FINAL WORK PLAN
FY 16 PHASE 1 REGIONAL SITE INSPECTIONS FOR PERFLUORINATED COMPOUNDS

104th FIGHTER WING
MASSACHUSETTS AIR NATIONAL GUARD
BARNES AIR NATIONAL GUARD BASE
WESTFIELD, MASSACHUSETTS

Contract #: W9133L-14-D-0002

Delivery Order 0006

Amec Foster Wheeler Project #: 2-9133-0006

April, 2017

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ACRONYMS

104th FW	104th Fighter Wing
AFFF	Aqueous film forming foam
Amec Foster Wheeler	Amec Foster Wheeler Environment & Infrastructure, Inc.
AMSL	Above Mean Sea Level
ANG	Air National Guard
ARNG	Army National Guard
AVGAS	Aviation Gasoline
BANGB	Barnes Air National Guard Base
BB&E	BB&E, Incorporated
bgs	Below Ground Surface
Bldg.	Building
CAC	Common Access Card
CERCLA	Comprehensive Environmental Response, Compensation, & Liability Act
COCs	Constituents of Concern
COR	Contracting Officer's Representative
DO	Delivery Order
DoD	Department of Defense
DOT	Department of Transportation
DPT	Direct Push Technology
DPW	Department of Public Works
DQO	Data Quality Objectives
EAL	Entry Authorization List
EDR	Environmental Data Resources, Inc.
ELAP	Environmental Laboratory Accreditation Program
ERP	Environmental Restoration Program
FAA	Federal Aviation Administration
FD	Fire Department
FSP	Field Sampling Plan
FSS	Fire Suppression System
ft.	Feet/foot
FTA	Fire Training Area
GPS	Global Positioning System
HA	Health Advisory
HASP	Health and Safety Plan
HEF	High-Expansion Foam
IDW	Investigation-Derived Waste
IRP	Installation Restoration Program
JP-4	Jet Propellant #4
LSP	Licensed Site Professional
MAANG	Massachusetts Air National Guard
MAARNG	Massachusetts Army National Guard
MassDEP	Massachusetts Department of Environmental Protection
MassGIS	Massachusetts Geographic Information System
MCP	Massachusetts Contingency Plan
NELAP	National Environmental Laboratory Accreditation Program
NFA	No Further Action
NGB	National Guard Base

ACRONYMS (continued)

NGB/A4OR	ANG Readiness Center/National Guard Bureau
NTP	Notice to Proceed
OWS	Oil/Water Separator
PA	Preliminary Assessment
PFAA	Perfluoroalkyl Acids
PFAS	Perfluorinated Alkylated Substances
PFBS	Perfluorobutane Sulfonate
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctanesulfonic Acid
PFC	Perfluorinated Compounds
PHAL	Provisional Health Advisory Level
POC	Point of Contact
ppt	Parts per Trillion
PRL	Potential Release Location
PVC	Polyvinyl Chloride
PWS	Public Water Supply
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RAPS	Response Action Performance Standards
RFP	Request for Proposal
RI	Remedial Investigation
RSL	Regional Screening Level
SI	Site Inspection
SOP	Standard Operating Procedure
SWMP	Stormwater Management Plan
UCMR	Unregulated Contaminant Monitoring Rule
USEPA	United States Environmental Protection Agency
WP	Work Plan

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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 DO includes preparation of this Work Plan (WP) to conduct SIs at on-base Potential Release Locations (PRLs) identified at the 104th Fighter Wing (104th FW), Massachusetts Air National Guard (MAANG), Barnes Air National Guard Base (BANGB), in the city of Westfield, Massachusetts. This SI WP has been prepared by Amec Foster Wheeler and presents site background information and findings from the Preliminary Assessment (PA) recently conducted by BB&E, Inc. (BB&E), and also describes the objectives, procedures, and activities to be conducted to execute the work. Eight PRLs were identified based on locations where Aqueous Film Forming Foam (AFFF) was potentially discharged or stored. PRL 2, [Fire Training Area (FTA) -06] warranted no further action (NFA) based on the findings of no known AFFF release, and is not included in the scope of this SI.

To streamline reporting and discussion of PFC sampling, these compounds will hereafter be referred to collectively as Perfluoroalkyl Acids (PFAA). The term PFAA refers to a family perfluorinated chemicals under the general Per- and Polyfluoroalkyl Substances (PFAS) classification that includes perfluoroalkyl carboxylic acids (e.g., Perflooctanoic Acid [PFOA]), perfluoroalkane sulfonic acids (e.g., perfluorooctanesulfonic Acid [PFOS]), perfluoroalkyl phosphonic acids, and perfluoroalkyl phosphinic acids.

The proposed SI will be conducted in accordance with the methods, standards, practices, and equipment prescribed by the Massachusetts Contingency Plan (the MCP- 310 CMR 40.0000) Response Action Performance Standard (RAPS), specifically, 310CMR 40.0191. These provisions are considered Applicable or Relevant and Appropriate Requirements (ARARs) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Additionally, we will use eDEP for all correspondence and reports going to Massachusetts Department of Environmental Protection (MassDEP).

PRL 1 (Former FTA-01) and PRL 8 (Fire Department [FD] Equipment Test Area) are located primarily on property abutting the BANGB. Proposed investigation of these areas is limited to areas on the BANGB that may have been impacted by operations at PRL 1 and PRL 8. A list of

the PRLs evaluated during the PA and resulting recommendations is presented in **Table 1** below.

Table 1
Preliminary Assessment Summary
104th Fighter Wing, Massachusetts Air National Guard
Barnes Air National Guard Base, Westfield, Massachusetts

List of PRLs		
PRL	**Use**	**Recommendation**
1. Former FTA-01	Off-Base Former Fire Training Area	Soil and Groundwater Inspection
2. FTA-06	Former Fire Training Area Prior to Use of AFFF	NFA
3.Stormwater Drainage Basin (IRP Site 4)	Drainage Basin Receiving Stormwater from Flight Line, Hangars, and Buildings on the Flight Line	Sediment and Groundwater Inspection
4. Hangars 27A and 27B	Hangar with AFFF Fire Suppression System (FSS)	Soil and Groundwater Inspection
5. Former Fire Station (Bldg. 004)	Former Fire Station	Soil and Groundwater Inspection
6. Current Fire Station (Bldg. 040)	Fire Station	Soil and Groundwater Inspection
7. Hush House	Hush House with AFFF FSS	Soil and Groundwater Inspection
8. Fire Dept. Equipment Test Area	Off-Base Former Fire Department Equipment Test Area	Soil and Groundwater Inspection

Additionally, groundwater quality at the base boundary will be assessed during the SI to evaluate the potential for off-site migration of PFAA.

Performance of SI activities at BANGB will be conducted in accordance with the Environmental Restoration Program (ERP) Air National Guard Investigation Guidance (ANG, 2009).

1.1 Site Location

The BANGB is located at the Westfield-Barnes Regional Airport (formerly Barnes Municipal Airport), approximately 3 miles northeast of the city of Westfield, Hampden County, Massachusetts (**Figure 1**). BANGB is the home of the 104th FW, and occupies approximately 182 acres on land leased from the city of Westfield. The base is divided into two separate parcels of land in the northern portion of the airport, bisected by Runway 2-20 that trends north/south (**Figure 2**). The western parcel encompasses approximately 112 acres, and contains the majority

of the facilities buildings, hangars, flight line, and fire station. PRLs 3, 4, 5, and 6 are contained within this portion of the base. The eastern parcel encompasses approximately 70 acres, and contains the hush house, a small arms firing range, a former FTA, and other facilities. PRLs 2 and 7 are located in this portion of the base. PRLs 1 and 8 are located primarily south of the base, on land not leased or maintained by BANGB.

Westfield-Barnes Regional Airport, including BANGB, is zoned for airport district usage. The airport is surrounded by properties zoned for industrial, residential, and business use.

1.2 Site History

The Site was originally known as Camp Bartlett, a training facility used by the Massachusetts Army National Guard (MAARNG) from 1905 until approximately 1918. During World War I, Camp Bartlett was expanded to a 1,000-acre mobilization camp which housed 13,000 people (AECOM, 2010). After World War I, the land was donated by Vincent E. Barnes to several private businessmen for development of the Westfield Aviation Field, later named the Barnes Municipal Airport, then finally the Westfield-Barnes Regional Airport. In 1946, Barnes Municipal Airport was selected as the home of the 131st Fighter Squadron, flying the P-47 Thunderbolt. The current base mission is the 104th Fighter Wing, an operational flying unit equipped with the F-15 Eagle (AECOM, 2014). Since 1946, the unit has flown operational missions in 9 different aircraft (ANG, 2016), with the 104th providing combat units during the Berlin Airlift Crisis in 1961, Operation Deliberate Force in 1995, Operation Allied Force in 1999, the Air Expeditionary Force deployed to Kuwait in 2000, Operations Noble Eagle and Enduring Freedom in 2001, and Operation Iraqi Freedom in 2003 (AECOM, 2010).

Activities at the base have been typical of those at most airports and military air bases, including fueling and maintenance operations. These activities include the usage, handling, storage, and disposal of various products, including potentially hazardous materials.

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 or ERP). Under this program, investigations began at the BANGB in 1987. These investigations included PAs, SIs, removal action investigations, and a remedial investigations (RIs). The investigations and subsequent remedial activities initiated under the IRP have been conducted

and reported in accordance with the MCP, 310 CMR 40.0000. Prior to the PFC PA (BB&E, 2016), potential releases of PFAA from use and storage of AFFF had not been evaluated at BANGB.

According to base personnel, 3% AFFF was used at BANGB from approximately 1970 to 2016. Most of the AFFF fire suppression systems were retrofitted for high-expansion foam (HEF) use in the early 2000s; however, the Fire Department continued to use AFFF until 2016.

1.3 Project Purpose and Scope

The objective of the SI is to determine the presence/absence of constituents of concern (COCs) in soil and/or groundwater at each of the PRLs and in groundwater at the base boundary to develop appropriate path(s) forward; either NFA or establishing data quality objectives (DQOs) for an RI phase.

2.0 PROJECT MANAGEMENT APPROACH

The general parties comprising the management structure of the SI include ANG Readiness Center/National Guard Bureau (NGB/A4OR), MAANG, BANGB, the MassDEP, the city of Westfield, BB&E, Amec Foster Wheeler, and Amec Foster Wheeler subcontractors. The NGB is the contracting entity through which this project is being executed. The city of Westfield is the current land owner, BANGB and the MAANG are the current lessees. MassDEP is the state's regulatory agency whose role is to enforce the state's environmental regulations, the MCP. As this base is within the state, any release of oil and or hazardous materials to the environment is governed by the MCP.

Amec Foster Wheeler personnel that will be involved with the SI include the following:

- Mr. Jay Mullett, Engineer – Program Manager;
- Mr. Rob Singer, Engineer – Senior Project Manager;
- Mr. Kerry Tull, Geologist - Licensed Site Professional (LSP);
- Mr. Todd Coffin, Geologist– Regional Base Lead;
- Ms. Ann Bernhardt, CQM – Quality Assurance/Quality Control (QA/QC) Manager;
- Ms. Cynthia Sundquist, Certified Industrial Hygienist (CIH), Certified Safety Professional (CSP) – Health and Safety Manager;
- Mr. Brad LaForest, Environmental Analytical Chemist (EAC) – Senior Chemist;
- Ms. Shalene Thomas, Project Management Professional (PMP) – Project Technical Lead;
- Mr. Herb Colby, Geologist– Base Task Manager;
- Mr. Craig Keating, Geologist – Field Manager; and
- Other supporting staff, as necessary.

Key NGB, MAANG, BANGB, MassDEP, and technical support personnel that will be involved with the SI include the following:

- Mr. Winston Crow – NGB/A4OR Restoration Program Manager;
- Mr. Dennis Pinigis – Contracting Officer's Representative (COR);
- Mr. John Richardson – BANGB Environmental Manager;
- Ms. Cynthia Pawloski – MassDEP Point of Contact (POC); and
- Mr. Tom Barzyk – BB&E Technical Support Contractor.

Mr. Todd Coffin will serve as Amec Foster Wheeler's primary POC. Mr. Coffin will ensure that objectives are addressed, and will be responsible to meet quality, cost, and schedule performance requirements. Supporting staff, as identified above, will include technical and administrative support personnel involved with the completion of the various SI tasks.

Anticipated subcontractors include a driller for soil borings and temporary monitoring well installation, a private utility locating company, a waste transporter and disposal company, and a laboratory for sample analysis. The selected laboratory will be DoD Environmental Laboratory Accreditation Program (ELAP) accredited, and maintain a National Environmental Laboratory Accreditation Program (NELAP) certification via reciprocity in the Commonwealth of Massachusetts. Subcontractors utilized on this project were pre-qualified by Amec Foster Wheeler. These laboratories will contract directly with and will be monitored by Amec Foster Wheeler to document project performance.

Completion of the SI activities includes, but is not limited to, the following tasks:

- Preparation of a program-wide Quality Assurance Project Plan (QAPP) that includes a program-wide Health and Safety Plan (HASP);
- Preparation of the Draft SI WP that includes a base specific short-form HASP;
- Preparation of the Draft-Final SI WP;
- Preparation of the Final SI WP;
- Completion of SI field activities;
- Preparation of the Draft SI Report;
- Preparation of the Draft-Final SI Report; and
- Preparation of Final SI Report.

The site-specific Project Schedule is presented in **Appendix A**.

Following MAANG approval and notice to proceed (NTP), Amec Foster Wheeler will initiate performance of the SI field activities described in the Final SI Field Sampling Plan (FSP; **Appendix C**). Amec Foster Wheeler and its subcontractors will mobilize to the site and complete the field activities. MAANG will be verbally updated by the Amec Foster Wheeler POC, or appointee, of significant observations during the implementation of field activities. Amec Foster Wheeler will document in writing (email, fax, or letter) any significant deviations from the planned activities.

3.0 PRELIMINARY ASSESSMENT SITE VISIT AND BACKGROUND INFORMATION

BB&E conducted a PA site visit for MAANG at BANGB on August 18, and 19, 2015, to identify potential locations of historic environmental releases of PFAA, specifically from AFFF usage and storage. The PA site visit process included a review of documented FTAs in operation since 1970, and any other use or release of AFFF, and the completion of a site reconnaissance.

Based on past use and storage of AFFF at BANGB, the PA identified eight PRLs where releases of PFAA might have occurred, including FTAs, hangars, drainage basins, firefighting equipment testing areas, fire department equipment storage areas, etc. Seven of the eight PRLs were recommended for further inspection, and one PRL warranted no further action. Two PRLs (PRL 1 and PRL 8) are located primarily off-base. The findings of AFFF use and storage at each of the seven PRLs included in the SI, as documented in the PA Site Visit Report, are summarized below.

3.1 Potential Release Locations

The following sections summarize the seven PRLs included in the SI based on use and storage of AFFF at:

- PRL 1 – Former FTA-01 (IRP Site 1);
- PRL 3 - Stormwater Drainage Basin (IRP Site 4);
- PRL 4 - Hangars 27A and 27B;
- PRL 5 - Former Fire Station (Bldg. 004);
- PRL 6 - Current Fire Station (Bldg. 040);
- PRL 7 - Hush House; and
- PRL 8 – Fire Department (FD) Equipment Test Area.

3.2 Operational History

The following sections summarize the operational history at each PRL included in the SI. The PRLs and pertinent site features described below are depicted in overview on **Figure 3,** and by each specific PRL on **Figure 3A** through **Figure 3C**.

3.2.1 PRL 1: Former FTA-01 (IRP Site 1)

Former FTA-01 is located primarily off-base, immediately south of the western parcel. According to the PA, former FTA-01 was used from approximately 1950 through 1987, and aviation gasoline (AVGAS), waste oils, solvents, and jet propellant #4 (JP-4) were used as accelerants during training exercises. In spring of 2000, 15,000 tons of soil were excavated from FTA-01, and transported off-site for use in asphalt batching. Groundwater quality was assessed during IRP activities, and was determined not to have been impacted by fuel and chlorinated constituents used during fire training activities. The site achieved closure in 2002, and portions of the site have since been improved by the Army National Guard (ARNG). Because FTA-01 abuts the ANGB, activities at this PRL may have impacted the ANGB.

3.2.2 PRL 3: Stormwater Drainage Basin (IRP Site 4)

According to the PA, the retention basin is approximately 100 ft. wide by 200 ft. long, and designed to percolate stormwater to the subsurface. In the 1980s and early 1990s, the base converted from septic systems to the city's sanitary sewer system. Prior to the conversion, floor drains in buildings and hangars on the flight line discharged to the stormwater drainage basin. Although there are no known releases of AFFF to the stormwater drainage basin, AFFF releases had the potential to impact the basin. The floor drains currently discharge to the sanitary sewer system. The site was investigated under the IRP program and closed in 1998 with a NFA decision (BB&E, 2016).

3.2.3 PRL 4: Hangars 27A and 27B

The FSS in Hangars 27A and 27B were converted from AFFF to HEF in the early 2000s. Two 50-gallon deck guns with AFFF remained in use after the FSS was converted to HEF. According to the PA, the hangars have floor drains that discharge to the city's sanitary sewer system through an oil/water separator (OWS). Prior to the early 1990s, the floor drains would have discharged to the stormwater drainage basin at PRL 3. There are no documented releases of AFFF at Hangars 27A and 27B.

3.2.4 PRL 5: Former Fire Station (Bldg. 004)

The former BANGB fire station was in use from the 1940s until approximately 1992 when the new

fire station was built (BB&E, 2016). There was no record of a release found during the PA; however, AFFF was likely used and stored given the timeframe that the fire station was in operation. Floor drains were present, which according to the PA discharged to the sanitary sewer system through an OWS. However, prior to connection to the city's sanitary sewer system, the floor drains likely discharged to a dry well.

3.2.5 PRL 6: Current Fire Station (Bldg.040)

The current fire station was built in 1992 and houses three FD crash trucks. At the time of the PA, the crash trucks contained a combined 320 gallons of 3% AFFF, and an additional 250 gallons of 3% AFFF was stored in 5-gallon totes. When needed, the totes were used to manually refill the reservoirs in the crash trucks. As of late 2016, AFFF is no longer used at Bldg. 040. There have been no known releases of AFFF, and there are no floor drains present in the fire station.

3.2.6 PRL 7: Hush House

The hush house was initially constructed in 1995, and is located on the eastern parcel, near Sierra Taxiway. The FSS contained AFFF from 1995 until the early 2000s when it was converted to HEF. Floor drains are present which discharge to the sanitary sewer system through an OWS. There have been three known discharges (two tests and one accidental release); however, most of the foam release was likely captured in the floor drains. At least one of the discharges likely released AFFF; however, it is not known if the other two releases were AFFF or HEF.

3.2.7 PRL 8: Fire Department Equipment Test Area

FD equipment testing occurred primarily off-base at the eastern end of Sierra Taxiway, immediately south of the eastern parcel. Three known foam tests or AFFF releases have occurred, all in the mid-1990s; however, testing practices prior to 1993 is unclear (BB&E, 2016). The amount of AFFF used is unknown, and use of foam for equipment testing purposes ceased at least 15 years ago. Because the Fire Department Equipment Test Area abuts BANGB, activities at this PRL may have impacted the ANGB.

3.3 Pathway Evaluation and Hazard Assessment

A preliminary evaluation of the threats and targets of PFAA was performed during the PA; at the

time, sampling for PFAA had not been performed at on-base locations. The city of Westfield had tested municipal water supply wells located downgradient from BANGB on at least four occasions (February 2013, August 2013, June 2016, September 2016), with PFAA detected in drinking water; however, no direct pathway has been established between BANGB and the municipal water supply wells. In 2015, the city of Westfield's Water Department notified MAANG that one of their wells (well No. 7) had trace amounts of PFAA detected; although at the time of the PA it was not known if concentrations were above the United States Environmental Protection Agency (USEPA) Provisional Health Advisory Levels (PHALs) established for PFOS and PFOA in drinking water (USEPA, 2014). Results of the pathway evaluation and hazard assessment as documented in BB&E's January 2016, PA Site Visit Report, are summarized below.

3.3.1 Soil

At the time of the PA site visit, no documentation was available showing that soils at the BANGB had been tested for PFAA; therefore, it is unknown whether PFAA are present in the soil. However, based on historical practices, evaluation of soil quality was recommended due to known or potential AFFF use at these locations: PRL 1, Former FTA-01; PRL 4, Hangars 27A and 27B; PRL 5, Former Fire Station; PRL 6, Current Fire Station; PRL 7, Hush House; and PRL 8, FD Equipment Test Area.

3.3.2 Groundwater

At the time of the PA site visit, no documentation was available for groundwater testing of PFAA at the BANGB; therefore, evaluation of groundwater quality was recommended due to known or potential AFFF use at these locations: PRL 1, Former FTA-01; PRL 3, Stormwater Drainage Basin; PRL 4, Hangars 27A and 27B; PRL 5, Former Fire Station; PRL 6, Current Fire Station; PRL 7, Hush House; and PRL 8, FD Equipment Test Area.

3.3.3 Water Wells

Based on a review of a Massachusetts Geographic Information System (MassGIS) Public Water Supply data layers (updated October, 2016), several water supply wells were identified near the Base (**Figure 2**). Three non-community groundwater source wells are located approximately 1 to 1.5 miles northwest of BANGB. Two Public Water Supply (PWS) wellfields (PWS Nos. 7 & 8)

are located approximately 0.5 miles south/southeast of the Base. Two other PWS wells (PWS No. 1 and PWS No. 2) are located 1.75 miles south, and 2.5 miles south of BANGB respectively. two surface water intakes are located to the northeast, and one surface water intake is located to the southeast of BANGB. There are no drinking water wells located on base.

MassDEP is currently evaluating the presence and location of sensitive receptors in the vicinity of the PFAS impacted municipal wells. Based on the review of the MassDEP Search well Database, MassDEP has potentially identified a number of domestic wells that are located within a mile radius of municipal wells No.7and No.8. This database only lists domestic well installations reported to the database by wells drillers and is not a comprehensive list of domestic wells which may exist. The Department is currently working with the City of Westfield to further evaluate the presents or absence of domestic wells which have the potential to be impacted by PFAS. The Department has also initiated an evaluation of sensitive receptors located within a mile of municipal wells No. 1 and No. 2.

3.3.4 Sediment

At the time of the PA site visit, no documentation was available for sediment testing of PFAA at the BANGB; therefore, evaluation of sediments was recommended at drainage basins which receive stormwater from areas where AFFF was likely used or stored. The PA recommended evaluation of sediment at PRL 3, Stormwater Drainage Basin (IRP Site 4).

3.3.5 Surface Water

According to the PA, surface water is not present on Base; therefore, an evaluation of PFAA in surface water was not recommended. However, several potential environmentally sensitive areas surrounding the base were identified in the PA, which were identified on the National Wetland Inventory in the Environmental Data Resources, Inc. (EDR) Report included as Appendix C-7 to the PA. The locations of the wetlands are shown on **Figures 1** and **4**.

4.0 ENVIRONMENTAL SETTING

The following sections provide information on the environmental setting at BANGB. This information is summarized from reports prepared during previous environmental evaluations at BANGB, as referenced in the following subsections.

4.1 Climate

The climate in Westfield is defined as having warm and humid summers and cool winters with considerable snowfall. Average temperatures range between 24 and 72 degrees Fahrenheit (°F), with extreme temperatures as low as -22 °F, and as high as 102 °F. Annual precipitation averages 43 inches of rain, and 51 inches of snow (AECOM, 2010).

4.2 Topography

The BANGB is generally flat, with elevations between approximately 260 and 270 above mean sea level (AMSL) in the western portion of the base, and between approximately 230 feet and 260 feet AMSL feet in the eastern portion of the base (**Figure 1**). The eastern and western parcels are separated by Runway 2-20, which trends north to south, and is a topographic high.

4.3 Geology

The BANGB is located in the Mesozoic-era Hartford Basin, characterized by Quaternary-aged glacial material underlain by Jurassic- and Triassic-age sedimentary and igneous bedrock (Aneptek, 2003). According to the Bedrock Geologic Map of Massachusetts (Zen, 1983), the bedrock in the vicinity of the base is described as New Haven Arkose Formation of the Upper Triassic Period primarily consisting of red, pink and gray coarse-grained locally conglomeratic arkose interbedded with brick-red shaley siltstone and fine-grained arkosic sandstone. Depth to bedrock at the site is not known; however, surficial glacial outwash sand and gravel deposits are typically 100 to 150 ft. thick in this region.

4.4 Surface Water Hydrology

The BANGB and the Westfield-Barnes Municipal Airport lie across a watershed divide that trends north-south, generally along Runway 2-20. According to the Stormwater Management Plan

(SWMP; MAANG, 2010), surface water flow west of Runway 2-20 flows regionally westward towards Arm Brook, and water east of the divide flows eastward towards Pond Brook (**Figure 1**).

Stormwater west of Runway 2-20, including near the fire stations, hangars, and flight line, is conveyed through a series of subsurface drainage pipes to multiple detention basins located throughout the base. The detention basins percolate stormwater to the subsurface through highly transmissive glacial outwash sand gravel deposits. According to base personnel, the basins are typically dry except immediately following precipitation or snowmelt events. As illustrated on **Figure 4**, there are no surface water features present in the western portion of the base.

East of Runway 2-20, stormwater flows through surface drainage ditches and as overland sheet flow to the east or southeast (MAANG, 2010). As shown on **Figures 1** and **4**, several wetlands are present in the northeast quadrant of the eastern parcel. According to the SWMP, some of the stormwater flows overland to the wetlands; however, the wetlands do not discharge to into waters of the US.

4.5 Hydrogeology

Based on the Final Comprehensive Site Evaluation Phase II Report (AECOM, 2010), the area surrounding Barnes ANGB and the Westfield-Barnes Municipal Airport are underlain by Barnes Aquifer. The Barnes Aquifer is a distinct portion of the sand and gravel outwash aquifer that extends in a north-south direction from the Connecticut River to the Westfield River, and is bound in the east west direction by the geologic contact between the outwash and till/bedrock. Groundwater in the vicinity of the Base generally flows in a south or southeasterly direction, with localized variations to the southwest (**Figure 2**). Groundwater flow directions illustrated on Figure 2 were obtained from Appendix C of the PA, which includes relevant information from previous environmental investigations at the base. Depth to groundwater at the base has been reported to be in the range of 20 to 45 ft. bgs.

According to the EDR Radius Report® presented in the PA, BANGB is located in a MassDEP approved zone II aquifer.

4.6 Critical Habitat and Threatened/Endangered Species

MassGIS data layers were plotted in relation to the installation boundaries, and reviewed for

critical habitats and threatened or endangered species. The following summarizes the findings of the review, which are illustrated on **Figure 4**. Stated directions are relative to BANGB.

- An area of Rare Wetland Wildlife Habitat is present to the west;
- Areas of Protected Open Space are present to the southwest, northeast, and southeast;
- Freshwater Wetlands are found to the northwest, northeast, east, and southeast;
- Two small Freshwater Wetland areas are present in the eastern BANGB parcel;
- Two Certified Vernal Pools and one Potential Vernal Pool are located on Base, in the eastern parcel. Additionally, one Potential and one Certified Vernal Pool are located to the east; and
- Portions of the Base, and the area immediately surrounding the Base contain Priority Habitats of Rare Species.

4.7 City of Westfield Water Supply

The city of Westfield supplies water to 11,000 residential and commercial customers from two reservoir watersheds and eight groundwater extraction wells. The city also owns and operates more than 220 miles of underground piping, two drinking water treatment facilities, four booster pumping stations, and seven dams (Westfield, 2016).

5.0 PERMITS

Amec Foster Wheeler will obtain Dig Safe Clearance with One Call no more than 30-days prior to initiating SI exploration activities. After the Dig Safe Ticket has been obtained, Amec Foster Wheeler will submit an AF Form 103 with the 104th FW base civil engineer at least two weeks prior to initiating SI exploration activities. SI exploration activities will begin after AF Form 103 is signed and returned. Utility location and clearance activities are described in **Section 8.2**.

6.0 SOIL AND GROUNDWATER STANDARDS

A soil or groundwater standard is an environmental and/or public health statute or rule used in identifying site 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 and guidelines used to:

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

In accordance with *Interim AF Guidance on Sampling and Response Actions for Perfluorinated Compounds at Active and BRAC Installations* (USAF, August 2012) and EPA lifetime drinking water HAs for PFOS (USEPA, May 2016a) and PFOA (USEPA, May 2016b), a release will be considered confirmed if the following concentrations are exceeded:

PFOS:

- 0.07 micrograms per liter (µg/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 (µg/kg) in soil (calculated in the absence of Regional Screening Level [RSL] values).
- 1,260 µg/kg in sediment (calculated in the absence of RSL values).

PFOA:

- 0.07 µg/L in groundwater/surface water (combined with PFOS value).
- 1,260 µg/kg in soil (calculated in the absence of RSL values).
- 1,260 µg/kg in sediment (calculated in the absence of RSL values).

EPA has also derived RSL values for perfluorobutane sulfonate (PFBS), for which there is a Tier 2 toxicity value (Provisional Peer-Reviewed Toxicity Value) (USEPA, May 2016c). The USAF will also consider a release to be confirmed if the following concentrations are exceeded:

PFBS:

- 380 µg/L in groundwater/surface water.

- 1,600,000 µg/kg in soil/sediment.

Table 2 presents the screening values for comparing the analytical results for PFBS, PFOA, and PFOS.

Table 2
Health-Based Screening Values
104th Fighter Wing, Massachusetts Air National Guard
Barnes Air National Guard Base, Westfield, Massachusetts

Parameter	Chemical Abstract Number	EPA Regional Screening Level Table (May 2016)[a]		Air Force Guidance for Soils and Sediments[b] (µg/kg)	EPA 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	1,600,000	380	NL	NL
Perfluorooctanoic acid (PFOA)	335-67-1	NL	NL	1,260	0.07*
Perfluorooctane sulfonate (PFOS)	1763-23-1	NL	NL	1,260	

[a] EPA Regional Screening Levels (USEPA, 2016c).

[b] Screening levels calculated using the EPA 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).*

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

EPA = U.S. Environmental Protection Agency

NL = not listed

7.0 INVESTIGATIVE APPROACH

7.1 General Approach

The objective of the SI WP is to define field activities needed to perform the SI. Field activities will be performed at locations for the seven PRLs recommended for further inspection at BANGB and for groundwater along the base boundary. PRL 1 and PRL 8 are located immediately south of the Base. Because the SI is limited to inspecting on-base locations only; soil borings and temporary monitoring wells will be placed at the closest possible location to their respective PRL, while remaining on land operated by BANGB.

The overall objective of the SI is to assess for the presence/absence of the six PFAS congeners included on the USEPA's Third Unregulated Contaminant Monitoring Rule (UCMR 3) list (USEPA, 2012), through performance of the following:

- Advance 14 soil borings to a maximum depth of 15 ft. bgs for collection of the following samples:
  - Two soil samples from each of the ten borings installed at on-base PRLs (PRLs 4, 5, 6, and 7): surface sample (0-2 feet) and sample at water table;
  - One soil sample from each of the four borings installed to inspect PRLs primarily south of the BANGB (PRLs 1 and 8): surface sample (0-2 feet);
- Advance up to five borings for the installation of up to five temporary monitoring wells at locations hydraulically downgradient from each on-base PRL and at the downgradient base boundary;
- Collect up to six groundwater samples total from the five temporary wells, and one existing permanent well; and
- Collect up to two sediment samples from within the on-base storm water retention basin.

Existing data, site history, and process information have been used, where possible, to design the SI. Groundwater flow direction provided in Appendix C of the PA was used to select temporary monitoring well locations.

The work will be conducted in accordance with the HASP, FSP, and QAPP presented in

Appendices B, C, and **D**, respectively. **Table 3** summarizes the inspection approach for each of the PRLs and groundwater at the base boundary:

Table 3
Site Inspection Summary
104th Fighter Wing, Massachusetts Air National Guard
Barnes Air National Guard Base, Westfield, Massachusetts

PRL Name	Location Type	Confirmed (C) or Suspected (S) Release	SBs	Wells		No. Samples				Comments
				EW	TW	SO	GW	SW	SD	
1. Former FTA-01 (IRP Site 1)	Former FTA	S	2	0	1	2	1	0	0	PRL primarily off the BANGB. Operations may have impacted surface soils at the abutting BANGB; soil samples will be collected from 0-2 ft.
3. Storm-Water Drainage Basin (IRP Site 4)	Storm Water Outfall	S	0	1	0	0	1	0	2	Received AFFF discharges from flight line area, trench drains in hangars and buildings on flight line. Basin typically dry; no surface water samples.
4. Hangars 27A and 27 B	Hangar with AFFF Fire Suppression System (FSS)	S	3	0	1	6	1	0	0	No documented AFFF releases.
5. Former Fire Station [building (bldg.) 004]	Fire Station (FS)	S	2	0	0	4	0	0	0	Floor drains in this former fire station likely went to drywell. Downgradient well shared with PRL 6.
6. Current Fire Station (Bldg. 040 S)	Fire Station	S	3	0	1	6	1	0	0	No documented AFFF releases. No floor drains present.
7. Hush House	Hangar with AFFF FSS	C	2	0	1	4	1	0	0	Release during fire suppression test
8. Fire Department Equipment Test Area	Former FD Equipment Test Area	C	2	0	1	2	1	0	0	PRL primarily off the BANGB. Operations may have impacted surface soils at the abutting BANGB; soil samples will be collected from 0-2 ft.
Base Boundary Wells			0	0	0	0	0	0	0	Five TWs and one EW sampled are dual-purpose wells [a].
Total			14	1	5	24	6	0	2	

Notes:

EW = Existing Well

TW = Temporary Well

SO = Soil

GW = Groundwater

SW = Surface Water

SD = Sediment

[a] - Dual purpose wells are intended to assess groundwater quality downgradient from the PRL, and at the base boundary. Dual purpose wells are counted in the associated PRL row in the above table.

7.1.1 PRL 1: Former FTA-01 (IRP Site 1)

The primary operations area of this PRL abuts the BANGB to the south; however, it is possible that fire training activities resulted in discharge of AFFF to the land surface at the BANGB. To determine if surface soils were impacted by AFFF, two soil borings and one temporary monitoring well will be installed at the southern base boundary, immediately north of PRL1. One of the soil borings (01SB01) will be co-located with the temporary well (TW-03). The borings will extend to 15 feet below grade for evaluation of soil characteristics, and one surface soil sample (0-2 feet) will be collected from each boring. Because 15,000 tons of soil were removed from FTA-01 during IRP remediation activities, the sample collection depth might be adjusted to account for potential imported fill placed after FTA activities ceased. This determination will be based on interviews with ANG personnel, and field observations during drilling. One temporary monitoring well will be installed, and a groundwater sample will be collected to assess groundwater quality at the northern edge of PRL1, which is also the southern base boundary. The locations of soil borings and the temporary monitoring well are shown on **Figure 3B**.

7.1.2 PRL 3: Stormwater Drainage Basin (IRP Site 4)

There are no documented releases; however, it is possible that AFFF might have been released to the floor drains in buildings along the flight line area, which prior to connection to the city's sanitary sewer system, discharged to the stormwater drainage basin. To determine if AFFF was released to the drainage system, two samples will be collected from the upper 2 ft. of sediment within the basin. Sample locations will target areas near outfall pipes which convey water from the flight line area, or other likely depositional areas based on field reconnaissance. To assess potential impacts to groundwater from infiltrating stormwater, one groundwater sample will be collected from an existing, downgradient monitoring well. The sample collected from this well will also be used to assess groundwater conditions near the base boundary. The locations of sediment samples and the monitoring well are shown on **Figure 3A**.

7.1.3 PRL 4: Hangars 27A and 27B

There are no documented releases; however, it is possible that undocumented releases of AFFF from the FSS or deck guns might have occurred within Hangars 27A and 27B. Smaller releases would have been contained within the floor drain system. Larger releases could have impacted

soil and groundwater in the vicinity of the hangar doors, or near the OWS from overflow. To assess whether soil and groundwater were impacted by a potential accidental release, up to 3 soil borings and one temporary monitoring well will be installed. Two borings will be advanced south of the hangars, and will be biased toward the grass on the margin of the asphalt surface where surface runoff would most likely infiltrate. A third boring will be advanced north of the hangars, near the OWS. The borings will be advanced to a maximum depth of 15 ft. bgs. One temporary monitoring well will be installed at the water table southeast of the hangars, and a groundwater sample will be collected to assess groundwater quality downgradient from the hangar. This well will also be used to assess groundwater conditions at the downgradient Base boundary. The locations of soil borings and the temporary monitoring well are shown on **Figure 3A**.

7.1.4 PRL 5: Former Fire Station (Bldg. 004)

There are no documented releases; however, prior to connection to the city's sanitary sewer system, the floor drains likely discharged to a dry well. To assess whether soil was impacted by potential releases to the floor drain system, up to two soil borings will be installed. The borings will be advanced to a maximum depth of 15 ft. bgs along the southern side of the former building. These areas were selected because the central and northern portions of the former building footprint were recently disturbed by construction activities during expansion of the flight line. No specific temporary well is proposed at this PRL; however, given its proximity to the current fire station, temporary well TW-01 (accounted for under PRL 6) will also be used to assess groundwater quality downgradient from PRL 5. The locations of the soil borings are shown on **Figure 3B**.

7.1.5 PRL 6: Current Fire Station (Bldg. 040)

There are no documented releases of AFFF, and there are no floor drains present in the fire station. To address whether soil and groundwater were impacted by a potential accidental release, up to three soil borings and one temporary monitoring well will be installed at PRL 6. The soil borings will be advanced outside the bay doors, and will be biased towards grass on the margin of the asphalt surface where surface runoff would most likely infiltrate. The borings will be advanced to a maximum depth of 15 ft. bgs. One temporary monitoring well will be installed at the water table and a groundwater sample collected to assess groundwater quality

downgradient from the fire station, which will also assess groundwater at the Base boundary. The locations of soil borings and the temporary monitoring well are shown on **Figure 3B**.

7.1.6 PRL 7: Hush House

There are three known discharges at the hush house, which at least one of released AFFF. To assess whether soil and groundwater were impacted by these releases, up to two soil borings will be advanced, and one temporary monitoring well will be installed. The borings will be advanced to a maximum depth of 15 ft. bgs to the south and southwest of the building. Borings will be placed downslope from hangar doors, in the grass (if present), on the margin of the asphalt surface where surface runoff would most likely infiltrate. One temporary monitoring well will be installed at the water table and a groundwater sample collected to assess groundwater quality immediately downgradient from the hush house. The locations of soil borings and the temporary monitoring well are shown on **Figure 3C**.

7.1.7 PRL 8: Fire Department Equipment Test Area

Three known foam tests with AFFF releases of unknown volume occurred in the mid-1990s; testing practices prior to 1993 is unclear. To assess whether soil and groundwater at the abutting BANGB were impacted by these releases, two soil borings will be advanced, and one temporary monitoring well will be installed. The borings will be advanced on BANGB property north of Sierra Taxiway, a potential AFFF infiltration point from pavement runoff. The borings will be advanced to a maximum depth of 15 ft. bgs for soil characterization, and surface samples will be collected from the surface (0-2 feet). One temporary monitoring well will be installed, and a groundwater sample will be collected to assess groundwater quality at the northern edge of PRL8, which is also the southern base boundary. Note that one of the soil boring locations (08SB01) will be co-located with the temporary well (TW-04). The locations of soil borings and the temporary monitoring well are shown on **Figure 3C**.

7.1.8 Base Boundary Wells

BANGB is located approximately ½ mile northwest from two of the city's municipal supply wells, which until recently contributed to the public water supply for Westfield, Massachusetts. This SI includes installation and sampling of five temporary monitoring wells, and one existing permanent

monitoring well to assess potential PFC concentrations in groundwater at the base boundary to determine the potential for off-site migration. All five of these base boundary temporary wells, and the one existing permanent well, will be dual purpose wells as they are intended to assess groundwater quality directly downgradient from each PRL included in the SI program, as well as at the downgradient base boundary. The locations of the temporary monitoring wells are shown on **Figure 3A** through **3C**.

8.0 FIELD INVESTIGATION PROCEDURES

Field investigation procedures to be utilized are presented in the following sections, and detailed in **Sections 2.0** of the FSP (**Appendix C**).

8.1 Site Access and Restrictions

Prior to mobilization to the Site, a list of field personnel and vehicles will be provided to BANGB to coordinate access. Contractors who do not possess a valid Common Access Card (CAC) will complete an Entry Authorization List (EAL), which will be submitted to the BANGB POC at least two weeks prior to field activities. Upon arriving at the base each morning, field personnel will check in with the BANGB POC. Field personnel and vehicles will access the base using the main drive and gate. Anticipated work hours are from 7:00 AM to 5:00 PM local time on weekdays.

8.2 Utility Location and Clearance

Prior to commencement of SI activities, Amec Foster Wheeler will review available site information, such as as-built drawings, to identify locations of subsurface utilities. In addition, Amec Foster Wheeler will schedule a site walk to pre-mark proposed ground disturbance locations with assistance from the BANGB POC. After the locations have been pre-marked, Amec Foster Wheeler will contact “Dig Safe”, the Massachusetts one-call utility clearance hotline. Amec Foster Wheeler will then submit an AF Form 103 with the 104th FW base civil engineer two weeks prior to initiating SI exploration activities. Once the signed AF Form 103 has been received from the 104th FW base civil engineer, a private utility locating subcontractor will be used to clear site utilities at the specified sampling locations. Specific permit requirements for utility clearance are discussed in **Section 5.0**.

8.3 Soil Boring Installation and Soil Sampling

Soil boring installation and soil sampling activities will be completed as summarized in the following sections. Soil boring locations are illustrated on **Figure 3**, and **Figures 3A** through **3C**.

8.3.1 Soil Boring Installation

Soil boring locations are based on site use and physical characteristics to target the most probable

release areas. Up to 14 soil borings will be advanced in and around the seven PRL areas using DPT drilling methods. The soil borings will be advanced from the ground surface to an approximate depth of 15 ft. bgs, unless groundwater or refusal is encountered at a shallower depth. Soil cores will be collected continuously for field screening at 4 to 5-ft intervals in new, dedicated polyvinyl chloride (PVC) liners. Drilling rods/tools will be decontaminated between borings in accordance with **Section 8.7.** Investigation-derived waste (IDW) generated during drilling activities will be containerized in 55-gallon steel drums and labeled for disposal in accordance with **Section 8.9**.

8.3.2 Soil Sampling

Soil samples will be collected in accordance with **Section 2.1** of the FSP (**Appendix C**). Samples will be analyzed to determine if PFAA are present in soil at each PRL as outlined in **Table 2** of the FSP.

8.3.3 Soil Boring Abandonment

Following completion of drilling activities, each boring will be backfilled with cuttings (and hydrated bentonite chips as necessary) to grade in order to seal the boring. Surface completions will be patched with like materials (i.e., asphalt, concrete, or topsoil/seed) in accordance with BANGB specifications.

8.4 Temporary Monitoring Well Installation and Groundwater Sampling

Temporary monitoring well installation, and groundwater sampling activities, will be completed as summarized in the following sections. Temporary monitoring well locations are illustrated on **Figure 3, and Figures 3A** through **3C**.

8.4.1 Temporary Monitoring Well Installation

Up to five temporary well borings will be advanced using DPT drilling methods. The primary purpose of installing the temporary monitoring wells is to assess groundwater quality hydraulically downgradient of the PRLs; therefore, PFAA compounds are not expected to be present in shallow soil (i.e. above the water table). As such, soil samples will not be collected for laboratory analysis from temporary well borings, except where a soil boring is co-located with a temporary well

location (PRL 1 and PRL 8). Soil cores will be collected continuously to verify soil lithology, then inspected, logged, and field screened in accordance with **Section 2.1.1** of the FSP. The temporary monitoring wells will be installed in accordance with Amec Foster Wheeler's PFC-specific Standard Operating Procedure (SOP) for installation of monitoring wells (AFW-04), which is included as Attachment E of the QAPP (**Appendix D**). Because the monitoring wells will be temporary, the SOP will be supplemented with the following installation-specific requirements:

- Each temporary monitoring well will be constructed using 1-inch diameter PVC pipe with a 5-ft long, 0.010-inch slotted screened interval. 2-inch diameter wells may be installed if the water table is greater than 25 ft. bgs to enable use of a submersible pump.
- The annulus surrounding the well screen and riser will be backfilled with No.1 filter sand, which will be placed from the bottom of the borehole to the ground surface. No annular seal will be installed. Alternatively, a pre-packed screen assembly may be utilized.
- A concrete pad and road box will not be installed.
- If the well is left unattended, an expandable cap will be placed within the riser, and a steel plate or traffic cone will be placed over the well to protect it.

Following temporary monitoring well completion, static water levels will be collected with an electronic water level indicator and recorded on a field data sheet. Well development will be conducted as described below and in accordance with Amec Foster Wheeler's Well Development SOP (AFW-05) included as Attachment E of the QAPP.

8.4.2 Monitoring Well Development

The temporary monitoring wells will be developed using a pump to develop the entire screened interval and remove fine particles that have accumulated. Water quality parameters will be monitored and recorded at periodic intervals. Monitoring wells will be considered adequately developed when water quality parameters have stabilized (see **Section 2.3.1** of the FSP) and turbidity is low (i.e., <50 NTU).

Well development water will be containerized in steel 55-gallon drums and managed in accordance with **Section 8.9**. All equipment and pumps inserted into the well will be decontaminated following each use in accordance with **Section 8.7**. A well development log will

be prepared for each well and contain the following information:

- Project
- Date
- Well number
- Condition of the well
- Geologist/Scientist
- Depth to water prior to development
- Depth to bottom of well prior to development
- Type of pump
- Pumping rate
- Purge volumes (containerized for disposal)
- Characteristics of purge water (color, particulates, clarity, and odor)
- Field measurements (temperature, pH, dissolved oxygen, specific conductance, redox potential, turbidity)
- Estimated recharge rate
- Development time
- Depth to water following development
- Depth to bottom of well following development
- General remarks

8.4.3 Groundwater Sampling

Groundwater samples will be collected from the five temporary monitoring wells and one existing permanent well in accordance with **Section 2.2** of the FSP. Dedicated sampling equipment, including tubing, will be changed between well locations. Re-usable equipment will be decontaminated in accordance with **Section 8.7**. Samples will be analyzed for PFAA at each PRL area, as outlined in **Table 2** of the FSP.

8.4.4 Temporary Well Boring Abandonment

After sample collection, the temporary well risers and screens will be removed and the borings properly abandoned in accordance with **Section 8.3.3**.

8.5 Sediment Sampling

Sediment samples will be collected in accordance with **Section 2.3** of the FSP, from locations shown on **Figure 3A**. Although surface water is not present at any of the PRLs, surficial material within stormwater drainage basins is considered sediment for the purposes of the SI. Re-usable sampling equipment will be decontaminated in accordance with **Section 8.7**. Sediment samples will be analyzed for the six UCMR3 PFAAs at each PRL as outlined in **Table 2** of the FSP.

8.6 Surface Water Sampling

Surface water is typically not present at any of the PRL areas; therefore, surface water sampling is not included in the scope of the SI.

8.7 Decontamination Procedures

Decontamination procedures will be conducted in accordance with **Section 2.7.5** of the FSP. Equipment (including sampling probes, rods, and tools) will be cleaned prior to initiating and following the completion of field activities. Non-dedicated sampling equipment will be decontaminated after each use during field activities. Decontamination fluids will be containerized in steel 55-gallon drums and managed in accordance with **Section 8.9**.

8.8 Site Survey

The horizontal position of all soil borings and temporary monitoring wells will be located with a hand-held Global Positioning System (GPS) unit capable of achieving 1-meter horizontal accuracy.

8.9 Management of IDW

IDW (excess soil cuttings, purge water, development water, and decontamination fluids) will be collected and contained in labeled, secured, 55-gallon drums. Liquid IDW will be stored in closed-top steel drums; soil cuttings will be stored in open-top steel drums. Soil drums will be filled to no more than 2/3 of maximum capacity of the drum to ensure compliance with Department of Transportation (DOT) weight restrictions. Waste characterization sampling is detailed in **Section 2.5** of the FSP. Drums will remain on-site in an area designated by the BANGB POC, pending

the results of laboratory testing. Appropriate disposal methods for these drums will be determined after reviewing the waste characterization analytical results. Disposal of IDW drums will be completed in a timely manner and in accordance with ANG policy for IDW.

9.0 PROJECT SCHEDULE AND DELIVERABLES

The anticipated project schedule is presented in **Appendix A**. It is estimated that the deliverables and field efforts presented in the schedule will occur as noted. However, these dates are tentative and may be revised based upon agreements reached among parties during the project execution. The scheduled due dates for the project deliverables are presented in the **Table 4** below:

Table 4
Project Schedule and Deliverables Summary
104th Fighter Wing, Massachusetts Air National Guard
Barnes Air National Guard Base, Westfield, Massachusetts

Deliverable	Scheduled Due Date	Distribution
Final SI WP	20 April, 2017	COR, ANG and Regulatory Stakeholders
Draft SI Report	30 July, 2017	COR, ANG
Draft-Final SI Report	15 September, 2017	COR, ANG and Regulatory Stakeholders
Final SI Report	31 October, 2017	COR, ANG and Regulatory Stakeholders

10.0 REFERENCES

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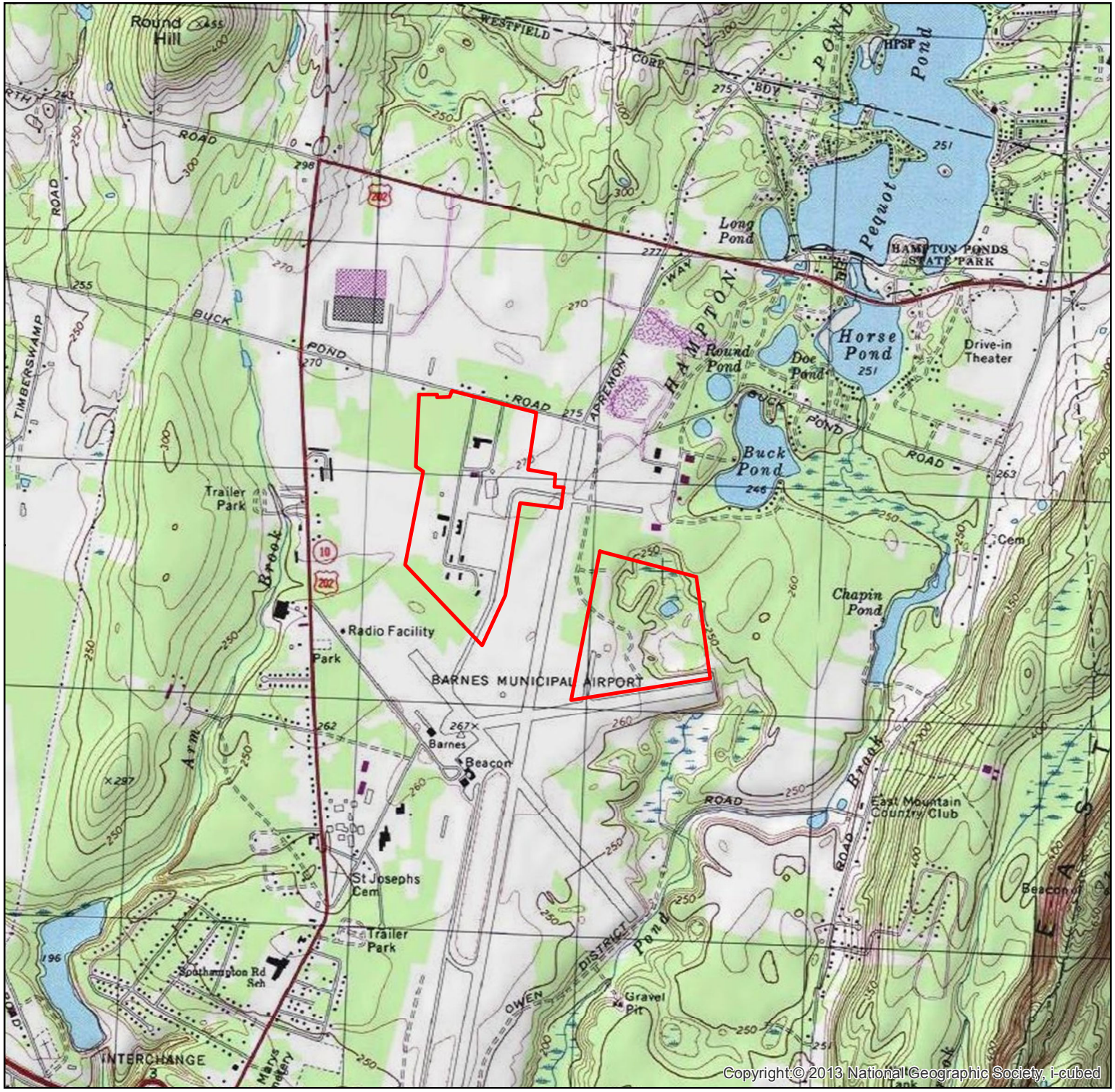
FIGURES



SITE LOCATION MAP

Barnes Air National Guard Base
Westfield, Massachusetts

Legend

Installation Area (approximate)

Location of Site

Notes & Sources

Notes: Installation Area datalayers obtained from Figure 2 (Site Features and Potential AOCs) of the Final Perfluorinated Compounds Preliminary Assessment Site Visit Report prepared by BB&E and dated January 2016.

0 2,000 Feet

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FIGURE 1

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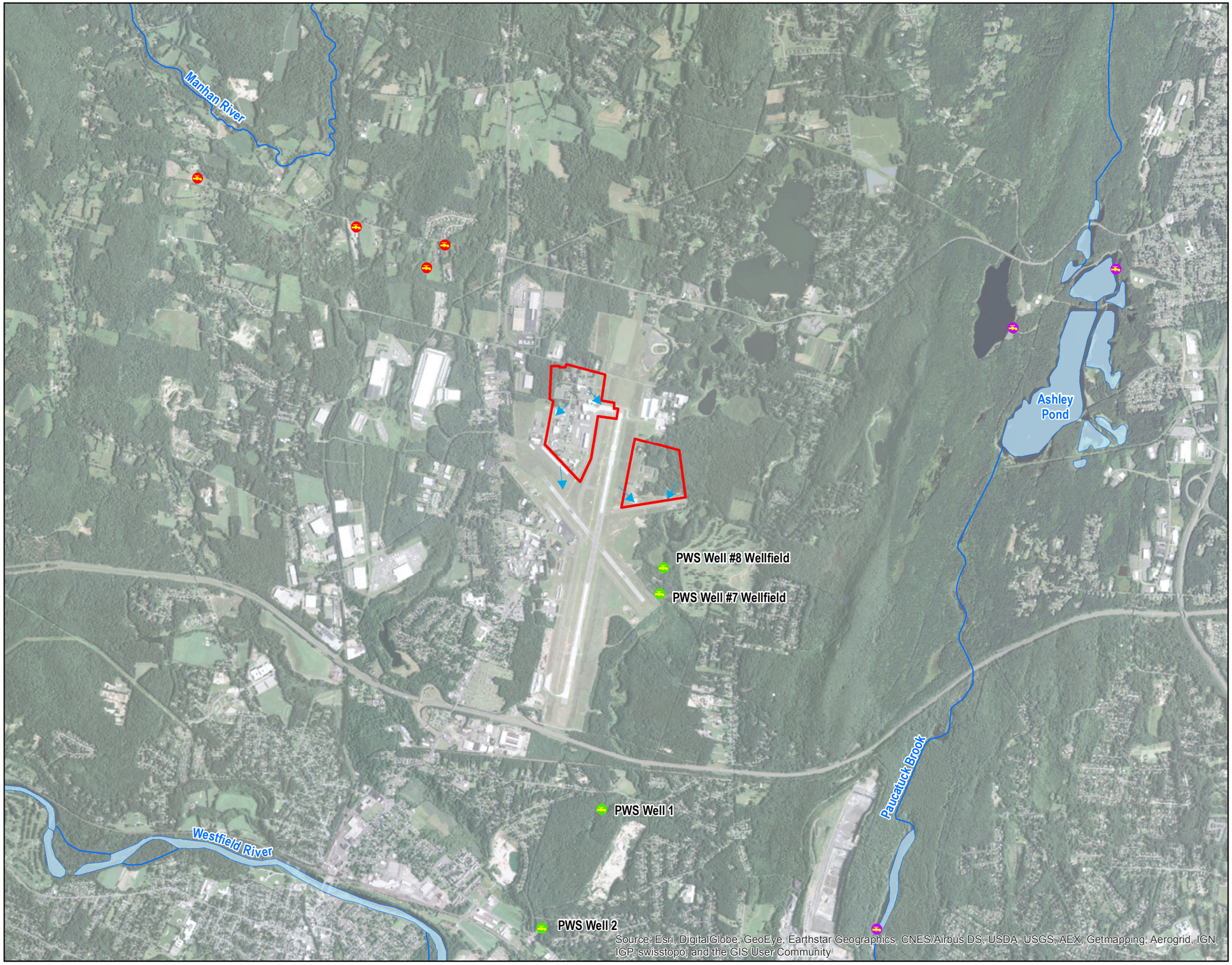

SITE & AREA FEATURES

Barnes Air National Guard Base
Westfield, Massachusetts

Legend

- Community Groundwater Source
- Surface Water Intake
- Non-Community Groundwater Source
- Groundwater Flow Direction
- Rivers and Streams
- Lakes and Ponds
- Installation Area (approximate)

Location of Site

Notes & Sources

Notes: AFFF - aqueous film forming foam. PFC - perfluorinated compounds. PWS - Public Water Supply
Sources:Installation Area datalayer obtained from Figure 2 of the Final Perfluorinated Compounds Preliminary Assessment Site Visit Report prepared by BB&E and dated January 2016. Public Water Supplies datalayer obtained from MassGIS (updated 10/2016).

0 1,500 3,000 Feet

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FIGURE 2

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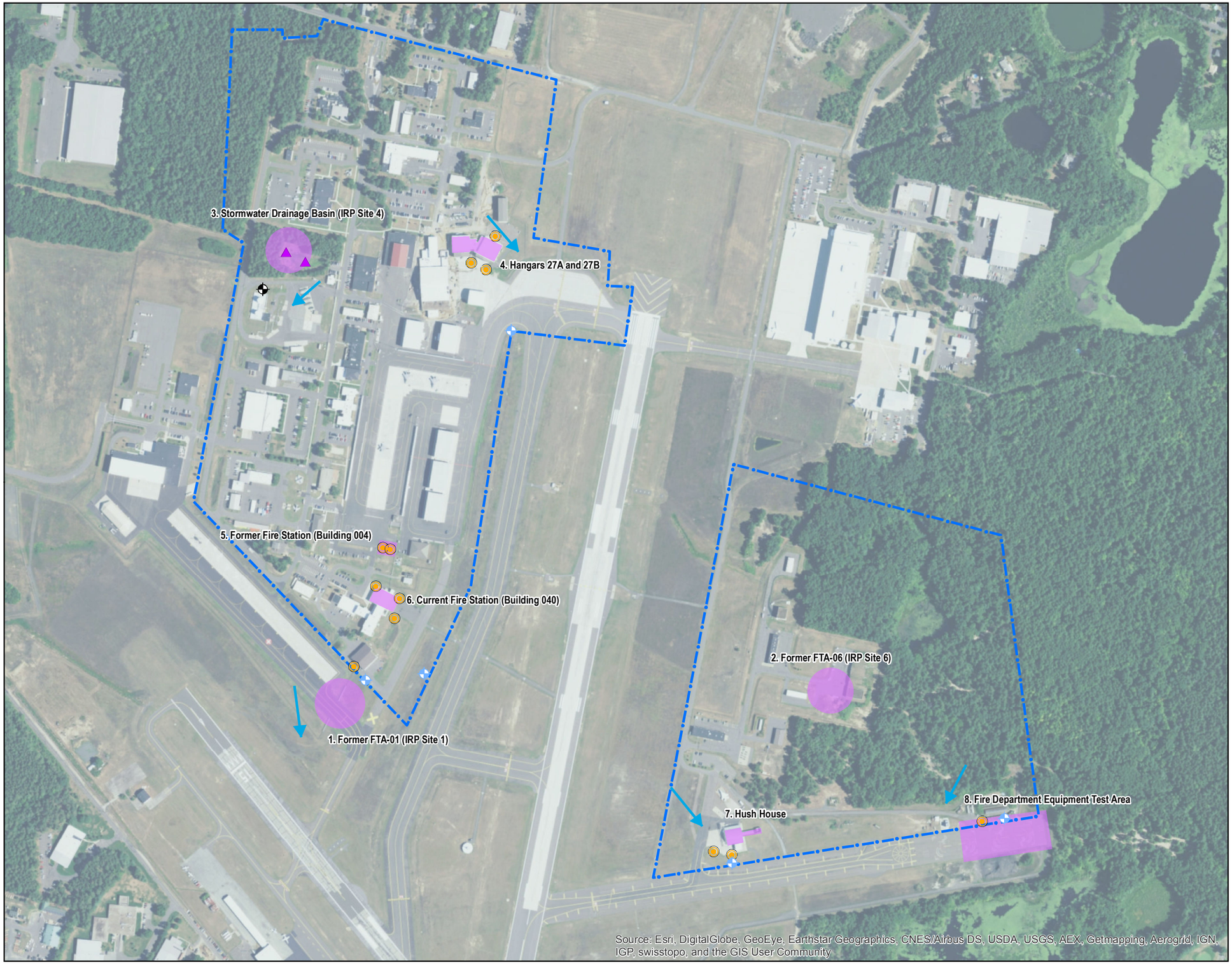

PROPOSED SAMPLE LOCATIONS

Barnes Air National Guard Base
Westfield, Massachusetts

Legend

- Monitoring Well
- Soil Sample
- Sediment Sample
- Existing Monitoring Well
- Groundwater Flow Direction
- Installation Area (approximate)
- Potential AFFF PFC PRL (approximate)

Location of Site

Notes & Sources

Notes: AFFF - aqueous film forming foam. PRL - potential release location. PFC - perfluorinated compounds
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 January 2016.

0 250 500 Feet

N

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FIGURE 3

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PROPOSED SAMPLE LOCATIONS PRLs 3 & 4

Barnes Air National Guard Base
Westfield, Massachusetts

Legend

- Monitoring Well
- Soil Sample
- Sediment Sample
- Existing Monitoring Well
- Groundwater Flow Direction
- Potential AFFF PFC PRL (approximate)
- Installation Area (approximate)

Location of Site

Notes & Sources

Notes: AFFF - aqueous film forming foam. PRL - potential release location. PFC - perfluorinated compounds
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 January 2016.

0 75 150 Feet

N

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FIGURE 3A

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

PROPOSED
SAMPLE LOCATIONS
PRLs 1, 5 & 6

Barnes Air National Guard Base
Westfield, Massachusetts

Legend

- Monitoring Well
- Soil Sample
- Sediment Sample
- Groundwater Flow Direction
- Potential AFFF PFC PRL (approximate)
- Installation Area (approximate)

Location of Site

Notes & Sources

Notes: AFFF - aqueous film forming foam. PRL - potential release location. PFC - perfluorinated compounds
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 January 2016.

0 75 150
Feet

N

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FIGURE
3B

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PROPOSED SAMPLE LOCATIONS PRLs 7 & 8

Barnes Air National Guard Base
Westfield, Massachusetts

Legend

- Monitoring Well
- Soil Sample
- Sediment Sample
- Groundwater Flow Direction
- Potential AFFF PFC PRL (approximate)
- Installation Area (approximate)

Location of Site

Notes & Sources

Notes: AFFF - aqueous film forming foam. PRL - potential release location. PFC - perfluorinated compounds
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 January 2016.

0 75 150 Feet

N

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Amec Foster Wheeler
Environment & Infrastructure, Inc.
271 Mill Road
Chelmsford, MA 01824
(978) 692-9090

FIGURE
3C

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CRITICAL HABITAT MAP

Barnes Air National Guard Base
Westfield, Massachusetts

Legend

- Installation Area (approximate)
- Groundwater Flow Direction
- NHESP Estimated Habitats of Rare Wildlife
- NHESP Priority Habitats of Rare Species
- Protected Open Space
- Marsh/Bog
- Wooded marsh
- Open Water
- Hydrologic Connection
- Wetland Limit
- Closure Line
- NHESP Certified Vernal Pool
- NHESP Potential Vernal Pool

Location of Site

Notes & Sources

Notes: AFFF - aqueous film forming foam. PRL - potential release location. PFC - perfluorinated compounds
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 January 2016. NHESP Estimated Habitat of Rare Wildlife, NHESP Priority Habitat of Rare Species, Protected Open Space, MassDEP Wetlands (polyline & polygon features), NHESP Certified Vernal Pools, & NHESP Potential Vernal Pools datalayers obtained from MassGIS.

0 440 880 Feet

N

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FIGURE 4

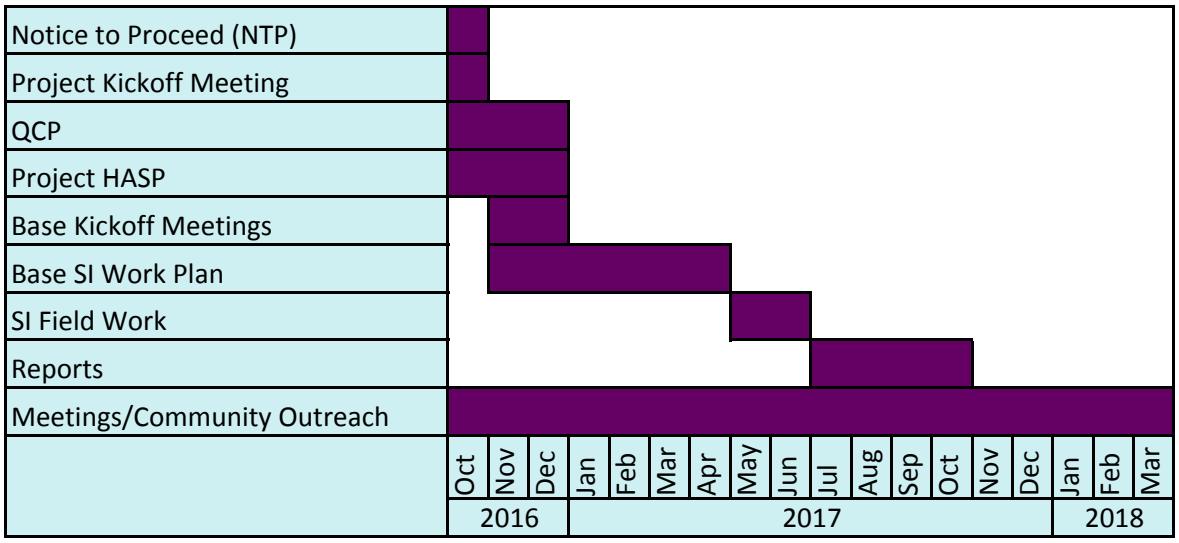
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

H:\ANG\Westfield_MA\Task5\MXD\Report\Fig4_Barnes_CriticalHabitatMap.mxd January 27, 2017 DWN: emily.gardiner CHKD: AKN

APPENDIX A

PROJECT SCHEDULE AND DELIVERABLES SUMMARY

Appendix A
Project Schedule and Deliverables Summary
104th Fighter Wing, Massachusetts Air National Guard
Barnes Air National Guard Base, Westfield, Massachusetts



Deliverable	Scheduled Due Date	Distribution
Final SI WP	20 April, 2017	COR, ANG and Regulatory Stakeholders
Draft SI Report	30 July, 2017	COR, ANG
Draft-Final SI Report	15 September, 2017	COR, ANG and Regulatory Stakeholders
Final SI Report	31 October, 2017	COR, ANG and Regulatory Stakeholders

APPENDIX B

SITE HEALTH AND SAFETY PLAN

amec foster wheeler

Site Health and Safety Plan
Preliminary Subsurface Investigation

General Information

Project Name:	Phase 1 Regional Site Inspections
Location:	Barnes Air National Guard Base, Westfield, Massachusetts
Client	National Guard Bureau (NGB)
Plan Prepared By:	Craig Keating
Plan Approved By:	Laurie Gneiding
Project Start Date:	April, 2017

Emergency Contacts

SERVICE	NAME	PHONE NUMBER
EMERGENCY		
Police	Westfield Police Department	911
Fire	Westfield Fire Department	911
Local Hospital	Baystate Noble Hospital 115 W. Silver St. Westfield, MA 01085	(413) 568-2811
Local Ambulance/Rescue	Emergency Service	911
Work Care		(888) 449-7787
Haz. Waste Natl. Response Center	HAZMAT	(800) 424-8802
HAZMAT (Local)	Westfield City Fire Department	(413) 572-6330
Amec Foster Wheeler Emergency Assistance		(800) 869-3960
OSHA Field Office		(800) 321-6742

Title	NAME	PHONE NUMBER
PROJECT/BUSINESS		
Amec Foster Wheeler Base Lead	Herb Colby	Office: (978) 392-5312 Cell: (774) 249-0226
Amec Foster Wheeler Eastern Regional Health & Safety Manager	Cynthia Sundquist	Office: (207) 828-3309 Cell: (207) 650-7593
Amec Foster Wheeler Corporate Health & Safety Manager	Vladimir Ivensky	Office: (610) 877-6144 Cell: (484) 919-5175
Amec Foster Wheeler Site Safety Office / Field Supervisor	TBD	Office: Cell:
Client Contact: NGB Program Manager	Winston Crow	Office: TBD
Client Contact: Base Environmental Manager	John Richardson	Office: (413) 568-9151 x6981710
Subcontractor	TBD	Office: Cell:

TABLE OF CONTENTS

Attachments

LIST OF ACRONYMS

AFFF	Aqueous Film Forming Foam
104th FW	104th Fighter Wing
BANGB	Barnes Air National Guard Base
CFR	Code of Federal Regulations
CHSM	Corporate Health and Safety Manual
CRZ	Contaminant Reduction Zone
DA PAM	Department of the Army Pamphlet
EPA	Environmental Protection Agency
EZ	Exclusion Zone
H&S	Health & Safety
HA	Hazard Analysis
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSE	Health, Safety and Environmental
JSA	Job Safety Analysis
MAANG	Massachusetts Air National Guard
OHSR	Office Health and Safety Representative
OSHA	Occupational Safety and Health Administration
PFC	Perfluorinated Compound
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctyl Sulfonate
PPE	Personal Protective Equipment
PRL	Potential Release Location
SDS	Safety Data Sheet
SHSO	Site Health and Safety Officer
SI	Site Inspection
SZ	Support Zone

1.0 INTRODUCTION

1.1 Purpose and Policy

The purpose of this document is to outline the health and safety plan (HASP) for the Site Inspection (SI) activities that are scheduled to be completed at 5 Potential Release Locations (PRLs) identified at the 104th Fighter Wing (104th FW), Massachusetts Air National Guard (MAANG), Barnes Air National Guard Base (BANGB), in the City of Westfield, Massachusetts.

This HASP addresses those activities associated with the scope of work stated within this HASP and will be implemented by the Site Health & Safety Officer (SHSO) during site work. **Compliance with this HASP is required of all persons and third parties who enter this work site**. Assistance in implementing this plan can be obtained from the SHSO and Project Manager, and/or Health, Safety and Environmental (HSE) Coordinator. The content of this HASP may change or undergo revision based upon additional information made available to health and safety (H&S) personnel, monitoring results, or changes in the scope of work. Any changes proposed must be reviewed by H&S staff and are subject to approval by the HSE Coordinator and Project Manager.

This site-specific HASP has been prepared for the use of Amec Foster Wheeler Environment & Infrastructure, Inc. and its employees and supplements the Health and Safety training that each Amec Foster Wheeler employee receives. The H&S guidelines in this plan were prepared specifically for this site and encompass known hazards. If additional hazards are encountered, the level of personal protection will be evaluated and the HASP will be modified as necessary.

This HASP is not intended to be used by any other contractor or personnel of any such contractor. This HASP may not address the specific H&S needs or requirements of any other such contractor and its employees. Neither this HASP nor any part of it should be used on any other site.

1.2 Applicability

This HASP presents requirements and guidelines for work at the Site. It is in compliance with applicable sections of 29 Code of Federal Regulations (CFR) 1910.120 and 1926.65, Hazardous Waste Operations and Emergency Response (HAZWOPER).

1.2.1 Modification Plan

Occasionally, procedural conflicts may arise from different documents. The requirement most protective of workers health and safety, the public, and property shall take precedence.

1.2.2 Subcontractor's Responsibilities

Subcontractors employed by Amec Foster Wheeler shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with its work. The subcontractor shall give all notices and comply with all applicable laws, ordinances, rules, regulations, and lawful orders of any public authority bearing on the safety of persons or property, the subcontractor shall act to prevent threatened damage, injury or loss.

1.3 Site Location

The BANGB is located at the Westfield-Barnes Regional Airport (formerly Barnes Municipal Airport), approximately 3 miles northeast of the City of Westfield, Hampden County, Massachusetts (SI Work Plan Figure 1). BANGB is the home of the 104th FW, and occupies approximately 182 acres on land leased from the City of Westfield. The installation is divided into two separate parcels of land in the northern portion of the airport, bisected by runway 2-20 that trends north/south (SI Work Plan Figure 2). The western parcel encompasses approximately 112 acres, and contains the majority of the facilities buildings, hangars, flight line, and fire station. The eastern parcel encompasses approximately 70 acres, and contains the hush house, a small arms firing range, a former FTA, and other facilities. Westfield-Barnes Regional Airport, including BANGB, is zoned for airport district usage. The airport is surrounded by properties zoned for industrial, residential, and business use.

1.4 Scope of Work

The scope of work included in the SI is intended to collect sufficient data to determine the presence or absence of Perfluorinated Compounds (PFCs) in soil, sediment and/or groundwater at each of the Potential Release Locations (PRLs) and in groundwater at the base boundary to develop appropriate path(s) forward.

It is anticipated that the project will take up to five days to complete. Amec Foster Wheeler will provide on-site oversight during all field activities. All subcontractors will be responsible for ensuring compliance with this HASP and with their company specific HASP, among its employees during the field work. Planned Site activities include the following tasks, listed in sequence of occurrence.

1. Visual Site inspections;
2. Site clearance for all utilities;
3. Advancement of soil and well borings using direct-push drilling methods;
4. Convert select borings to temporary monitoring wells;
5. Collect soil samples;
6. Collect groundwater samples using low flow sampling procedures;
7. Soil and well boring abandonment;
8. Collect sediment samples.

1.5 Health and Safety Planning

The Supervisor identifies the work area and task to be performed and then leads the crew in performing task hazard assessment evaluation. The hazard assessment is specific to the work to be performed and requires the Supervisor to solicit crew participation in identifying hazards and hazard control measures such as personal protective equipment (PPE), training requirements, permits, procedures, etc.

1.6 Project Organization and Responsibilities

Refer to the cover page of this HASP for emergency contact information.

1.6.1 Project Manager

Reports to upper-level management. Has authority to direct response operations. Assumes total control oversite activities.
Responsibilities:

- Prepares and organizes the background review of the situation, the Work Plan, the HASP, and the field team.
- Obtains permission for Site access and coordinates activities with appropriate officials.
- Ensures that the Work Plan is completed and on schedule.
- Briefs the field teams on their specific assignments.
- Uses the SHSO to ensure that health and safety requirements are met.
- Prepares the final report and support files on the response activities
- Serves as the liaison with public officials.

1.6.2 Site Health and Safety Officer

Advises the Project Manager on all aspects of health and safety on-site. Stops work if any operation threatens worker or public health safety.
Responsibilities:

- Periodically inspects protective clothing and equipment.
- Ensures that protective clothing and equipment are properly store and maintained.
- Controls entry and exit at the Access Control Points.
- Coordinates health and safety program activities with the Office Health and Safety Representative (OHSR).
- Confirms each team member's suitability for work based on a physician's recommendation.
- Monitors the work parties for signs of stress, such as cold exposure, heat stress, and fatigue.
- Implements the HASP.
- Conducts periodic inspections to determine if the HASP is being followed.
- Enforces the "buddy" system.
- Knows emergency procedures, evacuation routes, and the telephone numbers of the ambulance, local hospital, poison control center, fire department, and police department.

- Notifies, when necessary, local public emergency officials.
- Coordinates emergency medical care.
- Sets up decontamination lines and the decontamination solutions appropriate for the type of chemical contamination on the Site.
- Controls the decontamination of all equipment, personnel, and samples from the contaminated area.
- Assures proper disposal of contaminated clothing and materials.
- Ensures that all required equipment is available.
- Advises medical personnel of potential exposures and consequences.
- Notifies emergency response personnel by telephone or radio in the event of an emergency.

1.6.3 Field Manager

Responsibilities:

- Manages field operations.
- Executes the Work Plan and schedule.
- Enforces safety procedures.
- Coordinates with the SHSO in determining the personal protection level.
- Enforces Site control.
- Documents field activities and sample collection.
- Serves as a liaison with public officials.

1.6.4 Work Team

Responsibilities:

- Safely completes the on-site tasks required to fulfill the Work Plan.
- Complies with the HASP.
- Notifies SHSO or supervisor of suspected unsafe conditions.

1.7 Subcontractor's Safety Representative

The subcontractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury or loss to:

a. all employees on the Work-Site and all other persons who may be affected.
b. all the Work and its materials and equipment.
c. other property at or adjacent to the Work-Site.

2.0 SAFETY AND HEALTH RISK ANALYSIS

2.1 Chemical Hazard Analysis

Workers may be exposed to chemical hazards from chemicals used during the field operations such as instrument calibration gases, sample preservatives, insect repellent, and chemicals brought to the Site by contractors. Safety Data Sheets (SDSs) are provided in **Attachment A**, and will be maintained at the project Site for all hazardous materials that are brought to the Site (e.g., calibration gases, sample preservatives, decontamination materials, etc.) and available for inspection at all times.

PFCs is a term used to refer to the group of chemicals that includes Perfluorooctanoic Acid (PFOA) and Perfluorooctyl Sulfonate (PFOS), and other per- and polyfluoroalkyl substances. PFCs are man-made fluorocarbon-based acids which have been and are still used in various industrial processes. PFCs do not biodegrade and can persistent in the environment and in the human body. These chemicals may be released during production processes, and during their use in manufacturing of new products. According to the Environmental Protection Agency (EPA) and the Centers for Disease Control and Prevention (CDC), exposure to these chemicals can occur through ingestion of food that has been contaminated during growing (contaminated soil and water), during cooking in affected cooking ware, during processing from equipment used to process the food, from food packaging, etc. Exposure may also occur during the normal use of consumer projects that contain these chemicals (carpets, leather and apparel, textiles, paper and packaging materials), and from drinking water that has been contaminated with these chemicals. Soil and groundwater contamination can occur in areas where a facility has produced or used these chemicals, or other locations where these chemicals were used for firefighting. According to the Agency for Toxic Substances and Disease Registry (ATSDR), food is expected to be the primary source of exposure for most people. Communities near facilities where PFOA and PFOS were previously manufactured may have these substances in drinking water.

While the exact quantity or type of releases which may have occurred on the Site are unknown, the scope of work requires an assessment of the potential historical release of PFCs at 5 PRLs where Aqueous Film Forming Foam (AFFF) was potentially used or stored, which included drainage basins, hangars, hush house, fire stations, and firefighting equipment testing areas. Workers may be exposed to Site contamination during field operations, with the greatest risk of exposure occurring during sampling of groundwater, soil, sediment, and surface water. The potential routes of exposure to Project contamination include inhalation, dermal contact, and incidental ingestion, with inhalation and dermal contact being the highest potential.

The Occupational Safety and Health Administration (OSHA) and the American Conference of Governmental Industrial Hygienists (ACGIH) have not established occupational exposure limits[1].

[1] Currently no Occupational Safety and Health Administration Permissible Exposure Limit (PEL) nor American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV) exists for PFCs or PFOAs. However, the ACGIH® Biological Exposure Indices Commission determined that perfluorooctanoic acid may pose important risks to the health of workers and is encouraging the submission of new data since 2007 (ACGIH, TLVs and BEIs, 2016).

According to the ATSDR, some but not all human studies have shown that some of the PFCs may:

- affect developing fetuses and children (changes in growth, learning, and behavior),
- decrease fertility and interfere with the body's natural hormones,
- increase cholesterol,
- affect the immune system, and
- increase cancer risk.

ATSDR also states that more studies are needed to evaluate the health effects of exposure to these chemicals.

Amec Foster Wheeler anticipates that the potential for personnel exposure to Site contamination via incidental ingestion of contaminated groundwater is low. Amec Foster Wheeler will enforce proper personal hygiene and decontamination practices at the Site, and require the use of appropriate PPE when conducting field operations. In addition, to minimize the potential for exposure to Site contaminants, eating, drinking, and smoking in potentially contaminated areas will be prohibited.

2.2 Physical Hazards

Work sites may contain hazards for Site workers, such as:

- Slips, trips and falls from:
  - Holes, pits, or ditches.
  - High-speed vehicular traffic in vicinity of Site.
  - Slippery surfaces.
  - Steep grades.
  - Uneven grades.
  - Weather conditions that make surfaces slippery and obscure visibility
- Punctures, abrasions, compressions from sharp objects, such as nails, metal shards, and broken glass.
- Surrounding animal, insect and plant life.
- Underground utilities.
- Overhead utilities.
- Lifting heavy loads.
- Traffic.

2.2.1 Heavy Equipment

Planned SI activities at the Site will include heavy equipment such as direct-push drilling rigs. Dangerous conditions can develop from heavy equipment use. The following should be taken into consideration:

- Appropriate personal protective equipment consistent with the hazard should be worn.

- Signing and traffic control on the Site should be completed.
- Avoid walking under suspended loads.
- Maintain eye contact with heavy equipment operators and do not walk into their red zone without confirmation they are aware of your approach.
- Use appropriate fall protection if needed.
- Heavy equipment must be equipped with a backup alarm to alert workers.
- Establish a work zone around construction equipment and permit only those personnel and equipment required for the task within the zone.
- Getting off or on any equipment while it is in motion is prohibited.
- Machinery or equipment will be operated in a manner that will protect persons or property, including the operation of equipment at safe speeds and weight limits to be enforced.
- Stay clear of rotating parts.
- Maintain a distance of at least 15 feet from wires for heavy equipment.

2.2.2 Noise Hazards

Planned activities will involve the use of noise producing equipment such as the Geoprobe™ direct push rig. The unprotected exposure of Site workers to this noise during activities could result in noise-induced hearing loss. Drilling/boring, and any other activity that involves the use of heavy equipment or powered tools have the potential to generate elevated noise levels. Hearing protection will be worn whenever drill rigs or other heavy equipment are being operated, when powered tools are used, and when monitored noise levels exceed 85 decibels on a time-weighted-average (TWA).

Activities conducted in close proximity to generators, steam cleaners, other machinery, construction activities, and heavy equipment may expose workers to noise exceeding the OSHA PEL of 90 decibel A-scale (dBA). The following effects can result from this noise:

- psychological effects: workers being startled, annoyed, or distracted
- physiological effects: pain, temporary and/or permanent hearing loss, reduced muscular control (when exposure is severe)
- communication interference: increase in potential hazards due to the inability to warn of danger or properly issue instructions

It is anticipated that situations may arise when workers may be exposed to noise levels in excess of the 85 dBA, OSHA 8-hour time-weighted average (TWA) action level.

Each person will be provided with hearing protection to be used when noise levels are near or exceed the TWA of 85 dBA, including during drilling operations and sampling operations when a generator is in use. Areas or equipment with noise levels greater than 85 dBA will be posted as high noise areas/equipment, requiring the use of hearing protection.

All hearing protectors available have been evaluated for attenuation using the Noise Reduction Rating (NRR); the NRR number appears on the equipment packaging. The NRR is the number

of decibels the hearing protector absorbs if worn properly. The NRR for hearing protection devices is established based upon laboratory conditions and rarely holds true in field situations. Additionally, improper hearing protection device use by employees lowers the stated NRR values for a particular hearing protection device. Because of this, a more reasonable use of these ratings would be to decrease the NRR value by half. The hearing protection must have a NRR sufficient to bring noise levels below the OSHA action level.

Hearing protection maintenance includes the following practices:

- Do not reuse disposable ear plugs
- Wash reusable plugs and canal caps to guard against dirt and bacteria
- Wash and disinfect earmuffs
- Discard reusable plugs or canal caps if they become hard or discolored
- Replace worn cushion on earmuffs

Store hearing protection in a clean plastic bag.

2.2.3 Explosions

Amec Foster Wheeler does not anticipate the presence of explosive atmospheres during this work.

2.2.4 Oxygen Deficient Atmosphere

Amec Foster Wheeler does not anticipate the presence of oxygen deficient atmospheres during this work.

2.2.5 Heat/Cold Related Stress/Illness and Prevention

Heat

There is a potential for heat related injuries during this period, especially when heavy manual labor-intensive activities are performed with semi-permeable and impermeable PPE. If air temperatures and/or humidity levels rise, the potential for development of heat-related illnesses increases. Heat-related illnesses occur when the body is unable to cool itself.

Potential heat-related illnesses include:

- Heat rash. Heat rash, usually red dots or small pimples, can occur when the body excessive sweating.
- Heat cramps. Heat cramps are the least severe and often are the first signals that the body is having trouble with the heat. Heat cramps are painful muscle spasms that result from overheating. They usually occur in the legs and abdomen (American Red Cross).
- Heat exhaustion. Heat exhaustion is a heat-related illness that can develop after exposure to high temperatures and inadequate or unbalanced replacement of fluids. It typically occurs when people exercise heavily or work in a warm, humid place where body fluids are lost through heavy sweating and the sweat does not evaporate as it should (American Red Cross)

- Fainting. Loss of consciousness, or fainting, can occur when the body experiences heat exhaustion. Fainting can also occur with the more severe heat-related illness, heat stroke.
- Heat stroke. Heat stroke is the least common, but most severe heat-related illness. It results from the total failure of the body's heat regulation system. This occurs when the body's temperature rises rapidly, the sweating system fails and the body cannot cool down. Heat stroke is a medical emergency. It can cause permanent disability or even death. Symptoms include red skin that can either be dry or moist; changes in consciousness; rapid, weak pulse; rapid, shallow breathing.

Prevention

- Workers are trained to recognize the symptoms of heat-related injuries and illnesses.
- Heat-related injury and illness recognition and prevention measures will be emphasized during daily safety tailgate meetings when the potential for such injuries and illnesses exists. Adjustments to the work-rest schedule must be considered if temperatures and/or humidity levels rise to unhealthy levels as indicated in the table below.
- Cool beverages will be available on-site. Workers will be encouraged to drink fluids. Depending on the activity and location, shade areas may be erected.

General Heat Indices

°F	RELATIVE HUMIDITY									
TEMP.	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
104	137									
102	130	137								
100	124	129	136							
98	117	123	128	134						
96	112	116	121	126	132					
94	106	110	114	119	124	129	135			
92	101	105	108	112	116	121	126	131		
90	97	100	103	106	109	113	117	122	127	132
88	93	95	98	100	103	106	110	113	117	121
86	89	91	96	95	97	100	102	105	108	112
84	86	88	89	90	92	94	96	98	100	103
82	84	84	85	86	88	89	90	91	93	95
80	81	82	82	83	84	84	85	86	86	87

Source: NOAA, National Weather Service

Possible Heat Disorders Based on Heat Index

Category	Heat Index	Possible Heat Disorders for People in High Risk Groups

Extreme Danger	>130ºF	Heat stroke and sunstroke likely.
Danger	105ºF – 129ºF	Sunstroke, muscle cramps, heat exhaustion likely. Heatstroke likely w/prolonged exposure or physical activity.
Extreme Caution	90ºF – 105ºF	Sunstroke, muscle cramps, heat exhaustion possible w/prolonged exposure or physical activity
Caution	80ºF – 90ºF	Fatigue possible w/prolonged exposure or physical activity

Rest Periods for Temperatures Exceeding 72.5ºF

Temperature	Normal Work Clothing	Impermeable Work Clothing
>90ºF	After each 45 minutes of work	After each 15 minutes of work
87.5 ºF -90ºF	After each 60 minutes of work	After each 30 minutes of work
82.5 ºF -87.5ºF	After each 90 minutes of work	After each 60 minutes of work
77.5 ºF -82.5ºF	After each 120 minutes of work	After each 90 minutes of work
72.5 ºF -77.5ºF	After each 150 minutes of work	After each 120 minutes of work

Cold

Exposure to low temperatures presents a risk to employee safety and health both through the direct effect of the low temperature on the body and collateral effects such as slipping on ice, decreased dexterity, and reduced dependability of equipment. Specific potential hazards include:

- Frostbite. Frostbite is the freezing of body parts exposed to the cold. Severity depends on the air temperature, length of exposure and the wind. Frostbite can result in the loss of fingers, hands, arms, toes, feet and legs. The signals of frostbite include lack of feeling in the affected area, swelling and skin that appears waxy, is cold to the touch or is discolored (flushed, white, yellow or blue). In more serious cases, blisters may form and the affected part may turn black and show signs of deep tissue damage. (American Red Cross)
- Chilblains. This common condition is caused by local chilling of some part of the body and is most frequently seen in old people with poor circulation. The most common places for chilblains are the heel, toes, ears, nose and fingers. Symptoms include red skin, which appears when the part is brought near the heat, and considerable burning and itching. (American Red Cross)
- Hypothermia. In a hypothermic condition, the entire body cools because its ability to keep warm is failing. The air temperature does not have to be below freezing for people to develop hypothermia. This is especially true if the person is wet or if it is windy. Symptoms include Shivering, numbness, glassy stare, indifference, loss of consciousness. (American Red Cross)

Prevention

- Workers are trained to recognize the symptoms of frostbite and hypothermia.
- Cold injuries and illnesses recognition and prevention measures will be emphasized during daily safety tailgate meetings when the potential for cold injuries and illnesses exists.
- Work will cease under unusually hazardous conditions.
- Phenothiazine (a sedative) and beta blocker drug use will be prohibited.

- Heated vehicles will be available on-site.
- Insulating dry clothes will be available.
- Temperature will be recorded on-site.
- Warm beverages will be available on-site.
- Adjustments to the work-rest schedule must be considered if temperatures and/or wind conditions reach unhealthy levels as indicated in the table below.

Wind Chill Factors

Wind Speed (mph)	Local Temperature, ºF										
	32	23	14	5	-4	-13	-22	-31	-40	-49	-58
	Equivalent Temperature, ºF										
Calm	32	23	14	5	-4	-13	-22	-31	-40	-49	-58
5	29	20	10	1	-9	-18	-28	-37	-47	-56	-65
10	18	7	-4	-15	-26	-37	-48	-59	-70	-81	-91
15	13	-1	-13	-25	-37	-49	-61	-73	-85	-97	-109
20	7	-6	-19	-32	-44	-57	-70	-83	-96	-109	-117
25	3	-10	-24	-37	-50	-64	-77	-90	-104	-117	-121
30	1	-13	-27	-41	-54	-68	-82	-97	-109	-123	-137
35	-1	-15	-29	-43	-57	-71	-85	-99	-113	-127	-142
40	-3	-17	-31	-45	-59	-74	-87	-102	-116	-131	-145
45	-3	-18	-32	-46	-61	-75	-89	-104	-118	-132	-147
50	-4	-18	-33	-47	-62	-76	-91	-105	-120	-134	-148
LITTLE DANGER FOR PROPERLY CLOTHED PERSONS Maximum danger of false sense of security			**CONSIDERABLE DANGER** Danger from freezing of exposed flesh within one minute			**VERY GREAT DANGER** Flesh may freeze within 30 seconds					
Trenchfoot and immersion foot may occur at any point on this chart											

Table

Work/Warm-Up Schedule for Four-Hour Shift

Air Temp. - Sunny Sky	No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
ºF (approx.)	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks
-15º to -19º	norm. breaks	1	norm. breaks	1	75 min.	2	55 min.	3	40 min.	4
-20º to -24º	norm. breaks	1	75 min.	2	55 min.	3	40 min.	4	30 min.	5
-25º to -29º	75 min.	2	55 min.	3	40 min.	4	30 min.	5	Non-emergency work should cease ↓	
-30º to -34º	55 min.	3	40 min.	4	30 min.	5	Non-emergency work should cease ↓		↓	
-35º to -39º	40 min.	4	30 min.	5	Non-emergency work should cease ↓		↓		↓	
-40º to -44º	30 min.	5	Non-emergency work should cease ↓		↓		↓		↓	
-45º & below	Non-emergency work should cease		↓		↓		↓		↓	

NOTES:

1. Schedule applies to any 4-hour work period with moderate to heavy work activity, with warm-up periods in a warm location and with an extended break (*e.g.*, lunch) at the end of the 4-hour work period in warm locations. For light-to-moderate work (limited physical movement): apply the schedule one step lower.

2. The following is suggested as a guide for estimating wind velocity if accurate information is not available:

5 mph: light flag moves

10 mph: light flag fully extended

15 mph: raises newspaper sheet

20 mph: blowing and drifting snow

3.0 3. TLV APPLIES ONLY FOR WORKERS IN DRY CLOTHING.PERSONNEL PROTECTION AND MONITORING

3.1 Medical Surveillance

Periodic Comprehensive Exam:
All personnel requiring access to controlled work areas will have a baseline medical examination and a periodic (usually annual) update examination prior to assignment, in accordance with Occupational Safety and Health Administration (OSHA) 29 CFR 1910.120(f). The exam must be

performed by an Occupational Health Physician, who will provide written clearance for hazardous waste Site work. Protocols for the baseline, periodic, and exit exams must be at least as stringent as those defined in the Amec Foster Wheeler Medical Surveillance Program, Volume III of Amec Foster Wheeler's Corporate Health and Safety Manual (CHSM).

Emergency Medical Treatment:
In the event that a worker requires transportation to a hospital, the routes to the hospital are located in **Attachment D**. The identified hospital facility is Baystate Noble Hospital. See also the Emergency Response Section for specific information regarding emergency services and logs, reports, and record keeping. Subcontractors should provide internal Workers' Compensation information to the SHSO during the pre-work meeting, for emergency use.

Medical Clearance Record Keeping:
Medical clearance documents are on file at the employee's home office. To ensure confidentiality, results of the medical exams or treatment records are maintained at the Medical Care Provider's clinical offices.

3.2 Site-Specific Training

All routine on-site general Site workers performing intrusive activity or having potential to receive exposures exceeding permissible limits will have completed the OSHA 40-hour Hazardous Waste Operations Training. Three days of on-site supervised training must be completed upon initial assignment. Appropriate annual refresher (within 12 months) updates must be completed by all HAZWOPER personnel. Supervisors will have completed the above and an additional 8 hours of OSHA Supervisory Training.

Occasional Site workers that are not expected to receive exposures exceeding permissible exposure limits (e.g., geophysical and land surveyors) require only 24 hours of OSHA Hazardous Waste Operations Training and 1 day of on-site training and supervision.

3.3 Personal Protective Equipment and Action Levels

The purpose of personal protective clothing and equipment is to shield or isolate individuals from the hazards that may be encountered when engineering and other controls are not feasible or cannot provide adequate protection. Adherence to all prescribed controls is vital to minimize exposures. Levels of protection will be upgraded or downgraded in response to Site conditions.

3.4 Monitoring Requirements

3.4.1 Air Monitoring

Based on the suspected contaminants, air monitoring for volatile organic compounds (VOCs) using a direct reading instrument (e.g., photoionization detector) would not be applicable.

PFCs may be contained within/on dust particles that become airborne and create an inhalation hazard; therefore, dust monitoring will be required during any activity that generates large volumes of dust (i.e., excavation).

3.4.2 Routine Monitoring for Explosive Environments

None anticipated.

3.4.3 Oxygen Monitoring

None anticipated.

3.4.4 Monitoring for Heat/Cold -Related Stress/Illnesses

Using the buddy system, team members will be responsible for observing their buddy for any signs of heat-related stress or illness. It is also the responsible of individual employees to minimize overexertion by taking frequent breaks; work during cooler or warmer hours; drink plenty of fluids (2 gal of water during an 8-hr shift); and wear cotton or thermal clothing when appropriate.

3.5 Background Readings

None anticipated.

3.6 Data Logging

None anticipated.

3.7 Dust Control

Dust suppression is not expected to be a concern during this field event.

3.8 Personal Protective Equipment

Based on evaluation of potential hazards, the following levels of personal protection have been designated for the applicable work zones.

Work Zone Exclusion Zone (EZ) **Level of Protection** D

Personal Protective Equipment			
Initial levels of protection were assigned to this work task based on the potential risk of exposure. These levels may be changed if warranted by monitoring data (see Action Levels) and Site conditions. Any change to these initial levels must be noted here and documented in the H&S Plan and in the field log book.			
USEPA level of protection	( ) A ( ) D Modified	( ) B (X) D	( ) C
Respirator (Level C and up)	( ) SCBA, airline ( ) P-100 Filter	( ) purif. resp. ( ) dust pre-filters	( ) OV/AG cart ( ) other_____
Protective clothing	( ) encap. Suit ( ) Saranex ® or equiv.	(X) Tyvek ® or equiv. ( ) splash suit	( ) PE Tyvek ® or equiv. (X) other: Reflective Vest
Head, face, eyes, ears	(X) hard hat ( ) splash shield	(X) safety glasses (X) ear plugs/muffs	( ) goggles ( ) other_____
Gloves (outer) (inner)	( ) nitrile_____ (X) nitrile _____	( ) neoprene ( ) vinyl	(X) other Leather work gloves_____
Footwear	(X) safety-toe leather ( ) hip waders	( ) overboots/covers ( ) shin/knee guards	( ) safety-toe rubber ( ) other _____

Modifications:_____

X = required PPE; * = modifications permitted; † =in case of upgrade.

Work Zone Contamination Reduction Zone **Level of Protection** D

Personal Protective Equipment			
Initial levels of protection were assigned to this work task based on the potential risk of exposure. These levels may be changed if warranted by monitoring data (see Action Levels) and Site conditions. Any change to these initial levels must be noted here and documented in the H&S Plan and in the field log book.			
USEPA level of protection	( ) A ( ) D Modified	( ) B (X) D	( ) C
Respirator (Level C and up)	( ) SCBA, airline ( ) P-100 Filter	( ) purif. resp. ( ) dust pre-filters	( ) OV/AG cart ( ) other_____
Protective clothing	( ) encap. Suit ( ) Saranex ® or equiv.	(X) Tyvek ® or equiv. ( ) splash suit	( ) PE Tyvek ® or equiv. (X) other Reflective Vest_
Head, face, eyes, ears	(X) hard hat ( ) splash shield	(X) safety glasses (X) ear plugs/muffs	( ) goggles ( ) other_____
Gloves (outer) (inner)	( ) nitrile_____ (X) nitrile _____	( ) neoprene ( ) vinyl	( ) other_____
Footwear	(X) safety-toe leather ( ) hip waders	( ) overboots/covers ( ) shin/knee guards	( ) safety-toe rubber ( ) other _____

Modifications:_____

X = required PPE; * = modifications permitted; † =in case of upgrade.

4.0 SITE CONTROL, MEASURES, ACCIDENT PREVENTION, AND CONTINGENCY PLAN

4.1 Site Control Measures

The Site control currently anticipated involves Site security (Section 4.6), and communications (Section 4.7). Work zones that will be utilized during the Site Investigation field effort are discussed in Section 4.2.

4.2 Work Zones

The work zones established for this field effort are as follows:

- Exclusion Zone (EZ)
- Contamination Reduction Zone (CRZ)
- Support Zone (SZ)

4.2.1 Exclusion Zone

The EZ is defined as an area with an approximately 30-foot radius around intrusive activities. Access is restricted to field sampling crews and necessary equipment operators

4.2.2 Contamination Reduction Zone

As necessary, two separate decontamination lines shall be established for personnel and sampling equipment in the CRZ. The CRZ is a narrow area through which personnel and equipment pass from the EZ to the SZ.

4.2.3 Support Zone

The SZ will be upwind or crosswind and away from the contaminated area. Vehicles, emergency equipment, telephone and break area, and any nonessential personnel will be maintained in this area.

4.3 Illumination

Amec Foster Wheeler does not anticipate conducting Site work during non-daylight hours. However, if necessary, Site lighting will meet OSHA requirements for illumination at 29 CFR 1926.56 and Section 7 of 385-1-1 Lighting. Lighting is measured in foot-candles (English) or lux (metric). The minimum illumination intensity of 3 foot-candles (33 lux) will be maintained for all areas where Site workers may pass through on foot or are present.

The area surrounding each work area will be illuminated with a minimum illumination intensity of 30 foot-foot candles (325 lux). Vehicle or equipment headlights are not considered an approved light source. A “work area” is defined as a ten-foot radius around each location where active work area, and will include lighting for vehicle and worker access to comply with OSHA and USACE requirements.

4.4 Sanitation

Amec Foster Wheeler will identify a public restroom/toilet facility to the Site prior to beginning work at the Site. A temporary, personnel washing station (adequate potable water source and soap) will be established at the Site to ensure personnel maintain good personal hygiene.

4.5 Safe Work Practices

- Unauthorized personnel are not allowed on-site, particularly in the EZ.
- Work groups will always consist of at least two team members.
- A high standard of personal hygiene will be observed. Smoking, eating, drinking, chewing gum or tobacco, taking medication, and applying cosmetics will not be permitted within any restricted area or EZ.
- Personnel under the obvious influence of alcohol or controlled substances are not allowed on-site; those taking medications must notify the SHSO.
- All Site personnel will familiarize themselves with these practices and the emergency procedures during daily tailgate and pre-work safety meetings.
- Workers who are passengers or drivers of vehicles (both off-site and on-site) will wear their seat belts any time the vehicle is in motion.
- Personnel will avoid skin contact with contaminated or potentially contaminated media. If such contact occurs, the affected areas should be washed thoroughly with soap and water.
- Personnel will discard and replace any damaged or heavily soiled protective clothing. Discarded PPE will be containerized/drummed at the end of each day.
- Personnel should notify the SHSO of any defective monitoring, emergency, or other protective/safety equipment.
- A supply of potable water, electrolyte replacement solutions, shaded break area, and sufficient lighting will be maintained on-site; sanitary facilities will be accessible to personnel.

4.6 Health and Safety Equipment Checklist

- Open flames are not allowed anywhere on-site without a hot-work permit.
- Owners/operators of heavy equipment will ensure that the equipment is in good working order by performing daily inspections and routine maintenance. Deficiencies affecting health and safety shall be corrected prior to equipment use.
- All unsafe conditions shall be made safe immediately. All unsafe conditions shall be reported to the Project Manager and the condition corrected.
- Loose-fitting clothing or loose long hair are prohibited near moving machinery
- All internal combustion engines must have spark arrestors that meet the requirements for hazardous atmospheres if they are to be used in such areas.
- Do not fuel engines while vehicle is running.
- Install adequate on-site roads, signs, lights, and devices.
- When portable electric tools and appliances can be used (where there is no potential for flammable or explosive conditions), they will be equipped only with 3-wire grounded power and extension cords to prevent electrical shock.
- Store tools in clean, secure areas so they will not be damaged, lost, or stolen.
- When exiting a vehicle, shift into park, set the parking brake, and shut off the engine. Never leave a running vehicle unattended.

4.7 Accident Prevention

The SHSO as well as all Site employees will inspect the work Site daily to identify and correct any unsafe conditions.

Adherence to the Safe Work Practices (to follow) and procedures outlined in this HASP will assist with accident prevention. Job Safety Analysis/Hazard Analysis (JSA/HA) forms are included in **Attachment B**.

4.7.1 Heavy Equipment Operation

Working with large motor vehicles and heavy equipment could be a major hazard at this Site. Injuries can result from equipment hitting or running over personnel, impacts from flying objects, or overturning of vehicles. Vehicle and heavy equipment design and operation will be in accordance with 29 CFR, Subpart O, 1926.602. In particular, the following precautions will be utilized to help prevent injuries/accidents.

- Brakes, hydraulic lines, light signals, fire extinguisher, fluid levels, steering, tires, horn, and other safety devices will be checked at the beginning of each shift.
- Large construction motor vehicles will not be backed up unless:

    1. The vehicles has a reverse signal alarm audible above the surrounding noise level; or,
    2. The vehicle is backed up only when an observer signals that it is safe to do so.

- Heavy equipment or motor vehicles cable will be kept free of all nonessential items, and all loose items will be secured.
- Large construction motor vehicles and heavy equipment will be provided with necessary safety equipment (seat belts, roll-over protection, emergency shut-off in case of roll-over, backup warning lights and audible alarms.)
- Blades and buckets will be lowered to the ground and parking brakes will be set before shutting off any heavy equipment or vehicles.

4.7.2 Underground Utility Clearance

Prior to commencement of SI activities, Amec Foster Wheeler will review available site information, such as As-Built drawings, to verify locations of subsurface utilities. In addition, Amec Foster Wheeler will schedule a site walk to mark out proposed ground disturbance locations with assistance from the BANGB POC. The BANGB POC will review and approve the locations with respect to avoidance of subsurface utilities and structures. After the locations have been pre-marked, Amec Foster Wheeler will contact “Dig Safe” the Massachusetts one-call utility clearance hotline. Next, Amec Foster Wheeler will coordinate with the BANGB POC to complete a base dig permit and/or utility clearance checklist, as required. Finally, a private utility locating company will be used to locate site utilities at the specified sampling locations.

4.7.3 Drilling Activities

Underground utilities will be located prior to conducting drilling activities. Hard hats, safety glasses, high visibility safety vests, and safety boots must, as a minimum, be worn within 50 feet of the drilling rig. The Field Team Leader or his/her designee will provide constant on-site supervision of the drilling subcontractor to ensure they are meeting the H&S requirements. If deficiencies are noted, work will be stopped and corrective action will be taken (e.g., retrain, purchase additional safety equipment, etc). Reports of H&S deficiencies and the corrective action taken will be forwarded to the Project Manager.

4.8 Site Security

Access will be limited to all controlled areas via the prescribed administrative (certifications) controls. All Site personnel and visitors will note arrival and departure times in the Site logbook. All equipment, tools, and property shall be secured at the end of each day.

4.8.1 Visitor Access

All Site visitors (except OSHA inspectors) must receive prior approval from the PM, and client, and may do so only for the purposes of observing Site conditions or operations. Upon arrival, visitors will report to the SHSO. All visitors, regardless of their rank or professional level, will not be allowed into controlled work areas unless training and medical requirements have been met and documented.

4.9 Communications

The “buddy system” will be enforced for field activities involving potential exposure to hazardous or toxic materials, and during any work within the EZ. Each person will observe his/her buddy for symptoms of chemical or heat overexposure and will provide first aid or emergency assistance when warranted. A mobile phone will be maintained on-site for emergency use.

The following emergency hand signals will be used:

Thumbs up	=	OK; understand
Thumbs down	=	No; negative
Grasping buddy’s wrist	=	Leave Site now
Hands on top of head	=	Need assistance
Horn - one long blast	=	Evacuate Site
Horn - two short blasts	=	All clear, return to Site

4.10 Contingency Plan

4.10.1 Chemical Exposure

Although there are no OSHA or ACGIH established exposure limits and current information does not indicate that soil and/or groundwater sampling activities would cause an instantaneous reaction from exposure to PFCs in soil and/or groundwater, if a member of the field crew

demonstrates typical symptoms of chemical exposure (dizziness, fatigue, breathing difficulties, nausea/vomiting, eye irritation, redness or rash of the skin, nervousness, etc.) that cannot be attributed to another source (e.g., inhalation of vehicle exhaust fumes), the procedures outlined below will be followed:

- Another team member (buddy) will remove the individual from the immediate area of contamination whenever more than one person is working onsite. The buddy will communicate to the Field Team (via voice and hand signals) of the potential chemical exposure. The Site Manager will contact appropriate emergency response agency.
- Precautions will be taken to avoid exposure of other individuals.
- In case of eye irritation, flush the eyes with copious amounts of water and contact medical services.
- All chemical exposure incidents must be reported in writing to the OHSR. The SHSO or Site Manager is responsible for completing the accident report (See **Attachment C**).

4.10.2 Personal Injury

In the event of a work related injury or illness during normal working hours which requires either first aid or outside medical treatment to an employee, the following steps are to be taken:

- If the injury or illness requires First Aid Treatment only, the injured employee should immediately contact their immediate Supervisor and/or Manager and have first aid administered as required. First aid supplies are available in each vehicle and offices and qualified designated personnel have been identified to assist with this effort.
- If an injured person requires the services of outside medical services, such as paramedics, immediately contact 911 by cell phone.

4.10.3 Evacuation Procedures

Expeditious evacuation routes to the Safe Refuge Area(s) will be established daily for all work area locations, with respect to the wind direction. Evacuation notification will be a continuous blast on a canned siren, vehicle horn, or direct verbal communication. Emergency drills should be performed periodically. Any additions to evacuation procedures require an update to this HASP.

In the unlikely event that an evacuation is necessary, all personnel will immediately proceed to the predetermined Safe Refuge Area, decontaminating to the extent possible for personal safety, based on the emergency.

4.11 Decontamination Procedures

Procedures for the decontamination of sampling tools and other related equipment are specified in the work plan. Note that separate areas should be established for personnel and sampling equipment.

4.11.1 Personnel Decontamination

Amec Foster Wheeler will conduct decontamination procedures in accordance 29 CFR 1910.120(k). The decontamination procedures for Level D are as follows:

- Step 1: Outer glove removal. Place in plastic trash bag.
- Step 2: Inner glove removal. Place in plastic trash bag.
- Step 3: Field Wash (wash hands and face thoroughly).
- Step 4: Shower as soon as possible after leaving project.

In accordance with standard environmental sampling procedures, a fresh pair of outer gloves will be donned prior to the collection of each subsequent sample. Any re-usable safety gear will be washed with soap and water prior to re-use or removing from the work zone.

4.11.2 Sample Handling/Decontamination

Amec Foster Wheeler personnel will ensure that all sample containers are decontaminated prior to placing the sample container into the cooler for transport/storage/shipment. The outside of the sample bottle will be wiped clean and dry with a clean paper towel to remove any residual contamination.

4.11.3 Tools/Equipment Decontamination

Decontamination of sampling and hand tools will be performed between sample locations in accordance with the work plan. Safety Data Sheets (SDSs) for the chemicals used for equipment/tool decontamination are provided in **Attachment A**

4.11.4 Decontamination-Medical Emergencies

In an emergency, the primary concern is to prevent the loss of life or severe injury. If immediate medical attention is required to save a life, decontamination should be delayed until the victim is stabilized. If the decontamination can be performed without interfering with essential life-saving techniques or first aid, or if a worker has been contaminated with an extremely toxic or corrosive material that could cause severe illness or loss of life, decontamination must be performed immediately. If an emergency due to a heat-related illness develops, protective equipment should be removed carefully from the victim as soon as possible. See **Attachment D** for a map to the nearest hospital.

Any time emergency decontamination methods must be used, an Incident Report or Supervisor's Report of Injury or Illness must be completed by the SHSO and submitted to the OHSR.

4.11.5 Equipment Decontamination

Field sampling equipment (e.g. water level indicators, pumps, bowls, trowels, dip samplers, hand augers, and other downhole equipment) will require cleaning prior to initial use, and between samples. Alconox® and Liquinox® soap is acceptable for use since their safety data sheets do

not list fluoro-surfactants as an ingredient. However, Decon 90 will not be used during decontamination activities. Water used for the final rinse during decontamination of sampling equipment will be laboratory certified PFC-free water. For larger equipment (e.g. drill rig and downhole drilling and sampling equipment), decontamination will be conducted with potable water using a high-pressure washer and then rinsed using potable water.

4.11.6 Personal Decontamination

Disposable gloves will be used for sample handling and will be removed and disposed of following use. No other decontamination procedures will be necessary.

4.12 Places of Refuge

This will be discussed in the tailgate meetings by the SHSO daily, once on-site. It will be set up in the SZ or at an off-site location in the event of a site-wide evacuation. This area will be upwind, and the location and escape routes will be designated on-site control maps. It will contain emergency equipment, escape route maps, communications, and the Emergency Reference (call) List. This is required for all phases of work. In an emergency, the SHSO will take a "head count" against the Site personnel listed in the Site log book, initiate search/account for missing persons, notify the emergency crews (as applicable), and limit access into the hazardous emergency area to necessary rescue and response personnel in order to prevent additional injuries and possible exposures.

4.13 Fire

Fires and explosion are not anticipated. However, in the event of a fire or explosion, the emergency alarm will sound (continuous blast on a canned siren, vehicle horn, or direct oral communication) to summon the SHSO, who will then decide whether to call the Fire Department for outside assistance. Small-scale fires (less than one-half of the responder's height) should be extinguished with an accessible ABC fire extinguisher by any team member who has received training. Fires in boreholes may be smothered with a fire blanket. Trained emergency crews will be summoned to control any large-scale or potentially unmanageable incident. Any off-site responding agencies will be given the Site Map and briefed about site-specific hazards so they can be optimally helpful in an emergency situation. The SHSO will evacuate all non-response personnel and visitors to the Safe Refuge Area; will notify the Amec Foster Wheeler Project Manager (PM), as applicable, the client, and the OHSR; and will complete the appropriate reports.

4.14 Safety Eyewash

Field Crews are required to keep an eyewash/eye care kit readily available near their work area.

4.15 Incident Report

The SHSO will contact the OHSR and conduct an investigation jointly with the PM. The PM will complete the Supervisor's Report of Injury or Illness and the First Aid Incident Report (**Attachment C**). These completed reports must be transmitted to the OHSR within 24 hours of an occurrence; a fax is acceptable. The OHSR will submit the appropriate reports to the

appropriate Human Resources department (for Workers' Compensation), and OSHA (as applicable).

The foreman or field supervisor of subcontracting crews will investigate and complete an injury/illness report (similar in content to the Amec Foster Wheeler report) in accordance with their internal company policy. This report must be transmitted to the Amec Foster Wheeler OHSR within 24 hours.

In case of environmental incidents, property damage, power disruption, or mandated work "shutdowns," an Incident Report will be prepared by the PM. Any damage, loss, or theft of Amec Foster Wheeler property (items/tools/equipment) will be reported to the PM.

Any release of information in these reports to unauthorized persons or agencies is prohibited unless it is first approved by the client. Certain agencies or persons, such as OSHA or OSHA inspectors, can request this information and its release will be permitted. Review the Emergency Call List for additional contact names and phone numbers.

4.16 Operation Shutdown

If an operation shutdown is necessary, the steps below shall be followed:

- Personnel are to leave the work location (upwind) and assemble at a designated assembly point (if safe) after detecting the emergency signal for evacuation;
- If an emergency situation is of concern to local Site personnel, personnel will notify the SHSO who will notify the appropriate individuals.
- If appropriate and safe, the SHSO and a "buddy" are to remain at or near the location after the location has been evacuated to assist local responders and advise them of the nature and location of the incident;
- The field team leader/supervisor is to account for field team members at the assembly point; and
- The Site Manager is to complete an incident report (**Attachment C**) as soon as possible after the occurrence.

Evacuation routes and assembly points will be documented by the SHSO or Site Manager during the employee health and safety briefing and daily tailgate meetings. Such locations shall minimize the spread of contamination.

4.17 Spill or Hazardous Materials Release

In the event of a spill or release, notify the SHSO and Site Manager immediately. The SHSO or Site Manager will be responsible for ensuring that necessary notifications are given to the appropriate individuals.

4.18 Training and Medical Surveillance

4.18.1 Site-Specific Training

Visitor Training

If an official visitor seeks entry into the sampling area, the SHSO shall verify that the visitor has received health and safety training in accordance with 1910.120 and a medical surveillance examination, and has certification equivalent to that required for on-site work. In addition, a site-specific safety briefing shall be given by the SHSO.

Training Documentation

Documentation of training requirements is the responsibility of each employer. Written documentation verifying current first aid and CPR training and compliance with 29 CFR 191.120 (e)(3), (e)(4) (as applicable) and (e)(8) must be submitted to the SHSO prior to entering the EZ and CRZ. Documentation of worker's current training credentials will be kept on file at the employee's home office and can be provided upon request.

4.18.2 Medical Surveillance

Personnel engaged in hazardous waste operations must be enrolled in a medical monitoring program as required by 29 CFR 1910.120(f). A letter signed by a physician attesting to each individual's fitness for duty must be provided to the SHSO prior to beginning work.

4.19 Recordkeeping

The SHSO will establish and maintain a filing system on-site for Health and Safety records, reports, and information concerning individual training, medical surveillance, etc. Sections in this filing system will include:

- Personnel Records – Certificates for training required under 29 CFR 120, medical examination summary letters or certifications, signed acceptance forms, monitoring results, etc.
- Training – Sign-in sheets for on-site training with topics and dates;
- Visitor Logs – Sign-in sheets for Site visitors;
- Inspection Reports – Reports of daily inspections by SHSO and others concerning health and safety issues.
- Accident Prevention – Copies of all hazard analyses performed on new tasks or activities. Copies of any accident/incident reports and follow-up reports. Other pertinent correspondence;
- PPE – Records of periodic inspection, testing and maintenance performed on PPE;

Health & Safety Plan Acceptance

I have had the opportunity to read and ask questions about this HASP. My signature certifies that I understand the procedures, equipment, and restrictions of this plan and agree to abide by them. By signing below, all personnel are indicating they have received and are current with their

medical surveillance and training certification; in accordance with 29 CFR 1910.120 and Amec Foster Wheeler corporate health and safety policies.

Health and Safety Plan Acceptance

Signature*	Printed Name	Company	Date

* This acceptance form is required for all routine Site staff, subcontracting personnel, visitors, and non-routine subcontractors.

amec foster wheeler

Attachment A

Safety Data Sheets

Safety Data Sheet

This safety data sheet complies with the requirements of: 2012 OSHA Hazard Communication Standard (29CFR 1910.1200)

Product name ANSULITE 3% (AFC-3A) AFFF Concentrate

1. Identification

1.1. Product Identifier

Product name ANSULITE 3% (AFC-3A) AFFF Concentrate

1.2. Other means of identification

Product code 431499
Synonyms None
Chemical Family No information available

1.3. Recommended use of the chemical and restrictions on use

Recommended use Fire extinguishing agent
Uses advised against Consumer use

1.4. Details of the Supplier of the Safety Data Sheet

Company Name Tyco Fire Protection Products
One Stanton Street
Marinette, WI 54143-2542
Telephone: 715-735-7411

Contact point Product Stewardship at 1-715-735-7411
E-mail address psra@tycofp.com

1.5. Emergency Telephone Number

Emergency telephone CHEMTREC 800-424-9300 or 703-527-3887

2. Hazards Identification

Classification

OSHA Regulatory Status

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

2.2. Label Elements

The product contains no substances which at their given concentration, are considered to be hazardous to health

Precautionary Statements

2.3. Hazards Not Otherwise Classified (HNOC)

Not Applicable.

2.4. OTHER INFORMATION

Unknown Acute Toxicity 4.824% of the mixture consists of ingredient(s) of unknown toxicity

3. Composition/information on Ingredients

3.1. Mixture

The following component(s) in this product are considered hazardous under applicable OSHA(USA)

Chemical name	CAS No	weight-%
2-(2-Butoxyethoxy)ethanol	112-34-5	5 - 10
Lauryl Imino Propionate, Sodium Salt	14960-06-6	1 - 5

4. First aid measures

4.1. Description of first aid measures

Eye Contact Rinse thoroughly with plenty of water for at least 15 minutes, lifting lower and upper eyelids. Consult a physician.

Skin contact Wash skin with soap and water. Get medical attention if irritation develops and persists.

Inhalation Remove to fresh air. If breathing is difficult, give oxygen. (Get medical attention immediately if symptoms occur.).

Ingestion Rinse mouth. Do not induce vomiting without medical advice. If swallowed, call a poison control center or physician immediately.

4.2. Most Important Symptoms and Effects, Both Acute and Delayed

Symptoms No information available.

4.3. Indication of Any Immediate Medical Attention and Special Treatment Needed

Note to physicians Treat symptomatically.

5. Fire-fighting measures

5.1. Suitable Extinguishing Media

Product is extinguishing agent. Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

5.2. Unsuitable Extinguishing Media

None.

5.3. Specific Hazards Arising from the Chemical

None known.

Hazardous Combustion Products Carbon oxides, Fluorinated oxides, Nitrogen oxides (NOx), Oxides of sulfur

5.4. Explosion Data

Sensitivity to Mechanical Impact None.

Sensitivity to Static Discharge None.

5.5. Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal Precautions Ensure adequate ventilation, especially in confined areas.

For emergency responders Use personal protection recommended in Section 8.

6.2. Environmental Precautions

Environmental Precautions Prevent further leakage or spillage if safe to do so. Prevent entry into waterways, sewers, basements or confined areas. See Section 12 for additional Ecological Information.

6.3. Methods and material for containment and cleaning up

Methods for Containment Prevent further leakage or spillage if safe to do so.

Methods for Cleaning Up Pick up and transfer to properly labeled containers.

7. Handling and Storage

7.1. Precautions for Safe Handling

Advice on safe handling Avoid contact with skin and eyes. Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Conditions Keep containers tightly closed in a dry, cool and well-ventilated place.

Incompatible Materials Strong oxidizing agents. Strong acids. Strong bases.

8. Exposure Controls/Personal Protection

8.1. Control Parameters

Exposure guidelines

Chemical name	ACGIH TLV	OSHA PEL	NIOSH IDLH
2-(2-Butoxyethoxy)ethanol 112-34-5	TWA: 10 ppm inhalable fraction and vapor	-	-

ACGIH (American Conference of Governmental Industrial Hygienists) OSHA (Occupational Safety and Health Administration of the US Department of Labor) NIOSH IDLH Immediately Dangerous to Life or Health

8.2. Appropriate Engineering Controls

Engineering controls Showers
Eyewash stations
Ventilation systems.

8.3. Individual protection measures, such as personal protective equipment

Eye/Face Protection Avoid contact with eyes. Tight sealing safety goggles.

Skin and Body Protection Wear protective gloves and protective clothing.

Respiratory Protection	If exposure limits are exceeded or irritation is experienced, NIOSH/MSHA approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations.
Ventilation	Use local exhaust or general dilution ventilation to control exposure with applicable limits

8.4. General hygiene considerations

Do not eat, drink or smoke when using this product. Handle in accordance with good industrial hygiene and safety practice.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State	Liquid		
Odor	Characteristic	**Color**	Light yellow
odor threshold	No data available		

Property	**VALUES**	**Remarks • Method**
pH	7.5	
Melting point/freezing point	No data available	
Boiling point / boiling range	> 100 °C / 212 °F	
Flash Point	> 100 °C / > 212 °F	
Evaporation Rate	No data available	
flammability (solid, gas)	No data available	
Flammability limit in air		
Upper flammability limit:	No data available	
Lower flammability limit:	No data available	
Vapor Pressure	No data available	
Vapor Density	No data available	
Specific gravity	No data available	
Water Solubility	No data available	
Solubility in Other Solvents	No data available	
Partition coefficient	No data available	
Autoignition Temperature	No data available	
Decomposition Temperature	No data available	
Kinematic viscosity	2.9 mm2/s	

density 1.03

10. Stability and Reactivity

10.1. Chemical Stability

Stable under recommended storage conditions.

10.2. Reactivity

No data available

10.3. Possibility of hazardous reactions

None under normal processing.

hazardous polymerization Hazardous polymerization does not occur.

10.4. Conditions to Avoid

Extremes of temperature and direct sunlight.

10.5. Incompatible Materials

Strong oxidizing agents. Strong acids. Strong bases.

10.6. Hazardous decomposition products

Carbon oxides. Nitrogen oxides (NOx). Oxides of sulfur. Fluorinated oxides.

11. Toxicological Information

11.1. Information on Likely Routes of Exposure

Product information no data available

INHALATION no data available.

Eye Contact no data available.

Skin contact no data available.

INGESTION no data available.

Acute Toxicity

Chemical name	Oral LD50	dermal LD50	Inhalation LC50
2-(2-Butoxyethoxy)ethanol 112-34-5	= 3384 mg/kg (Rat)	= 2700 mg/kg (Rabbit)	-

11.2. Information on Toxicological Effects

Symptoms No information available.

11.3. Delayed and immediate effects as well as chronic effects from short and long-term exposure

sensitization No information available.
Germ Cell Mutagenicity No information available
carcinogenicity No information available.
Reproductive Toxicity No information available.
STOT - Single Exposure No information available.
STOT - Repeated Exposure No information available.
Aspiration Hazard No information available.

11.4. Numerical Measures of Toxicity - Product information

The following values are calculated based on chapter 3.1 of the GHS document mg/kg

12. Ecological Information

12.1. ecotoxicity

Not classified

0% of the mixture consists of components(s) of unknown hazards to the aquatic environment

Chemical name	Algae/aquatic plants	Fish	Crustacea
2-(2-Butoxyethoxy)ethanol 112-34-5	EC50 96 h > 100 mg/L Desmodesmus subspicatus	LC50 96 h = 1300 mg/L Lepomis macrochirus static	EC50 24 h = 2850 mg/L Daphnia magna EC50 48 h > 100 mg/L Daphnia magna
2-Methyl-2,4-pentanediol 107-41-5	-	LC50 96 h 10500 - 11000 mg/L Pimephales promelas flow-through LC50 96 h = 10000 mg/L Lepomis macrochirus static LC50 96 h = 8690 mg/L Pimephales promelas flow-through LC50 96 h = 10700 mg/L Pimephales promelas static	EC50 48 h 2700 - 3700 mg/L Daphnia magna
t-Butanol 75-65-0	EC50 72 h > 1000 mg/L Desmodesmus subspicatus	LC50 96 h 6130 - 6700 mg/L Pimephales promelas flow-through	EC50 48 h = 933 mg/L Daphnia magna EC50 48 h 4607 - 6577 mg/L Daphnia magna Static
Sodium chloride 7647-14-5	-	LC50 96 h 5560 - 6080 mg/L Lepomis macrochirus flow-through LC50 96 h = 12946 mg/L Lepomis macrochirus static LC50 96 h 6020 - 7070 mg/L Pimephales promelas static LC50 96 h = 7050 mg/L Pimephales promelas semi-static LC50 96 h 6420 - 6700 mg/L Pimephales promelas static LC50 96 h 4747 - 7824 mg/L Oncorhynchus mykiss flow-through	EC50 48 h = 1000 mg/L Daphnia magna EC50 48 h 340.7 - 469.2 mg/L Daphnia magna Static
Polyethylene Glycol 25322-68-3	-	LC50 24 h > 5000 mg/L Carassius auratus	-
Formaldehyde 50-00-0	-	LC50 96 h 22.6 - 25.7 mg/L Pimephales promelas flow-through LC50 96 h = 1510 µg/L Lepomis macrochirus static LC50 96 h = 41 mg/L Brachydanio rerio static LC50 96 h 0.032 - 0.226 mL/L Oncorhynchus mykiss flow-through LC50 96 h 100 - 136 mg/L Oncorhynchus mykiss static LC50 96 h 23.2 - 29.7 mg/L Pimephales promelas static	LC50 48 h = 2 mg/L Daphnia magna EC50 48 h 11.3 - 18 mg/L Daphnia magna Static

12.2. Persistence and Degradability
No information available.

12.3. Bioaccumulation
No information available.

12.4. Other Adverse Effects
No information available

13. Disposal Considerations

13.1. Waste Treatment Methods
Disposal of wastes Disposal should be in accordance with applicable regional, national and local laws and regulations.

Contaminated Packaging Do not reuse container.

14. Transport Information

DOT	NOT REGULATED
TDG	NOT REGULATED
MEX	NOT REGULATED
ICAO (air)	NOT REGULATED
IATA	NOT REGULATED
IMDG	NOT REGULATED

15. Regulatory Information

15.1. International Inventories

TSCA	Complies
DSL/NDSL	Complies
ENCS	Does not comply
IECSC	Does not comply
KECL	Does not comply
PICCS	Does not comply
AICS	Complies

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
AICS - Australian Inventory of Chemical Substances

15.2. US Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

Chemical name	SARA 313 - Threshold Values %
2-(2-Butoxyethoxy)ethanol - 112-34-5	1.0

SARA 311/312 Hazard Categories

Acute Health Hazard	No
Chronic health hazard	No
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

CWA (Clean Water Act)
This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

CERCLA
This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

15.3. US State Regulations

California Proposition 65
This product contains the following Proposition 65 chemicals

Chemical name	California Proposition 65
Formaldehyde - 50-00-0	Carcinogen

U.S. State Right-to-Know Regulations

Chemical name	New Jersey	Massachusetts	Pennsylvania
2-(2-Butoxyethoxy)ethanol 112-34-5	X	-	X
t-Butanol 75-65-0	X	X	X
Formaldehyde 50-00-0	X	X	X

16. Other information, including date of preparation of the last revision

NFPA	**Health Hazards** 0	**flammability** 1	**Instability** 0	**Physical and chemical properties** -
HMIS	**Health Hazards** 0	**flammability** 1	**Physical Hazards** 0	**Personal Protection** X

Revision date 25-May-2015
Revision note
No information available
Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

End of Safety Data Sheet

Safety Data Sheet

This safety data sheet complies with the requirements of: 2012 OSHA Hazard Communication Standard (29CFR 1910.1200)

Product name ANSULITE 1% AFFF

1. Identification

1.1. Product Identifier

Product name ANSULITE 1% AFFF

1.2. Other means of identification

Product code 055811
Synonyms None
Chemical Family No information available

1.3. Recommended use of the chemical and restrictions on use

Recommended use Fire extinguishing agent
Uses advised against Consumer use

1.4. Details of the Supplier of the Safety Data Sheet

Company Name Tyco Fire Protection Products
One Stanton Street
Marinette, WI 54143-2542
Telephone: 715-735-7411
Contact point Product Stewardship at 1-715-735-7411
E-mail address psra@tycofp.com

1.5. Emergency Telephone Number

Emergency telephone CHEMTREC 800-424-9300 or 703-527-3887

2. Hazards Identification

Classification

OSHA Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Skin Corrosion/Irritation - Category 2
Serious eye damage/eye irritation - Category 1

2.2. Label Elements

Signal Word
DANGER

hazard statements
CAUSES SKIN IRRITATION
Causes serious eye damage

Precautionary Statements

Prevention
Wash face, hands and any exposed skin thoroughly after handling. Wear protective gloves/protective clothing/eye protection/face protection.

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/physician.
IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.

2.3. Hazards Not Otherwise Classified (HNOC)

Not Applicable.

2.4. OTHER INFORMATION

Unknown Acute Toxicity — 3.89781% of the mixture consists of ingredient(s) of unknown toxicity

3. Composition/information on Ingredients

3.1. Mixture

The following component(s) in this product are considered hazardous under applicable OSHA(USA)

Chemical name	CAS No	weight-%
2-(2-Butoxyethoxy)ethanol	112-34-5	10 - 30
Sodium Decyl Sulfate	142-87-0	1 - 5
Perfluorinated Amphoteric Surfactant	Proprietary	1 - 5
Sodium Octyl Sulfate	142-31-4	1 - 5
Perfluoro Telomer	Proprietary	1 - 5

4. First aid measures

4.1. Description of first aid measures

Eye Contact — Rinse thoroughly with plenty of water for at least 15 minutes, lifting lower and upper eyelids. Consult a physician.

Skin contact — Wash skin with soap and water. Get medical attention if irritation develops and persists.

Inhalation — Remove to fresh air. If breathing is difficult, give oxygen. (Get medical attention immediately if symptoms occur.).

Ingestion — Rinse mouth. Do not induce vomiting without medical advice. If swallowed, call a poison control center or physician immediately.

4.2. Most Important Symptoms and Effects, Both Acute and Delayed

Symptoms — No information available.

4.3. Indication of Any Immediate Medical Attention and Special Treatment Needed

Note to physicians — Treat symptomatically.

5. Fire-fighting measures

5.1. Suitable Extinguishing Media
Product is extinguishing agent. Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

5.2. Unsuitable Extinguishing Media
None.

5.3. Specific Hazards Arising from the Chemical
None known.

Hazardous Combustion Products Carbon oxides, Fluorinated oxides, Nitrogen oxides (NOx), Oxides of sulfur

5.4. Explosion Data

Sensitivity to Mechanical Impact None.
Sensitivity to Static Discharge None.

5.5. Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal Precautions Ensure adequate ventilation, especially in confined areas.

For emergency responders Use personal protection recommended in Section 8.

6.2. Environmental Precautions

Environmental Precautions Prevent further leakage or spillage if safe to do so. Prevent entry into waterways, sewers, basements or confined areas. See Section 12 for additional Ecological Information.

6.3. Methods and material for containment and cleaning up

Methods for Containment Prevent further leakage or spillage if safe to do so.

Methods for Cleaning Up Pick up and transfer to properly labeled containers.

7. Handling and Storage

7.1. Precautions for Safe Handling

Advice on safe handling Avoid contact with skin and eyes. Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Conditions Keep containers tightly closed in a dry, cool and well-ventilated place.

Incompatible Materials Strong oxidizing agents. Strong acids. Strong bases.

8. Exposure Controls/Personal Protection

8.1. Control Parameters

Exposure guidelines

Chemical name	ACGIH TLV	OSHA PEL	NIOSH IDLH

2-(2-Butoxyethoxy)ethanol 112-34-5	TWA: 10 ppm inhalable fraction and vapor	-	-

ACGIH (American Conference of Governmental Industrial Hygienists) OSHA (Occupational Safety and Health Administration of the US Department of Labor) NIOSH IDLH Immediately Dangerous to Life or Health

8.2. Appropriate Engineering Controls

Engineering controls Showers
Eyewash stations
Ventilation systems.

8.3. Individual protection measures, such as personal protective equipment

Eye/Face Protection Avoid contact with eyes. Tight sealing safety goggles.

Skin and Body Protection Wear protective gloves and protective clothing.

Respiratory Protection If exposure limits are exceeded or irritation is experienced, NIOSH/MSHA approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations.

Ventilation Use local exhaust or general dilution ventilation to control exposure with applicable limits

8.4. General hygiene considerations

Do not eat, drink or smoke when using this product. Handle in accordance with good industrial hygiene and safety practice.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State Liquid
Odor Characteristic
odor threshold No data available

Color Light yellow

Property	VALUES	Remarks • Method
pH	No data available	
Melting point/freezing point	No data available	
Boiling point / boiling range	> 100 °C / 212 °F	
Flash Point	> 100 °C / > 212 °F	
Evaporation Rate	No data available	
flammability (solid, gas)	No data available	
Flammability limit in air		
Upper flammability limit:	No data available	
Lower flammability limit:	No data available	
Vapor Pressure	No data available	
Vapor Density	No data available	
Specific gravity	No data available	
Water Solubility	No data available	
Solubility in Other Solvents	No data available	
Partition coefficient	No data available	
Autoignition Temperature	No data available	
Decomposition Temperature	No data available	
Kinematic viscosity	No data available	

10. Stability and Reactivity

10.1. Chemical Stability

Stable under recommended storage conditions.

10.2. Reactivity

No data available

10.3. Possibility of hazardous reactions

None under normal processing.

hazardous polymerization Hazardous polymerization does not occur.

10.4. Conditions to Avoid

Extremes of temperature and direct sunlight.

10.5. Incompatible Materials

Strong oxidizing agents. Strong acids. Strong bases.

10.6. Hazardous decomposition products

Carbon oxides. Nitrogen oxides (NOx). Oxides of sulfur. Fluorinated oxides.

11. Toxicological Information

11.1. Information on Likely Routes of Exposure

Product information no data available

INHALATION no data available.

Eye Contact no data available.

Skin contact no data available.

INGESTION no data available.

Acute Toxicity

Chemical name	Oral LD50	dermal LD50	Inhalation LC50
2-(2-Butoxyethoxy)ethanol 112-34-5	= 3384 mg/kg (Rat)	= 2700 mg/kg (Rabbit)	-
Sodium Decyl Sulfate 142-87-0	= 1950 mg/kg (Rat)	-	-
Sodium Octyl Sulfate 142-31-4	= 3200 mg/kg (Rat)	-	-

11.2. Information on Toxicological Effects

Symptoms No information available.

11.3. Delayed and immediate effects as well as chronic effects from short and long-term exposure

sensitization No information available.

Germ Cell Mutagenicity No information available

carcinogenicity	No information available.
Reproductive Toxicity	No information available.
STOT - Single Exposure	No information available.
STOT - Repeated Exposure	No information available.
Aspiration Hazard	No information available.

11.4. Numerical Measures of Toxicity - Product information

The following values are calculated based on chapter 3.1 of the GHS document mg/kg

12. Ecological Information

12.1. ecotoxicity

Not classified

1E-05% of the mixture consists of components(s) of unknown hazards to the aquatic environment

Chemical name	Algae/aquatic plants	Fish	Crustacea
2-(2-Butoxyethoxy)ethanol 112-34-5	EC50 96 h > 100 mg/L Desmodesmus subspicatus	LC50 96 h = 1300 mg/L Lepomis macrochirus static	EC50 24 h = 2850 mg/L Daphnia magna EC50 48 h > 100 mg/L Daphnia magna
1,2-Propanediol 57-55-6	EC50 96 h = 19000 mg/L Pseudokirchneriella subcapitata	LC50 96 h = 51600 mg/L Oncorhynchus mykiss static LC50 96 h 41 - 47 mL/L Oncorhynchus mykiss static LC50 96 h = 51400 mg/L Pimephales promelas static LC50 96 h = 710 mg/L Pimephales promelas	EC50 48 h > 1000 mg/L Daphnia magna Static EC50 24 h > 10000 mg/L Daphnia magna
t-Butanol 75-65-0	EC50 72 h > 1000 mg/L Desmodesmus subspicatus	LC50 96 h 6130 - 6700 mg/L Pimephales promelas flow-through	EC50 48 h = 933 mg/L Daphnia magna EC50 48 h 4607 - 6577 mg/L Daphnia magna Static
1-Octanol 111-87-5	EC50 48 h = 14 mg/L Desmodesmus subspicatus static	LC50 96 h 11.4 - 12.9 mg/L Pimephales promelas flow-through LC50 96 h = 17.68 mg/L Oncorhynchus mykiss static	EC50 24 h 15 - 26 mg/L Daphnia magna
Formaldehyde 50-00-0	-	LC50 96 h 22.6 - 25.7 mg/L Pimephales promelas flow-through LC50 96 h = 1510 µg/L Lepomis macrochirus static LC50 96 h = 41 mg/L Brachydanio rerio static LC50 96 h 0.032 - 0.226 mL/L Oncorhynchus mykiss flow-through LC50 96 h 100 - 136 mg/L Oncorhynchus mykiss static LC50 96 h 23.2 - 29.7 mg/L Pimephales promelas static	LC50 48 h = 2 mg/L Daphnia magna EC50 48 h 11.3 - 18 mg/L Daphnia magna Static

12.2. Persistence and Degradability

No information available.

12.3. Bioaccumulation

No information available.

12.4. Other Adverse Effects

No information available

13. Disposal Considerations

13.1. Waste Treatment Methods

Disposal of wastes Disposal should be in accordance with applicable regional, national and local laws and regulations.

Contaminated Packaging Do not reuse container.

14. Transport Information

DOT NOT REGULATED

TDG NOT REGULATED

MEX NOT REGULATED

ICAO (air) NOT REGULATED

IATA NOT REGULATED

IMDG NOT REGULATED

15. Regulatory Information

15.1. International Inventories

TSCA	Complies
DSL/NDSL	Complies
ENCS	Does not comply
IECSC	Does not comply
KECL	Complies
PICCS	Does not comply
AICS	Complies

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
AICS - Australian Inventory of Chemical Substances

15.2. US Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

Chemical name	SARA 313 - Threshold Values %
2-(2-Butoxyethoxy)ethanol - 112-34-5	1.0

SARA 311/312 Hazard Categories

Acute Health Hazard	No
Chronic health hazard	No
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

CWA (Clean Water Act)
This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

CERCLA
This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

15.3. US State Regulations

California Proposition 65
This product contains the following Proposition 65 chemicals

Chemical name	California Proposition 65
Formaldehyde - 50-00-0	Carcinogen

U.S. State Right-to-Know Regulations

Chemical name	New Jersey	Massachusetts	Pennsylvania
2-(2-Butoxyethoxy)ethanol 112-34-5	X	-	X
1,2-Propanediol 57-55-6	X	-	X
t-Butanol 75-65-0	X	X	X
1-Octanol 111-87-5	-	-	X
Formaldehyde 50-00-0	X	X	X

16. Other information, including date of preparation of the last revision

NFPA	**Health Hazards** 2	**flammability** 1	**Instability** 0	**Physical and chemical properties** -
HMIS	**Health Hazards** 2	**flammability** 1	**Physical Hazards** 0	**Personal Protection** X

Revision date 25-May-2015
Revision note
No information available
Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

End of Safety Data Sheet

amec foster wheeler

Attachment B

Hazard Evaluations

AHA - Mobilization/Demobilization and Site Preparation
Activity Description

Activity/Work Task:	Mobilization/Demobilization and Site Preparation		
Project Location:	Barnes ANGB, Westfield, MA		
Project Number:	**2-9133-0006**		
Date Prepared:	1/03/2017	Date Accepted:	1/04/2017
Prepared by (Name/Title):	Craig Keating, Field Operations Lead		
Reviewed by (Name/Title):	Laurie Gneiding/Project Health & Safety Officer		

This AHA involves the following:

- Establishing site specific measures for mobilizing to, and demobilizing from the site

This AHA is not an exhaustive summary of all hazards associated with the Site. Refer to the site HASP for additional requirements. Contractor to follow general site safety controls for Slips Trips and Falls, Biological hazards, cuts lacerations and pinch points, and emergency procedures.

Overall Risk Assessment Code (RAC) (Use highest code): **M**

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
PPE (Hard Hat, safety glasses, gloves, safety toe work boots, high visibility safety vest) Note: When initially entering the site the following PPE must be donned: • Work Uniform or Work Clothes • Hard Hat • Safety Glasses • Steel Toe Boots • Reflective Vests	**Competent / Qualified Personnel:** Name – Position/Employer **Training requirements:** List specific certification (as applicable) Site Specific HASP Orientation Toolbox safety meeting Task kick-off meeting	Daily inspection of equipment per manufacturer's instructions. Tag tools that are defective and remove from service. Inspect power cord sets prior to use. Inspect all PPE prior to use

AHA - Mobilization/Demobilization and Site Preparation
Activity Description

Job Steps	Hazards	Controls	RAC
1. Prepare for Site Visit	1A) N/A	Prior to leaving for site: ▪ Obtain and review HASP prior to site visit, if possible ▪ Determine PPE needs – bring required PPE to the site, if not otherwise being provided at the site (e.g., steel toed boots) ▪ Determine training and medical monitoring needs and ensure all required Health and Safety training and medical monitoring has been received and is current ▪ Ensure all workers are fit for duty (alert, well rested, and mentally and physically fit to perform work assignment) ▪ If respiratory protection is required/potentially required, ensure that training and fit-testing has occurred within the past year. ▪ Familiarize yourself with route to the site	**L**
	1b) Vehicle defects	Inspect company owned/leased vehicle for defects such as: ▪ Flat tires ▪ Windshield wipers worn or torn ▪ Oil puddles under vehicle ▪ Headlights, brake lights, turn signals not working	**L**
	1c) Insufficient emergency equipment, unsecured loads	Insufficient emergency equipment, unsecured loads: ▪ Ensure vehicle has first aid kit and that all medications are current (if first aid kits are not provided at the site) ▪ Ensure vehicle is equpped with warning flashers and/or flares and that the warning flashers work ▪ Cell phones are recommended to call for help in the event of an emergency ▪ Vehicles carrying tools must have a safety cage in place. All tools must be properly secured ▪ Vehicles must be equipped with chocks if the vehicle is to be left running, unattended. ▪ Ensure sufficient gasoline is in the tank	**L**
2. Operating vehicles	2a) Collisions, unsafe driving conditions	Drive Defensively!: ▪ Seat belts must be used at all times when operating any vehicle on company business. ▪ Drive at safe speed for road conditions	**L**

AHA - Mobilization/Demobilization and Site Preparation
Activity Description

Job Steps	Hazards	Controls	RAC
		▪ Maintain adequate following distance ▪ Pull over and stop if you have to look at a map ▪ Try to park so that you don't have to back up to leave. ▪ If backing in required, walk around vehicle to identify any hazards (especially low level hazards that may be difficult to see when in the vehicle) that might be present. Use a spotter if necessary	
3. Driving to the jobsite (mobilization)	3a) Dusty, winding, narrow roads	Dusty, winding, narrow roads ▪ Drive confidently and defensively at all times. ▪ Go slow around corners, occasionally clearing the windshield.	**L**
	3b) Rocky or one-lane roads	Rocky or one-lane roads: ▪ Stay clear of gullies and trenches, drive slowly over rocks. ▪ Yield right-of-way to oncoming vehicles---find a safe place to pull over.	**L**
	3c) Stormy weather, near confused tourists	Stormy weather, near confused tourists: ▪ Inquire about conditions before leaving the office. ▪ Be aware of oncoming storms. ▪ Drive to avoid accident situations created by the mistakes of others.	**L**
	3d) When angry or irritated	When angry or irritated: ▪ Attitude adjustment; change the subject or work out the problem before driving the vehicle. Let someone else drive.	**L**
	3e) Turning around on narrow roads	Turning around on narrow roads: ▪ Safely turn out with as much room as possible. ▪ Know what is ahead and behind the vehicle. ▪ Use a backer if available.	**L**
	3f) Sick or medicated	Sick or medicated: ▪ Let others on the crew know you do not feel well. ▪ Let someone else drive.	**L**
	3g) On wet or slimy roads	On wet or slimy roads ▪ Drive slow and safe, wear seatbelts.	**L**

AHA - Mobilization/Demobilization and Site Preparation
Activity Description

Job Steps	Hazards	Controls	RAC
	3h) Animals on road	Animals on road ▪ Drive slowly, watch for other animals nearby. ▪ Be alert for animals darting out of wooded areas	L
4. Gain permission to enter site	4a) Hostile landowner, livestock, pets	Hostile landowner, livestock, pets ▪ Talk to land owner, be courteous and diplomatic ▪ Ensure all animals have been secured away from work area	L
5. Mobilization/ Demobilization of Equipment and Supplies	5a) Struck by Heavy Equipment/Vehicles	Struck by heavy equipment: ▪ Be aware of heavy equipment operations. ▪ Keep out of the swing radius of heavy equipment. ▪ Ground personnel in the vicinity of heavy equipment operations will be within the view of the operator at all times ▪ Employees shall wear a high visibility vest or T-shirt (reflective vest required if working at night). ▪ Ground personnel will be aware of the counterweight swing and maintain an adequate buffer zone. ▪ Ground personnel will not stand directly behind heavy equipment when it is in operation.	L
	5b) Struck by Equipment/Supplies	Struck by Equipment/Supplies: ▪ Workers will maintain proper space around their work area, if someone enters it, stop work. ▪ When entering another worker's work space, give a verbal warning so they know you are there.	L
	5c) Overexertion Unloading/Loading Supplies	Overexertion Unloading/Loading Supplies: ▪ Train workers on proper body mechanics, do not bend or twist at the waist while exerting force or lifting. ▪ Tightly secure all loads to the truck bed to avoid load shifting while in transit.	L
	5d) Overexertion Unloading/Loading Supplies	Caught in/on/between: ▪ Do not place yourself between two vehicles or between a vehicle and a fixed object.	L
	5e) Slip/Trip/Fall	Slip/Trip/Fall:	L

AHA - Mobilization/Demobilization and Site Preparation
Activity Description

Job Steps	Hazards	Controls	RAC
		▪ Mark all holes and low spots in area with banner tape. Instruct personnel to avoid these areas. ▪ Drivers will maintain 3 point contact when mounting/dismounting vehicles/equipment. ▪ Drivers will check surface before stepping, not jumping down.	
	5f) Vehicle accident	Vehicle accident: ▪ Employees should follow AMEC vehicle operation policy and be aware of all stationary and mobile vehicles.	L
6. Site Preparation	6a) Slip/Trip/Fall	Slip/Trip/Fall: ▪ Mark all holes and low spots in area with banner tape. Instruct personnel to avoid these areas	L
7. Installation of soil erosion and sediment controls	7a) Overexertion	Overexertion: ▪ Workers will be trained in the proper method of placing erosion controls. ▪ Do not bend and twist at the waist while lifting or exerting force.	L
	7b) Struck by Equipment/Supplies	Struck by Equipment/Supplies: ▪ Workers will maintain proper space around their work area, if someone enters it, stop work. ▪ When entering another worker's work space, give a verbal warning so they know you are there.	L
8. Driving back from the jobsite	7c) See hazards listed under item #3	See safe work practices under item #3	L

AHA - Field Work General

Activity/Work Task:	Field Work General		
Project Location:	Barnes ANGB, Westfield, MA		
Project Number:	**2-9133-0006**		
Date Prepared:	1/03/2017	Date Accepted:	1/04/2017
Prepared by (Name/Title):	Craig Keating, Field Operations Lead		
Reviewed by (Name/Title):	Laurie Gneiding/Project Health & Safety Officer		

This AHA involves the following:

- Establishing site specific measures for staying safe while performing general field work

This AHA is not an exhaustive summary of all hazards associated with the Site. Refer to the site HASP for additional requirements. Contractor to follow general site safety controls for Slips Trips and Falls, Biological hazards, cuts lacerations and pinch points, and emergency procedures.

Overall Risk Assessment Code (RAC) (Use highest code): **L**

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
PPE: safety glasses, gloves (per HASP), safety toe work boots. Hard hat if overhead heavy equipment involved	**Competent / Qualified Personnel:** All AMEC employees with 40 hour training **Training requirements:** Site Specific HASP Orientation Toolbox safety meeting Task kick-off meeting	Daily inspection of equipment per manufacturer's instructions. Tag tools that are defective and remove from service. Inspect all PPE prior to use

Job Steps	Hazards	Controls	RAC
1. Mobilization/ See Mobilization/Demobilization and Site Preparation AHA Demobilization and Site Preparation	1A) See Mobilization/Demobilization and Site Preparation AHA	1A) See Mobilization/Demobilization and Site Preparation AHA	**L**

AHA - Field Work General

2. Communication	2A) Safety, crew unity	2A) Talk to each other. ▪ Let other crewmembers know when you see a hazard. ▪ Avoid working near known hazard trees (trees that are rotten, dead, damaged, etc.). ▪ Always know the wherabouts of fellow crewmembers. ▪ Carry a radio and spare batteries or cell phone. ▪ Review Emergency Evacuation Procedures (see below).	**L**
3. Walking and working in the field	3A) Falling down, twisted ankles and knees, poor footing	3A) Always watch your footing. ▪ Slow down and use extra caution around logs, rocks, and animal holes. ▪ Extremely steep slopes (>50%) can be hazardous under wet or dry conditions; consider an alternate route. ▪ Wear laced boots with a minimum 8" high upper and non-skid Vibram-type soles for ankle support and traction.	**L**
	3B) Falling objects	3B) Protect head agains falling objects. ▪ Wear your hardhat for protection from falling limbs and pinecones, and from tools and equipment carried by other crewmembers. ▪ Stay out of the woods during extremely high winds.	**L**
	3C) Damage to eyes	3C) Protect eyes: ▪ Watch where you walk, ecpecially around trees and brush with limbs sticking out. ▪ Exercise caution when clearing limbs from tree trunks. Advise wearing eye protection. ▪ Ultraviolet light from the sun can be damaging to the eyes; look for sunglasses that specify significant protection from UV-A and UV-B radiation. If safety glasses require, use one's with tinted lenses	**L**
	3D) Bee and wasp stings	3D) See AHA for Insect Stings and Bites	**L**
	3E) Ticks and infected mosquitos	3E) See AHA for Insect Stings and Bites	**L**
	3F) Lifting Injuries (e.g., Back Injuries)	3F) Lifting Injuries (e.g., Back Injuries) • Site personnel will be instructed on proper lifting techniques. • Perform warm-up excercises before starting work. • **DO NOT EXCEED THE AMEC LIFTING LIMIT OF 50 POUNDS.** • Use two people to lift, lower, or carry equipment or materials heavier than 50 pounds. • Mechanical devices should be used to reduce manual handling of materials. • Drive the field vehicle as close to the point that the heavy equipment/material will be used as long as the area is safe to drive into and you do not create hazards to you, your co-worker, or the vehicle.	**L**

	3G) Slips/Trips/Falls	3G) Slips/Trips/Falls • Maintain work areas safe and orderly; unloading areas should be on even terrain; mark or repair possible tripping hazards. • Site SHSO inspect the entire work area to identify and mark hazards. • Be aware of work area conditions that can cause slip hazards such as ponding of water on concrete surfaces. Ponding of water on smooth surfaces, such as concrete, coupled with the warm or freezing weather conditions has the potential to cause slippery condiitons such as growth of scum or ice, as applicable. Adding a layer of clean fill to the surface may prevent the growth of scum, and/or create a non-slippery walking surface.	**L**
	3H) Vehicular Traffic	3H) Vehicular Traffic ▪ Spotters will be used when backing up trucks and heavy equipment and when moving equipment. ▪ High visibility vests will be worn when workers are exposed to vehicular traffic at the site or on public roads.	**L**
	3I) Overhead Hazards	3I) Overhead Hazards ▪ Personnel will be required to wear hard hats that meet ANSI Standard Z89.1. ▪ All ground personnel will stay clear of suspended loads. ▪ All equipment will be provided with guards, canopies or grills to protect the operator from falling or flying objects. ▪ All overhead hazards will be identified prior to commencing work operations.	**L**
	3J) Dropped Objects	3J) Dropped Objects ▪ Steel toe boots meeting ANSI Standard Z41 will be worn.	**L**
	3K) Noise	3K) Noise ▪ Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (ear muffs or plugs); all equipment will be equipped with manufacturer's required mufflers. Hearing protection shall be worn by all personnel working in or near heavy equipment.	**L**
	3L) Eye Injuries	3L) Eye Injuries ▪ Safety glasses meeting ANSI Standard Z87 will be worn.	**L**

AHA - Field Work General

	3M) Heavy Equipment (overhead hazards, spills, struck by or against)	3M) Heavy Equipment ▪ Equipment will have seat belts. ▪ Operators will wear seat belts when operating equipment. ▪ Do not operate equipment on grades that exceed manufacturer's recommendations. ▪ Equipment will have guards, canopies or grills to protect from flying objects. ▪ Ground personnel will stay clear of all suspended loads. ▪ Ground personnel will wear high visibility vests ▪ Spill and absorbent materials will be readily available. ▪ Drip pans, polyethylene sheeting or other means will be used for secondary containment. ▪ Ground personnel will stay out of the swing radius of excavators. ▪ Eye contact with operators will be made before approaching equipment. ▪ Operator will acknowledge eye contact by removing his hands from the controls. ▪ Equipment will not be approached on blind sides. ▪ All equipment will be equipped with backup alarms and use spotters when significant physical movement of equipment occurs on-site, (i.e., other than in place excavation or truck loading).	**L**
	3N) Struck by vehicle/equipment	3N) Struck by vehicle/equipment ▪ Be aware of heavy equipment operations. ▪ Keep out of the swing radius of heavy equipment. ▪ Ground personnel in the vicinity of heavy equipment operations will be within the view of the operator at all times and will wear high visibility vests. ▪ Ground personnel will be aware of the counterweight swing and maintain an adequate buffer zone. ▪ Ground personnel will not stand directly behind heavy equipment when it is in operation. ▪ Drivers will keep workers on foot in their vision at all times, if you lose sight of someone, Stop!	**L**
	3O) Struck/cut by tools	3O) Struck/cut by tools ▪ Cut resistant work gloves will be worn when dealing with sharp objects. ▪ All hand and power tools will be maintained in safe condition. ▪ Guards will be kept in place while using hand and power tools.	**L**
	3P) Caught in/on/between	3P) Caught in/on/between ▪ Workers will not position themselves between equipment and a stationary object. ▪ Workers will not wear long hair down (place in pony-tail and tuck into shirt) or jewelry if working with tools/machinery.	**L**

AHA - Field Work General

	3Q) Contact with Electricity/Lightning	3Q) Contact with Electricity/Lighting ▪ All electrical tools and equipment will be equipped with GFCI. ▪ Electrical extension cords will be of the "Hard" or "Extra Hard" service type. ▪ All extension cords shall have a three-blade grounding plug. ▪ Personnel shall not use extension cords with damaged outer covers, exposed inner wires, or splices. ▪ Electrical cords shall not be laid across roads where vehicular traffic may damage the cord without appropriate guarding. ▪ All electrical work will be conducted by a licensed electrician. ▪ All utilities will be marked prior to excavation activities. ▪ All equipment will stay a minimum of 10 feet from overhead energized electrical lines (50 kV). This distance will increase by 4 inches for each 10 kV above 50 kV. Rule of Thumb: Stay 10 feet away from all overhead powerlines known to be 50 kV or less and 35 feet from all others.) ▪ The SHSO shall halt outdoor site operations whenever lightning is visible, outdoor work will not resume until 30 minutes after the last sighting of lightning.	**L**
	3R) Equipment failure	3R) Equipment failure ▪ All equipment will be inspected before use. If any safety problems are noted, the equipment should be tagged and removed from service until repaired or replaced.	**L**
	3S) Hand & power tool usage, cuts, burns, etc.	3S) Hand & power tool usage ▪ Inspect the tool daily. ▪ Remove broken or damaged tools from service. ▪ Use the tool for its intended purpose. ▪ Use in accordance with manufacturers instructions.	**L**

	3T) Burns and Exposure to Exhaust from Portable Propane Torch Use	3T) Portable propane torch usage • Read the manual to become familiar with the propane torch and follow all safety precautions. Don PPE (safety glasses, heavy leather gloves) before using the torch. • Inspect the propane cylinder and the torch tip to ensure there are no defects, damage, etc. • Assemble the torch kit per instruction manual. The torch is designed to be used with the small propane cylinder, do not attempt to attach the torch to any other gas cylinder. • Do not use the torch in areas where gasoline or other liquids having flammable vapors are stored or used. • Do not smoke while igniting or operating the propane torch. • Have an ABC type fire extinguisher readily accessible to the work area. • Be sure the torch tip has a tight seal to the cylinder. If you smell gas, do not try to light the torch. Check the seal between the cylinder and torch. Do not attempt to light the torch until the seal is secure and no gas is leaking. • To ignite the torch flame, first position the point of the torch tip away from you. • If the unit requires a striker to ignite the torch, only use the striker provided with the unit. Never use a match or lighter to ignite torch. • Do not place hand or any part of your body in the path of the flame while lighting or operating the propane torch. • Never leave an ignited torch unattended while in operation. When not in use, the torch tip must be removed from the propane cylinder. • Be aware of the weather conditions. On bright sunny days, the torch flame may be barely visible. On windy days, the wind may carry the torch's heat back towards you. • The torch can produce combustion products such as carbon monoxide. Do not breathe in the exhaust. Propane vapors are heavier than air and can accumulate in low or confined areas. Use the torch only in a well ventilated area. • Heating a surface may cause heat to be conducted to adjoining surfaces that may be combustible or become pressurized when heated. Always check to make sure no unintended parts or materials are being heated. • Torch will be extremely hot, allow the torch to cool before touching it to remove it from the cylinder. • Never store a torch that is still hot. • When cooled, disconnect the torch from the cylinder for storage, and store them in a safe manner to prevent damage.	**L**

AHA - Field Work General

4. Environmental health considerations	4A) HEAT Stress	4A) Take precautions to prevent heat stress ▪ Remain constantly aware of the four basic factors that determine the degree of heat stress (air temperature, humidity, air movement, and heat radiation) relative to the surrounding work environmental heat load. ▪ Know the signs and symptoms of heat exhaustion, heat cramps, and heat stroke. Heat stroke is a true medical emergency requiring immediate emergency response action. NOTE: The severity of the effects of a given environmental heat stress is decreased by reducing the work load, increasing the frequency and/or duration of rest periods, and by introducing measures which will protect employees from hot environments. ▪ Maintain adequate water intake by drinking water periodically in small amounts throughout the day (flavoring water with citrus flavors or extracts enhances palatability). ▪ Allow approximately 2 weeks with progressive degrees of heat exposure and physical exertion for substantial acclimatization. ▪ Acclimatization is necessary regardless of an employee's physical condition (the better one's physical condition, the quicker the acclimatization). Tailor the work schedule to fit the climate, the physical condition of employees, and mission requirements. ▪ A reduction of work load markedly decreases total heat stress. ▪ Lessen work load and/or duration of physical exertion the first days of heat exposure to allow gradual acclimatization. ▪ Alternate work and rest periods. More severe conditions may require longer rest periods and electrolyte fluid replacement.	**L**
	4B) Wet Bulb Globe Temperature (WBGT) Index	4B) WBGT ▪ Curtail or suspend physical work when conditions are extremely severe (see attached Heat Stress Index). ▪ Compute a Wet Bulb Globe Temperature Index to determine the level of physical activity (take WBGT index measurements in a location that is similar or closely approximates the environment to which employees will be exposed).	**L**
		WBGT THRESHOLD VALUES FOR INSTITUTING PREVENTIVE MEASURES 80-90 degrees F — Fatigue possible with prolonged exposure and physical activity. 90-105 degrees F — Heat exhaustion and heat stroke possible with prolonged exposure and physical activity. 105-130 degrees F — Heat exhaustion and heat stroke are likely with prolonged heat exposure and physical activity.	.

	4C) Cold Extremes	4C) Take precautions to prevent cold stress injuries ▪ Cover all exposed skin and be aware of frostbite. While cold air will not freeze the tissues of the lungs, slow down and use a mask or scarf to minimize the effect of cold air on air passages. ▪ Dress in layers with wicking garments (those that carry moisture away from the body – e.g., cotton) and a weatherproof slicker. A wool outer garment is recommended. ▪ Take layers off as you heat up; put them on as you cool down. ▪ Wear head protection that provides adequate insulation and protects the ears. ▪ Maintain your energy level. Avoid exhaustion and over-exertion which causes sweating, dampens clothing, and accelerates loss of body heat and increases the potential for hypothermia. ▪ Acclimate to the cold climate to minimize discomfort. ▪ Maintain adequate water/fluid intake to avoid dehydration.	**L**
	4D) Wind	4D) Effects of the wind ▪ Wind chill greatly affects heat loss (see attached Wind Chill Index). ▪ Avoid marking in old, defective timber, especially hardwoods, during periods of high winds due to snag hazards.	**L**
	4E) Thunderstorms	4E) Thunderstorms ▪ Monitor weather channels to determine if electrical storms are forcased. ▪ Plan ahead and identify safe locations to be in the event of a storm. (e.g., sturdy building, vehicle, etc.) ▪ Suspend all field work at the first sound of thurnder. You should be in a safe place when the time between the lightning and thunder is less than 30 seconds. ▪ Only return to work 30 minutes after the after the last strike or sound of thunder	**L**
5. Check and calibrate industrial hygiene and other field instruments and equipment as required and as recommended by the manufacturer	5A) Exposure to Calibration Gases/Chemicals due to: • Use of damaged instruments.	5A) Verify proper operation of the instrument prior to calibration. Calibrate instruments in an area with adequate ventilation and follow the manufacturer's recommendations. ▪ Wear appropriate PPE to conduct calibrations as specified in the instrument manual.	**L**

	5B) Exposure to Site contaminants due to: • Improper instrument calibration; • Misinterpretation of calibration results; • Improper instrument repair; • Improper use of instrument due to lack of training.	5B) Calibrate the instrument in accordance with the manufacturer's recommendations (see instrument manual) using the applicable calibration standard and calibration procedure. • Perform calibrations at a frequency recommended by the manufacturer. Be aware of the instrument's limitations (e.g., detection limit, maximum sensitivity) and the conditions (e.g., humidity) that may affect correct operation or accuracy of that equipment. Possible sources of error that may affect the correct calibration of the instrument. • Use only calibration materials recommended by the manufacturer for calibration. Do not use substitutions. • Confirm that the connections between the instrument and the calibration gas/material is leak-free. • Record all instrument calibrations in the field logbook. Include the instrument ID (type/manufacture/serial number/lamp eV, etc.), calibration gas used (chemical and concentration), and instrument result. • Do not attempt to repair instrument. Return to the vendor for replacement. Report any damaged or malfunctioning instrument to the vendor. • All personnel must be familiar with operation of the instrument and understand: - Theroy of its operation including any alarms and their setpoints - Materials the instrument can and cannot detect, - Instrument's limitations - The expected responses to calibration gases/materials - Interfering gases/chemicals and their affects on the instrument readings - When re-zeroing is appropriate	**L**

AHA - Field Work General

Heat Index Chart

% Relative Humidity

Temperature	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
110	108	112	117	123	130											
105	102	105	108	113	117	122	130									
100	97	98	102	104	107	110	115	120	126	132						
95	91	93	95	96	98	100	104	106	109	113	119	124	130			
90	86	87	88	90	91	92	95	97	98	100	103	106	110	114	117	121
85	81	82	83	84	85	86	87	88	89	90	92	94	96	97	100	102
80	76	77	78	78	79	79	80	81	82	83	84	85	86	87	88	89

Legend	
80-89 degrees	Fatigue is possible with prolonged exposure and/or physical activity.
90-104 degrees	Sunstroke, heat cramps and heat exhaustion are possible with prolonged exposure and/or physical activity.
105-129 degrees	Sunstroke, heat cramps and heat exhaustion are likely. Heat stroke is possible with prolonged exposure and/or physical activity.
130+ degrees	Heatstroke/sunstroke is highly likely with continued exposure.

Wind Chill Chart

Wind (mph)	Temperature (°F)																	
	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
	5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
	10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
	15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
	20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
	25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
	30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
	35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
	40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
	45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
	50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
	55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
	60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times — 30 minutes — 10 minutes — 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

TICKS IN THE WORKPLACE

Types of Ticks

- **Deer Tick (Ixodes Scapularis)** – Found in Northeast and Upper Midwest and transmits agents of Lyme, babesiosis, human granulocytic ehrlichiosis (anaplasmosis) and powassen encephalitis

From Left: adult female, adult male, nymph and larvae Deer Tick (cm scale)

- **Western Black Legged Tick (Ixodes Pacificus)**- Found in the West and transmits agents of Lyme, babesiosis and human granulocytic ehrlichiosis (anaplamosis)

- **Lone Star Tick (Amblyomma Americanum)**- Found throughout the United States and transmits agents of human monocytic ehrlichiosis, Lyme and Tularemia

- **American Dog Tick and Wood Tick (Dermacentor Variabilis)** – found throughout the US. and transmits agents of Rocky Mountain spotted fever and tularemia

American Dog Tick

American Wood Tick

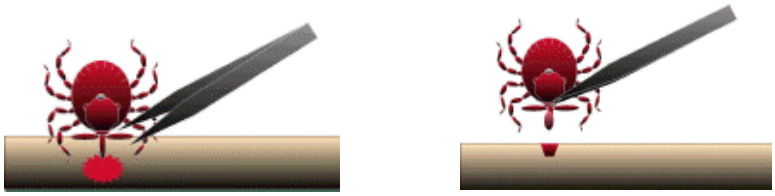
Tick Bite Prevention

Ticks can be found all over the world, but are more present in warmer climates. Here are some ways to prevent a tick bite:

- Perform frequent visual inspections of the skin and clothes.
- Remove attached ticks promptly (preferably with the aid of fine-tip forceps).
- If portion of the tick's mouth parts remain embedded in the skin, use only topical disinfection on the site.
- Use protective clothing that includes:
    1. Long sleeve shirts tucked into the pants.
    2. Long pants tucked into the socks.
- Wear light colored clothing to allow for better recognition of the presence of ticks
- Put clothes in dryer for 30 minutes to kill the ticks
- Use tick and insect repellents that contain N,N-diethyl-3-methylbensamide (DEET)
    1. DEET should be applied to skin and clothing. Avoid applying DEET to face, hands and skin that is irritated or abraded.
    2. DEET may require reapplication for maximum effectiveness (timing of reapplication depends on the specific preparation utilized).
    3. After returning indoors, skin that was treated with DEET should be washed with soap and water.
- Permethrin is available in a spray solely for application to clothing (it is inactivated by skin lipids). It kills ticks on contact.

Tick Removal by an Employee

- Remove attached ticks promptly (preferably with the aid of fine-tip forceps).



- Pull tick straight out.
- If portion of the tick's mouth parts remain embedded in the skin, use only topical disinfection on the site.
- Do not burn or use any caustic substance on tick
- Do not grasp, squeeze or twist body of the tick

Facts About Lyme disease

- There is a very low risk that a person with a recognized bite will develop a serious complication of Lyme disease.
- The risk of Lyme disease is highest during the summer months when the nymph stage is seeking a blood meal.
- Most common clinical manifestation of Lyme disease is a skin lesion called erythema migrans resulting from a cutaneous infection.
- Lyme disease generally occurs in parts of New England, the Mid-Atlantic States and parts of Minnesota and Wisconsin.
- The best currently available method for preventing infection with B. burgdorferi is to avoid exposure to vector ticks.
- You can test serpositive and still not have Lyme disease.
- Not everyone who contracts Lyme disease gets a rash.
- Lyme disease is a clinical diagnosis based on a patient's symptoms, history and examination
- Lyme disease bacteria can cross the placenta into the fetus, and its DNA can be found in breast milk.
- Lyme disease symptoms generally appear in the acute phase but can develop days or even up to one month after a tick bite.
- When being treated for Lyme disease there are two differential diagnoses that should be considered: HGA and babesiosis.

- Doxycycline is very effective in treating Lyme disease. There is no biological evidence for the existence of symptomatic chronic Lyme disease infection among patients after receipt of recommended treatment regimens for Lyme disease. Therefore, long term antibiotic treatment is not recommended for patients with chronic subjective symptoms and should be considered for a differential diagnosis.

Lyme disease, HGA, & Babesiosis

According to the Centers for Disease Control (CDC), the most commonly reported tick-borne disease in the United States is Lyme disease. The two types of ticks that can pass Borrelia burgdorferi, commonly known as Lyme disease, include:

- **Deer Tick**
- **Western Black Legged Tick**

Other diseases to be concerned about when the tick has been identified as I. Scapularis include:

- **HGA** – human granulocytic anaplasmosis previously known as human granulocytic ehrlichiosis.
- **Babesiosis -** a malaria-like parasitic disease.

The bite from the deer tick may lead to one single infection. It is rare for the patient to contract Lyme disease, HGA, and Babesiosis from the same tick bite. When this occurs the patient is considered to have a coinfection.

Diagnosis of Lyme disease, HGA, and Babesiosis

Erythema Migrans (a rash) is the clinical manifestation of Lyme disease and is sufficiently distinctive to allow clinical diagnosis in the absence of laboratory confirmation. The majority of patients infected with Lyme disease present with Erythema Migrans and should do the following:

- Actively search for skin lesions that subsequently develop at the location of the tick bite (prognosis for those treated for erythema migrans is excellent).

- For persons with compatible epidemiologic and clinical history, the preferred means of diagnosis is visual inspection of the skin lesion. ***Serologic testing is too insensitive in the acute phase (the first two weeks of infection) to be helpful diagnostically***.

    1. In a minority of cases for which there may be diagnostic uncertainty, both acute-phase and convalescent-phase (two weeks after the acute-phase) serum samples should be tested using CDC guidelines.

2. ***It should be noted that the presence of seropositivity does not guarantee that a given medical condition is due to B. burgdorferi infection***. (This is because faint bands are commonly seen in samples from healthy people without tick exposure and with patients with illness other than Lyme disease).

- Erythema Migrans can be confused with hypersensitivity to the tick bite and should only be diagnosed by a trained clinician.

- If the person develops fever or clinical illness in areas of endemicity and the tick has been identified as a Deer Tick, HGA and babesiosis should be included in the differential diagnosis.

- To diagnose extracutaneous symptoms of Lyme disease, HGA, or babesiosis, testing with quality controls is required. Specimens should only be sent to laboratories that are familiar or that specialize in this type of testing.

- Laboratory tests should follow the recommendations of the Infectious Diseases Society of America (IDSA) to properly diagnose Lyme disease, HGA and babesiosis.

- ***Methods for determining the B. burgdorferi infection status of ticks removed from patients are not standardized, and the results do not necessarily correlate with the risk of infection. Testing of ticks removed from patients for B. burgdorferi is therefore, not recommended except in research studies.***

Persons who have been exposed to a tick bite (including those who have received antibiotic prophylaxis) should be monitored closely for signs and symptoms of tick borne diseases for up to 30 days.

Lyme disease, HGA, & Babesiosis Signs and Symptoms

The following signs and symptoms to monitor will include, but not be limited to, the following:

- **Rash**
  1. Expanding skin lesions at the tick bite site
  2. Bull's eye rash at tick bite site < 50%
  3. Rashes other than tick bite site
- **Musculoskeletal**
  1. Joint/muscle pain and burning in feet, swelling in toes and ankle pain
  2. Shin splints, joint pain or swelling, stiffness of the joints, neck creaks or cracks and neck stiffness
- **Neurological**
  1. Twitching of the face, eyelids or muscles
  2. Headache
  3. Burning or stabbing sensation

- **Upper Gastrointestinal**
    1. Nausea and vomiting
    2. Difficulty eating
    3. Change in bowel function
    4. Gastritis and abdominal cramping
- **Cardiac Symptoms**
    1. Irregular, slow heartbeat
    2. Dizziness, shortness of breath
- **Other**
    1. Development of skin lesions or viral infection-like illness within one month after removing an attached tick.

Treatment of Deer Tick and Western Black Legged Tick Bites

According to the Infectious Disease Society of America (IDSA), after a recognized tick bite, the routine use of antibiotics, serological testing to prevent Lyme disease, or clinical testing of the removed tick is not currently recommended. The rationale for this includes the following:

- ***There is no clinical based evidence that shows that the use of prophylactic antibiotics reduces the incidence of Lyme disease, HGA or babesiosis.***
- ***Currently, the tests for determining the B. burgdorferi infection status of ticks, removed from patients, are not standardized and the results do not necessarily correlate with the risk of infection.***
- ***The presence of seropositivity does not guarantee that a given medical condition is due to B. burgdorferi infection.***
- ***When infection is confirmed, there is a high rate of efficacy from treatment with antibiotic.***

A single-200 mg oral-dose of doxycycline may be offered when all of the following circumstances exist:

- The attached tick can be reliably identified as an adult or nymph Deer Tick. Identification should be completed by a health practitioner oriented in the process.

- Attachment time estimated to be ≥ 36 hours. Attachment time is based on degree of engorgement of the tick with blood or on the certainty of the exposure time of the tick. ***(Only a trained health practitioner can determine degree of engorgement).***

- Ecological information indicates that the local rate of infection with the Lyme disease organism (*B. burgdorferi*) is ≥ 20% in:

    1. Parts of New England
    2. Parts of the mid-Atlantic states
    3. Parts of Minnesota and Wisconsin
    4. Not generally in other parts of the USA

- Doxycycline is not contradicted (includes pregnant women and children younger than the age of 8).

Prophylaxis after Deer Tick bites is generally not necessary due to the low infection rates; however, if a higher infection rate (20%) is identified, then follow the above criteria.

Protocol for Deer Tick and Western Black Legged Tick Bites

- Nurse Case Manager (NCM) will follow all employees for 45 days with a suspected tick bite. (Per the CDC, the patient should be followed for 30 days to monitor symptoms.)
- WorkCare clinician will be responsible to identify the following questions:
    1. What were the employees' field and work activities four days prior to identifying the tick?
    2. What in the employees' history would expose them to tick infestation?
- WorkCare will assist in identifying the tick where applicable.
- NCM will monitor for flu like symptoms on a weekly basis and educate the employee on what symptoms to look for (see prior list of Lyme disease signs and symptoms).
- If at anytime the employee appears to exhibit Lyme disease, HGA or babesiosis symptoms, the NCM will refer the employee to the appropriate clinic.
    1. Clinician will contact treating physician and discuss appropriate treatment and diagnostic studies. Clinician will refer physician to IDSA for diagnosis and treatment guidelines. Treating physician and WorkCare physician will consult on appropriate plan of action and ensure it follows IDSA guidelines.
    2. If employee exhibits bull's eye rash or treating physician determines that employee requires medical management of tick bite, file will then be managed by NCM (if agreed upon in contract with client). NCM will consult with treating physician and WorkCare physician to ensure appropriate treatment is rendered, thus allowing the employee to reach his maximum medical improvement level. NCM will follow the employee until he is released form medical care.
        - In cases of individuals who develop symptoms of Lyme disease, HGA or babesiosis then the NCM will direct the physician to IDSA guidelines to ensure the employee receives appropriate care.

References:

1. The Clinical Assessment, Treatment, and Prevention of Lyme Disease, Human Granulocytic Anaplasmosis and Babesiosis: Clinical Practice Guidelines by the Infectious Diseases Society of America. *Clinical Infectious Diseases* 2009; 43:1089-1134
2. IDSA Guidelines,CID2006:43(1November),1089

amec foster wheeler

Attachment C

Incident Reporting Forms

AMEC Earth & Environmental, Inc.
Tailgate Safety Meeting Report

Check One:

❑ Initial Kickoff Safety Meeting ❑ Regular/Daily Tailgate Safety Meeting ❑ Unscheduled Tailgate Safety Meeting

Date: _____ Site: _____

Field Manager: _____ Site Health and Safety Coordinator: _____
(print) *(print)*

Order of Business

Topics Discussed (check all that apply):

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

Safety suggestions by site workers: _____

_____

_____

Action taken on previous suggestions: _____

_____

_____

Injuries/accidents/personnel changes since previous meeting: _____

_____

_____

AMEC Earth & Environmental, Inc.
Tailgate Safety Meeting Report *(continued)*

Observations of unsafe work practices/conditions that have developed since previous meeting: _____

_____

_____

Location of (or changes in the locations of) evacuation routes/safe refuge areas: _____

_____

_____

Additional comments: _____

_____

_____

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

Name (print)	Company	Signature

Meeting conducted by: _____ Title: _____
(print)

Signature: _____ Time: _____

Incident flow chart

Call immediately

E&I Corporate HSE department contact list

Name/email	Office location	Contact information
Bruce Voss bruce.voss@amecfw.com	Cathedral City, CA	760.202.3737 (office) 951.897.6381 (cell)
Chad Barnes chad.barnes@amecfw.com	Phoenix, AZ	602.733.6000 (office) 480.495.9846 (cell)
Cindy Sundquist cynthia.sundquist@amecfw.com	Portland, ME	207.828.3309 (office) 207.650.7593 (cell) 207.892.4402 (home)
Gabe Sandholm gabe.sandholm@amec.com	Minneapolis, MN	612.252.3785 (office) 206.683.9190 (cell)
John Mazur john.mazur@amec.com	Wilmington, NC	910.444.2978 (office) 910.431.2330 (cell) 910.681.0538 (home)
Lori Dowling lori.dowling@amec.com	Prince George, BC	250.564.3243 (office)
Philip Neville philip.neville@amec.com	Thorold, ON	905.687.6616 (office) 905.380.4465 (cell)
Tim Kihn tim.kihn@amec.com	Edmonton, AB	780.944.6363 (office) 780.717.5058 (cell)
Vladimir Ivensky (can call 24/7) vladimir.ivensky@amec.com	Plymouth Meeting, PA	610.877.6144 (office) 484.919.5175 (cell) 215.947.0393 (home)
Kirby Lastinger kirby.lastinger@amec.com	Lakeland, FL	836-667-2345 x207 (office) 863-272-4775 (cell)

*High potential near misses, subcontractor incidents, regulatory inspections, spills, and property damage should be reported within 60 minutes to one of the above HSE Representatives.
WITHIN 24 HOURS - Local Supervisor, HSE Coordinator, Project HSE Officer, and any applicable safety committees must complete preliminary investigation, along with the initial Incident Analysis Report Form and forward it to the Corporate HSE Department

Check one
Initial Report: ☐
Update: ☐
Final Report: ☐ ____

INCIDENT ANALYSIS REPORT (IAR)

Amec Foster Wheeler E&I

Confidential - Privileged

Incident Potential Severity
Letter: Select One
Number: Select One
Investigation Level: Select One
Severity Matrix (LINK)

Group: Select One Group HSE Manager: ____ Incident Review Panel Team (if applicable): ____

Incident Date: _____ Report Date: _____

Section 1 – General Information

Employee Name: ____ Sex: ☐ M ☐ F Date of Birth: ____ Age Range: Select One

Job Position: Select One Hire Date: ____ Time employee began work: _____ Time of incident: ____ ☐ am | ☐ pm

Business Line: Select One Department Number: ____ Project Manager: ____

Project Name: ____ Project Number: ____ Client: ____

Office where employee works from: ____ Immediate Supervisor: ____ Hours employee worked during last 7 days: ____ hrs

Location: Select One Is this a Company controlled work site: ☐ Yes ☐ No Incident Assigned to: Select One

Location description: ____

Section 2 – Incident Type - Process (**mark at least ONE BOLD TYPE** and all that apply)

☐ **Fatality** ☐ **Environmental** ☐ **Injury/Illness Incident** If Injury/illness: Select One

☐ **Security** ☐ **Near Miss/Hazard ID** ☐ **Property Damage** If Damage: Select One ☐ 3rd Party?

☐ Hospitalization ☐ **Regulatory Inspection** ☐ **Notice of Violation or Citation** ☐ Agency Reportable

☐ Motor Vehicle Incident Involving Injury ☐ Other (describe): ____

Outcome/Result: Select One If "other", specify: ____ Source of Hazard: Select One If "other", specify: ____

Immediate Cause: Select One

A. If **injury/illness**: Indicate the part of the body: Select One If "other", specify: ____

Indicate body part location: Select One If "other", specify: ____

Injury Type: Select One If "other" specify: ____ Illness Type: Select One If "other", specify: ____

☐ Bleeding? Select One If yes, "First Aider" name: ____ ☐ Contact with blood/infectious material? Select One

Exposure Control Precautions taken by First Aider (check all that apply):

☐ None (If none, contact WorkCare) ☐ Gloves ☐ Previous HBV Immunization
☐ Immediate Personal Hygiene ☐ One-way CPR valve ☐ Recommended for HBV Immunization
☐ Eye protection ☐ Face mask ☐ Other (describe): ____

☐ Blood contaminated work area / surface? If contaminated, describe cleanup/disposal: ____

☐ Medical treatment provided (i.e. prescriptions, referrals, etc.). If medical treatment, describe: ____

☐ Physical limitations received from physician? If limitations, describe: ____ ☐ Modified Work Offer provided.

☐ Second medical opinion? If second opinion, describe: ____

☐ Workers Compensation claim filed? If filed, claim number: ____

B. If **property damage**: describe what happened and estimate ($) of damage to all objects involved? ____

C. If **environmental**: Environmental incident category: ☐ Pollution Event ☐ Non-conformance

Was Regulatory Action Taken: Select One If "Yes" describe: ____

Type of pollution event: Select One Type of substance: Select One Name, CAS#, physical state: ____

Quantity: ____ Substance Unit: Select One Source of release: Select One If "other", specify: ____

Duration of Breach: Select One Receiving Environment: Select One If "other", specify: ____

Level of Non-conformance: Select One Describe Non-conformance: ____

D. If **security**: Security Incident Type: Select One If Physical: Select One If Criminal: Select One If Intellectual: Select One

E. If an **inspection by a regulatory agency**, what agency, who were the inspectors, inspector contact information? ___

Section 3 – Incident Description

Attach and number additional pages, as needed, to ensure all details related to the incident are captured.

A. List the names of all persons involved in the incident, and employer information: ___

B. List the names of any witnesses, their employer, and a local/company telephone number or address: ___

C. Name of Employee's supervisor: ___ Contact phone number for supervisor: ___

D. What specific job/task or action was the employee(s) doing just prior to the incident: ___

E. Was a tool or equipment involved? ☐ Yes ☐ No What was it: ___ Last Inspection Date: ___Defects: ___

F. Explain in **detail** what happened: ___

G. Explain in **detail** what object or substance directly harmed the employee: ___

H. What were the weather conditions at time of incident?: ___

I. What was the lighting like at time of incident? Bright ☐ Shadows ☐ Dark ☐ Other: ___

J. List any damaged equipment or property (other than motor vehicles). Provide model and serial number **and** estimated costs to repair/replace damaged equipment or property, if applicable: ___

Section 4 - Incident Analysis

A. Was a Health and Safety Plan (HASP) or Activity Hazard Analysis (AHA) completed for the work being performed? ☐ Yes ☐ No
If "yes", Who prepared the document?: ___

B. Who and when was the last manager (Project, Unit, etc.) at the site of the incident?: ___

C. When and what safety training **directly related** to the incident has the person(s) involved had?: ___

D. List attached documentation (HASP acknowledgement forms, kickoff/daily/weekly meetings, inspections, photographs): ___

Section 5 - Incident Investigation Results and Corrective Actions

This section to be completed by the Group HSE Manager/IRP with support from location where incident occurred, in accordance with A-Z List of Accident Causes and Glossary of A-Z Causes (click links).

Causal Factors (Acts or Omissions / Conditions)

(Attach and number any additional pages as needed to completely address this section)

	IMMEDIATE CAUSE	IMMEDIATE CAUSE SUB-TYPE	DESCRIPTION
1	Select One	_____	_____
2	Select One	_____	_____
3	Select One	_____	_____
4	Select One	_____	_____

Root Cause(s) Analysis - The below items represents major root cause categories which have been determined to be Less Than Adequate (LTA). A more detailed determination of the root cause will be facilitated, if needed, by the applicable Group HSE Manager / IRP.

	ROOT CAUSE TYPE	ROOT CAUSE SUB-TYPE	DESCRIPTION
1	Select One	_____	_____

2	Select One	____	____
3	Select One	____	____
4	Select One	____	____

Amec Foster Wheeler Safety Rules and Safety Essentials

Safety Rules **Select all applicable breaches of rules or** ☐ None		**Safety Essentials** **Select all applicable breaches of behavioral expectations or** ☐ None	
☐ Permit to Work ☐ Ground Disturbance ☐ Driving ☐ Confined Spaces ☐ Working At Height	☐ Lifting Operations ☐ Energy Isolations ☐ Pressure Testing ☐ Plant and Equipment ☐ Housekeeping	☐ Always Take Care ☐ Follow the Rules ☐ Do a Risk Assessment	☐ You Must Intervene ☐ Manage Any Change ☐ Wear the Correct PPE

Corrective Actions

Root Cause #	**Corrective Actions Taken** (Attach additional pages as needed to completely address this section)	**Responsible Person**	**Proposed Completion Date**	**Closed on Date**	**Verified by and Date Verified**
____	___	___	___	___	___
____	___	___	___	___	___
____	___	___	___	___	___
____	___	___	___	___	___
____	___	___	___	___	___

Section 6 - Notifications, Certification & Approvals

Check the appropriate boxes indicating the applicable reports have been made to the following applicable organizations:

Auto Insurance Carrier was called ☐ Group HSE Manager Notified ☐

WorkCare was called ☐ Post-incident Drug/Alcohol Testing Performed ☐

Incident Report prepared by: ___

Employee (s): ___	Date: ___	Employee's Supervisor: ___	Date: ___
HSE Coordinator/Project/Unit Manager: ___	Date: ___	Group HSE Manager: ___	Date: ___

TrackWise notification form - Injury incident
General information

Remember to complete any 'Actions'

Fields required for intial entry
Fields required to submit incident
Fields required for Levels 1 & 2 investigations

Business unit			
Short description			
Incident assigned to		Is incident work related?	

Parties involved table	Person involved	Type of involvement	Employing company

Operating unit		Project/Office	
Site/Unit		Office/Site/Offshore	
Discipline/Group (E&I only)			
Incident date		Time incident occurred	
Where did incident occur?		Specific location	
AMEC HSE Advisor		AMEC HSE Manager	
AMEC Project Manager		Person reporting incident	
Description		Immediate actions taken	
Incident outcome/result			
Height of fall (Meters)		Weight of object (kg)	
Source of hazard Select multiple options from this list	Cold Dust Elevated working surface Excavation Floor/ Ground condition	OSHA Global Severity	
Reportable to authorities			
		Related incident	
Potential letter		Potential number	
Is incident potential rating confirmed?			

Injury/Illness information

Person injured - First name		Person injured - Last name	
Employment status		Name of employer	
Injured party occupation		Length of service	
1st date of absence		Date IP returned to full duty	
1st date restricted/modified		Injury/Illness	
Injury/Illness type Select multiple options from this list	Abrasion Amputation Asphyxia Back problem Bruise/Contusion	Injury location Select multiple options from this list	Ankle Left Ankle Right Back Chest Eye
Exact injury location			
Diagnosis comments		Treatment given	
Medical restrictions			
Date of birth		Shift	
Age profile			
Hours/Shift		Shifts/Week	
Days since last day off		Time into shift (hours)	
Activity at time of incident		Duty HR informed	

Investigation

AMEC Senior Site Rep.		Direct supervisor	
Investigation conducted by			

Investigation team	Team member	Invest' Relevance/Expertise

Incident review panel | | Has this investigation been through incident review panel?

Immediate causes	Immediate cause type	Immediate cause sub-type	Act/ Conditions	Immediate cause description
The first letter of 'Immediate cause sub-type' **MUST** match the first letter of 'Immediate cause type"			Acts or Omissions	
			Acts or Omissions	
			Acts or Omissions	
			Acts or Omissions	
			Acts or Omissions	

Root causes	Root cause type	Root cause sub-type	Job/ Personal factors	Root cause description
The first letter of 'Root cause sub-type' **MUST** match the first letter of 'Root cause type"			Job Factors	
			Job Factors	
			Job Factors	
			Job Factors	
			Job Factors	

Investigation findings summary		Conclusions summary	

Safety rules breaches		Safety essentials breaches	
Select multiple options from this list	Energy Isolations Pressure testing Plant and Equipment House Keeping None	Select multiple options from this list	Always Take Care Follow the Rules Do A Risk Assessment You Must Intervene Manage Any Change

Near Miss Report

Note: The office supervisor or field supervisor will complete this form when an event occurs that could have resulted in a serious injury, but did not. The goal of Near Miss Reports is to inform coworkers and management of potentially dangerous conditions or behavior to prevent future injuries or illnesses. The completed form must be submitted to the Unit Manager, Project Manager (as applicable), the SHE Coordinator, and the Corporate SHE Director within 1 day of the occurrence.

Date of Occurrence:	Time of injury: ❑ AM ❑ PM
Location:	
Employee's brief description of occurrence:	
Employee's recommendation to prevent further occurrence:	
Signed:	Date:
Supervisor recommendations:	
Management recommendations:	
Signed:	Date:

ATTACHMENT 2
VEHICLE INCIDENT REPORT

Confidential - Privileged

Section 1 - General Information Date of Incident: _____

Time incident occurred: _____ ☐ am | ☐ pm | Illumination: ☐ Dark ☐ Dusk ☐ Light | Road Condition: ☐ Dry ☐ Wet ☐ Icy/snow

Were police summoned to scene? ☐ Yes ☐ No Police Department and Location: _____

Report #; _____ Officer's Name: _____ Officer's Badge Number: _____

Section 2 - Company Driver and Vehicle

Driver's name: _____ D/L #: _____ State: _____

Driver's home office address: _____ Driver's Phone #: _____

Company Vehicle #: _____ Year: _____ Model: _____ License #: _____ State: _____

Company car?: ☐ Yes ☐ No Personal Vehicle?: ☐ Yes ☐ No Rental Vehicle?: ☐ Yes ☐ No

If rental, rented from: _____

Passenger/Witness Name(s): _____ Address: _____ Telephone: _____

Passenger/Witness Name(s): _____ Address: _____ Telephone: _____

Damage to vehicle: _____

Was an employee injured?: ☐ Yes ☐ No If yes, please describe: _____

Injuries to others?: ☐ Yes ☐ No If yes, please describe: _____

Vehicle was being used for: Company business ☐ Yes ☐ No Personal business ☐ Yes ☐ No

Towed?: ☐ Yes ☐ No If yes, by whom?: _____ To Where?: _____

Section 3 - Other Driver and Vehicle Information

Driver's Name: _____ D/L # : _____ State: _____

Current address: _____ City: _____ State: _____

Telephone: _____ Work: _____ Cell: _____

Registered Owner's Name: _____ Address: _____ City: _____ State: _____

(verify registration document)

The Other Vehicle: Make: _____ Model: _____ Year: _____ License #: _____ State: _____

Insurance company name: _____ Address: _____ Phone #: _____

Policy No.: _____ Contact Person: _____ Phone #: _____

Passenger/Witness Name(s): _____ Address: _____ Telephone: _____

Passenger/Witness Name(s): _____ Address: _____ Telephone: _____

Damage: (*Make note of pre-existing damage and take pictures if possible – you may attach additional pages if necessary):* _____

Injuries to other driver/passengers: _____

Section 4 – Approvals (signatures required)

Form completed by (please print): _____ Date: _____

Signature: _____

Office/Project Manager (please print): _____ Date: _____

Signature: _____

Things to Do First In The Event Of a Motor Vehicle Incident

GENERAL INFORMATION

1. Do not decide on your own whether a particular incident is "covered" by insurance. Should there be any doubt, it is always preferable to report an occurrence, as this allows underwriters, the Risk Management Department and insurance adjusters to determine if a covered loss has taken place.

2. Policy Conditions do require that all losses and occurrences, which may result in a claim be promptly reported.

3. Do not admit liability or offer your opinion of liability to anyone.

4. Complete this IAR/VIR form promptly and forward with all applicable supporting documentation. It is essential both division and location information be provided.

5. For automobile collisions within the **United States**, please indicate on the IAR form that you have contacted Zurich at:

Zurich Insurance Company
1-800-987-3373 or
1-877-928-4531
24 hours a day, 7 days a week

6. For automobile collisions within **Canada**, please indicate on the IAR form that you have contacted Crawford at:

Crawford Adjusters Canada
Claims Alert
1-888-218-2346
24 hours a day, 7 days a week

The more details you have the better but, don't delay reporting if you don't have all of the information - that may be obtained later. A Zurich trained operator will answer your call and ask for all relevant information regarding the incident. The initial information required includes:

- Your division,
- Office location and division contact name – advise that you are an AMEC Company
- Name, drivers license and phone number of the driver involved in the loss
- Description of the vehicle which he/she was driving (i.e., year, make, model, license plate number, serial number)
- Date, time and location of incident
- Passenger information (if applicable)
- Third party information (i.e., name, phone number, address, vehicle information, insurance information)
- If any injuries occurred (if applicable)
- Police information
- Witness information (if applicable)

Call 911 if there are serious injuries!

If you are injured or think you were injured, **contact your supervisor and call WorkCare at 888-449-7787**. Your supervisor will notify your HSE Coordinator and your Group HSE Manager. For additional instructions on what to do, go to AMEC's HSE website at:

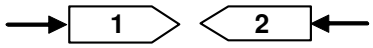
http://ee.amecnet.com/she/sheweb/incident_reporting.htm

1. Call for an officer if the incident occurred on public property (streets, highways or roads). Disputes often arise between the parties involved as to who was at fault; therefore, a police report is important. If an officer is unable to attend the scene of the collision, a counter police report may be filed at most stations. Insurance companies rely on police reports to determine liability.
2. Complete the Incident Investigation Report and the Vehicle Incident Report forms. It is important that both these forms are completed in detail. Include a diagram of the incident on the provided sheet. Incomplete information may lead to delays in processing associated claims and in helping to prevent this type of incident from occurring again.
3. Give only information that is required by the authorities or as directed by AMEC contractual requirements.
4. Sign only those statements required by the authorities or as directed by AMEC contractual requirements. Do not sign away your or the company's rights.

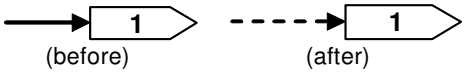
Vehicle Incident Diagram

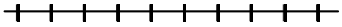
This or a similar diagram must be completed with all VIRs

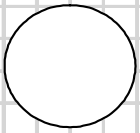
Instructions:

1. Number each vehicle and show directions 

2. Use a solid line to show path before incident and use a dotted line to show path after incient



3. Show pedestrian/non-motorist by: 
4. Show railroad by: 
5. Indicate north by arrow as: 
6. Show street or highway names or numbers
7. Show signs, signals, warning and traffic controls.



Indicate North
by Arrow

Prepared by: _____ Date: _____

Attachment D

Route to Hospital Map

HOSPITAL ROUTE MAP

From A Barnes Air National Guard Base
Falcon Drive Westfield, Massachusetts

To B Baystate Noble Hospital,
115 W. Silver Street, Westfield, Massachusetts

Distance: 5.7 miles
Time: 16 minutes

Directions

A - Depart Falcon Dr. toward Tank Destroyer Blvd.

0.8 mi

Turn left onto US-202 / RT-10 / Southampton Rd.

3.9 mi.

Bear left onto US-20 / US-202 / RT-10 / Elm St.

0.3 mi.

Keep straight onto US-202 S / RT-10 S / Court St.

0.1 mi.

Bear right onto Court St.

0.5 mi.

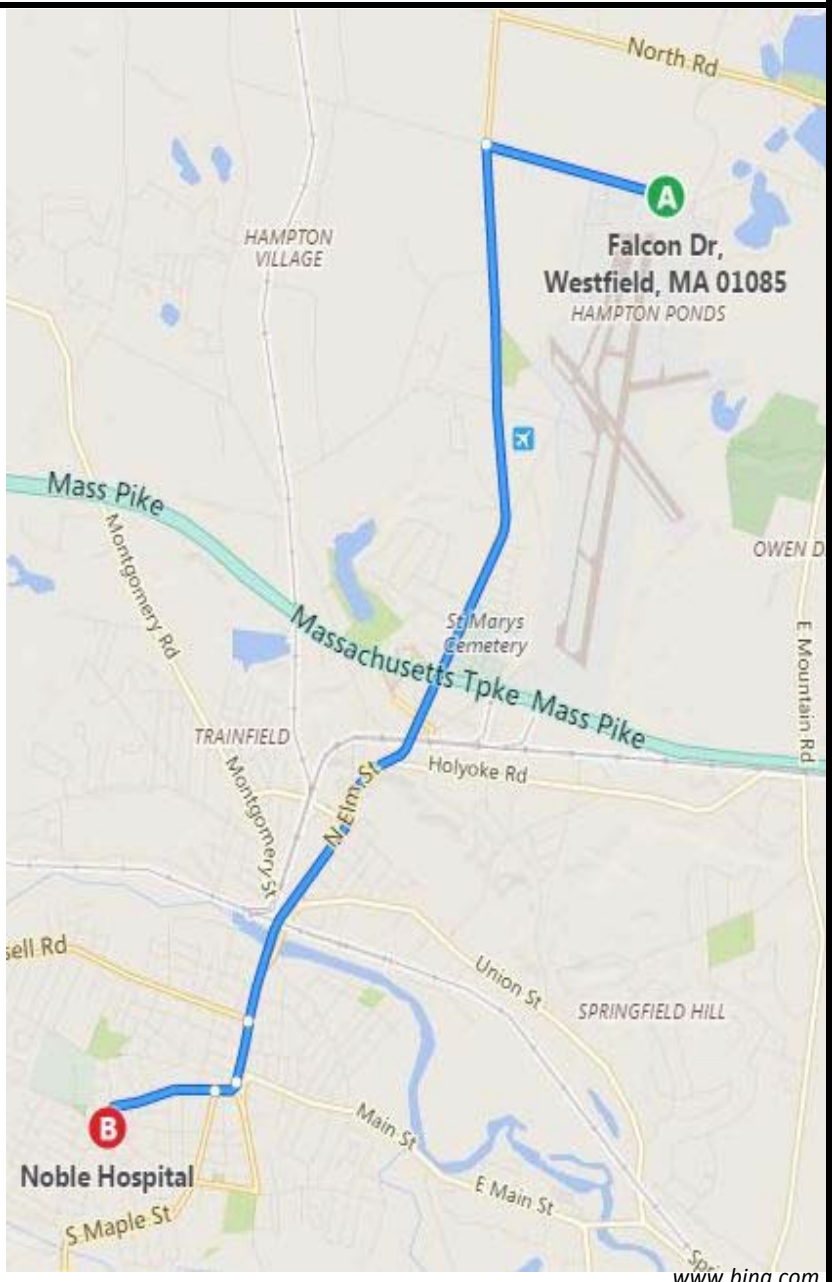
Turn left onto Mill St.

486 ft.

Turn left onto W. Silver St.

190 ft.

B - Arrive at 115 W. Silver St.



APPENDIX C

FIELD SAMPLING PLAN

FINAL FIELD SAMPLING PLAN

FY16 PHASE 1 REGIONAL SITE INSPECTIONS FOR PERFLUORINATED COMPOUNDS

104th FIGHTER WING
MASSACHUSETTS AIR NATIONAL GUARD
BARNES AIR NATIONAL GUARD BASE
WESTFIELD, MASSACHUSETTS

Contract #: W9133L-14-D-0002

Delivery Order 0006

Amec Foster Wheeler Project #: 2-9133-0006

April 2017

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TABLE OF CONTENTS

TABLES

ATTACHMENTS

ACRONYMS

Amec Foster Wheeler	Amec Foster Wheeler, Environment & Infrastructure, Inc.
AFFF	Aqueous Film Forming Foam
ANG	Air National Guard
BANGB	Barnes Air National Guard Base
bgs	Below Ground Surface
Bldg.	Building
°C	Degrees Celsius
COC	Chain of Custody
DO	Dissolved Oxygen or Delivery Order
DoD	Department of Defense
DPT	Direct-Push Technology
EB	Equipment Blank
EDD	Electronic Data Deliverable
ELAP	Environmental Laboratory Accreditation Program
ERPIMS	Environmental Resources Program Info Management System
FB	Field Blank
FD	Field Duplicate or Fire Department
FID	Flame-ionization Detector
FM	Field Manager
FS	Fire Station
FSP	Field Sampling Plan
FSS	Fire Suppression System
Ft.	Feet/Foot
HASP	Health and Safety Plan
HDPE	High-Density Polyethylene
IDW	Investigation-Derived Waste
LDPE	Low Density Polyethylene
ml/min	Milliliters per Minute
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MW	Monitoring Well
NFA	No Further Action
NGB	National Guard Bureau
NTU	Nephelometric Turbidity Units
ORP	Oxidation-Reduction Potential
PA	Preliminary Assessment
PID	Photo-Ionization Detector
PCB	Polychlorinated biphenyl
PFAA	Perfluoroalkyl Acid
PFAS	Per- and Polyfluoroalkyl Substances
PFBS	Perfluorobutanesulfonic Acid
PFC	Perfluorinated Compounds
PFHpA	Perfluoroheptanoic Acid
PFHxS	Perfluorohexanesulfonic Acid
PFNA	Perfluorononanoic Acid
PFOS	Perfluorooctanesulfonic Acid

ACRONYMS (continued)

PFOA	Perfluorooctanoic Acid
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
PRL	Potential Release Location
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RFP	Request for Proposal
SI	Site Inspection
SOP	Standard Operating Procedure
SVOC	Semivolatile Organic Compound
TCLP	Toxicity Characteristic Leaching Procedure
TW	Temporary Well
UCMR	Unregulated Contaminant Monitoring Rule
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
WP	Work Plan

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1.0 INTRODUCTION

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler) has been 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. This Field Sampling Plan (FSP) has been prepared to describe the procedures and activities to be conducted during performance of SI field sampling activities at Barnes Air National Guard Base (BANGB) located in Westfield, Massachusetts [see Figure 1 of the SI Work Plan (Amec Foster Wheeler, 2017)].

To streamline reporting and discussion of PFC sampling, these compounds will hereafter be referred to collectively as Perfluoroalkyl Acids (PFAA).

1.1 Project Purpose and Scope

The purpose of the SI is to determine whether PFAAs are present in soil, groundwater, and sediment from potential historic releases of Aqueous Film Forming Foam (AFFF) at the BANGB. Based on locations where AFFF was potentially used or stored, eight Potential Release Locations (PRLs) were identified at the Base in the Preliminary Assessment (PA) Site Visit Report (BB&E, 2016). Due to findings of no known AFFF release at PRL 2 [former FTA-06 (IRP Site 6)] documented in the PA, no further action (NFA) was recommended for this area. The PRLs are illustrated on Figure 3 of the SI Work Plan, and the SI summary is presented as **Table 1** of this FSP.

The objective of this FSP is to describe the procedures for the collection of field samples and measurements which are appropriate to inspect soil, groundwater, surface water, and sediment for the presence or absence of PFAA, specifically the six per- and polyfluoroalkyl substances (PFAS) included on the Third Unregulated Contaminant Monitoring Rule (UCMR 3) list. Included are perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), perfluoroheptanoic acid (PFHpA), and perfluorobutanesulfonic acid (PFBS).

This FSP is intended to be used in conjunction with the SI Work Plan (Amec Foster Wheeler, 2017) and the Quality Assurance Project Plan (QAPP; Amec Foster Wheeler, 2016), prepared concurrently with this FSP. The potential AFFF PRLs and sampling locations are shown on

Figures 3A through **3C** in the SI Work Plan. The specific objectives at each of the five PRLs included in the SI are described in the ensuing text:

PRL 1, Former FTA (IRP Site 1)

- Advance two soil borings (01SB01, 01SB02) using DPT for collection of one shallow (0-2 ft.) sample per boring (two samples total).
- Install one temporary monitoring well (TW-03) utilizing DPT, and collect one shallow groundwater sample.

PRL 3, Stormwater Drainage Basin

- Collect two sediment samples (03SD01, 03SD02) using hand augers, from within the stormwater drainage basin. Samples will be collected from a depth of 0-2 feet (ft.) below ground surface (bgs).
- Collect one shallow (water table) groundwater sample from existing permanent well MW-6.

PRL 4, Hangars 27A & 27B

- Advance three soil borings (04SB01, 04SB02, 04SB03) using DPT for collection of one shallow (0-2 ft.) and one deep (15 ft. bgs, or first encountered ground water) soil sample per boring (six samples total).
- Install one downgradient, temporary monitoring well (TW-02) utilizing DPT, and collect one shallow groundwater sample.

PRL 5, Former Fire Station, Bldg. 004

- Advance two soil borings (05SB01, 05SB02) using DPT for collection of one shallow and one deep soil sample per boring (four samples total).

PRL 6, Current Fire Station, Bldg. 040

- Advance three soil borings (06SB01, 06SB02, 06SB03) using DPT for collection of one

shallow and one deep soil sample per boring (six samples total).

- Install one downgradient, temporary monitoring well (TW-01) utilizing DPT, and collect one shallow groundwater sample.

PRL 7, Hush House

- Advance two soil borings (07SB01, 07SB02) using DPT for collection of one shallow and one deep soil sample per boring (four samples total).
- Install one downgradient, temporary monitoring well (TW-05) utilizing DPT, and collect one shallow groundwater sample.

PRL , Fire Department Equipment Test Area

- Advance two soil borings (08SB01, 08SB02) using DPT for collection of one shallow (0-2 ft.) sample per boring (two samples total).
- Install one temporary monitoring well (TW-04) utilizing DPT, and collect one shallow groundwater sample.

1.2 Document Organization

This FSP presents the sampling objectives and outlines procedures for:

- Soil sample collection and field screening;
- Groundwater sample collection and field screening;
- Sediment sample collection and field screening;
- Waste characterization sampling;
- Laboratory analyses;
- PFAA-specific field procedures and considerations;
- Laboratory analytical program;
- Quality Assurance/Quality Control (QA/QC);
- Sample packaging and shipping;
- Field equipment calibration; and
- Documentation.

Field work will be conducted in accordance with the Site Health and Safety Plan (HASP), provided

in Appendix B of the SI Work Plan [WP (Amec Foster Wheeler, 2017)], and with the Standard Operating Procedures (SOP) for PFAAs provided in Attachment E of the QAPP (Amec Foster Wheeler, 2016), which is provided in Appendix D of the SI Work Plan.

Blank field reporting forms, such as soil boring logs and monitoring well construction diagrams, are provided in **Attachment A** of this FSP.

1.3 Project Setting

A detailed description of the site location and project setting for the PRLs located at BANGB, in Westfield, Massachusetts is described in Sections 1 and 4 of the SI Work Plan and depicted on Figures 1 through 4 of the SI Work Plan (Amec Foster Wheeler, 2017).

2.0 SAMPLING AND ANALYSIS PLAN

2.1 Soil Sampling

Soil samples will be collected in accordance with Amec Foster Wheeler's Soil Sampling Standard Operating Procedure (AFW-02) developed specifically for collecting soil samples for analysis of PFAAs, and included as Attachment E of the QAPP (Amec Foster Wheeler, 2016). Reusable equipment will be decontaminated prior to and between sample locations as described in **Section 2.7.5**.

Soil core samples will be collected directly from single-use, polyvinyl chloride (PVC) liners. After retrieval from the core barrel, soil cores will be inspected and screened as described below in **Section 2.1.1**.

Shallow soil samples will be collected from the upper two feet of soil, directly beneath asphalt or pavement, if present. Deep soil samples will be collected from the 2-ft interval above the water table. If refusal occurs prior encountering to groundwater, the deep sample will be collected from the bottom 2 ft. of the soil boring. If groundwater is not encountered in the upper 15 ft. of the boring, the deep sample will be collected from the bottom 2 ft. of the soil boring

Soil samples will be homogenized using clean stainless steel bowls and trowels, before being placed in laboratory-supplied containers. Samples will be immediately cooled with ice to less than 4 degrees Celsius (°C). New, disposable nitrile gloves will be donned prior to sample collection and will be worn throughout the sample collection process.

2.1.1 Field Screening

The sample sleeve will be opened lengthwise and the soil will be inspected for evidence of organic contamination (e.g., odor, staining, sheen, and free product). Soil characteristics will be logged in accordance with the Unified Soil Classification System (USCS). A blank soil boring log is presented in **Attachment A**. The boring logs will be prepared for each soil boring and will contain the following information:

- Project
- Date

- Boring number
- Driller
- Geologist/Scientist/Engineer
- Sample number
- Sample depth (from, to)
- Sample description (color, soil grain size, sorting, plasticity, strength, compaction, moisture, evidence of contamination, and general remarks)
- Depth to water

2.2 Groundwater Sampling

Groundwater samples will be collected in accordance with Amec Foster Wheeler's Groundwater Sampling SOP (AFW-03), developed specifically for collecting groundwater samples for analysis of PFAAs, and included as Attachment E of the QAPP (Amec Foster Wheeler, 2016). Reusable equipment will be decontaminated prior to and between sample locations as described in **Section 2.7.5**. Groundwater samples will be collected once groundwater parameters have achieved stabilization as described below in **Section 2.2.1**.

Groundwater samples will be collected using either a peristaltic pump or submersible pump and tubing. Water level measurements will be collected prior to placing the pump/tubing into the well, and measured again after placing the pump/tubing in the well. New or dedicated tubing will be used at each location. The pump/tubing will be lowered into the well to the depth of at least 2 ft. above the bottom of the well to prevent disturbance and re-suspension of sediment present in the bottom of the well. The well will be purged prior to sampling at a pump rate of 100 to 500 milliliters per minute (ml/min) with a steady flow rate maintained, such that drawdown of the water level within the well does not exceed a maximum allowable drawdown of 0.3 ft. Laboratory-supplied sample containers will be filled with minimal turbulence by allowing the groundwater to flow from the tubing gently down the inside of the container. Samples will be immediately cooled with ice to less than 4°C. New, disposable nitrile gloves will be donned prior to sample collection and will be worn throughout the sample collection process.

After sample collection is completed, the depth to water will be measured and recorded and the well will be closed and locked, except at temporary well locations, where the well casing will be removed and the well boring properly abandoned. A groundwater sampling log will be prepared

for each well sampled and contain the following information:

- Project
- Date
- Well number
- Type of well (temporary or permanent)
- Condition of the well
- Geologist/Scientist
- Depth to water
- Purge volumes (containerized for disposal)
- Field screening measurements
- Sample number
- Sample depth (from, to)
- General remarks

2.2.1 Field Screening

Field screening parameters (temperature, pH, dissolved oxygen [DO], specific conductance, oxidation-reduction potential [ORP], and turbidity) will be monitored and recorded approximately every five minutes during purging. The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive readings as follows:

- +/-0.1 for pH
- +/-3% for specific conductance (conductivity)
- +/-10 mv for ORP
- +/-10% for dissolved oxygen and turbidity, and <50 Nephelometric Turbidity Units (NTU)

If these parameters do not stabilize and five well volumes have been purged, or the well goes dry, the well will be considered stabilized and ready for sample collection when there is enough water volume to collect the samples.

2.3 Sediment Sampling

Sediment samples will be collected in accordance with Amec Foster Wheeler's Sediment Sampling SOP (AFW-07) included as Attachment E of the QAPP (Amec Foster Wheeler, 2016). Reusable equipment will be decontaminated prior to and between sample locations as described

in **Section 2.7.5**.

Samples will be collected from the upper 2 ft. of sediment utilizing a hand auger, or similar sampling device constructed of stainless steel. After retrieval from the sampling device, sediment will be transferred to a clean stainless steel bowl for inspection and screened as described in **Section 2.3.1**.

Sediment samples will be homogenized using clean stainless steel bowls and trowels before being placed in laboratory-supplied containers, then immediately cooled with ice to less than 4 degrees °C. New, disposable nitrile gloves will be donned prior to sample collection and will be worn throughout the sample collection process.

2.3.1 Field Screening

Sediment characteristics will be logged in accordance with the Unified Soil Classification System. Sediment will also be inspected for evidence of organic contamination (i.e., odor, staining, sheen, and free product). A sediment log will be prepared for each boring and will contain the following information:

- Project
- Date
- Location ID
- Geologist/Scientist/Engineer
- Sample number
- Sample depth (from, to)
- Sample description (color, soil grain size, sorting, plasticity, strength, compaction, moisture, evidence of contamination, and general remarks)

2.4 Surface Water Sampling

Surface water is not typically present at BANGB; therefore, collection of surface water samples is not included in the scope of the SI at BANGB.

2.5 Waste Characterization Sampling

After completion of sampling activities, waste characterization samples will be collected from 55-gallon drums containing Investigative-Derived Waste (IDW). Representative composite samples will be collected for both solid and liquid IDW. Samples will be placed in laboratory-

supplied containers and immediately cooled with ice to less than 4°C. New, disposable nitrile gloves will be donned prior to sample collection and will be worn throughout the sample collection process.

2.6 Laboratory Analyses

Soil, groundwater, and sediment samples will be analyzed for PFAS compounds on the UCMR 3 list by Modified United States Environmental Protection Agency (USEPA) Method 537.1, as described in **Table 1**.

Waste characterization samples will be analyzed for Toxicity Characteristic Leaching Procedure (TCLP) Resource Conservation and Recovery Act (RCRA) metals, Volatile Organic Compounds (VOCs), Semi-volatile Organic Compounds (SVOCs), and total Polychlorinated Biphenyls (PCBs), or as required by the disposal facility. Waste characterization samples will be collected in accordance with the methods outlined in the QAPP (Amec Foster Wheeler, 2016).

Containers will be labeled and the labels will provide the following information, if applicable:

- Site name
- Sample identification
- Date and time of sample collection
- Name of sampler
- Sample preservation
- Type of analysis

2.7 Field Procedures and Considerations

The following are procedures and considerations to be made during field activities when assessing potential PFAA releases. A summary of the prohibited and acceptable items for PFAA investigation areas is included in Amec Foster Wheeler's PFAA-Specific SOP Procedures (AFW-01) included as Attachment E of the QAPP (Amec Foster Wheeler, 2016). The Field Manager shall review this table with field team members and subcontractors daily, prior to the commencement of field work to ensure compliance, and complete the Daily PFAA Protocol Checklist included in the AFW-01 SOP.

2.7.1 Field Equipment & Supplies

The following list contains commonly used field items which are **prohibited** from within work zones.

- Teflon®-containing materials (e.g. Teflon® tubing, bailers, tape, plumbing paste, or other Teflon® materials).
- Waterproof field books other than Rite in the Rain® brand.
- Plastic clipboards, binders, or spiral hard cover notebooks.
- Post-It® notes.
- Markers other than Sharpie® brand.
- Chemical (blue) ice packs. This includes use for the storage of food and/or samples.
- Water resistant, waterproof, or stain resistant clothing. Field clothing made of synthetic and natural (preferably cotton) are acceptable. Field clothing should be laundered without the use of fabric softener. Do not wear new clothing until it has been washed at least 6 times prior to use.
- Gore-Tex™ materials, including in clothing and boots.
- Laboratory-provided sample containers containing Teflon® materials.

The following list contains commonly used field items which are **permitted** for field sampling activities.

- High-density polyethylene (HDPE), low-density polyethylene (LDPE), and silicon materials, provided they are not stored in containers with PFAA-containing materials.
- Acetate or PVC sample liners for direct-push technology or during conventional drilling.
- Peristaltic pumps are preferred for groundwater sample collection at depths shallower than 25 feet. Amec Foster Wheeler will use ProActive SS Pumps with PVC leads or Geotech SS Geosub pumps for groundwater sample depths greater than 25 feet. Grundfos RediFlo pumps (or similar) may only be used due to pumping limitations (i.e. >150 feet deep) of ProActive or Geotech pumps.
- Rite in the Rain® products are the only waterproof field books that may be used. To avoid plastic coatings or glue materials, do not use other brands of waterproof field books. If Rite in the Rain® products are not available, field reports will be documented on loose paper secured on Masonite or aluminum clipboards.
- Pens, pencils, and sharpies. Pens are preferred and will be used when documenting field activities in the field log and on field forms as well as sample containers and chain of

custody.

- Safety footwear will consist of steel-toe boots made with polyurethane and PVC, untreated leather boots, or well-worn leather boots. Newer leather boots may be worn in they are covered with polypropylene, polyethane, or PVC boot covers.
- Disposable nitrile gloves, which must be worn during sampling and handling of related equipment (e.g., equipment transportation, decontamination, operation).

2.7.2 Personal Protective Equipment

Personal protective equipment (PPE), including safety-toe boots, reflective vest, safety glasses, hard hat, hearing protection, and disposable nitrile gloves must be worn as specified in the HASP, included as Appendix B of the SI Work Plan. Safety-toe boots must meet the requirements specified in **Section 2.7.1**. Further, a new pair of nitrile gloves shall be donned prior to the following activities at each sample location:

- Decontamination of re-usable sampling equipment;
- Prior to contact with sample bottles or water containers;
- Insertion of anything into the well;
- Insertion of silicon tubing into the peristaltic pump;
- Completion of monitoring well purging, prior to sample collection;
- Handling of any quality assurance/quality control samples including field blanks and equipment blanks.

2.7.3 Sample Containers

Different laboratories may supply sample collection containers of varying sizes dependent on the type of media to be sampled (e.g., soil, groundwater, etc.). All PFAA samples should be collected in polypropylene or HDPE bottles. The screw cap will be made of polypropylene or HDPE and may be lined or unlined. However, if lined, the liner may not be made of Teflon® or contain PFAAs. Glass containers are not to be used when collecting PFAA samples due to potential loss of analyte through adsorption. Glass containers may be used for waster characterization samples as appropriate. Container labels will be completed using pens after the caps have been placed back on each bottle.

2.7.4 Wet Weather

Field sampling occurring during wet weather (e.g., rainfall and snowfall) should be conducted

while wearing the appropriate clothing that will not pose a risk of cross-contamination. Teams will avoid synthetic gear that has been treated with water repellant finishes containing PFAAs. Use rain gear made from polyurethane, vinyl, and wax or rubber-coated materials. Teams should consider the use of a gazebo tent, which can be erected overtop of the sample location and provide shelter from inclement weather. It should be noted that the canopy material is likely a treated surface and should be handled as such; therefore, gloves should be worn when setting up and moving the tent, changed immediately afterwards and further contact with the tent should be avoided until all sampling activities have been finished and the team is ready to move on the next sample location. Further, care should be taken when transferring samples from outside the tent to inside to prevent cross contamination, which would require passing beneath the drip edge.

2.7.5 Decontamination Procedures

Field sampling equipment (e.g. water level indicators, pumps, bowls, trowels, dip samplers, hand augers, and other downhole equipment) will require cleaning prior to initial use, and between samples. Alconox® and Liquinox® soap is acceptable for use since their safety data sheets do not list fluoro-surfactants as an ingredient. However, Decon 90 will not be used during decontamination activities. Water used for the final rinse during decontamination of sampling equipment will be laboratory certified PFAA-free water. For larger equipment (e.g. drill rig and downhole drilling and sampling equipment), decontamination will be conducted with potable water using a high-pressure washer and then rinsed using potable water.

2.7.6 Personal Hygiene

Field personnel will not use cosmetics, moisturizers, hand cream, or other related products as part of their personal cleaning/showering routine on the morning of a sampling event, unless the products are applied to a part of the body that will be covered by clothing. These products may contain surfactants and represent a potential source of PFAAs.

Many manufactured sunblock and insect repellants contain PFAAs and should not be brought or used on-site. Sunblock and insect repellants that are used on-site should consist of 100% natural ingredients, unless previously vetted by the project chemist.

For washroom breaks, field personnel will leave the exclusion zone and then remove gloves and overalls. Field personnel should wash as normal with extra time for rinsing with water after soap

use. When finished washing, the use of a mechanical dryer is preferred and the use of paper towels for drying is to be avoided if possible.

2.7.7 Food Considerations

No food or drink shall be brought on-site, with the exception of bottled water and hydration drinks (i.e. Gatorade® and Powerade®), which will only be allowed to be brought and consumed within the staging area.

2.7.8 Visitors

Visitors to the investigation are asked to remain outside of the exclusion zone during sampling activities.

2.8 Laboratory Analytical Program

The analytical program will consist of off-site laboratory analysis and QC samples to evaluate data quality. The QC sampling program is detailed in **Section 2.9**, and generally consists of field duplicates (one for each 10 samples), Matrix Spike/Matrix Spike Duplicate (MS/MSDs) (one for each 20 samples), rinsate samples (daily when dedicated equipment not used), and field blanks (one per lot of “PFAA-free” deionized water).

The laboratory will report full data packages which include all necessary information for the recalculation of analytical results. Level II validation will be performed on 90% of the analytical results, and Level IV validation performed on 10% of the results. The laboratory will also provide an Environmental Resources Program Information Management System (ERPIMS) compliant electronic data deliverable (EDD). Laboratory analysis will be conducted by a Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP)-certified laboratory on soil and groundwater for the six PFAS congeners included in the UCMR 3 list, including PFOS, PFOA, PFNA, PFHxS, PFHpA, and PFBS. This FSP is intended to be used in conjunction with the SI Work Plan (Amec Foster Wheeler, 2017) and the QAPP (Amec Foster Wheeler, 2016), prepared concurrently with this FSP. The data generated from this analytical program will be validated using USEPA approved protocols for data validation. The analytical program is described in greater detail in the QAPP presented in Appendix D of the Site Inspection Work Plan (Amec Foster Wheeler, 2017).

2.9 Quality Assurance/Quality Control

Sampling activities will follow the investigation procedures and quality assurance/quality control protocols stated in the QAPP presented in Appendix D of the SI Work Plan. Investigation activities including documentation, sampling, decontamination, field screening, and analysis will be in accordance with this SI Work Plan and ANG protocols. Additional QA/QC measures to be accomplished are discussed herein.

2.9.1 Soil QA/QC Samples

The following QA/QC samples will be collected as part of the soil investigation and sampling procedures for the PRLs.

Matrix Spike/Matrix Spike Duplicate: One MS sample and one MSD sample will be collected for every 20 (or less) soil samples collected. MS/MSD analysis is conducted to understand the influence the matrix has on analyte recovery during analysis.

Equipment Blank: One equipment blank will be prepared each day during the soil investigation. The equipment blank will be prepared from the final rinse of one of the decontamination events for the sampling equipment.

Field Blank: One field blank will be prepared each day during the soil sampling. The field blank will consist of the distilled or deionized water used for decontamination. The purpose of the field blank is to demonstrate that the water used for decontaminating the sample tools and equipment does not contain potential contaminants, which may affect the analytical values of the samples.

Field Duplicate Sample: One field duplicate sample will be collected for every 10 soil samples during the soil sampling. The field duplicates will be prepared by thoroughly mixing the soil from a sample location and then splitting the soil into two samples for individual laboratory analysis.

2.9.2 Sediment QA/QC Samples

The following QA/QC samples will be collected as part of the sediment investigation and sampling procedures for the PRL sites.

Matrix Spike/Matrix Spike Duplicate: One MS sample and one MSD sample will be collected for every 20 (or less) sediment samples collected. MS/MSD analysis is conducted to understand the influence the matrix has on analyte recovery during analysis.

Equipment Blank: One equipment blank will be prepared each day during the sediment

investigation. The equipment blank will be prepared from the final rinse of one of the decontamination events for the sampling equipment.

Field Blank: One field blank will be prepared each day during the sediment sampling. The field blank will consist of the distilled or deionized water used for decontamination. The purpose of the field blank is to demonstrate that the water used for decontaminating the sample tools and equipment does not contain potential contaminants, which may affect the analytical values of the samples.

Field Duplicate Sample: One field duplicate sample will be collected for every 10 sediment samples during the soil sampling. The field duplicates will be prepared by thoroughly mixing the sediment from a sample location and then splitting the sediment into two samples for individual laboratory analysis

2.9.3 Groundwater QA/QC Samples

The following QA/QC samples will be collected as part of the groundwater investigation and sampling procedures at the PRL areas, and the base boundary wells.

Matrix Spike/Matrix Spike Duplicate: One MS sample and one MSD sample will be collected for every 20 (or less) groundwater samples collected. MS/MSD analysis is conducted to understand the influence the matrix has on analyte recovery during analysis.

Equipment Blank: One equipment blank per day will be prepared during the groundwater sampling event. The equipment blank will be prepared from the final rinse of one of the decontamination events for the sampling equipment.

Field Blank: One field blank per day will be prepared during the groundwater sampling event. The field blank will consist of the distilled or deionized water used for decontamination. The purpose of the field blank is to demonstrate that the water used for decontaminating the sample tools and equipment does not contain potential contaminants, which may affect the analytical values of the samples.

Field Duplicate Sample: One field duplicate sample will be collected for every 10 groundwater samples during the sampling event. The field duplicates will be taken directly after the primary sample container has been filled before the pump has been removed from the well.

2.10 Sample Packing and Shipping

Immediately following sample collection, sample containers shall be placed in an insulated cooler. Plastic bags containing ice will be placed in coolers so that samples will be maintained at or below 4°C. Samples will be shipped as soon as possible to allow the laboratory to meet holding times for analyses. Prior to shipment, ice will be replaced to keep samples at or near 4°C during transport.

Glass containers will be wrapped with bubble wrap or other appropriate padding to prevent breakage during transport. The chain-of-custody (COC) will be placed in a sealable plastic bag and taped to the inside cover of the cooler. The cooler drain plug will be taped over to prevent opening, if applicable. Signed and dated custody seals will be placed in two locations such that they will be broken if the cooler is opened. Packing tape will be used to encircle the sample cooler in two locations.

2.11 Field Equipment Calibration

Calibration of field instruments will be performed at the intervals specified by the manufacturer, or more frequently as conditions require. A water quality meter will be used for the collection of groundwater samples and will include a pH/ORP meter, thermometer, specific conductivity meter, turbidity meter, and dissolved oxygen meter.

2.11.1 Water Quality Meter Calibration

The pH/ORP meter will be calibrated with standard buffer solutions prior to initiation of field activities. In the field, the meter will be calibrated daily with standard buffers before use. Thereafter, the meter will be checked against two buffers as deemed necessary by the Field Manager (FM). Calibration procedures and frequency will be recorded in a field logbook.

The thermometer will be calibrated by the manufacturer. No field calibration procedure is necessary.

The conductivity cells of the specific conductivity meter will be cleaned and checked against known conductivity standards prior to field activities. In the field, the instrument will be checked daily with calibration standards.

The turbidity meter will be calibrated daily (and at the beginning of each sampling event) using one or two standards provided by the manufacturer.

The DO meter will be calibrated daily and at the beginning of each sampling event.

2.11.2 Photo-Ionization Detector/Flame-Ionization Detector

If used, the photo-ionization detector (PID)/flame-ionization detector (FID) will be calibrated daily per the manufacturer's specifications prior to initiation of field activities. In the field, the meter will be calibrated daily before use. Calibration procedures and frequency will be recorded in a field logbook.

2.12 Documentation

To produce reliable field and laboratory data, certain measures will be taken with regard to documentation, field and laboratory checks, and sample handling procedures to show that data has been collected, documented, and managed in a consistent manner.

2.12.1 Daily QC Reports

Fieldwork and daily on-site inspections of field equipment will be recorded on the Daily QC Report maintained by the FM. Daily inspections of on-site field equipment will include drill rigs, monitoring equipment, and sampling devices. Field work descriptions will include the number and names of personnel working on-site, weather conditions, work activities, field measurements, and changes to scope. Daily QC Reports will also include equipment calibration logs as well as health and safety monitoring information.

2.12.2 Field Logbooks

Dedicated field logbooks will be maintained by the FM throughout the duration of the SI. Pertinent information regarding on-site activities will be recorded in the field logbooks. Pertinent information includes, at a minimum, dates, names and details of on-site personnel, detailed descriptions of field activities, sampling activities, field measurements, sample locations, equipment calibrations, and problems encountered. Information recorded in the field logbooks will be entered with an indelible black or blue ink pen. Logbooks shall be permanently bound with sequentially-numbered pages. Each page will be signed and dated by the personnel documenting the on-site activities. Corrections shall be made by crossing out the error with a single line, and initialing and dating the correction.

2.12.3 Sample Identification

Amec Foster Wheeler personnel will perform sample labeling and identification in a consistent

manner so that field samples are properly labeled and traceable. A unique alpha-numeric sample identification system will be used for sample collected using the following procedure for each matrix.

Soil and Sediment Samples

The following nomenclature shall be used for soil samples (collected from soil borings) and sediment samples (collected from drainage structures, oil/water separators, retention basins, surface water bodies, etc.). Soil Sample Example: BARNS-01-SB01-042817-06-08-FD. Sediment Sample Example: BARNS-01-SD01-042817-06-08-FD.

- **BARNS**-01-SB01-042817-06-08-FD: 5 digit ERPIMS installation code;
- BARNS-**01**-SB01-042817-06-08-FD: 2 digit PRL location;
- BARNS-01-**SB01**-042817-06-08-FD: Sample type and location within PRL (SB = Soil sample and SD = Sediment sample);
- BARNS-01-SB01-**042817**-06-08-FD: Date in MMDDYY format;
- BARNS-01-SB01-042817-**06**-08-FD: Top of sample interval measured from the land surface or top of sediment;
- BARNS-01-SB01-042817-06-**08**-FD: Bottom of sample interval measured from the land surface or top of sediment;
- BARNS-01-SB01-042817-06-08-**FD**: Field duplicate. Leave blank for primary samples and MS/MSD samples.

Groundwater Samples

The following nomenclature shall be used for groundwater samples collected from existing permanent monitoring wells and temporary monitoring wells. Example: BARNS-GW-TW01-042817-FD.

- **BARNS**-GW-TW01-042817-FD: 5 digit ERPIMS installation code;
- BARNS-**GW**-TW01-042817-FD: Groundwater sample. PRL location not used for groundwater samples because some locations are linked to multiple PRLs, and others are base-boundary wells;
- BARNS-GW-**TW01**-042817-FD: Sample type and location (TW = Temporary monitoring well. MW = Permanent monitoring well). Hyphens included in existing

permanent well IDs (e.g. MW-06) will be removed in the sample ID (e.g. BARNS-GW-MW06-042817);

- BARNS-GW-TW01-**042817**-FD: Date in MMDDYY format;
- BARNS-GW-TW01-042817-**FD**: Field duplicate. Leave blank for primary samples and MS/MSD samples.

Field QC Samples

The following nomenclature shall be used for field QC samples, including field blanks and equipment blanks. Example: BARNS-FB-ATJ-042817.

- **BARNS**-FB-ATJ-042817: 5 digit ERPIMS installation code;
- BARNS-**FB**-ATJ-042817: Sample type. FB = Field Blank. EB = Equipment blank;
- BARNS-FB-**ATJ**-042817: Sampler initials;
- BARNS-FB-ATJ-**042817**: Date in MMDDYY format.

Waste Characterization Samples

The following nomenclature shall be used for waste characterization samples, including solid and liquid IDW. Example: BARNS-IDW-SO-042817.

- **BARNS**-IDW-SO-042817: 5 digit ERPIMS installation code;
- BARNS-**IDW**-SO-042817: IDW Sample;
- BARNS-IDW-**SO**-042817: Sample type. SO = Solid. AQ = aqueous;
- BARNS-IDW-SO-**042817**: Date in MMDDYY format.

2.12.4 Chain of Custody

COC procedures will be used to establish, document, and maintain custody of field samples. A complete COC record will accompany samples while in the field, during shipment to the laboratory, and during analysis. When transferring samples, the individuals relinquishing and receiving will sign, date, and note the time on the COC record. Two copies (including the original) of the COC record will accompany the samples to the laboratory. One copy of the COC record will remain with the field team. The following information will be provided on the COC form:

- Site name
- Sample identification
- Date and time of sample collection

- Name and signature of sampler
- Sample preservation
- Matrix
- Type of analysis
- Signature(s) of individual involved in sample transfers
- Delivery of samples to the laboratory and storage at 4°C or below

2.12.5 Photo Log

Photographs will be taken to document field activities and site conditions. A description of each photograph will be recorded in the field logbook.

2.12.6 Project File

Incoming materials related to the project including sketches, correspondence, authorization, and logs will be forwarded to the Project Manager. These documents will be placed in the project file as soon as is practical. If correspondence is required for reference by project personnel, a copy will be made rather than retaining the original. Records will be legible and easily identifiable. Examples of the types of records that will be maintained in the project file are:

- Field documents;
- Correspondences;
- Photographs;
- Laboratory data;
- Reports; and,
- Procurement agreements.

Outgoing project correspondences and reports will be reviewed and signed by the Project Manager prior to transmittal. The office copy of outgoing documents will bear distribution information.

3.0 REFERENCES

Amec Foster Wheeler, 2016. *FY 16 Phase 1 Regional Site Inspections for Perfluorinated Compounds Quality Assurance Project Plan*, *Multiple Air National Guard Installations.* December, 2016.

Amec Foster Wheeler, 2017. *FY 16 Draft Final Phase 1 Regional Site Inspections for Perfluorinated Compounds Work Plan, 104th Fighter Wing, Massachusetts Air National Guard, Barnes Air National Guard Base.* January, 2017.

BB&E, 2016. *Final Perfluorinated Compounds Preliminary Assessment Site Visit Report, Massachusetts Air National Guard, Barnes Air National Guard Base, Westfield, Massachusetts. January* 2016.

USEPA, 2012. *Federal Register, Volume 77, No. 85, Revisions to the Unregulated Contaminant Monitoring Rule (UCMR 3) for Public Water Systems; Final Rule.* May 2, 2012.

TABLES

Table 1
Site Inspection Summary
104th Fighter Wing, Massachusetts Air National Guard
Barnes Air National Guard Base, Westfield, Massachusetts

PRL Name	Location Type	Confirmed (C) or Suspected (S) Release	SBs	Wells		No. Samples				Comments
				EW	TW	SO	GW	SW	SD	
1. Former FTA-01 (IRP Site 1)	Former FTA	S	2	0	1	2	1	0	0	Soil samples will be collected from 0-2. Deeper (i.e., 13-15 feet) samples are not proposed at this PRL.
3. Storm-Water Drainage Basin (IRP Site 4)	Storm Water Outfall	S	0	1	0	0	1	0	2	Received AFFF discharges from flight line area, trench drains in hangars and buildings on flight line. Basin typically dry; no surface water samples.
4. Hangars 27A and 27 B	Hangar with AFFF Fire Supression System (FSS)	S	3	0	1	6	1	0	0	No documented AFFF releases.
5. Former Fire Station [building (bldg.) 004]	Fire Station (FS)	S	2	0	0	4	0	0	0	Floor drains in this former fire station likely went to drywell.
6. Current Fire Station (Bldg 040 S)	Fire Station	S	3	0	1	6	1	0	0	No documented AFFF releases. No floor drains present.
7. Hush House	Hangar with AFFF FSS	C	2	0	1	4	1	0	0	Release during fire suppression test
8. Fire Department Equipment Test Area	Former FD Equipment Test Area	C	2	0	1	2	1	0	0	Soil samples will be collected from 0-2 feet. Deeper (i.e., 13-15 feet) samples are not proposed at this PRL.
Base Boundary Wells			0	0	0	0	0	0	0	Five TWs and one EW sampled are dual-purpose wells [a].
Total			14	1	5	24	6	0	2	

Notes:

EW = Existing Well

TW = Temporary Well

SO = Soil

GW = Groundwater

SW = Surface Water

SD = Sediment

[a] - Dual purpose wells are intended to assess groundwater quality downgradient from the PRL, and at the base boundary. Dual purpose wells are counted in the associated PRL row in the above table.

Table 2
Sample Summary
104th Fighter Wing, Massachusetts Air National Guard
Barnes Air National Guard Base, Westfield, Massachusetts

PRL Name	Sample Location Type	Location ID	Number of Samples[1]	Sample Collection Depth (ft. bgs)	Analysis
1. Former FTA-01 (IRP Site 1)	Temporary Well	TW-03	1	Middle of saturated well screen	PFASs (UCMR 3 List)3 Method 537.1 Modified
	Soil Boring	01SB01 01SB02	1 1	0-2 ft. 0-2 ft.	
3. Storm-Water Drainage Basin (IRP Site 4)	Sediment	03SD01 03SD02	1 1	0-2 ft.	PFASs (UCMR 3 List)[3] Method 537.1 Modified
	Existing Permanent Well	MW-6	1	Middle of saturated well screen	
4. Hangars 27A and 27B	Soil Boring	04SB01 04SB02 04SB03	2 2 2	0-2 ft., 13-15 ft.[2]	PFASs (UCMR 3 List)[3] Method 537.1 Modified
	Temporary Well	TW-02	1	Middle of saturated well screen	
5. Former Fire Station (Bldg. 004)	Soil Boring	05SB01 05SB02	2 2	0-2 ft. and 13-15 ft.[2]	PFASs (UCMR 3 List)[3] Method 537.1 Modified
6. Current Fire Station (Bldg. 040)	Soil Boring	06SB01 06SB02 06SB03	2 2 2	0-2 ft. and 13-15 ft.[2]	PFASs (UCMR 3 List)[3] Method 537.1 Modified
	Temporary Well	TW-01	1	Middle of saturated well screen	
7. Hush House	Soil Boring	07SB01 07SB02	2 2	0-2 ft. and 13-15 ft.[2]	PFASs (UCMR 3 List)[3] Method 537.1 Modified
	Temporary Well	TW-05	1	Middle of saturated well screen	
8. Fire Department Equipment Test Area	Temporary Well	TW-04	1	Middle of saturated well screen	PFASs (UCMR 3 List)3 Method 537.1 Modified
	Soil Boring	08SB01 08SB02	1 1	0-2 ft. 0-2 ft.	

Notes:

1 - Sample count excludes QA/QC samples.

2 - If the water table is encountered shallower than 15 ft. bgs, then the deep soil sample (i.e. 13-15') will be collected from the two-foot interval directly above the water table.

3 - Analysis includes the six per- and polyfluoroalkyl Substances (PFAS) congeners included on the Third Unregulated Contaminant Monitoring Rule (UCMR 3) list; including perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), perfluoroheptanoic acid (PFHpA), and perfluorobutanesulfonic acid (PFBS).

4 – Base boundary well

ATTACHMENT A

Field Forms

FIELD ACTIVITY DAILY LOG

Project Name:	Phase 1 Regional Site Inspections for Per-Fluorinated Compounds at Multiple Air National Guard Installations	**Project Number:**	291330006
Contract:	W9133L-14-D-0002	**Task Order:**	0006
Installation:		**Investigation Area:**	
Technician Name:		**Date and Time:**	
Personnel Onsite:			
Weather Conditions:			

Description of Daily Activities and Events:

List Samples Collected:

Deviation from Plans:

Visitors on Site:	**Important Telephone Calls / Photos Taken:**	**Technician Signature:**
		Technician Name (print)**:**

QA/QC'd by: **QA/QC Date:**

ATTACHMENT 1 TO SOP AFW-01
DAILY PFC PROTOCOL CHECKLIST

Project Name:	Phase 1 Regional Site Inspections for Per-Fluorinated Compounds at Multiple Air National Guard Installations	**Project Number:**	291330006
Contract:	W9133L-14-D-0002	**Task Order:**	0006
Installation:		**Weather (temp./precipitation):**	
Site Name:			
Field Manager:		**Date and Time:**	

Field Clothing and PPE (as applicable):

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

Field Equipment:

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

Sample Containers:

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

Wet Weather (as applicable):

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

Equipment Decontamination:

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

Food Considerations:

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

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

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

Field Manager Signature:

Field Manager Name (print)**:**

QA/QC'd by: **QA/QC Date:**

GRAB SAMPLE COLLECTION LOG

Project Name:	Phase 1 Regional Site Inspections for Per-Fluorinated Compounds at Multiple Air National Guard Installations	**Project Number:**	291330006
Contract:	W9133L-14-D-0002	**Task Order:**	0006
Installation:		**Date:**	
Technician(s):		**Location ID(s):**	
Field Parameters Collected?		**If No, Provide Explanation:**	

Time	Rate	Temp. (°C) ±0.5°C	pH (SU) ±0.1	Specific Electrical Conductance (mS/cm) ±3%	DO (mg/L) ±10%	ORP (mV) ±10%	Turbidity (NTU) ±10% and <10 NTU	Cum. Vol (gal)	Comments/Observations During Purging (color, sediment, odor, etc.)
Stability Reached (Y/N):				If No, Provide Explanation					
Final Values:									

Sample Information

Sample Type	Sample ID	Sample Date	Sample Time	Comments

Analysis/Method(s):		**Sample Container Type(s):**	
Preservative(s):			

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

Notes:

Technician Signature:

Technician Name (print)**:**

QA/QC'd by: **QA/QC Date:**

GROUNDWATER SAMPLING RECORD

Project Name:	Phase 1 Regional Site Inspections for Per-Fluorinated Compounds at Multiple Air National Guard Installations	**Project Number:**	291330006
Contract:	W9133L-14-D-0002	**Task Order:**	0006
Installation:		**Sample Technician:**	
Well ID:		**Date:**	
Initial Depth to Water (ft):		**Well Diameter (in):**	
Total Depth of Well (ft):		**1 Casing Volume (gal):**	
Method of Purging:		**3 Casing Volumes (gal):**	
Measuring Point (toc, tor, etc.):		**Pump Intake Depth (feet):**	

Time	Water Level (feet)	Flow Rate	Cum. Volume (gal.)	Temp. (°C)	pH (SU)	Specific Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Comments/Observations During Purging (color, sediment, odor, etc.)
		Stabilization Criteria		±0.5°C	±0.1	±3%	±10%	±10%	±10% and <10 NTU	
Final Values:										

Stability Reached (Y/N): If No, Provide Explanation

Sample ID:		**Method of Sampling:**	
QA/QC Samples (Yes/No):		**Sample Date:**	
Duplicate ID:		**Sample Collection Time:**	
Sample Container Type(s):		**Total Volume Purged (gal):**	
Preservative(s):		**Sample Depth (ft):**	
Analysis/Method(s):		**Depth to Water After Sampling (ft):**	

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

Calculations:

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

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

Technician Signature:

Notes:

Technician Name (print)**:**

QA/QC'd by: **QA/QC Date:**

OPEN HOLE BEDROCK WELL CONSTRUCTION FORM

Project Name: Phase 1 Regional Site Inspections for Per-Fluorinated Compounds at Multiple Air National Guard Installations

Project Number: 291330006

Contract Number: W9133L-14-D-0002

Task Order: 0006

Installation:

Location ID:

Drilling Subcontractor:

Well ID:

Drilling Personnel:

Date:

Technician Name:

Drilling Method:

Other Amec Foster Wheeler Representatives:

Type of Well:

Measuring Point:

TOC/TOR Difference (in):

Approximate Diameter of Borehole (in):

Depth to Water (ft):

During Drilling:

Date:

Post Development:

Date:

Water added during drilling (gal):

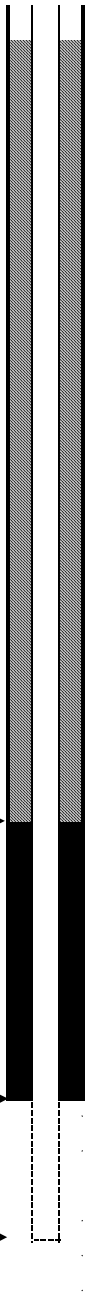
Water removed during development (gal):

Borehole Yield (gpm):

Bottom of Overburden / Top of Bedrock (ft):

Casing Depth (ft):

Bottom Depth (ft):



Surface Pad:

Type:

Length (ft):

Width (ft):

Thickness (in):

Well Casing:

Manufacturer:

Type/Material:

Diameter (in):

Annular Seal (above BRx):

Manufacturer:

Type:

Installation Method:

Annular Seal (below BRx):

Manufacturer:

Type:

Installation Method:

Notes:

Technician Signature:

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

Technician Name (print)**:**

QA/QC'd by:

QA/QC Date:

PUMPING TEST LOG

Project Name:	Phase 1 Regional Site Inspections for Per-Fluorinated Compounds at Multiple Air National Guard Installations	**Project Number:**	291330006
Contract:	W9133L-14-D-0002	**Task Order:**	0006
Installation:		**Start Date:**	
Sample Technician:		**End Date:**	
Other Representatives:		**Test Type:**	
Well ID:		**Transducer Serial No:**	
Screened Interval (ft):		**Initial DTW (ft):**	
Surveyed TOC (ft. AMSL):		**Total Well Depth (ft):**	

Date/Time	DTW (ft. bTOC)	Water Elevation (ft. AMSL)	Comments	Date/Time	DTW (ft. bTOC)	Water Elevation (ft. AMSL)	Comments

Instruments (Manufacturer, Model, and Serial No.):	**Notes:**	**Technician Signature:**
		Technician Name (print)**:**

QA/QC'd by: **QA/QC Date:**

SCREENED WELL CONSTRUCTION FORM

Project Name: Phase 1 Regional Site Inspections for Per-Fluorinated Compounds at Multiple Air National Guard Installations

Project Number: 291330006

Contract Number: W9133L-14-D-0002

Task Order: 0006

Installation:

Location ID:

Drilling Subcontractor:

Well ID:

Drilling Personnel:

Date:

Technician Name:

Drilling Method:

Other Amec Foster Wheeler Representatives:

Type of Well:

Measuring Point:

TOC/TOR Difference (in)

Approximate Diameter of Borehole (in):

Depth to Water (ft):

During Drilling:

Date:

Post Development:

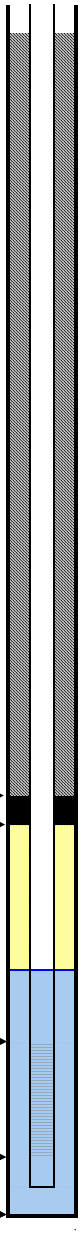
Date:

Hydrologic Unit: (circle one):

Unknown
Aquifer
Bedrock Aquifer
Perched Aquifer
Unsaturated Zone
Water Table Aquifer
Confining Layer/Aquiclude
Lower/Confined Aquifer

Water added during drilling (gal):

Water removed during development (gal):



Top of Bentonite Seal (ft):

Top of Filter Pack (ft):

Top of Screen Interval (ft):

Bottom of Screened Interval (ft):

Bottom of Filter Pack (ft):

Bottom of Borehole (ft):

Protective Casing:

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

Surface Pad:

- **Type:**
- **Length (ft):**
- **Width (ft):**
- **Thickness (in):**

Annular Seal (grout above well seal):

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

Bentonite Seal:

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

Filter Pack Material:

- **Manufacturer:**
- **Material:**
- **Size:**
- **Installation Method:**
- **Surging time:**

Well Casing (Riser):

- **Manufacturer:**
- **Type/Material:**
- **Length:**
- **Diameter (in):**

Well Screen:

- **Manufacturer:**
- **Type/Material:**
- **Diameter (in):**
- **Slot Size (in):**
- **Slot Type:**

Sump/End Cap:

Notes:

Technician Signature:

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

Technician Name (print)**:**

QA/QC'd by:

QA/QC Date:

SOIL SAMPLE COLLECTION LOG

Project Name:	Phase 1 Regional Site Inspections for Per-Fluorinated Compounds at Multiple Air National Guard Installations	**Project Number:**	291330006
Contract:	W9133L-14-D-0002	**Task Order:**	0006
Installation:		**Date:**	
Location ID:		**Technician:**	

Other Amec Foster Wheeler Representatives:

Sample ID	Sample Time	Sample Depth (ft)	USCS Symbol	Comments/Observations

Sample Collection Method:		**Analysis/Method(s):**	
Sample Container Type(s):		**Preservative(s):**	

Notes:

Technician Signature:

Technician Name (print)**:**

QA/QC'd by: **QA/QC Date:**

SAMPLE COLLECTION LOG
SEDIMENT / SURFACE SOIL / SURFACE WATER

Project Name:	Phase 1 Regional Site Inspections for Per-Fluorinated Compounds at Multiple Air National Guard Installations	**Project Number:**	291330006
Contract:	W9133L-14-D-0002	**Task Order:**	0006
Installation:		**Date:**	
Location ID:		**Sample Technician:**	
Northing:		**Easting:**	

SEDIMENT SAMPLE

Description

NAME (USCS Symbol): color, moisture, % by wt, plasticity, dilatancy, toughness, dry strength,consistency

Sample Depth (ft):		**Sample ID:**	
MS/MSD Collected:		**Sample Date:**	
Duplicate ID:		**Sample Collection Time:**	
Sample Container Type(s):		**Sample Collection Methods:**	
Preservative(s):		**Analysis/Method(s):**	

SURFACE SOIL SAMPLE

Description

NAME (USCS Symbol): color, moisture, % by wt, plasticity, dilatancy, toughness, dry strength,consistency

Sample Depth (ft):		**Sample ID:**	
MS/MSD Collected:		**Sample Date:**	
Duplicate ID:		**Sample Collection Time:**	
Sample Container Type(s):		**Sample Collection Methods:**	
Preservative(s):		**Analysis/Method(s):**	

SURFACE WATER SAMPLE

Time	Intake Depth (feet)	Temp. (°C)	pH (units)	Specific Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Comments/Observations During Purging (color, sediment, etc.)

Sample Depth (ft):		**Sample Date:**	
Sample ID:		**Sample Collection Time:**	
MS/MSD Collected:		**Sample Collection Methods:**	
Duplicate ID:		**Surface Water Depth (ft):**	
Sample Container Type(s):		**Water Body and Water Quality Characteristics** (circle all that apply)**:**	
Preservative(s):		River Stream Pond Flowing Stagnant	
Analysis/Method(s):		Clear Cloudy Turbid Other:	

Location Sketch:

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

Notes:

Technician Signature:

Technician Name (print)**:**

QA/QC'd by: **QA/QC Date:**

TAILGATE SAFETY MEETING REPORT

Project Name:	Phase 1 Regional Site Inspections for Per-Fluorinated Compounds at Multiple Air National Guard Installations	**Project Number:**	291330006
Contract:	W9133L-14-D-0002	**Task Order:**	0006
Installation:		**Date and Time:**	
Field Manager Name:		**Site Health and Safety Officer (HSO):**	

Safety Meeting Type (circle one)**:** Initial Kickoff Safety Meeting Regular/Daily Tailgate Safety Meeting Unscheduled Tailgate Safety Meeting

Order of Business

Topics Discussed (check all that apply):

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

Safety suggestions by site workers:

Action taken on previous suggestions:

Injuries/accidents/personnel changes since previous meeting:

Observations of unsafe work practices/conditions that have developed since previous meeting:

Location of (or changes in the locations of) evacuation routes/safe refuge areas:

Other Safety Topics:

Additional comments:

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

Attendee Name (print)	Company	Signature	Attendee Name (print)	Company	Signature

Meeting Conducted By (print)**:**	**Company and Title**	**Signature**

QA/QC'd by: **QA/QC Date:**

WATER QUALITY SAMPLING INSTRUMENT CALIBRATION FORM

Project Name:	Phase 1 Regional Site Inspections for Per-Fluorinated Compounds at Multiple Air National Guard Installations	**Project Number:**	291330006
Contract:	W9133L-14-D-0002 **Task Order:** 0006	**Date:**	
Installation:		**Calibration Start Time:**	
Sample Technician:		**Calibration End Time:**	

Readings Before Calibration

Date	Time (24hr)	Temperature (°C)	pH (SU)	Turbidity (NTUs)	Specific Electrical Conductance (mS/cm)	D.O. (%, mg/L)	Salinity (%)	ORP/Eh (mV)	Barometric Pressure (mm Hg)	Comments

Readings After Calibration

Date	Time (24hr)	Temperature (°C)	pH (SU)	Turbidity (NTUs)	Specific Electrical Conductance (mS/cm)	D.O. (%, mg/L)	Salinity (%)	ORP/Eh (mV)	Barometric Pressure (mm Hg)	Comments

Calibration Materials Record:

pH Calibration Standards

Standard	Cal. Standard Lot #	Expiration Date
pH (4)		
pH (7)		
pH (10)		

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

Standard	Cal. Standard Lot #	Expiration Date
Spec. Conductance		
Salinity		
D.O.		
ORP		

Turbidity Standards

Standard	Cal. Standard Lot #	Expiration Date
10		
20		
100		
800		

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

	Manufacturer/Model	Serial No
Water Quality Meter:		
Turbidity Meter:		

Calibrated Within Acceptance Criteria (Y/N):

If No, Provide Explanation:

Notes:

Technician Signature:

{Signature}

Technician Name (print)**:**

QA/QC'd by: **QA/QC Date:**

WELL DEVELOPMENT LOG

Project Name:	Phase 1 Regional Site Inspections for Per-Fluorinated Compounds at Multiple Air National Guard Installations	**Project Number:**	291330006
Contract:	W9133L-14-D-0002	**Task Order:**	0006
Installation:		**Sample Technician:**	
Well ID:		**Date Started/Date Completed:**	
Measuring Point:		**Initial Depth to Water (ft):**	
Development Method:		**Total Depth of Well (ft):**	
Pump Start Date/Time:		**Depth to Water After Purging (ft):**	
Pump Start Rate:		**1 Casing Volume (gal):**	
Total Volume Purged (gal):		**3 Casing Volumes (gal):**	

Time	Intake Depth (feet)	Water Level (feet)	Rate	Temp. (°C)	pH (units)	Specific Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)

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

Calculations:

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

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

Technician Signature:

Notes:

Technician Name (print)**:**

QA/QC'd by: **QA/QC Date:**

APPENDIX D

QUALITY ASSURANCE PROJECT PLAN

The QAPP has not been included in the eDEP upload

due to the large file size, and is available upon request

to the LSP.