layer Credits: Copyright © 2013 National Geographic Society, i-cubed



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FIGURE




1



SITE AND AREA FEATURES

Truax Field Air National Guard Base
Madison, Wisconsin

Legend

-  Rivers and Streams
-  Lakes and Ponds
-  Installation Area (approximate)

Location of Site



Notes & Sources

Notes: AFFF - aqueous film forming foam. PFC - perfluorinated compounds.
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Hydrogeography data courtesy of Wisconsin Department of Natural Resources.

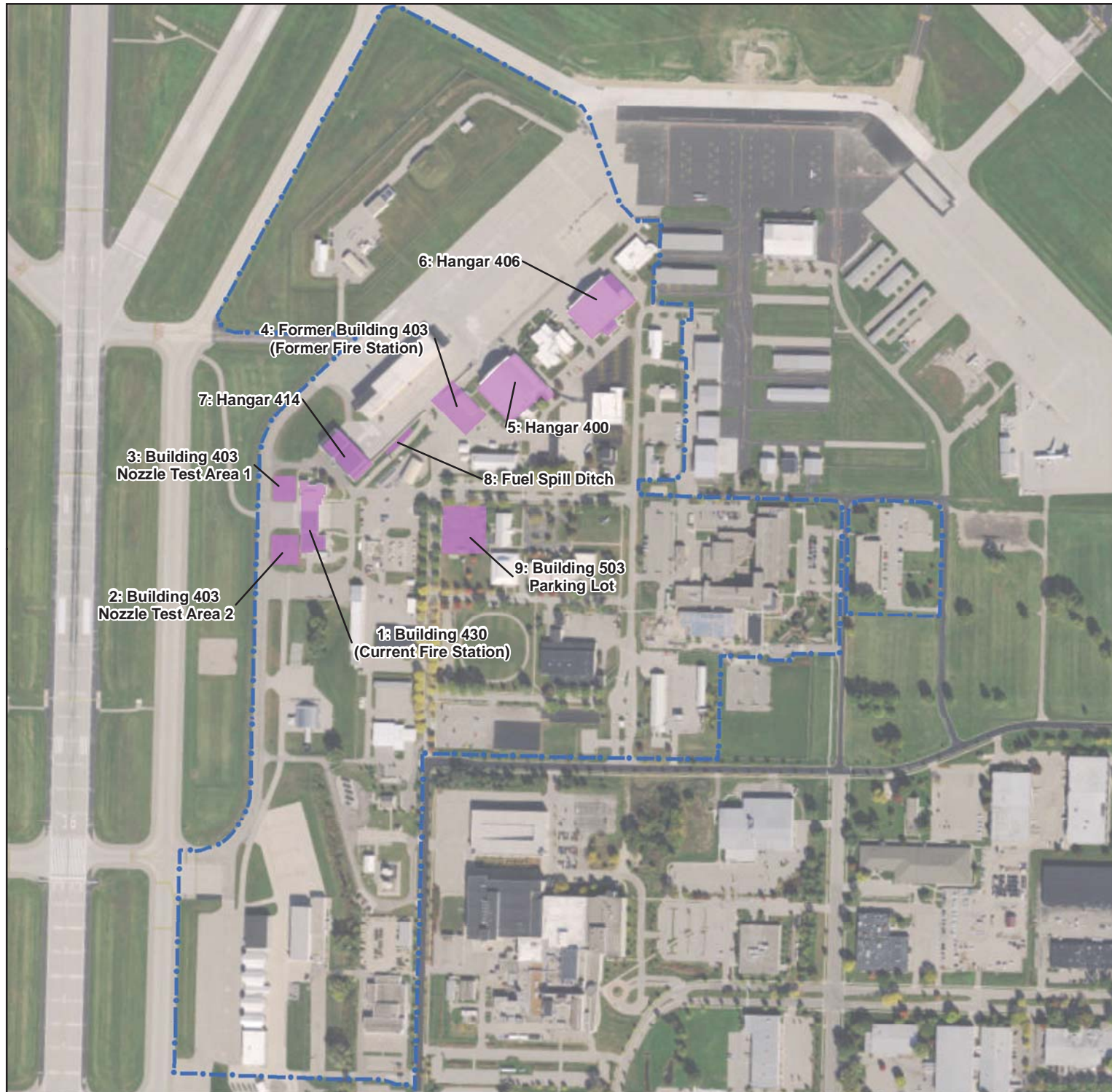


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FIGURE

2



PRL LOCATION MAP

Truax Field Air National Guard Base
Madison, Wisconsin

Legend

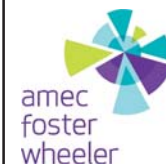
- Potential AFFF PFOS/PFOA PRL (approximate)
- Installation Area (approximate)

Location of Site



Notes & Sources

Notes: AFFF - aqueous film forming foam. PRL - potential release location. PFC - perfluorinated compounds
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



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FIGURE

3

PRLs 1, 2, and 3 ANALYTICAL RESULTS

Truax Field Air National Guard Base
Madison, Wisconsin

Legend

-  Soil Boring
-  Soil Boring and Temporary Well
-  Assumed Groundwater Flow
-  Potential AFFF PFOA PRL (approximate)
-  Installation Area

Notes & Sources

Notes:
 AFFF = aqueous film forming foam
 PRL = potential release location
 PFC = perfluorinated compounds
 PFOS = Perfluorooctanesulfonic acid
 PFOA = Perfluorooctanoic acid
 PFBS = Perfluorobutanesulfonic acid
 PFHpA = Perfluoroheptanoic acid
 PFHxS = Perfluorohexanesulfonic acid
 PFNA = Perfluorononanoic acid

BOLD text indicates a detection

YELLOW highlighted cells indicate 0.07 µg/L Health Advisory Exceedance.

* Field duplicate value exceeded primary sample

Sources: Potential AFFF PFC PRLs and Installation Area datalayers obtained from Figure 2 of the Final Perfluorinated Compounds Preliminary Assessment Site Visit Report prepared by BB&E and dated February 2016.

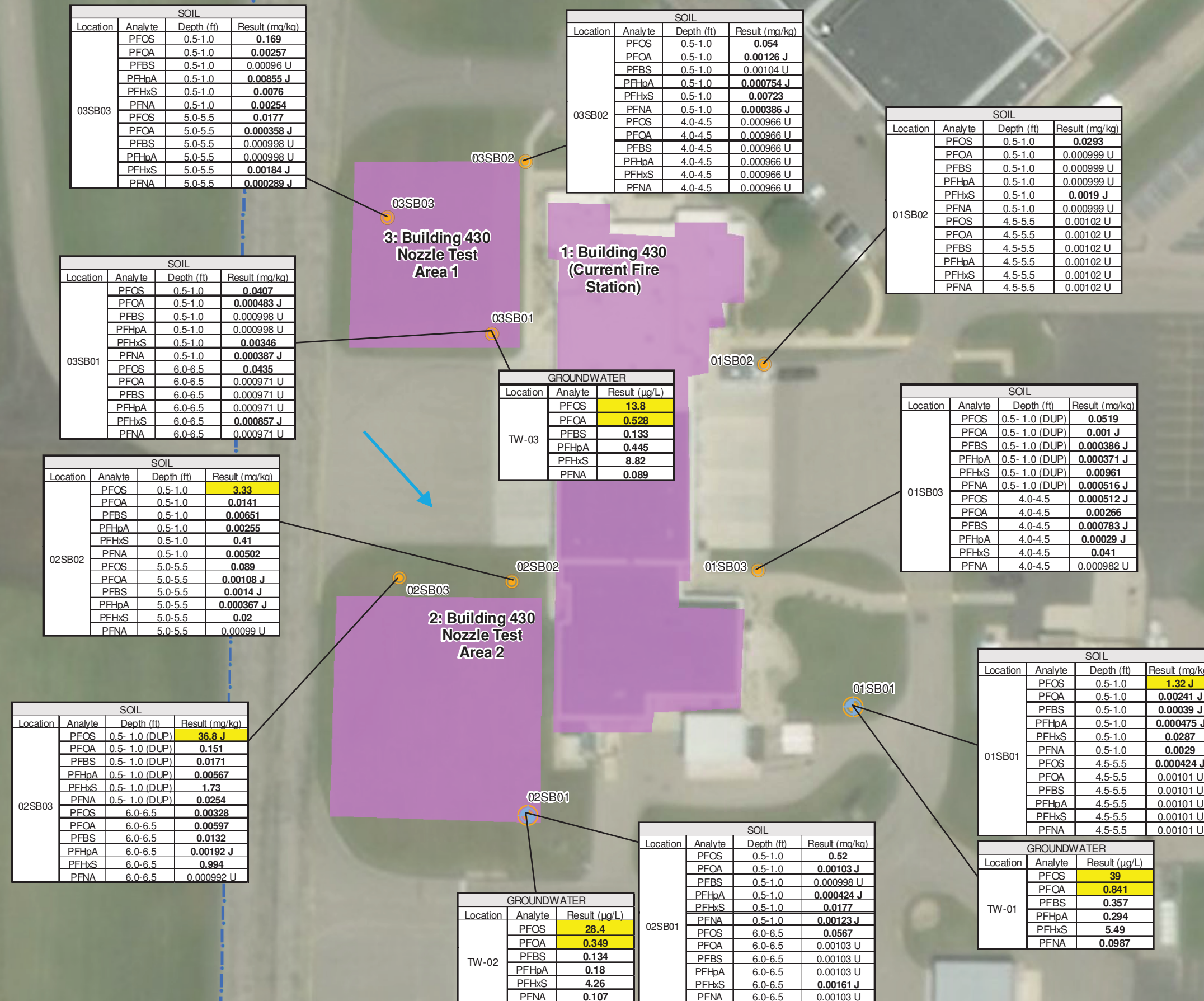


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FIGURE

4







Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

PRLs 4 and 5 ANALYTICAL RESULTS

Truax Field Air National Guard Base
Madison, Wisconsin

Legend

-  Soil Boring
-  Soil Boring And Temporary Well
-  Assumed Groundwater Flow
-  Potential AFFF PFOS/PFOA PRL (approximate)

Notes & Sources

Notes:
 AFFF = aqueous film forming foam
 PRL = potential release location
 PFC = perfluorinated compounds
 PFOS = Perfluorooctanesulfonic acid
 PFOA = Perfluorooctanoic acid
 PFBS = Perfluorobutanesulfonic acid
 PFHpA = Perfluoroheptanoic acid
 PFHxS = Perfluorohexanesulfonic acid
 PFNA = Perfluorononanoic acid

BOLD text indicates a detection

YELLOW highlighted cells indicate 0.07 µg/L Health Advisory Exceedance.

* Field duplicate value exceeded primary sample

Sources: Potential AFFF PFC PRLs and Installation Area datalayers obtained from Figure 2 of the Final Perfluorinated Compounds Preliminary Assessment Site Visit Report prepared by BB&E and dated February 2016.



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FIGURE

5

SOIL			
Location	Analyte	Depth (ft)	Result (mg/kg)
05SB03	PFOS	0.5-1.0	0.333 J
	PFOA	0.5-1.0	0.00164 J
	PFBS	0.5-1.0	0.000968 U
	PFHpA	0.5-1.0	0.00062 J
	PFHxS	0.5-1.0	0.00883 J
	PFNA	0.5-1.0	0.00355
	PFOS	6.0-6.5	0.0477
	PFOA	6.0-6.5	0.00102 U
	PFBS	6.0-6.5	0.00102 U
	PFHpA	6.0-6.5	0.00102 U
PFHxS	6.0-6.5	0.000693 J	
PFNA	6.0-6.5	0.00142 J	

SOIL			
Location	Analyte	Depth (ft)	Result (mg/kg)
05SB02	PFOS	0.5-1.0	0.0222
	PFOA	0.5-1.0	0.00181 J
	PFBS	0.5-1.0	0.00102 U
	PFHpA	0.5-1.0	0.00122 J
	PFHxS	0.5-1.0	0.00377
	PFNA	0.5-1.0	0.00163 J
	PFOS	7.0-7.5	0.00103 U
	PFOA	7.0-7.5	0.00103 U
	PFBS	7.0-7.5	0.00103 U
	PFHpA	7.0-7.5	0.00103 U
PFHxS	7.0-7.5	0.00103 U	
PFNA	7.0-7.5	0.00103 U	

SOIL			
Location	Analyte	Depth (ft)	Result (mg/kg)
04SB02	PFOS	1.0-2.0	0.368
	PFOA	1.0-2.0	0.0016 J
	PFBS	1.0-2.0	0.00104 U
	PFHpA	1.0-2.0	0.000448 J
	PFHxS	1.0-2.0	0.00272
	PFNA	1.0-2.0	0.00104 U
	PFOS	5.0-5.5	0.611 J
	PFOA	5.0-5.5	0.00431
	PFBS	5.0-5.5	0.00096 U
	PFHpA	5.0-5.5	0.000895 J
PFHxS	5.0-5.5	0.016 J	
PFNA	5.0-5.5	0.0011 J	

GROUNDWATER		
Location	Analyte	Result (µg/L)
TW-05	PFOS	0.174
	PFOA	0.0649
	PFBS	0.013
	PFHpA	0.0299
	PFHxS	0.285
PFNA	0.00526 J	

SOIL			
Location	Analyte	Depth (ft)	Result (mg/kg)
05SB01	PFOS	0.5-1.0	0.088
	PFOA	0.5-1.0	0.00458 J
	PFBS	0.5-1.0	0.001 U
	PFHpA	0.5-1.0	0.00185 J
	PFHxS	0.5-1.0	0.0388 J
	PFNA	0.5-1.0	0.00126 J
	PFOS	6.0-6.5	0.00104 U
	PFOA	6.0-6.5	0.00104 U
	PFBS	6.0-6.5	0.00104 U
	PFHpA	6.0-6.5	0.00104 U
PFHxS	6.0-6.5	0.002 J	
PFNA	6.0-6.5	0.00104 U	

SOIL			
Location	Analyte	Depth (ft)	Result (mg/kg)
04SB01	PFOS	0.5-1.0	0.0124
	PFOA	0.5-1.0	0.00037 J
	PFBS	0.5-1.0	0.00103 U
	PFHpA	0.5-1.0	0.00103 U
	PFHxS	0.5-1.0	0.0011 J
	PFNA	0.5-1.0	0.00103 U
	PFOS	4.5-5.5	0.0176
	PFOA	4.5-5.5	0.000979 U
	PFBS	4.5-5.5	0.000979 U
	PFHpA	4.5-5.5	0.000979 U
PFHxS	4.5-5.5	0.000354 J	
PFNA	4.5-5.5	0.000305 J	

GROUNDWATER		
Location	Analyte	Result (µg/L)
TW-04	PFOS	0.149
	PFOA	0.0849
	PFBS	0.0163
	PFHpA	0.035
	PFHxS	0.593
PFNA	0.0028 J	





SOIL			
Location	Analyte	Depth (ft)	Result (mg/kg)
04SB03	PFOS	1.0-2.0	0.00207
	PFOA	1.0-2.0	0.000972 U
	PFBS	1.0-2.0	0.000972 U
	PFHpA	1.0-2.0	0.000972 U
	PFHxS	1.0-2.0	0.000972 U
	PFNA	1.0-2.0	0.000972 U
	PFOS	5.0-5.5	0.00345
	PFOA	5.0-5.5	0.000975 U
	PFBS	5.0-5.5	0.000975 U
	PFHpA	5.0-5.5	0.000975 U
PFHxS	5.0-5.5	0.000975 U	
PFNA	5.0-5.5	0.000975 U	

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

PRL 6 ANALYTICAL RESULTS

Truax Field Air National Guard Base
Madison, Wisconsin

Legend

-  Soil Boring
-  Soil Boring and Temporary Well
-  Assumed Groundwater Flow
-  Potential AFFF PFOS/PFOA PRL (approximate)

Notes & Sources

Notes:
 AFFF = aqueous film forming foam
 PRL = potential release location
 PFC = perfluorinated compounds
 PFOS = Perfluorooctanesulfonic acid
 PFOA = Perfluorooctanoic acid
 PFBS = Perfluorobutanesulfonic acid
 PFHpA = Perfluoroheptanoic acid
 PFHxS = Perfluorohexanesulfonic acid
 PFNA = Perfluorononanoic acid

BOLD text indicates a detection

YELLOW highlighted cells indicate 0.07 µg/L Health Advisory Exceedance.

* Field duplicate value exceeded primary sample

Sources: Potential AFFF PFC PRLs and Installation Area datalayers obtained from Figure 2 of the Final Perfluorinated Compounds Preliminary Assessment Site Visit Report prepared by BB&E and dated February 2016.

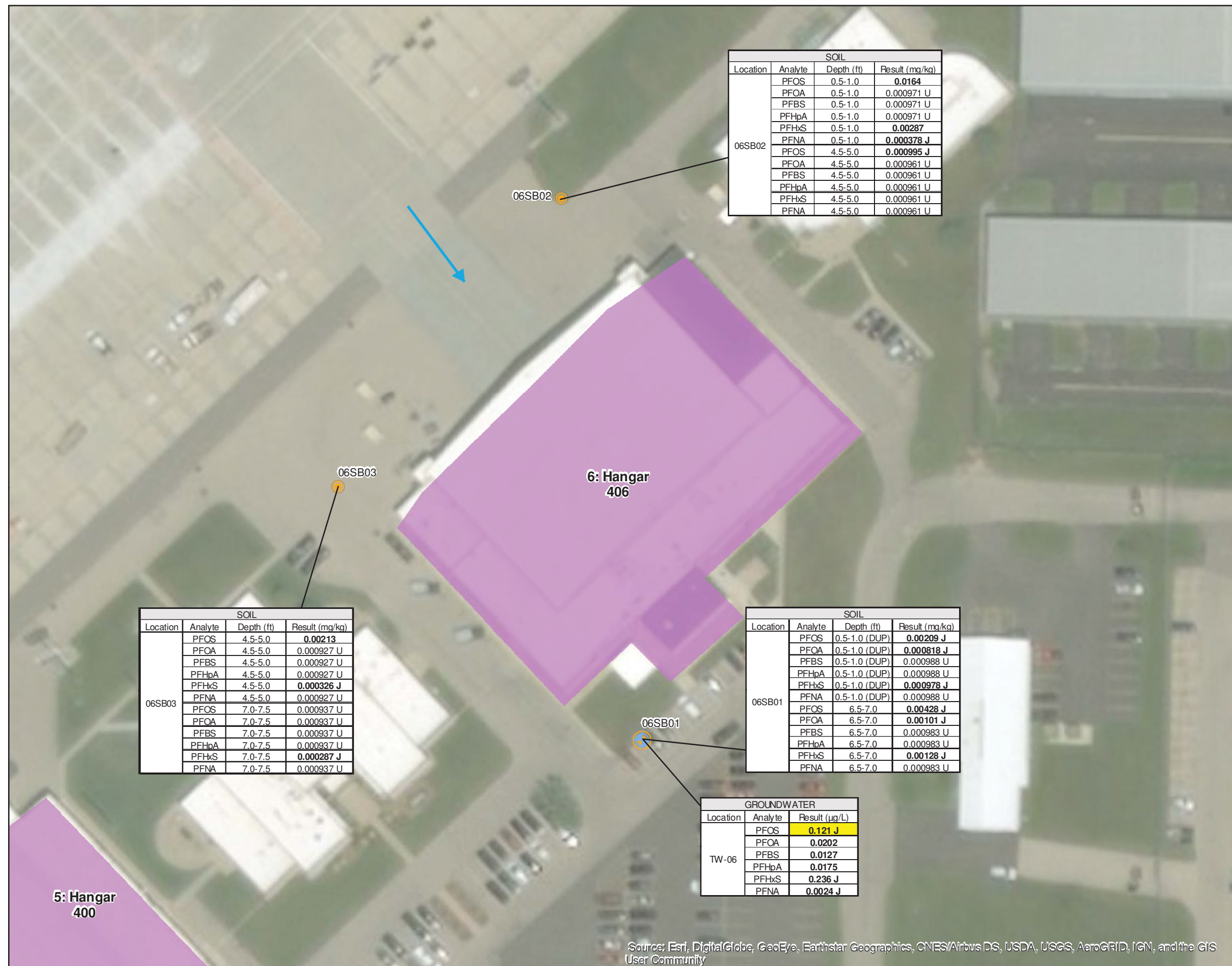


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FIGURE

6







Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

PRLs 7 and 8 ANALYTICAL RESULTS

Truax Field Air National Guard Base
Madison, Wisconsin

Legend

-  Soil Boring
-  Soil Boring and Temporary Well
-  Assumed Groundwater Flow
-  Potential AFFF PFOS/PFOA PRL (approximate)

Notes & Sources

Notes:
 AFFF = aqueous film forming foam
 PRL = potential release location
 PFC = perfluorinated compounds
 PFOS = Perfluorooctanesulfonic acid
 PFOA = Perfluorooctanoic acid
 PFBS = Perfluorobutanesulfonic acid
 PFHpA = Perfluoroheptanoic acid
 PFHxS = Perfluorohexanesulfonic acid
 PFNA = Perfluorononanoic acid

BOLD text indicates a detection

YELLOW highlighted cells indicate 0.07 µg/L Health Advisory Exceedance.

* Field duplicate value exceeded primary sample

Sources: Potential AFFF PFC PRLs and Installation Area datalayers obtained from Figure 2 of the Final Perfluorinated Compounds Preliminary Assessment Site Visit Report prepared by BB&E and dated February 2016.

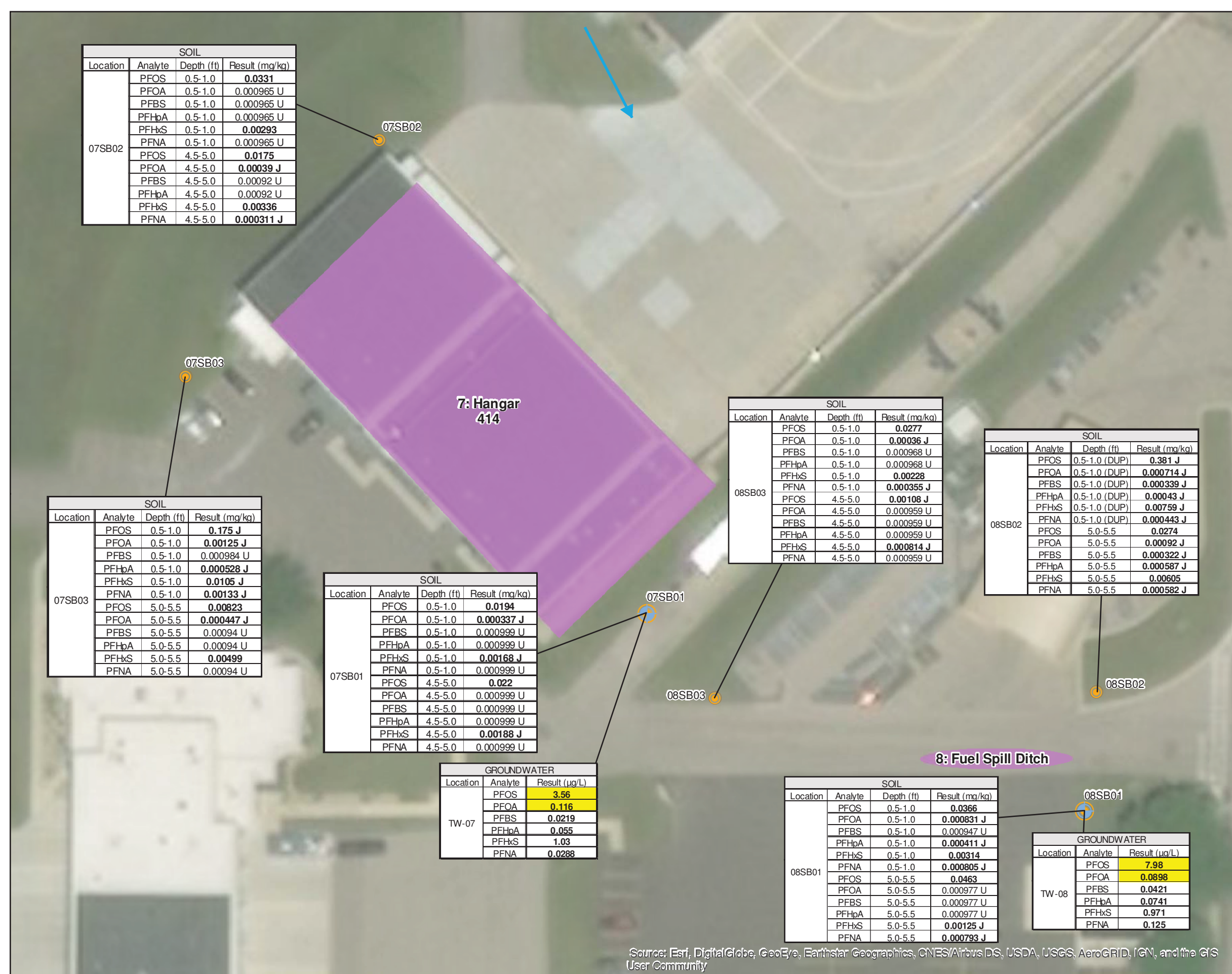


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FIGURE

7







Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

PRL 9 ANALYTICAL RESULTS

Truax Field Air National Guard Base
Madison, Wisconsin

Legend

-  Soil Boring
-  Soil Boring and Temporary Well
-  Assumed Groundwater Flow
-  Potential AFFF PFOS/PFOA PRL (approximate)

Notes & Sources

Notes:
 AFFF = aqueous film forming foam
 PRL = potential release location
 PFC = perfluorinated compounds
 PFOS = Perfluorooctanesulfonic acid
 PFOA = Perfluorooctanoic acid
 PFBS = Perfluorobutanesulfonic acid
 PFHpA = Perfluoroheptanoic acid
 PFHxS = Perfluorohexanesulfonic acid
 PFNA = Perfluorononanoic acid

BOLD text indicates a detection

YELLOW highlighted cells indicate 0.07 µg/L Health Advisory Exceedance.

* Field duplicate value exceeded primary sample

Sources: Potential AFFF PFC PRLs and Installation Area datalayers obtained from Figure 2 of the Final Perfluorinated Compounds Preliminary Assessment Site Visit Report prepared by BB&E and dated February 2016.

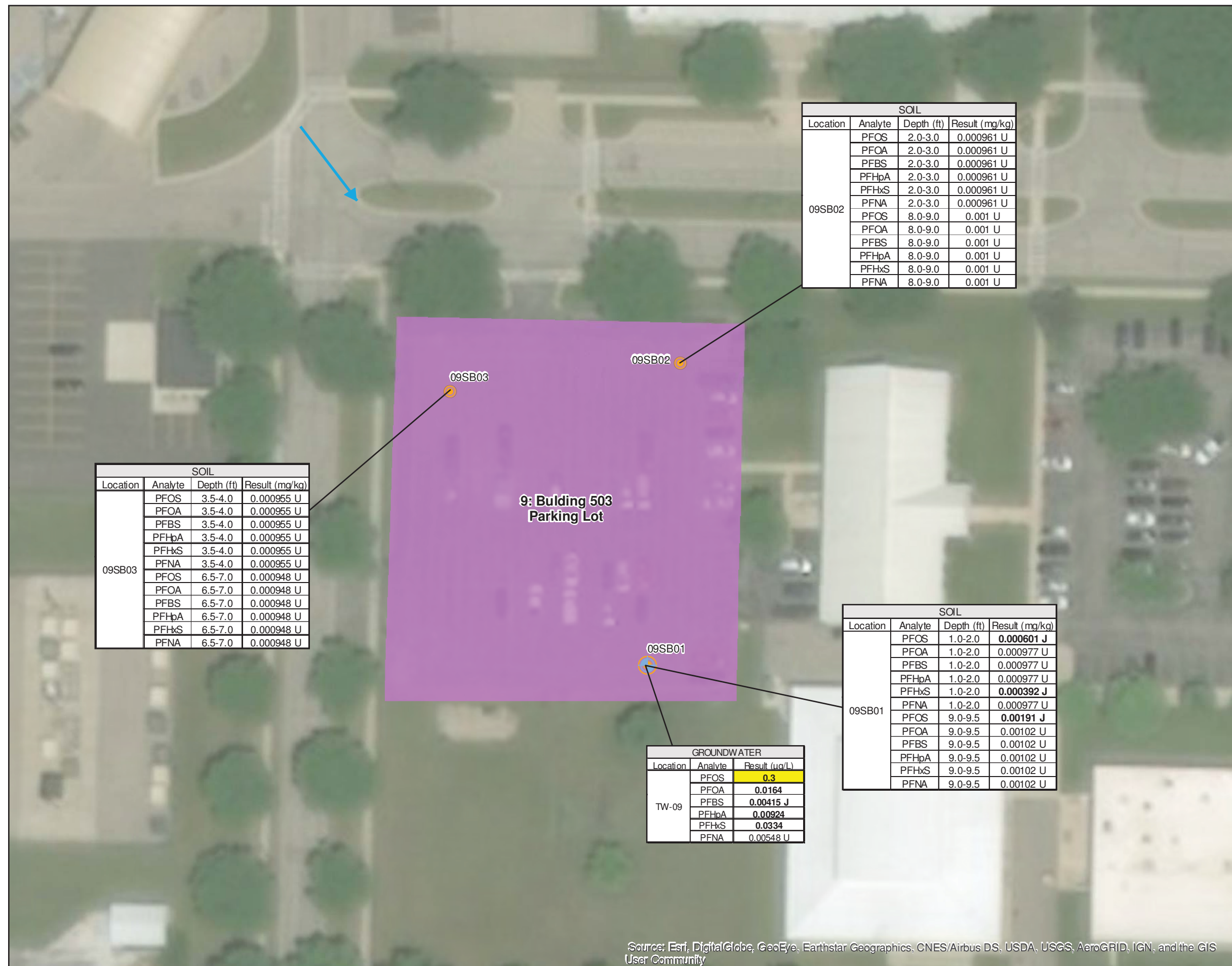


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FIGURE

8







Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

BASE BOUNDARY ANALYTICAL RESULTS

Truax Field Air National Guard Base
Madison, Wisconsin

Legend

-  Temporary Monitoring Well
-  Installation Area (approximate)
-  Potential AFFF PFOS/PFOA PRL (approximate)
-  Assumed Groundwater Flow

Notes & Sources

Notes:
 AFFF = aqueous film forming foam
 PRL = potential release location
 PFC = perfluorinated compounds
 PFOS = Perfluorooctanesulfonic acid
 PFOA = Perfluorooctanoic acid
 PFBS = Perfluorobutanesulfonic acid
 PFHpA = Perfluoroheptanoic acid
 PFHxS = Perfluorohexanesulfonic acid
 PFNA = Perfluorononanoic acid

BOLD text indicates a detection

YELLOW highlighted cells indicate 0.07 µg/L Health Advisory Exceedance.

* Field duplicate value exceeded primary sample

Sources: Potential AFFF PFC PRLs and Installation Area datalayers obtained from Figure 2 of the Final Perfluorinated Compounds Preliminary Assessment Site Visit Report prepared by BB&E and dated February 2016.

0 317.5 635
Feet

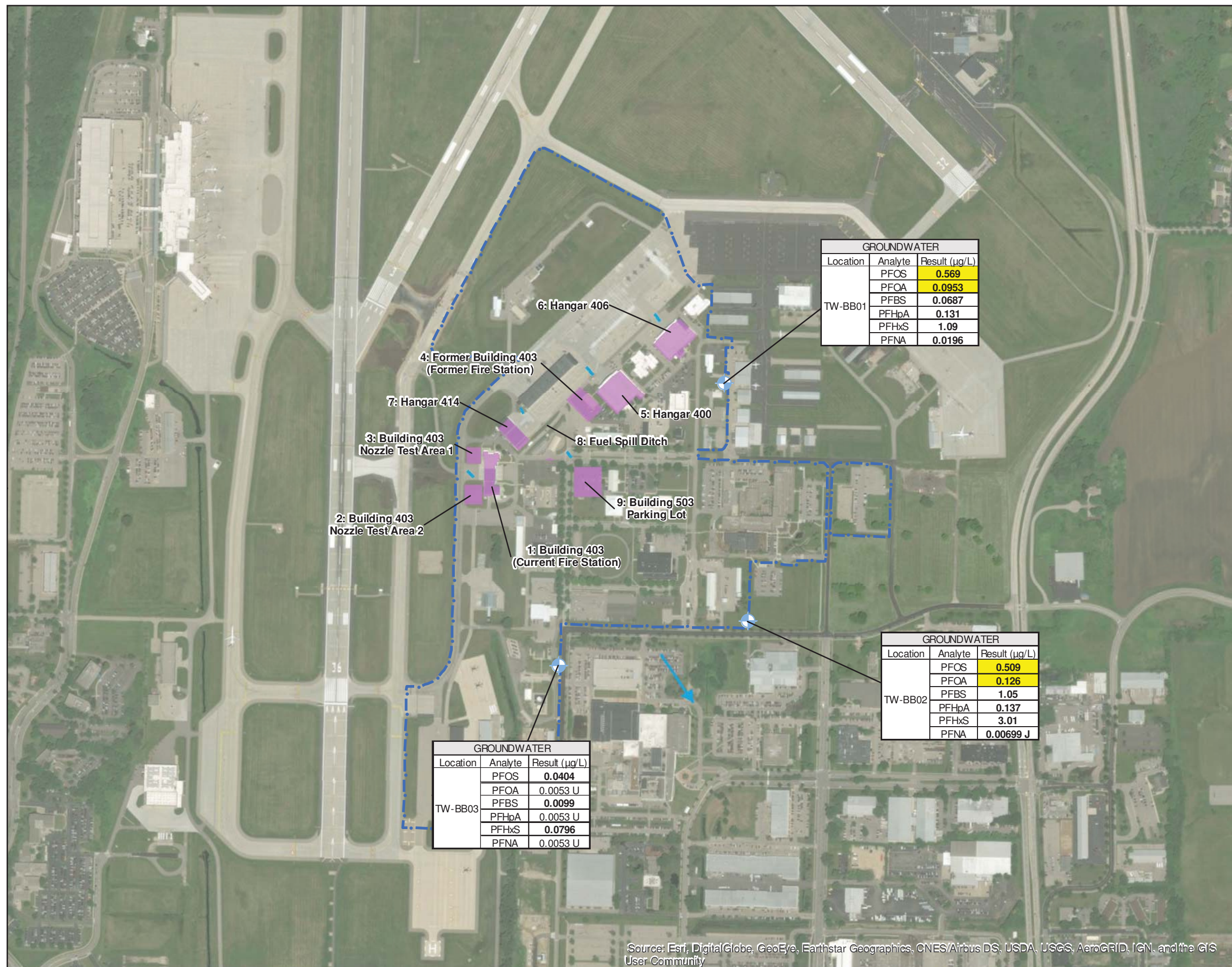


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FIGURE

9



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community