FINAL
Site Inspection
Quality Assurance Project
Plan Addendum
Albany Army Aviation Support Facility #3
Latham, New York

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

July 2021

Prepared for:

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

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Acronyms and Abbreviations

˚C	degrees Celsius
˚F	degrees Fahrenheit
AASF #3	Army Aviation Support Facility #3
ACP	access control point
ACSIM	Assistant Chief of Staff for Installation Management
AECOM	AECOM Technical Services, Inc.
AFD	Albany Fire Department
AFFF	aqueous film forming foam
AOI	area of interest
APP	Accident Prevention Plan
ARNG	Army National Guard
ASTM	American Society for Testing and Materials
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFD	Colonie Fire Department
CFR	Code of Federal Regulations
CoC	chain of custody
CPR	cardiopulmonary resuscitation
CSM	conceptual site model
DA	Department of the Army
DL	detection limit
DO	dissolved oxygen
DoD	Department of Defense
DPT	direct-push technology
DQI	data quality indicators
DQO	data quality objectives
DUA	Data Usability Assessment
ELAP	Environmental Laboratory Accreditation Program
EDR™	Environmental Data Resources, Inc.™
ERB	equipment rinsate blank
FRB	field reagent blank
GCAL	Gulf Coast Analytical Laboratories, LLC
GPS	global positioning system
HA	Health Advisory
HAZWOPER	hazardous waste operations and emergency response
HDPE	high-density polyethylene
IDQTF	Intergovernmental Data Quality Task Force
IDW	investigation-derived waste
ISC	instrument sensitivity check
LC/MS/MS	liquid chromatography tandem mass spectrometry
LOD	limit of detection

LOQ	limit of quantitation
MAES	Multiple Award Environmental Services
MCL	maximum contaminant level
MPC	measurement performance criteria
MS/MSD	matrix spike/ matrix spike duplicate
NELAP	National Environmental Laboratory Accreditation Program
ng/L	nanograms per liter
NYARNG	New York Army National Guard
NYCRR	New York Codes, Rules, and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
ORP	oxidation-reduction potential
OSD	Office of the Secretary of Defense
OSHA	Occupational Safety and Health Administration
OWS	oil-water separator
PA	Preliminary Assessment
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PID	photoionization detector
PPE	personal protective equipment
PQAPP	Programmatic UFP-QAPP
PVC	poly-vinyl chloride
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QL	quantitation limit
QSM	Quality Systems Manual
RI	Remedial Investigation
SDG	sample delivery group
SI	Site Inspection
SL	screening level
SOP	standard operating procedure
SSHP	Site Safety and Health Plan
TCRA	Time Critical Removal Action
TO	Task Order
TOC	total organic carbon
TPP	Technical Project Planning
TSA	technical system audit
UCL	upper confidence limit
UCMR 3	Unregulated Contaminant Monitoring Rule 3

UFP	Uniform Federal Policy
US	United States
USACE	United States Army Corps of Engineers
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VSI	visual site inspection

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1. Introduction

1.1 Project Authorization

This is the Installation-Specific Addendum to the Army National Guard (ARNG) Site Inspection (SI) Programmatic Uniform Federal Policy-Quality Assurance Project Plan (UFP-QAPP). This SI UFP-QAPP Addendum addresses specific SI activities to be completed at Albany Army Aviation Support Facility #3 (AASF #3) in Latham, New York.

The ARNG G9 is the lead agency in performing *Preliminary Assessments (PAs) and Site Inspections (SIs) for Perfluorooctanesulfonic acid (PFOS) and Perfluorooctanoic acid (PFOA) Impacted Sites at ARNG Facilities Nationwide*. This work is supported by the United States (US) Army Corps of Engineers (USACE) Baltimore District and their contractor AECOM Technical Services, Inc. (AECOM) under Contract Number W912DR-12-D-0014, Task Order (TO) W912DR17F0192, issued 11 August 2017. Programmatically, the ARNG is assessing the potential environmental impacts primarily from aqueous film forming foam (AFFF) and similar chemical releases suspected at their properties related to processes that used per- and polyfluoroalkyl substances (PFAS) (e.g., fire training, firefighting, and metal plating).

The SI project elements will be performed by AECOM in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; US Environmental Protection Agency [USEPA], 1980), as amended, the National Oil and Hazardous Substances Pollution Contingency Plan (40 Code of Federal Regulations [CFR] Part 300; USEPA, 1994), and in compliance with US Department of the Army (DA) requirements and guidance for field investigations, including specific requirements for sampling for PFOA, PFOS, and perfluorobutanesulfonic acid (PFBS), and the group of related compounds known in the industry as PFAS. The term PFAS will be used throughout this plan to encompass all PFAS being evaluated, including PFOA, PFOS, and PFBS, which are the key components of the suspected releases being evaluated, and the other 15 related compounds listed in the TO. This UFP-QAPP Addendum focuses on the SI phase of work specific to Albany AASF #3 (also referred to as the “facility”) in Latham, New York.

1.2 SI Purpose

The objective of this SI effort is to identify whether there has been a release to the environment from the Areas of Interest (AOIs) identified in the PA and determine the presence or absence of PFOA, PFOS, and PFBS at or above screening levels (SLs) at the facility.

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

1) Develop information to potentially eliminate a release from further consideration because it is determined that it poses no significant threat to human health or the environment.
2) Determine the potential need for a removal action (i.e., Time Critical Removal Action [TCRA]; applies to drinking water only).
3) Collect or develop data to evaluate the release.
4) Collect additional data to develop the conceptual site model (CSM) in preparation for an effective Remedial Investigation (RI).
5) Collect data to determine whether the release is more than likely the result of activities associated with the Department of Defense (DoD).

In addition to the USEPA identified goals of an SI, the ARNG SI effort will also aim to evaluate whether the concentrations can be attributed to on-facility or off-facility sources that were identified within 4 miles of the installation as part of the PA (e.g., fire stations, major manufacturers, other DoD facilities).

1.3 QAPP Addendum Organization

Elements of every ARNG PFAS SI are addressed in the SI Programmatic UFP-QAPP (PQAPP) (AECOM, 2018). The PQAPP is comprehensive and is consistent with the USEPA's intent that the UFP-QAPP be the primary planning document for an entire project (Intergovernmental Data Quality Task Force [IDQTF], 2005a-c). This QAPP Addendum, in combination with the PQAPP elements, meets the requirements set forth in the UFP for QAPPs (IDQTF, 2005a-c) *and USEPA Requirements for Quality Assurance Project Plans* (USEPA, 2001).

This QAPP Addendum was prepared to include the detailed information specific to the SI at Albany AASF #3. For ease of review, material from the PQAPP is included in this deliverable alongside the Albany AASF #3-specific worksheets. **Table 1-1** below describes the components that are covered under the PQAPP, and those that are covered under this UFP-QAPP Addendum:

Table 1-1: Comparison of PQAPP to QAPP Addendum

QAPP Addendum Worksheets	Applicable Document
Worksheets #1 and #2- Title and Approval Page and QAPP Identifying Information	**Programmatic/Site-Specific**
Worksheets #3 and #5- Project Organization and QAPP Distribution	**Programmatic/Site-Specific**
Worksheets #4, #7, #8- Personnel Qualifications and Sign-off Sheet	**Programmatic/Site-Specific**
Worksheet #6- Communication Pathways	**Programmatic/Site-Specific**
Worksheet #9- Technical Project Planning Session Summary	**Site-Specific**
Worksheet #10- Conceptual Site Model	**Site-Specific**
Worksheet #11- Project/ Data Quality Objectives	**Site-Specific**
Worksheet #12- Measurement Performance Criteria	**Programmatic**
Worksheet #13- Secondary Data Uses and Limitations	**Programmatic**
Worksheets #14 and #16- Project Tasks and Schedule	**Site-Specific**
Worksheet #15- Screening Limits and Laboratory- Specific Detection/ Quantitation Limits	**Programmatic**
Worksheet #17- Sampling Design and Rationale	**Site-Specific**
Worksheet #18- Sampling Locations and Methods	**Site-Specific**
Worksheets #19 and #30- Sample Containers, Preservation and Hold Times	**Programmatic**
Worksheet #20- Field Quality Control Summary	**Programmatic/Site-Specific**
Worksheet #21- Field Standard Operating Procedures	**Programmatic**

QAPP Addendum Worksheets	Applicable Document
Worksheet #22- Field Equipment Calibration, Maintenance, Testing and Inspection	**Programmatic**
Worksheet #23- Analytical Standard Operating Procedures	**Programmatic**
Worksheet #24- Analytical Instrument Calibration	**Programmatic**
Worksheet #25- Analytical Instrument and Equipment Maintenance, Testing and Inspection	**Programmatic**
Worksheets #26 and #27- Sample Handling, Custody and Disposal	**Programmatic**
Worksheet #28- Analytical Quality Control and Corrective Actions	**Programmatic**
Worksheet #29- Project Documents and Records	**Programmatic**
Worksheets #31, #32 and #33- Assessments and Corrective Action	**Programmatic**
Worksheet #34- Data Verification and Validation Inputs	**Programmatic**
Worksheet #35- Data Verification Procedures	**Programmatic**
Worksheet #36- Data Validation Procedures	**Programmatic**
Worksheet #37- Data Usability Assessment	**Programmatic**

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QAPP Worksheets #1 & #2: Title and Approval Page and QAPP Identifying Information

Site Name/Project Name: Army National Guard/Multiple Award Environmental Services (MAES) Delivery Order 00014/ Preliminary Assessments (PA) and Site Inspections (SI) for Perfluorooctanesulfonic Acid (PFOS) and Perfluorooctanoic Acid (PFOA) Impacted Sites, ARNG Installations, Nationwide

Installation: Albany AASF #3, Latham, New York

Contract Work Assignment Number: USACE Contract No. W912DR-12-D-0014; Delivery Order No. W912DR17F0192

Relevant Plans and Reports from Previous Investigations: Relevant plans and reports from previous investigations are identified in the references cited in the introductory text that precedes these worksheets and in subsequent worksheets, as appropriate.

	Mitchell, Claire — Digitally signed by Mitchell, Claire DN: dc=com, dc=aecomnet, dc=na, ou=AECOMIsolated, ou=USDFARS, ou=AECOMUsers, ou=USSTL1, cn=Mitchell, Claire Date: 2021.07.13 09:37:04 -04'00'
Investigative Organization Project Manager Printed Name / Organization	Signature / Date Claire Mitchell / AECOM Project Manager
	Gettier, Sarah — Digitally signed by Gettier, Sarah Date: 2021.07.15 07:40:32 -04'00'
Investigative Organization Quality Manager Printed Name / Organization	Signature / Date Sarah Gettier / AECOM Project QC Officer
	CONNOLLY.DAVID.M.1292853633 — Digitally signed by CONNOLLY.DAVID.M.1292853633 Date: 2021.07.16 14:09:32 -04'00'
Army National Guard Printed Name / Organization	Signature / Date David Connolly / ARNG Program Manager
	FREEHART.JAMES.PATRICK.1020134450 — Digitally signed by FREEHART.JAMES.PATRICK.1020134450 Date: 2021.07.26 15:29:48 -04'00'
New York Army National Guard Printed Name / Organization	Signature/Date James Freehart / Environmental Branch Chief
	PECK.TIMOTHY.JOSEPH.1252325553 — Digitally signed by PECK.TIMOTHY.JOSEPH.1252325553 Date: 2021.07.15 12:53:06 -04'00'
Contract Organization Project Manager Printed Name / Organization	Signature / Date Timothy Peck / USACE, Baltimore District

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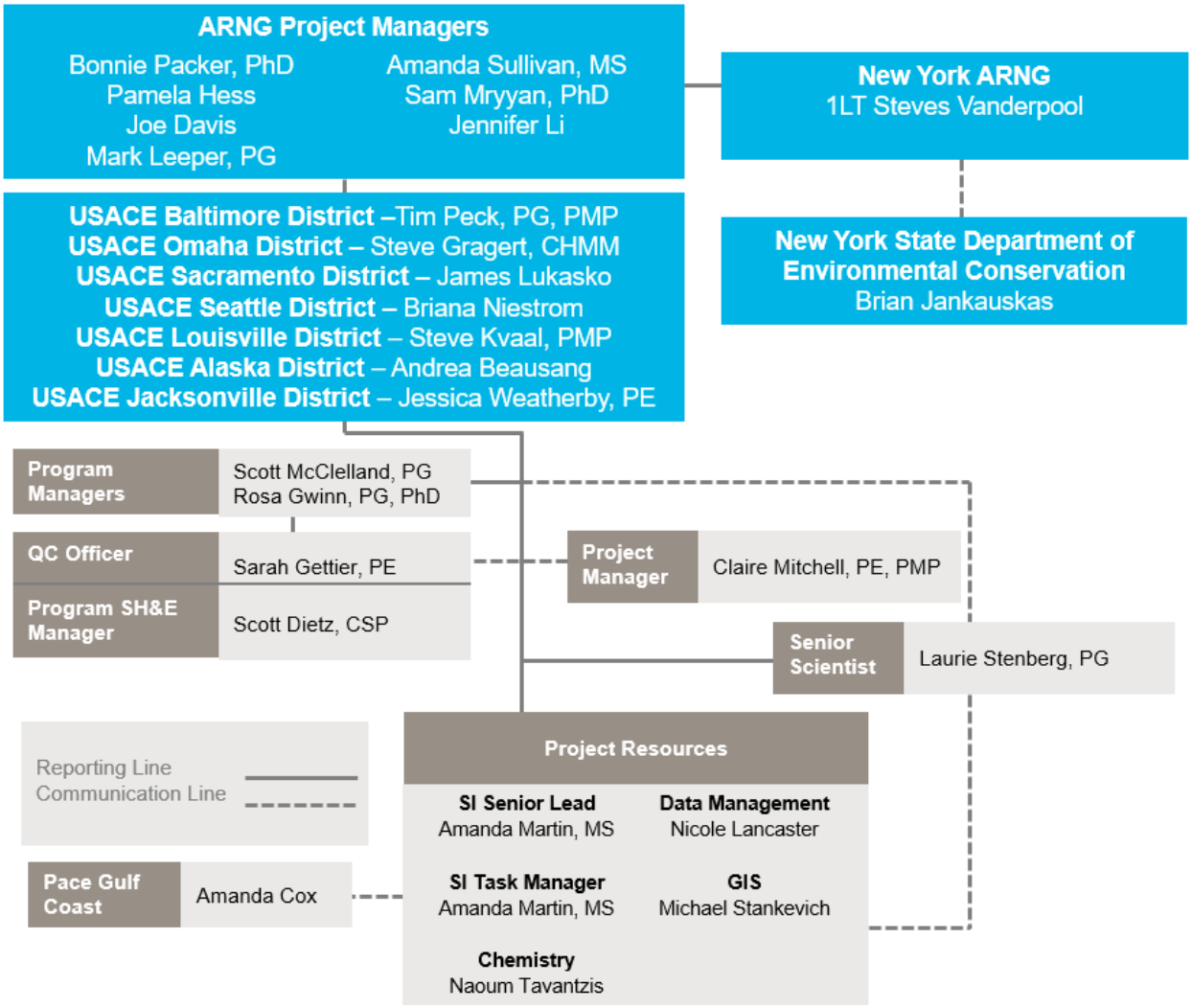
QAPP Worksheets #3 & #5: Project Organization and QAPP Distribution

The organization chart in **Figure 3-1** identifies key project personnel, as well as lines of authority and lines of communication among the ARNG, USACE, and prime contractor (AECOM). The QAPP Addendum will be distributed to all parties noted in the figure below. This organization chart is consistent with the PQAPP with the exception of the state regulatory personnel.

Figure 3-1 Project Organizational Chart



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QAPP Worksheets #4, #7 & #8: Personnel Qualifications and Sign-off Sheet

This worksheet contains a list of the key project personnel who are identified as performing the tasks that are defined in this QAPP Addendum for Albany AASF #3 and includes the personnel's organization, project role, education/experience, and specialized training/certifications. The personnel have signed and dated the worksheet to signify that they agree with the information in this QAPP Addendum and agree to implement it.

Name	Organization	Project Role	Education/Experience	Specialized Training / Certifications	Signature/Date
Scott McClelland, PG	AECOM	MAES Program Manager	Education: BA, Geology MS, Geology Experience. 30+ years; executing and managing environmental investigation and remediation projects including program management of USACE Baltimore contracts.	Professional Geologist, KY AECOM Certified PM	Signature available upon request.
Rosa Gwinn, PG, PhD	AECOM	ARNG Program Manager	Education: BA, Geology MS, Geology PhD, Geology Experience: 33+ years; managed 4 ORA Phase II TOs of similar scope, complexity, and duration for USACE and ARNG; experience with PFAS investigations.	Professional Geologist, WA, UT AECOM Certified PM OSHA 40hr HAZWOPER OSHA 8hr Refresher AECOM PFAS Sampling Training	Signature available upon request.
Claire Mitchell, PE, PMP	AECOM	Project Manager	Education: BS, Civil Engineering Experience: 10+ years of environmental engineering experience including task management for PFAS investigations for DoD clients.	Professional Engineer, MO PMP Certification AECOM Certified PM OSHA 40hr HAZWOPER OSHA 8hr Refresher First Aid/ CPR AECOM PFAS Sampling Training	Signature available upon request.

Name	Organization	Project Role	Education/Experience	Specialized Training / Certifications	Signature/Date
Laurie Stenberg, PG	AECOM	Senior Scientist	Education: BA, Geology Experience: 27 years; served as senior scientist for ORA Phase II TOs; experience with PFAS investigations.	Professional Geologist, PA AECOM Certified PM OSHA 40hr HAZWOPER OSHA 8hr Refresher AECOM PFAS Sampling Training	Signature available upon request.
Jacquelyn Harrington, CHMM	AECOM	Senior Scientist	Education: BA, Biology Experience: 27+ years; served as senior scientist for ORA Phase II TOs; MMRP RIs, experience with PFAS investigations.	CHMM AECOM Certified PM OSHA 40hr HAZWOPER OSHA 8hr Refresher OSHA 8hr Supervisor First Aid/CPR AECOM PFAS Sampling Training	Signature available upon request.
Sarah Gettier	AECOM	QC Officer	Education: BS, Civil Engineering, MS Environmental Engineering Experience: 15+ years direct experience developing QAPPs and other environmental planning documents as a technical leader.	OSHA 40hr HAZWOPER OSHA 8hr Supervisor OSHA 8hr Refresher First Aid/CPR AECOM PFAS Sampling Training	Signature available upon request.
Scott Dietz, CSP, STSC	AECOM	Health and Safety Officer	Education: BS, Safety Sciences Experience: 23+ years; managing safety, health, and environment on construction, environmental, and remediation projects including government projects requiring compliance with the USACE Engineering Manual 385-1-1.	CSP STSC OSHA 40hr HAZWOPER OSHA 500 Trainer for OSHA for Construction Industry OSHA 510 OSHA Standards for the Construction Industry OSHA 30hr Construction OSHA 10hr Construction OSHA 8hr Refresher	Signature available upon request.

Name	Organization	Project Role	Education/Experience	Specialized Training / Certifications	Signature/Date
Amanda Martin, MS	AECOM	SI Senior Lead and Task Manager	Education: BS, Environmental Science MS, Environmental Science & Engineering Experience: 8+ years; experience with QAPP development and PFAS investigations for DoD clients, including PAs and SIs for the ARNG; SIs and RIs on USACE Baltimore and New England contracts.	OSHA 40hr HAZWOPER OSHA 30hr Construction OSHA 8hr Refresher OSHA 8hr Supervisor First Aid/ CPR AECOM PFAS Sampling Training	Signature available upon request.
Robert Kennedy	AECOM	Senior Chemist	Education: BA, Chemistry Experience: 27+ years; served as senior scientist for ORA Phase II TOs; experience with PFAS investigations.	Auditing/Data Review training	Signature available upon request.
Naoum Tavantzis	AECOM	Project Chemist	Education: BA, Environmental Science Masters of Business Administration Experience: 10+ years; project chemist for ORA Phase II TOs; PFAS investigations, data validation, laboratory coordination.	OSHA 40hr HAZWOPER OSHA 8hr Refresher OSHA 8hr Supervisor AECOM PFAS Sampling Training	Signature available upon request.
Michael Stankevich	AECOM	GIS Specialist	Education: BA, Environmental Studies Experience: 9+ years; completed SDSFIE submittals for multiple ARNG installations.	ArcGIS Training	Signature available upon request.
Nicole Lancaster	AECOM	Data Management	Education: BS, Marine Biology, MS, Chemistry Experience: 10+ years, experience with data validation, data management, laboratory coordination, and field sampling.	OSHA 40hr HAZWOPER OSHA 8hr Refresher First Aid/CPR AECOM PFAS Sampling Training	Signature available upon request.

Name	Organization	Project Role	Education/Experience	Specialized Training / Certifications	Signature/Date
Gretchen Welshofer	AECOM	Regulatory Specialist	Education: BA, Communication MS, Environmental Science Experience: 27+ years; performing human health risk assessments; expertise in evaluating potential risks and hazards to human health posed by PFAS at DoD facilities; developed technical approach document that helps facilities manage PFAS-affected environmental media and waste streams; expertise in evaluating contaminant fate and transport for validity of exposure pathways	NA	Signature available upon request.
Sarah Stinger, PG	AECOM	Technical Quality	Education: BS, Geology MS, Geology Experience: 33+ years; performing CERCLA investigations; served as task leader and in QA role for ORA Phase II TOs at multiple ARNG installations.	Professional Geologist, VA, PA, LA AECOM Certified PM OSHA 40hr HAZWOPER OSHA 8hr Refresher	Signature available upon request.
Joe Witte	AECOM	Project Coordinator	Education: BS, Environmental Science and Policy Experience: 4+ years with 2 years direct experience working on ARNG and Army investigations under MMRP and ORA and developing QAPPs.	OSHA 40hr HAZWOPER OSHA 8hr Refresher First Aid/CPR AECOM PFAS Sampling Training	Signature available upon request.
Amanda Cox	Pace Gulf Coast (Formerly GCAL)	Laboratory Project Manager	Education: BS, Biology Experience: 4+ years as Project Manager.	NA	Signature available upon request.
William Perry	Pace Gulf Coast	Laboratory Quality Assurance Specialist	Education: BS, Chemistry American Chemistry Society Program Experience: 30+ years including QAPP development, data validation, laboratory auditing and procurement, laboratory and sampling management, organic analysis and sample preparation management.	Statistics and 17025/TNI/QSM standards	Signature available upon request.

Notes:

AECOM = AECOM Technical Services, Inc.
ARNG = Army National Guard
BA = Bachelor of Arts
BS = Bachelor of Science
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
CHMM = Certified Hazardous Materials Manager
CPR = cardiopulmonary resuscitation
CSP = Certified Safety Professional
DoD = Department of Defense
GCAL = Gulf Coast Analytical Laboratories, LLC
GIS = Geographic Information System
HAZWOPER = Hazardous Waste Operations and Emergency Response
hr = hour
ITRC= Interstate Technology and Regulatory Council
KY = Kentucky
LA = Louisiana
MAES = Multiple Award Environmental Services
MC = munitions constituents
MMRP = Military Munitions Response Program
MO = Missouri
MS = Master of Science
NA = not applicable
NH = New Hampshire
OSHA = Occupational Safety and Health Administration
PA = Pennsylvania
PE = Professional Engineer
PFAS = per- and polyfluoroalkyl substances
PG = Professional Geologist
PhD = Doctor of Philosophy
PM = Project Manager
PMP = Project Management Professional
QA = quality assurance
QAPP = Quality Assurance Project Plan
QC = quality control
QSM = Quality Systems Manual
RI = Remedial Investigation
SDSFIE = Spatial Data Standards for Facilities Infrastructure and Environment
SI = Site Inspection
STSC = Safety Trained Supervisor Construction
TNI = The NELAC Institute
TO = Task Order
USACE = United States Army Corps of Engineers
UT = Utah
VA = Virginia
WA = Washington

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QAPP Worksheet #6: Communication Pathways

Worksheet #6 documents the issues (communication drivers) that trigger the need to communicate with other project personnel or stakeholders. The purpose of **Worksheet #6** is to ensure there are procedures in place for providing the appropriate notifications and generating the appropriate documentation when handling important communications, including those involving regulatory interfaces, unexpected events, emergencies, non-conformances, and stop-work orders.

Communication Driver	Organization	Name	Contact Information	Procedure (Timing, Pathway, Documentation)
Program Manager decisions and modification	USACE, Baltimore District Project Manager	Tim Peck, PG, PMP	410-962-3416 timothy.j.peck@usace.army.mil	Initiate award of work and options. Track project progress through monthly reporting and daily field reporting. Stop work for quality or performance concerns.
	USACE, Omaha District Project Manager	Steve Gragert, CHMM	402-995-2743 steve.p.gragert@usace.army.mil	
	USACE, Sacramento District Project Manager	James Lukasko	916-557-5392 james.j.lukasko@usace.army.mil	
	USACE, Seattle District Project Manager	Briana Niestrom	206-764-3498 Briana.C.Niestrom@usace.army.mil	
	USACE, Louisville District Project Manager	Steve Kvaal, PMP	502-315-6316 Steven.Kvaal@usace.army.mil	
	USACE, Alaska District Project Manager	Andrea Beausang	907-753-2557 Andrea.L.Beausang@usace.army.mil	
	USACE, Jacksonville District Project Manger	Jessica Weatherby, PE	904-232-2178 Jessica.A.Weatherby@usace.army.mil	

Communication Driver	Organization	Name	Contact Information	Procedure (Timing, Pathway, Documentation)
Program Technical Review	ARNG	Bonnie Packer, PhD Pamela Hess Joe Davis Mark Leeper, PG Amanda Sullivan, MS Sam Mryyan, PhD Jennifer Li	703-607-7977 bonnie.m.packer.ctr@mail.mil 208-880-9734 pamela.s.hess.mil@mail.mil 615-791-1139 joe.b.davis36.ctr@mail.mil 804-516-3529 Mark.s.leeper.civ@mail.mil 304-642-6000 Amanda.d.sullivan7.ctr@mail.mil 703-601-7785 Mahmoud.a.mryyan.ctr@mail.mil 301-717-6939 jennifer.j.li2.ctr@mail.mil	The AECOM PM will obtain ARNG technical review and concurrence of the QAPP and project documents and any field modifications/QAPP changes as necessary. All approved modifications will be included in QAPP revisions (prior to field work). ARNG technical review and comments will be incorporated into the QAPP and project documents and a record of ARNG comments saved in project files for documentation.
Installation interface	NYARNG	1LT Steves Vanderpool James Freehart	518-786-4367 steves.vanderpool.mil@mail.mil 518-786-4555 james.p.freehart.civ@mail.mil	Communicate project scope/schedule and coordinate logistics between project team and installation personnel on an as-needed basis, documented via phone records and emails.
Regulatory agency interface (NYSDEC)				Communicate technical approaches and decisions directly to regulatory agencies' representative(s) on an as-needed basis, documented via phone records and emails.
Community/ media interface				Communicate information directly to communities or media on an as-needed basis.

Communication Driver	Organization	Name	Contact Information	Procedure (Timing, Pathway, Documentation)
Manage all project phases Field progress reports Field modifications/QAPP changes	AECOM Project Manager	Claire Mitchell, PE, PMP	703-682-9098 claire.mitchell@aecom.com	All materials and information about the project will be forwarded from the AECOM PM to ARNG/ USACE. Any field or laboratory changes will be coordinated with Tim Peck (USACE), Jennifer Li (ARNG), and 1LT Steves Vanderpool and James Freehart (NYARNG). The AECOM PM will obtain ARNG/ USACE approval/ concurrence for field modifications/ QAPP changes as necessary. All approved modifications will be included in QAPP revisions (prior to field work) or field change request forms (during field work), and resolution/ corrective action identified.
	AECOM SI Senior Lead and Task Manager	Amanda Martin, MS	978-905-2486 amanda.martin@aecom.com	Support AECOM PM in implementing SI tasks/procedures. Disseminate programmatic information from PM to SI Task Managers. Serve as lead verifier for SI documents.
	AECOM QC Officer	Sarah Gettier	301-820-3166 sarah.gettier@aecom.com	Oversee/conduct quality audits to assure field program performed in accordance with approved protocols. Support AECOM PM, Technical Task Manager, and Team Leaders to assure quality reviews are completed on project deliverables, including consistency and conformance with applicable regulatory and DoD guidance and with industry practices. Work with Project Chemist to resolve performance problems with contracted analytical laboratory.
Analytical laboratory modifications and performance problems	AECOM Project Chemist / Data Validator	Naoum Tavantzis	301-267-8761 naoum.tavantzis@aecom.com	Notify AECOM PM and QC Officer in a timely manner of performance problems encountered by the contracted analytical laboratory. PM will secure approval for modifications to the QAPP as necessary from ARNG/ USACE. All approved modifications will be included in Nonconformance and Corrective Action Report.

Communication Driver	Organization	Name	Contact Information	Procedure (Timing, Pathway, Documentation)
Data verification issues (e.g., incomplete records) and data validation issues (e.g., non-compliance with procedures)	AECOM Project Chemist / Data Validator	Naoum Tavantzis	301-267-8761 naoum.tavantzis@aecom.com	Verify/validate all analytical chemistry sample results from analytical laboratories with criteria developed in this QAPP and deliver to the PM and the Project QA Managers.
Data review corrective actions	AECOM Project Chemist / Data Validator	Naoum Tavantzis	301-267-8761 naoum.tavantzis@aecom.com	Notify Laboratory PMs to identify resolution/corrective actions.
Sample receipt variances	Pace Gulf Coast	Amanda Cox	225-214-7047 amanda.cox@pacelabs.com	Report all project non-conformances and problems to the AECOM Project Chemist.
Laboratory QC variances				Report all project non-conformances and problems to the AECOM Project Chemist.
Analytical corrective actions				Report all project non-conformances and problems to the AECOM Project Chemist.
Laboratory modifications and performance problems				Report all project non-conformances and problems to the Pace Gulf Coast PM. Pace Gulf Coast PM will report to AECOM Project Chemist.

Notes:

AECOM = AECOM Technical Services, Inc.
ARNG = Army National Guard
DoD = Department of Defense
NYARNG = New York Army National Guard
NYSDEC = New York State Department of Environmental Conservation
SH&E = Safety, Health, and Environment
PM = Project Manager
QA = quality assurance
QAPP = Quality Assurance Project Plan
QC= quality control
SI = Site Inspection
USACE = United States Army Corps of Engineers

QAPP Worksheet #9: Technical Project Planning Session Summary

This worksheet serves as a record of future Technical Project Planning (TPP) sessions. The intent is to provide a concise record of participants, key decisions or agreements reached, and action items. Minutes will be approved by all participants prior to being implemented into the QAPP Addendum (TPP Meeting Minutes, **Appendix A**).

AECOM will implement the TPP process as listed in Engineer Manual 200-1-2 (USACE, 2016) including facility meetings in a professional and organized manner to obtain consensus on specific Data Quality Objectives (DQOs) for SI work. Three meetings will be held (in person and/ or teleconference) per the Performance Work Statement as described below:

- TPP Meeting 1 - Discuss DQOs (pre-work plan) and CSM
- TPP Meeting 2 - Finalize work plan technical approach
- TPP Meeting 3 - Verify all data gaps have been filled and finalize SI Report

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QAPP Worksheet #10: Conceptual Site Model

The information presented in this section was gathered during the PA at Albany AASF #3. The PA process included the following tasks:

- Reviewed data resources to obtain information relevant to suspected PFAS releases;
- Conducted a 1-day site visit on 12 June 2018;
- Interviewed current and former NYARNG personnel during the site visit, including the Flight Facility Commander, Albany Fire Department (AFD) Chief, and former AFD Firefighter;
- Completed visual site inspections (VSI) at known or suspected PFAS release locations and documented with photographs;
- Developed a preliminary CSM to outline the potential release and pathway of PFAS for the AOIs and the facility.

The findings of the PA, as well as the CSM developed as part of the PA process, are summarized in this worksheet. Additional details about Albany AASF #3 can be found in the PA Report (AECOM, 2020).

Facility Location and Description

Albany AASF #3 is in Latham, Albany County, which is located in eastern New York. The facility is on Albany International Airport property and leased to the New York ARNG (NYARNG) (**Figure 10-1**). The facility is approximately 7 miles north-northwest from the Albany city center and 0.75 miles east of the southern end of Runway 1, at Albany International Airport. Interstate 87 is 0.25 miles to the east of the facility.

Prior to 1977, the facility property was undeveloped. A small airplane hangar was built shortly before 1983, which the NYARNG began operating immediately. Since that time, lease agreements for multiple additional parcels adjacent to the original facility property expanded the current property to a total of roughly 50 acres.

Facility Environmental Setting

Albany AASF #3 is located in a predominantly urban area comprised of a hilly mix of deciduous and evergreen trees, with an average elevation of 354 feet above mean sea level. According to the 2010 US Census, Albany County has a population of 305,506 and comprises 533 square miles of which only ten are water (US Census Bureau, 2010). Approximately 2 miles north of the Albany AASF #3 is the Mohawk River, which trends west to east before it converges with the Hudson River roughly 4 miles to the northeast of AASF #3. Several towns are less than 2 miles from the Albany AASF #3, including the Town of Verdoy, located 1.25 miles to the north, and the Town of Colonie located 1.75 miles to the southwest. There are also multiple industries located within a 2-mile radius of Albany AASF #3.

Geology

The facility is located south of the Mohawk River, within the southeastern geological region of the Hudson-Mohawk River Lowlands, which is a segment of the Mohawk River Basin physiographic province (US Geological Survey [USGS], 2006). This region extends eastward from the Great Lakes Lowlands to the Hudson Valley through the center of the basin. The Mohawk River valley is an area of generally subdued topography shaped over multiple periods of extensive glacial advancement and recession (deglaciation).

Deglaciation is responsible for thick deposits of fluvial sand, gravel, and lacustrine clay, silt, and fine sand found throughout the region. As a result, glacially-derived landforms are present near

the facility, including eskers, drumlins, recessional moraines, outwash systems, and massive deposits of sand and gravel, known as kame, laid down at the periphery of ice sheets during glacial drainage (Fairchild, 1896; Isachsen et al., 2000).

The facility lies on the southernmost edge of the Colonie Channel, a north-south oriented bedrock channel that runs from the Town of Colonie up through the Town of Malta (USGS, 2002). The majority of both the surface and underlying material of the facility are Pleistocene age unconsolidated glacial deposits, recent floodplain deposits, and lacustrine delta. These sediments consist of layers of fine sands and gravel underlain by silts and clays of variable thicknesses ranging between 20 to nearly 350 feet (USGS, 1964; USGS 1981b). These sediments were deposited fluvially against glacial ice but prograded into glacial Lake Albany, distinguished by steeply dipping forest beds, which indicate deposition in standing water (USGS, 1964). The nearshore lake sediments were reworked by wind, after the lake had drained, to form well-sorted blanket lake sands and dune fields; this creates permeable dunes and blanket sands that overlie thick sequences of relatively impermeable lacustrine silt and clay (USGS, 1988).

A previous subsurface investigation by the US Department of Agriculture Soil Conservation Service, who perform the National Cooperative Soil Survey, indicated that the majority of the upper 0-12 feet of the western side of the facility subsurface material are various types of ground moraines and silt loam. This silt loam consists of low permeability, somewhat-poorly to poorly-drained, fine-grained silts and clays with very slow infiltration rates. These soil layers can impede the downward movement of water, suggesting there is high surficial runoff from the facility to surrounding water body features. The central and eastern areas of the facility, however, are composed of fine sands with high infiltration rates and high permeability, causing this area to have more influence on the local groundwater flow.

Underneath the silt loam and fine-grained sands lies sedimentary bedrock such as shale, sandstone, and carbonate rocks. Many of the drinking water wells in the Mohawk River Basin come from bedrock; however, they do not yield as much as the unconsolidated sediments (USGS, 2006).

Hydrogeology

Based on review of USEPA's map of Sole Source Aquifers, Albany AASF #3 is not located above a sole source aquifer. Based on review of New York State Department of Environmental Conservation's (NYSDEC) Map of Principal and Primary Aquifers in New York State, the facility cantonment area is located over a primary aquifer spanning roughly 40 square miles as well as portions of two other aquifers. The unconsolidated sand and gravel units form a virtually continuous aquifer system underlying the Mohawk River Valley (USGS, 1981a). Water in the aquifer is principally under water-table conditions and in hydraulic contact with the Mohawk River, so that pumping of most wells in the area induces recharge from the river to an unknown extent (USGS, 2002).

An unconfined lacustrine sand aquifer is the most surficial aquifer, and there are also parts of the Colonie Channel aquifer, which is confined within the deepest parts of the channel, is variably confined and unconfined within the shallower peripheral channel areas, and consists of thin sand and gravel. The unconsolidated sand and gravel units yield the largest supply to wells in the Mohawk River Valley, with yields as much as nine million gallons per day across the entire aquifer (USGS, 1981a). Precipitation that infiltrates the land surface is the sole source of recharge to the lacustrine sand aquifer and recharges the alluvial aquifer and unconfined parts of the Colonie channel aquifer (USGS, 2002).

Groundwater direction in the cantonment area is inferred to be north towards the Mohawk River (**Figure 10-2**). An EDR™ Report conducted a well search for a 1-mile radius surrounding the facility (AECOM, 2020). Using additional online resources, such as state and local GIS databases, wells were researched to a 4-mile radius of the facility. Well data from New York State indicated

there are several potable wells within 4 miles of the facility, as shown on **Figure 10-2** (New York State, 2016). There are six potable water wells between the facility and the Mohawk River, in the inferred direction of groundwater flow. The depth to groundwater ranges between 4.5 and 150 feet below ground surface (bgs), with well depths ranging anywhere from 30 to 900 feet bgs and yield anywhere from 0.5 to 120 gallons per minute. Data from the USGS National Water Information System Mapper identified inactive monitoring wells within the 4-mile radius, but no active USGS monitoring wells were identified (USGS, 2020). The facility receives water from the Town of Colonie municipal water utility and utilizes the Town of Colonie sanitary sewer system; there are no septic systems present at the facility.

Hydrology

The facility is in the Shakers Creek-Mohawk River Watershed (**Figure 10-3**), which is a part of the much larger Mohawk River Basin. The Mohawk River Basin covers 3,500 square miles, drains over 12,000 square miles of streams, and encompasses parts of 14 counties, including all of Montgomery County, most of Schoharie and Schenectady Counties, and parts of Herkimer, Hamilton, Fulton, Greene, Oneida, Saratoga, Albany, Lewis, Madison, Ostego, and Delaware Counties. The Mohawk River is a major tributary to the Hudson River, while the Schoharie and West Canada Creeks are major tributaries to the Mohawk River (USGS, 2006). The main channel of the Mohawk River runs west to east roughly 2 miles north of the facility and forms a floodplain. Surface water resources near the Albany AASF #3 include natural streams, rivers, and open water features (**Figure 10-3**).

The stormwater system at the facility routes surface runoff to a drainage ditch on the southwestern boundary of the facility. From there, the runoff travels south around the southern runway (Runway 1) and flows west-northwest before converging with Ann Lee Pond. Approximately 0.75 miles west of the facility is Shaker's Creek. Shakers Creek headwaters flow south to north from Ann Lee Pond and then west to east-northeast at the end of the Runway 19 of Albany International Airport (**Figure 10-3**). A second branch of Shakers Creek flows south to north 0.75 miles east of the facility, which converges with Shaker's Creek slightly east of Runway 19. Shaker's Creek empties into the Mohawk River less than 1 mile after the convergence of the eastern branch (**Figure 10-3**).

Climate

The climate is predominately continental, with an average annual temperature of 48.2 degrees Fahrenheit (°F). Seasonally, temperatures vary from an average summer high of 68.9 °F to average winter lows of 27 °F (National Oceanic and Atmospheric Association, 2018). The total mean annual precipitation is 34.27 inches. February is the driest month, with 1.95 inches of precipitation, while August is the wettest month, with 3.47 inches.

Current and Future Land Use

The facility has access through a guarded security gate off Old Niskayuna Road. The property is leased by the NYARNG, which conducts training of personnel and aircraft maintenance. There are no current expansion plans for the facility and, in general, the future land use at the facility is not expected to change. Surrounding current land use includes mostly aviation, commercial, industrial and residential uses. Besides Albany International Airport, some of the closest commercial and industrial neighbors to Albany AASF #3 include a pool manufacturer, an auto glass repair company, and an industrial equipment supplier.

Areas of Interest and Conceptual Site Models

PFAS were potentially released to soil and groundwater within the boundary of Albany AASF #3 through fire training, fire equipment maintenance, AFFF storage, and emergency response. Two

AOIs were identified based on preliminary data and assumed groundwater flow directions. An additional AOI, AOI 3, was identified during the SI planning phase. These AOIs are described below and presented on **Figure 10-4**.

In general, the potential routes of exposure to PFAS are ingestion and inhalation. Human exposure via the dermal contact pathway may occur, and current risk practice suggests it is an insignificant pathway compared to ingestion; however, exposure data for dermal pathways are sparse and continue to be the subject of toxicological study.

AOI 1 AASF #3 Hangar Release / Fire Response Unit

AOI 1 encompasses the release of AFFF from the AASF #3 Hangar and the former Fire Response Unit room. The area surrounding the AOI is predominantly paved, with a few grassy areas between paved areas. A 500-gallon 3% AFFF fire suppression system is stored in the AASF #3 Hangar. The tank is located in the former Fire Response Unit building. An initial testing of the system caused AFFF to completely fill the hangar. The hangar bay doors were opened, allowing the AFFF to spill out onto the tarmac and into the grass. The release was cleaned up and disposed of by a contractor. Knowledge regarding the fire suppression system is based solely on the recollections of interviewed personnel from the AFD and NYARNG.

Albany AASF #3 had a Fire Response Unit during the 1980s that was disbanded in the early 1990's. During this time, a firetruck was reported to have been stationed in the Fire Response Unit, housed in a room attached to the northern side of the AASF #3 Hangar. The firetruck was reported to have a 150-gallon dual line of 3% AFFF and water tank and a 400-gallon Purple K tank. It is unknown where the firetruck was filled or washed or whether the firetruck leaked. There were no documented releases of AFFF within the Fire Response Unit. This unit existed between 1983 and 1992 and responded to all fire and emergency related incidents that occurred at the Albany AASF #3 and Albany International Airport, in conjunction with the AFD.

The floor drains within the AASF #3 flow to an oil-water separator (OWS) located approximately 40 feet west of AASF #3 Hangar. The OWS discharges to the Town of Colonie sanitary sewer system during washing events, and when not washing, it discharges to the drainage ditch along the southwest boundary of the facility. The drainage ditch flows to the west within the facility property. Even if the foam was diverted during the test event, it is possible that residual foam within the drain piping may impact subsequent water that is discharged to the drainage ditch.

AFFF releases at AOI 1 occurred on both paved areas and grassy surfaces. Some AFFF releases occurred directly onto surface soil but may also have infiltrated subsurface soil via cracks in pavement or joints between areas that are paved with different materials. If AFFF released at the AOI infiltrated the subsurface, then ground-disturbing activities in the grassy areas as well as beneath the pavement may result in potential PFAS exposure to construction workers.

Between May and November 2020, the NYARNG constructed four new cold storage hangars (Hangars A through D) at Albany AASF #3 (**Figure 17-1**). The hangars do not have fire suppression systems and at no time was any AFFF stored or used in the new hangars. During construction activities, soil was removed to approximately 4 feet bgs in portions of the grassy area between the Albany AASF #3 main hangar and Hangar D. Soil was also excavated in this area during construction of an underground stormwater detention system to the east of Hangar D. Additionally, in the grassy area between the main hangar and Hangars C and D, a pit was dug at each side of the taxiway/roadway in order to bore under the taxiway and roadway at a depth of approximately 6 feet bgs. Excavated soil was used as backfill material at the same location. Any excess soil from the excavation work was stockpiled to the north of the facility's access control point (ACP). The stockpiled soil will be investigated as AOI 3 (see additional details below). These soil removal activities may have partially fallen within the footprint of the previous hangar release. However, facility staff indicated than an approximately 100 foot by 100 foot area within the grass

to the west of the AASF remains intact from prior to construction activities at approximate geographic coordinates 42°44'32.73"N, 73°48'0.27"W.

Because potential PFAS releases at AOI 1 have occurred, PFAS may have migrated from the surface soil to the groundwater via leaching. Ground disturbing activities in these areas could result in site worker, construction worker, and trespasser exposure to potential PFAS contamination via inhalation of dust or ingestion of surface soil. Ground-disturbing activities to subsurface soil could result in construction worker exposure. Therefore, the exposure pathways for inhalation of soil particles and ingestion of soil are potentially complete for these receptors.

The facility receives water from the Town of Colonie municipal water utility, with the distribution plant and source water wells less than 3.5 miles northeast and downgradient of the facility. Groundwater at the facility generally flows in a north-northwest direction towards the Mohawk River. There are some private drinking water wells located immediately downgradient, north-northwest, and north-northeast of the facility (**Figure 10-2**). The ingestion exposure pathway for groundwater is potentially complete for residents that are located downgradient of AOI 1 along with residents supplied by the Town of Colonie municipal water utility. Although no surface water features flow through this AOI, the stormwater network carries surface runoff from AOI 1 to the drainage ditch along the southwest boundary of the facility. The drainage ditch flows to the west within the facility property and subsequently to an offsite stream, which flows to Shakers Creek and on to the Mohawk River. Therefore, the surface water and sediment exposure pathways are potentially complete.

AOI 2 Garbage Truck Fire

A fire occurred in the back of a garbage truck, southeast of the AASF #3 Hangar, in May 2017. The Colonie Fire Department (CFD) responded to the incident. While the use of AFFF during the emergency response was not documented, photographs of the incident appear to show foam being used. The photographs were received after finalization of the PA Report and are included in **Appendix D** of this SI QAPP Addendum.

AFFF releases at AOI 2 may have occurred on both the paved area on the roadway and the grassy area adjacent to the roadway. The AFFF releases may have occurred directly onto surface soil but may also have infiltrated subsurface soil via cracks in pavement or joints between areas that are paved with different materials. If AFFF released at the AOI infiltrated the subsurface, then ground-disturbing activities in the grassy areas as well as beneath the pavement may result in potential PFAS exposure to construction workers.

Because potential PFAS releases to surface soil at AOI 2 may have occurred, PFAS may migrate from the surface soil to the groundwater via leaching. Ground disturbing activities in these areas could result in site worker, construction worker, and trespasser exposure to potential PFAS contamination via inhalation of dust or ingestion of surface soil. Ground-disturbing activities to subsurface soil could result in construction worker exposure. Therefore, the exposure pathways for inhalation of soil particles and ingestion of soil are potentially complete for these receptors.

The facility receives water from the Town of Colonie municipal water utility, with the distribution plant and source water wells less than 3.5 miles northeast and downgradient of the facility. Groundwater at the facility generally flows in a north-northwest direction towards the Mohawk River. There are some private drinking water wells located immediately downgradient, north-northwest, and north-northeast of the facility (**Figure 10-2**). The ingestion exposure pathway for groundwater is potentially complete for private well residents that are located downgradient of AOI 2, along with residents supplied by the Town of Colonie Municipal Water Utility.

Although no surface water features flow through this AOI, a stormwater drop inlet is located immediately north of the AOI 2 release area in the grass on the north side of the road. Although historical photographs show that booms and socks were used to protect contents from the

garbage truck fire from flowing into the stormwater drain, it is possible that some runoff from the incident entered the drains. The stormwater network carries surface runoff from AOI 2 to the drainage ditch along the southwest boundary of the facility. The drainage ditch flows to the west within the facility property and subsequently to an offsite stream, which flows to Shakers Creek and on to the Mohawk River. Therefore, the surface water and sediment exposure pathways are potentially complete.

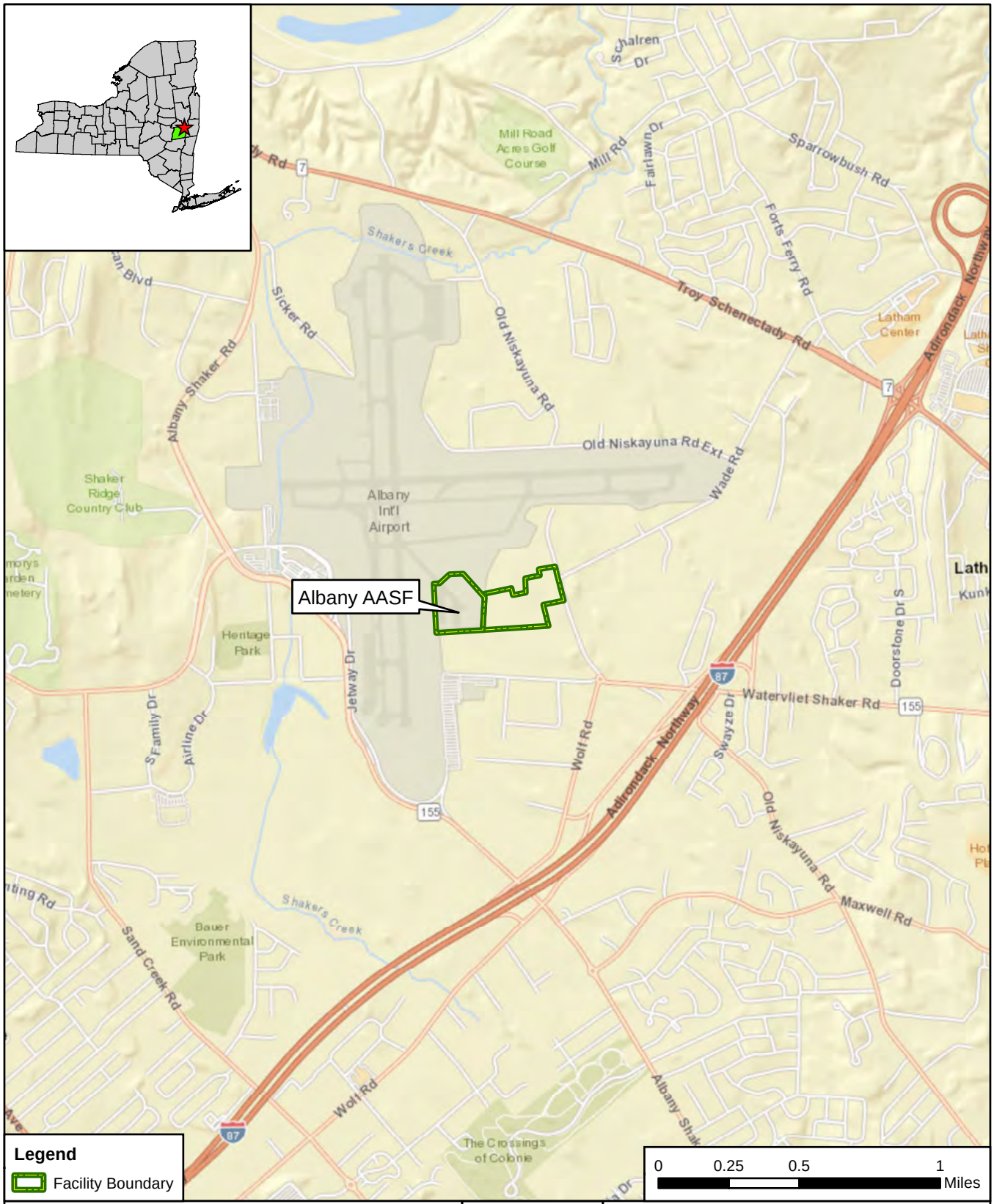
AOI 3 Stockpiled Soil

Between May and November 2020, the NYARNG constructed four new cold storage hangars (Hangars A through D) at Albany AASF #3. During construction of the hangars and associated subsurface infrastructure, including an underground stormwater detention system, soil was removed from within the footprint of the potential PFAS release area at AOI 1, as described above. Excess soil from the excavation work was stockpiled to the north of the facility's ACP at approximate geographic coordinates 42°44'40.74"N, 73°47'40.42"W. AOI 3 encompasses the stockpiled soil, which may contain PFAS from the AOI 1 hangar release. According to interviewed facility staff, the stockpiles contains approximately 80 cubic yards of soil.

If the stockpiled soil contains AFFF from the hangar release, PFAS may have migrated from the stockpiled soil to the native surface soil, subsurface soil, and groundwater via leaching. Ground disturbing activities in these areas could result in site worker, construction worker, and trespasser exposure to potential PFAS contamination via inhalation of dust or ingestion of surface soil. Ground-disturbing activities to subsurface soil could result in construction worker exposure. Therefore, the exposure pathways for inhalation of soil particles and ingestion of soil are potentially complete for these receptors.

The facility receives water from the Town of Colonie municipal water utility, with the distribution plant and source water wells less than 3.5 miles northeast and downgradient of the facility. Groundwater at the facility generally flows in a north-northwest direction towards the Mohawk River. There are some private drinking water wells located immediately downgradient, north-northwest, and north-northeast of the facility (**Figure 10-2**). Therefore, the ingestion exposure pathway for groundwater is considered potentially complete for private well residents that are located downgradient of AOI 3, along with residents supplied by the Town of Colonie Municipal Water Utility.

Although no surface water features flow through this AOI, the surface water runoff at this AOI is anticipated to follow a similar pathway as the rest of the facility. Therefore, the surface water and sediment exposure pathways are potentially complete.



CLIENT	ARNG			
NOTES	Site Inspection for PFAS at Albany AASF #3, NY			
REVISED	5/14/2021	GIS BY	MS	5/14/2021
SCALE	1:31,680	CHK BY	BP	5/14/2021
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI,		PM	CM	5/14/2021

Facility Location

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 10-1

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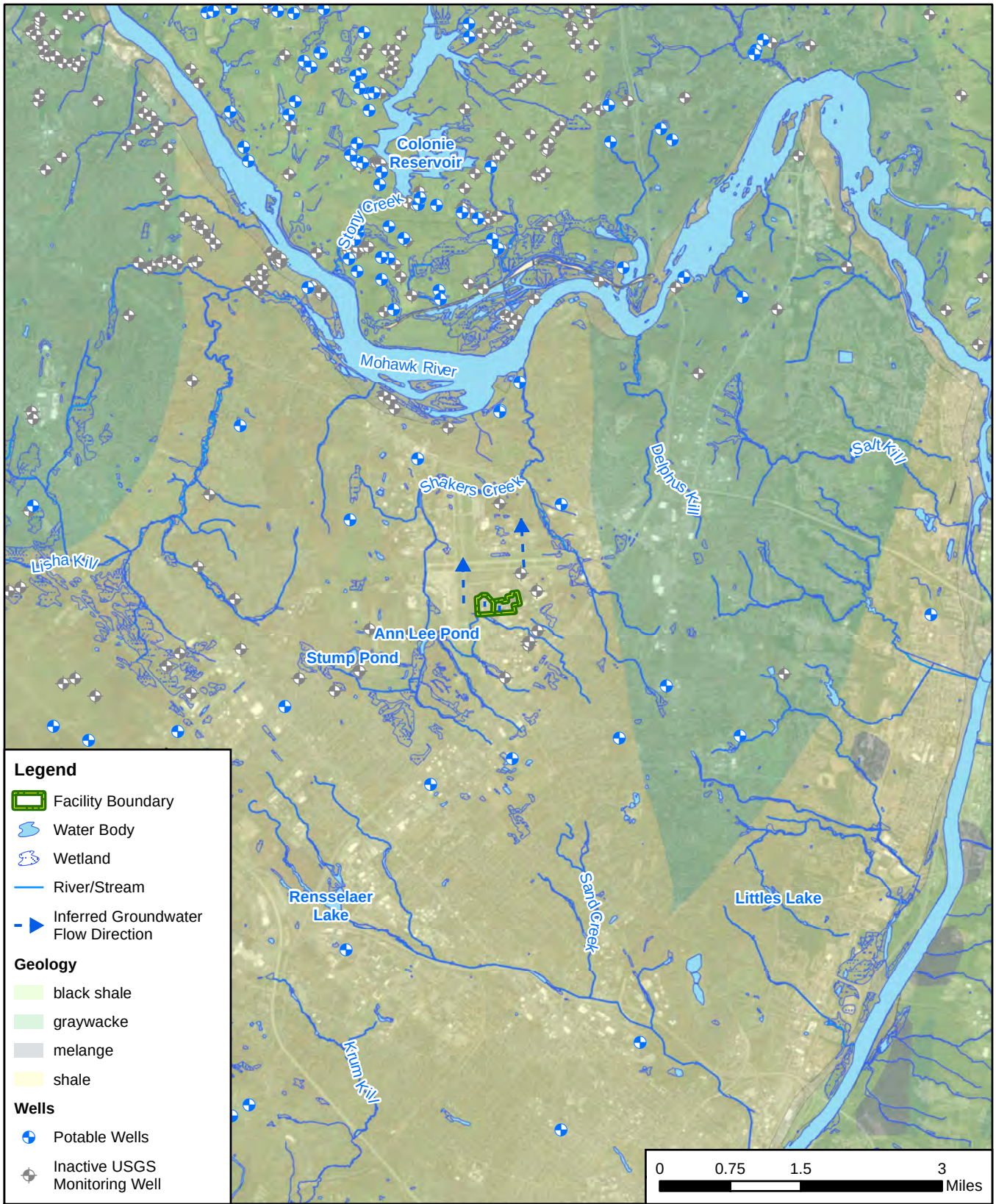

CLIENT	ARNG			
NOTES	Site Inspection for PFAS at Albany AASF #3, NY			
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SCALE	1:95,040	CHK BY	BP	5/14/2021
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,		PM	CM	5/14/2021

N

Groundwater Features

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 10-2

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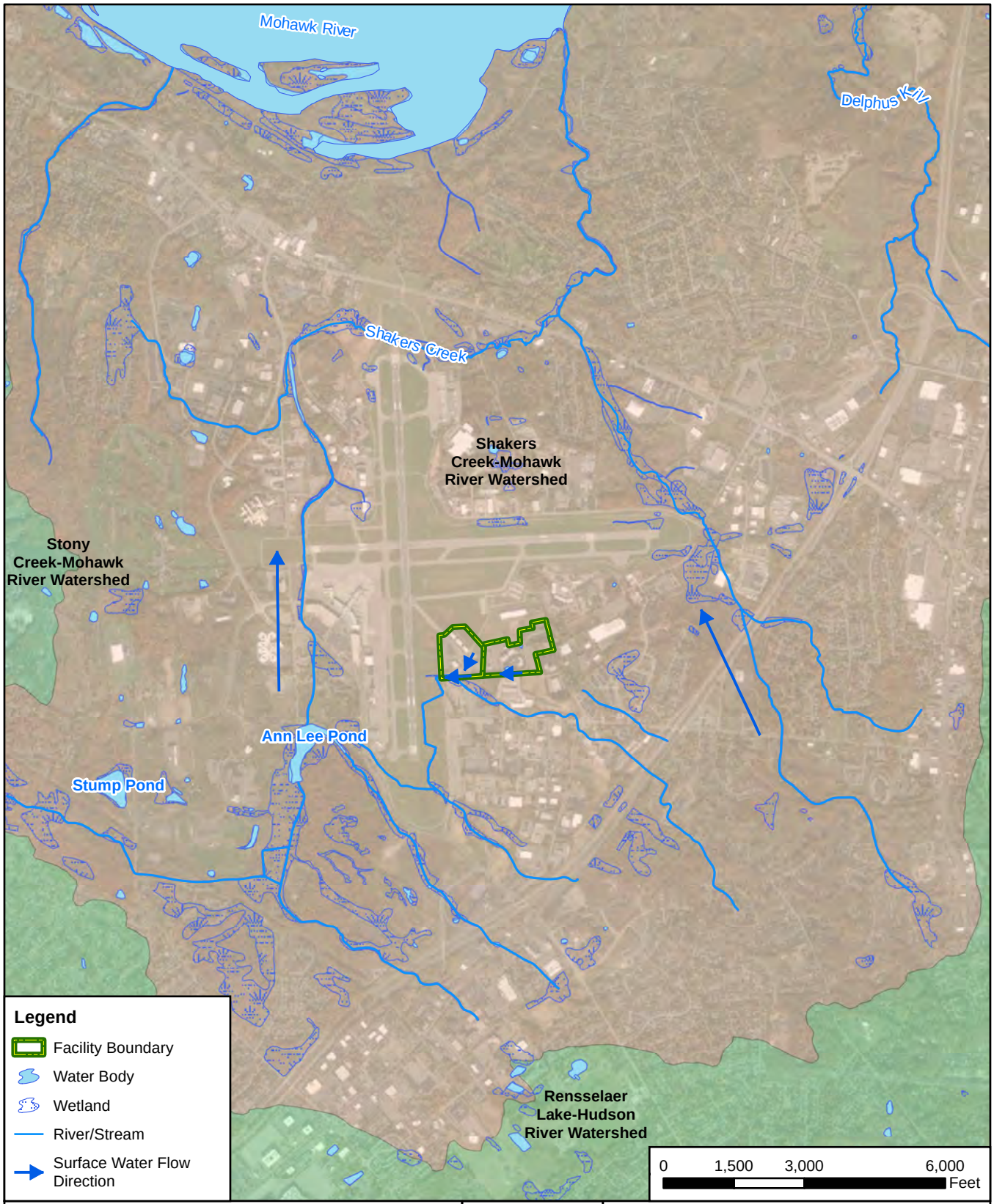
Base Map: NYS Digital Ortho-imagery Program (NYSDOP), 2016



CLIENT	ARNG			
NOTES	Site Inspection for PFAS at Albany AASF #3, NY			
REVISED	5/14/2021	GIS BY	MS	5/14/2021
SCALE	1:36,000	CHK BY	BP	5/14/2021
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,		PM	CM	5/14/2021

N

Surface Water Features

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 10-3

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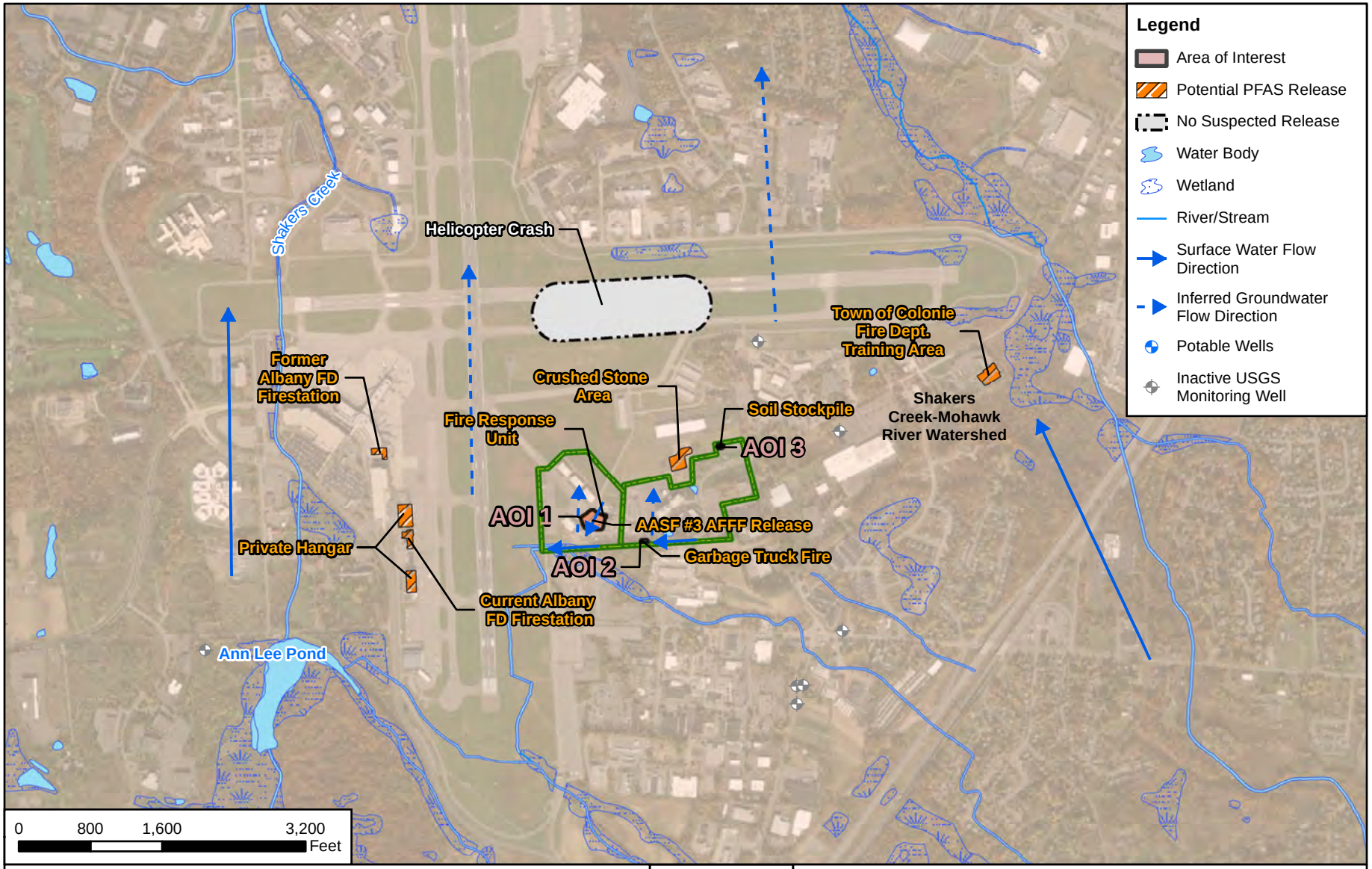

CLIENT	ARNG			
PROJECT	Site Inspection for PFAS at Albany AASF #3, NY			
REVISED	5/25/2021	GIS BY	MS	5/25/2021
SCALE	1:19,200	CHK BY	BP	5/25/2021
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	CM	5/25/2021

N

TITLE

Areas of Interest

AECOM

12420 Milestone Center Drive
Germantown, MD 20876

Figure 10-4

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QAPP Worksheet #11: Project/ Data Quality Objectives

DQOs specify the level of data required to support the decision-making process for a project. Specific DQOs have been established for each facility and are described in this UFP-QAPP Addendum. These DQOs follow the USEPA's seven-step iterative process for DQO development. DQOs are influenced by the ongoing project planning discussions with stakeholders and will be updated if new consensus decisions materialize.

1. State the Problem

The presence of PFAS, which may pose a risk to human health or the environment, in environmental media at the facility is currently unknown. PFAS are classified as emerging environmental contaminants that are garnering increasing regulatory interest due to their potential risks to human health and the environment. The regulatory framework for managing PFAS at both the federal and state level continues to evolve. The DoD has adopted a policy to retain facilities in the CERCLA process based on risk-based SLs for soil and groundwater, as described in a memorandum from the Office of the Secretary of Defense (OSD) dated 15 October 2019 (Assistant Secretary of Defense, 2019). The ARNG program under which this SI will be performed follows this DoD policy. Should the maximum concentration for sampled media exceed the SLs established in the OSD memorandum, the AOI will proceed to the next phase under CERCLA. The SLs established in the OSD memorandum apply to three compounds: PFOS, PFOA, and PFBS. The SLs were calculated using the USEPA Office of Superfund Sites On-Line Calculator, which was updated on 8 April 2021 based on the release of the final Human Health Toxicity Values for PFBS (USEPA, 2021).

Additionally, the USEPA issued drinking water lifetime Health Advisories (HAs) for PFOA and PFOS in May 2016 (USEPA 2016a; USEPA, 2016b). The USEPA HAs may also be used as SLs for groundwater samples collected at the facility boundary where off-facility drinking water wells are present downgradient. This determination will be based on localized groundwater flow direction established during the SI. The SLs are presented in **Worksheet #15** of this QAPP Addendum.

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

- "The Army will research and identify locations where PFOS and/or PFOA containing products, such as AFFF, are known or suspected to have been used. Installations shall coordinate with installation/facility fire response or training offices to identify AFFF use or storage locations. The Army will consider fire training areas, AFFF storage locations, hangars/buildings with AFFF suppression systems, fire equipment maintenance areas, and areas where emergency response operations required AFFF use as possible source areas. In addition, metal plating operations, which used certain PFOS-containing mist suppressants, shall be considered possible source areas."

- "Based on a review of site records…determine whether a CERCLA PA is appropriate for identifying PFOS/PFOA release sites. If the PA determines a PFOS/PFOA release may have occurred, a CERCLA SI shall be conducted to determine presence/absence of contamination."

- "Identify sites where perfluorinated compounds are known or suspected to have been released, with the priority being those sites within 20 miles of the public systems that tested above the USEPA HA levels" (USEPA, 2016a; USEPA, 2016b).

2. Identify the Goals of the Study

The goals of the SI include the following:

1. Determine the presence or absence of PFOA, PFOS, and PFBS at or above SLs at Albany AASF #3.
2. Develop information to potentially eliminate a release from further consideration because it is determined that it poses no significant threat to human health or the environment.
3. Determine the potential need for a TCRA (applies to drinking water only). The primary actions that will be considered include provision of alternative water supplies or wellhead treatment.
4. Collect or develop data to evaluate the release.
5. Collect data to better characterize the release for more effective and rapid initiation of an RI (if determined necessary).
6. If PFOA, PFOS, and PFBS are determined to be present, aim to evaluate whether the concentrations can be attributed to on-facility or off-facility sources that were identified within 4 miles of the installation as part of the PA (e.g., fire stations, major manufacturers, other DoD facilities).

3. Identify Information Inputs

Primary information inputs include:

- The PA Report for Albany AASF #3;
- Analytical data collected during other environmental sampling efforts at the Albany AASF #3;
- Groundwater, surface water, soil, and/or sediment sample data collected (if applicable) in accordance with this QAPP Addendum; and
- Field data collected including groundwater elevation and water quality parameters measured using a multi-parameter water quality meter.

4. Define the Boundaries of the Study

The scope of the SI is horizontally bounded by the property limits of Albany AASF #3. Off-facility sampling is not included in the scope of this SI; however, if future off-facility sampling is required, the proper stakeholders will be notified, and necessary rights of entry will be obtained by ARNG with the property owner(s). The scope of the SI is vertically bounded as follows: groundwater (20 feet bgs), soil from direct-push technology (DPT) borings (20 feet bgs), and surface soil (0 to 2 feet bgs).

5. Develop the Analytic Approach

Samples will be analyzed by a DoD Environmental Laboratory Accreditation Program (ELAP) and National Environmental Laboratory Accreditation Program (NELAP) certified laboratory [i.e., Pace Gulf Coast (formerly Gulf Coast Analytical Laboratory [GCAL])]. Data will be compared to SLs (**Worksheet #15**), and decision rules as defined in the PQAPP will be applied concerning actions to be taken based on any SL exceedances. Decision rules have been developed for groundwater and soil that will apply to all data collected. These rules will govern response actions based on the results of the SI sampling effort.

The decision rules described in the tables at the end of this section (**Tables 11-1** and **11-2**) identify actions based on the following:

Groundwater:

1. Is there a human receptor within 4-miles of the facility?
2. What is the concentration of PFOA, PFOS, and PFBS at the potential source area?
3. What is the concentration of PFOA, PFOS, and PFBS at the boundary?
4. What does the CSM suggest in terms of source, pathway, and receptor?

Soil:

1. What is the concentration of PFOA, PFOS, and PFBS in shallow surface soil (0-2 feet bgs)?
2. What is the concentration of PFOA, PFOS, and PFBS in soil (i.e., capillary fringe) (4-15 feet bgs)?
3. What does the CSM suggest in terms of source, pathway, and receptor?

Soil and groundwater will be collected from potential source areas identified in **Worksheet #10**. Based on previous investigations, groundwater is expected to be encountered no deeper than 20 feet bgs. Proposed SI sample locations and depths are defined in **Worksheet #17**.

6. Specify Performance/Acceptance Criteria

See **Worksheet #37**.

7. Develop the Detailed Plan for Obtaining Data

See **Worksheet #17** and **#18**.

Table 11-1: Groundwater Decision Rules

Scenario	PFAS Concentration Range	Response (Off-facility human receptor within 4 miles)	Response (No off-facility human receptor within 4 miles)
Scenario 1	ND	No further action required during SI phase.	No further action required during SI phase.
Scenario 2	> ND (any positive detection) and < SLs	1.) Assess CSM including: - Data reliability and bias - Migration via groundwater flow (i.e., groundwater flow towards potential receptors) - Flow to surface water bodies, drinking water intakes - Distance from boundary to receptor - Aquifer where drinking water well(s) are screened - Estimated timeframe of release(s) 2.) No further action during SI Phase at this time. ARNG may consider need for additional evaluation in the future for groundwater.	1.) Assess CSM as described. 2.) No further action during SI Phase at this time. ARNG may consider need for additional evaluation in the future for groundwater.
Scenario 3	> SLs	1.) Assess CSM as described above and: - Potential off-facility alternative PFAS sources 2.) If exceedance of SLs is near facility boundary and the assessment of the CSM implies unacceptable risk to human health caused by a PFAS release attributable to ARNG activities, ARNG may initiate off-facility sampling protocol. 3.) Proceed to RI.	1.) Assess CSM as described. 2.) Proceed to RI.

Notes:
< = less than
> = greater than
ARNG = Army National Guard
CSM = conceptual site model
ND = non-detect
PFAS = per- and polyfluoroalkyl substances
RI = Remedial Investigation
SI = Site Inspection
SL = screening level

Table 11-2: Soil Decision Rules

Scenario	PFAS Concentration Range	Response
Scenario 1	ND	No further action during SI Phase.
Scenario 2	> ND (any positive detection) and < SLs	1. Assess CSM including: - Potential for particulate runoff (i.e., transport via surface water) - Nearby receptors and land use (residential or industrial/commercial worker) at the source location (i.e., potential for incidental ingestion) - Depth to groundwater; distance to nearby surface water body - Comparison of soil concentrations to groundwater concentrations at the source or nearby surface water body - Data reliability and bias 2. No further action for soil during SI Phase at this time. ARNG may consider need for additional evaluation in the future.
Scenario 3	> SLs	1. Assess CSM as above and: - Comparison of soil concentrations to groundwater concentrations at the source and downgradient at the boundary 2. Proceed to RI.

Notes:
= less than
> = greater than
ARNG = Army National Guard
CSM = conceptual site model
ND = non-detect
OSD= Office of the Secretary of Defense
PFAS = per- and polyfluoroalkyl substances
RI = Remedial Investigation
SI = Site Inspection
SL = screening level

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Final PQAPP Worksheet #12: Measurement Performance Criteria

Matrix Groundwater and Surface Water
Analytical Group PFAS
Concentration Low

Data Quality Indicators	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for S, A or Both (S&A)
Accuracy/Bias	LCS/LCSD and MS/MSD shall be spiked with all analytes. Analyte recovery limits per Worksheet #15	LCS/LCSD, MS/MSD	A
Precision	Laboratory duplicates analysis should have an RPD <30%	LCS/LCSD, MS/MSD	A
Precision	Values > 5X LOQ: RPD must be ⩽30% Values ≤ 5X LOQ: Absolute difference ≤ 2x the LOQ	Field Duplicates	S
Accuracy/ Contamination	No analytes detected > 1/2 LOQ or >1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater	Method Blank, Field Reagent Blanks, Equipment Rinsate Blanks	A
Sensitivity	Detection limits ≤ to acceptance criteria Instrument Sensitivity Check concentrations must be within ±30% of their true values.	Detection Limits, Instrument Sensitivity Check	A
Completeness	Completeness criteria will be considered met if 100% of all planned sample data (as requested on CoC in lab reports and EDD; including requested reanalyses) are collected	Reported Sample Data	S & A
Comparability	Based on accuracy and media comparison	Use of standardized SOPs in field and laboratory	S & A
Comparability	Serial dilution preparation (allowed due to known high concentrations of PFAS, notation of 'foamed' on CoC is considered documented approval)	Field shake test	S & A
Representativeness	Samples met conditions per Worksheet #19/30.	Laboratory Receipt Checklist, Cooler Temperature Blank	S

Notes:
% = percent
< = less than
> = greater than
≤ = less than or equal to
A= analytical
CoC = chain of custody
EDD = electronic data deliverable
LCS/LCSD = laboratory control sample/ laboratory control sample duplicate
LOQ = limit of quantitation
MS/MSD = matrix spike/ matrix spike duplicate
QC = quality control
RPD = relative percent difference
S = sampling
SOP = standard operating procedure

Matrix Soil and Sediment
Analytical Group PFAS
Concentration Low

Data Quality Indicators	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Accuracy/Bias	LCS/LCSD and MS/MSD shall be spiked with all analytes. Analyte recovery limits 70-130%	LCS, LCSD, MS, MSD	A
Precision	Laboratory duplicates analysis should have a RPD <30%	LCS/LCSD, MS/MSD	A
Precision	Values > 5X LOQ: RPD must be ⩽30% Values ≤ 5X LOQ: Absolute difference ≤ 2x the LOQ	Field Duplicates	S
Accuracy/ Contamination	No analytes detected > 1/2 LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater	Method Blank, Field Reagent Blanks, Equipment Rinsate Blanks	A
Sensitivity	Detection limits ≤ to acceptance criteria Instrument Sensitivity Check concentrations must be within ±30% of their true values.	Detection Limits, Instrument Sensitivity Check	A
Completeness	Completeness criteria will be considered met if 100% of all planned sample data (as requested on CoC in lab reports and EDD; including requested reanalyses) are collected	Reported Sample Data	S & A
Comparability	Based on accuracy and media comparison	Use of standardized SOPs in field and laboratory	S & A
Representativeness	Samples met conditions per Worksheet #19/30.	Laboratory Receipt Checklist, Cooler Temperature Blank	S

Notes:
< = less than
> = greater than
≤ = less than or equal to
A= analytical
CoC = chain of custody
EDD = electronic data deliverable
LCS/LCSD = laboratory control sample/ laboratory control sample duplicate
LOQ = limit of quantitation
MS/MSD = matrix spike/ matrix spike duplicate
QC = quality control
RPD = relative percent difference
S = sampling
SOP = standard operating procedure

Final PQAPP Worksheet #13: Secondary Data Uses and Limitations

Secondary data sources, uses, and limitations are tabulated below. Original source documents were reviewed for uncertainty discussions that may identify additional or more suitable data limitations.

Data Type	Source	Data Uses Relative to Current Project	Factors Affecting Reliability of Data and Limitations on Data Use
Meteorological	National Weather Service	Estimates of seasonal fluctuations in precipitation.	Meteorological data is generally for a regional area. Actual site conditions may vary.
Topographic	USGS	Inferred surface water pathways based on local topography at each site. Groundwater flow maps will ultimately rely upon groundwater measurements from monitoring wells.	Topography of some sites may have been altered by building or grading activities.
Soil and groundwater chemistry, groundwater monitoring data, and data gaps identification	Historical site reports	Applicable to the evaluation of historical site conditions in soil and groundwater to supplement data being collected under this delivery order.	The data may not represent current conditions because of the age of some of the data. Reliability of second- or third-party data quality.
Historical site records (i.e., material inventories)	Purchase records, site inventories, onsite records, safety data sheets	Applicable to the evaluation of potential constituents of concern and source areas.	Records may be incomplete or inaccurate.
Periodicals (i.e., news articles)	Local newspapers, magazines or other periodicals	Applicable to the evaluation of the use of potential constituents of concern at off-facility locations or mutual use/ aid agreements with local fire department or other entities.	Records may be incomplete or inaccurate.

Notes:
USGS = United States Geological Survey

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QAPP Worksheet #14 & #16: Project Tasks and Schedule

The following table describes the main tasks and schedule for the SI:

Task	Start Date	End Date
Pre-mobilization	July 2021	July 2021
Mobilization	July/ August 2021	July/ August 2021
Field Work	August/ September 2021	August/ September 2021
Demobilization	September 2021	September 2021
Data Review/ Validation	October 2021	November 2021
Reporting	December 2021	June 2022

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Final PQAPP Worksheet #15: Screening Limits and Laboratory-Specific Detection/ Quantitation Limits

Matrix: Groundwater/ Surface Water
Analyte Group: PFAS
Method: PFAS by LC/MS/MS Compliant with QSM 5.3 Table B-15

Analyte	CAS Number	Laboratory Control Spike Lower Control Limit (%)	Laboratory Control Spike Upper Control Limit (%)	Achievable Laboratory Limits		
				DL (ng/L)	LOD (ng/L)	LOQ (ng/L)
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	65	140	0.81	4.0	10
Perfluoroheptanoic acid (PFHpA)	375-85-9	72	130	0.48	4.0	10
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	68	131	0.95	4.0	10
Perfluorononanoic acid (PFNA)	375-95-1	69	130	0.78	4.0	10
Perfluorooctanoic acid (PFOA)	335-67-1	71	133	0.95	4.0	10
Perfluorobutanesulfonic acid (PFBS)	375-73-5	72	130	0.81	4.0	10
Perfluorobutanoic acid (PFBA)	375-22-4	73	129	0.90	4.0	10
Perfluoropentanoic acid (PFPeA)	2706-90-3	72	129	0.85	4.0	10
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	2991-50-6	61	135	0.97	8.0	10
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	2355-31-9	65	136	0.91	8.0	10
Perfluorodecanoic acid (PFDA)	335-76-2	71	129	0.86	4.0	10
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	71	132	0.98	4.0	10
Perfluorododecanoic acid (PFDoA)	307-55-1	72	134	0.88	4.0	10
Perfluorohexanoic acid (PFHxA)	307-24-4	72	129	0.99	4.0	10
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	65	144	0.99	4.0	10
Perfluoroundecanoic acid (PFUdA)	2058-94-8	69	133	0.95	4.0	10
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	64	140	0.94	4.0	10
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	67	138	0.90	4.0	10

Notes:
% = percent
CAS = Chemical Abstracts Service
DL= detection limit
LC/MS/MS = liquid chromatography tandem mass spectrometry
LOD = limit of detection
LOQ = limit of quantitation
ng/L = nanograms per liter
PFAS = per- and polyfluoroalkyl substances
QSM =Quality Systems Manual
USEPA = United States Environmental Protection Agency

Matrix: Soil/Sediment
Analyte Group: PFAS
Method: PFAS by LC/MS/MS Compliant with QSM 5.3 Table B-15

Analyte	CAS Number	Laboratory Control Spike Lower Control Limit (%)	Laboratory Control Spike Upper Control Limit (%)	Achievable Laboratory Limits		
				DL (µg/kg)	LOD (µg/kg)	LOQ (µg/kg)
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	68	136	0.194	0.40	1.0
Perfluoroheptanoic acid (PFHpA)	375-85-9	71	131	0.078	0.40	1.0
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	67	130	0.122	0.40	1.0
Perfluorononanoic acid (PFNA)	375-95-1	72	129	0.062	0.40	1.0
Perfluorooctanoic acid (PFOA)	335-67-1	69	133	0.059	0.40	1.0
Perfluorobutanesulfonic acid (PFBS)	375-73-5	72	128	0.071	0.40	1.0
Perfluorobutanoic acid (PFBA)	375-22-4	71	135	0.046	0.40	1.0
Perfluoropentanoic acid (PFPeA)	2706-90-3	69	132	0.054	0.40	1.0
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	2991-50-6	61	139	0.097	0.40	1.0
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	2355-31-9	63	144	0.196	0.40	1.0
Perfluorodecanoic acid (PFDA)	335-76-2	69	133	0.041	0.40	1.0
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	69	133	0.119	0.40	1.0
Perfluorododecanoic acid (PFDoA)	307-55-1	69	135	0.101	0.40	1.0
Perfluorohexanoic acid (PFHxA)	307-24-4	70	132	0.043	0.40	1.0
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	66	139	0.119	0.40	1.0
Perfluoroundecanoic acid (PFUdA)	2058-94-8	64	136	0.011	0.40	1.0
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	64	140	0.066	0.40	1.0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	65	137	0.122	0.40	1.0

Notes:
% = percent
µg/kg = micrograms per kilogram
CAS = Chemical Abstracts Service
DL= detection limit
LC/MS/MS = liquid chromatography with tandem mass spectrometry
LOD = limit of detection
LOQ = limit of quantitation
PFAS = per- and polyfluoroalkyl substances
QSM =Quality Systems Manual
USEPA = United States Environmental Protection Agency

Matrix: Soil
Analyte Group: Wet Chemistry

Analyte	Method	Laboratory Control Spike Lower Control Limit (%)	Laboratory Control Spike Upper Control Limit (%)	Achievable Laboratory Limits		
				DL (mg/kg)	LOD (mg/kg)	LOQ (mg/kg)
Total Organic Carbon	9060A (Lloyd Kahn)*	90	110	150	200	250

Notes:
% = percent
DL= detection limit
LOD = limit of detection
LOQ = limit of quantitation
mg/kg = milligrams per kilogram
NA = not applicable
*New York Department of Health certified Lloyd Kahn

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SLs for Soil and Groundwater

The DoD has adopted a policy to retain facilities in the CERCLA process based on conservative SLs for soil and groundwater, as described in a memorandum from the OSD dated 15 October 2019 (Assistant Secretary of Defense, 2019). The ARNG program under which this SI will be performed follows this DoD policy and should the maximum concentration for sampled media exceed the SLs established in the OSD memorandum, the AOI will proceed to the next phase under CERCLA. The SLs established in the OSD memorandum apply to three compounds: PFOS, PFOA, and PFBS. The SLs were calculated using the USEPA Office of Superfund Sites On-Line Calculator, which was updated on 8 April 2021 based on the release of the final Human Health Toxicity Values for PFBS (USEPA, 2021).

Additionally, the USEPA issued drinking water lifetime Health Advisories (HAs) for PFOA and PFOS in May 2016 (USEPA 2016a; USEPA, 2016b). The USEPA HAs may also be used as SLs for groundwater samples collected at the facility boundary where off-facility drinking water wells are present downgradient. This determination will be based on localized groundwater flow direction established during the SI.

Analyte	CAS Number	Residential (Soil) (µg/kg)[a,b] 0-2 feet bgs	Industrial/ Commercial Composite Worker (Soil) (µg/kg)[a,b] 2-15 feet bgs	Tap Water (Groundwater) (ng/L)[a]	USEPA HA (Groundwater as Drinking Water) (ng/L)[c,d]
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	130	1,600	40	70[d]
Perfluoroheptanoic acid (PFHpA)	375-85-9	-	-	-	-
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	-	-	-	-
Perfluorononanoic acid (PFNA)	375-95-1	-	-	-	-
Perfluorooctanoic acid (PFOA)	335-67-1	130	1,600	40	70[d]
Perfluorobutanesulfonic acid (PFBS)[e]	375-73-5	1,900	25,000	600	-
Perfluorobutanoic acid (PFBA)	375-22-4	-	-	-	-
Perfluoropentanoic acid (PFPeA)	2706-90-3	-	-	-	-
N-ethyl perfluorooctanesulfonamidoacetic acid	2991-50-6	-	-	-	-
N-methyl perfluorooctanesulfonamidoacetic acid	2355-31-9	-	-	-	-
Perfluorodecanoic acid (PFDA)	335-76-2	-	-	-	-
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	-	-	-	-
Perfluorododecanoic acid (PFDoA)	307-55-1	-	-	-	-
Perfluorohexanoic acid (PFHxA)	307-24-4	-	-	-	-
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	-	-	-	-
Perfluoroundecanoic acid (PFUdA)	2058-94-8	-	-	-	-
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	-	-	-	-
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	-	-	-	-

Notes:

a.) Assistant Secretary of Defense, 2019. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater and Soil using USEPA's Regional Screening Level Calculator. Hazard quotient (HQ) = 0.1. 15 October 2019.

b.) The SLs for soil are based on incidental ingestion of soil applied to the soil intervals reasonably anticipated to be encountered; surface soil (0 to 2 feet bgs for the residential scenario) and subsurface soil (2 to 15 feet bgs for the industrial/commercial worker scenario).

c.) USEPA. 2016a. Drinking Water HA for Perfluorooctanoic Acid (PFOA). Office of Water (4304T). Health and Ecological Criteria Division, Washington, DC 20460. USEPA Document Number: 822-R-16-005. May 2016. / USEPA. 2016b. Drinking Water HA for Perfluorooctane Sulfonate (PFOS). Office of Water (4304T). Health and Ecological Criteria Division, Washington, DC 20460. USEPA Document Number: 822-R-16-004. May 2016.

d.) USEPA HAs apply to the PFOS and PFOA concentrations individually or combined.

e.) USEPA, 2021. Risk Based Screening Levels Calculated for PFBS in Groundwater and Soil using USEPA's Regional Screening Level Calculator. HQ = 0.1. 8 April 2021.

CAS = Chemical Abstracts Service
bgs = below ground surface
HA= Health Advisory
ng/L = nanograms per liter
OSD= Office of the Secretary of Defense
µg/kg = micrograms per kilogram

QAPP Worksheet #17: Sampling Design and Rationale

Worksheet #17a-f describes the sampling design, basis for its selection, and field investigation details. Field activities will be completed per the Standard Operating Procedures (SOPs) in **Appendix B**.

The objective of the SI is to identify whether there has been a release to soil and groundwater (if present) at each AOI and determine the presence or absence of PFOA, PFOS, and PFBS at or above SLs. As discussed in **Worksheet #10**, three AOIs have been identified at Albany AASF #3. Regional groundwater flow at the Albany AASF #3 is to the north.

- AOI 1: During a fire suppression system test in 2012, the AASF #3 Hangar was filled with AFFF. The hangar bay doors were opened, allowing the AFFF to spill out onto the tarmac and into the grass. The release was cleaned up and disposed of by a contractor. It is unknown how much AFFF was used during the testing or spilled outside of the hangar. The Fire Response Unit was located in a room attached to the northern side of the AASF #3 Hangar. The Fire Response Unit was active between 1983 and 1992 and responded to all fire and emergency related incidents that occurred at the Albany AASF #3 and the Albany Airport in conjunction with the AFD. The Fire Response Unit had one firetruck with a 150-gallon dual line of 3% AFFF and water tank and a 400-gallon Purple K tank. It is unknown where the firetruck was filled, washed, or if it leaked. There were no known releases of AFFF within the Fire Response Unit.
- AOI 2: In May 2017, a garbage truck fire occurred south of the AASF Hangar. The Colonie Fire Department responded to the incident, but it is unknown if any AFFF were used during the emergency response.
- AOI 3: Between May and November 2020, the NYARNG constructed four new cold storage hangars (Hangars A through D) at Albany AASF #3 (Figure 10-4). During construction of the hangars and associated subsurface infrastructure, soil was removed from within the footprint of the potential PFAS release area at AOI 1, and stockpiled to the north of the facility's ACP. There is a potential that PFAS from the stockpiled soil may have leached to the subsurface at this location.

Environmental media samples will be collected from each AOI in accordance with the applicable CSM, as summarized in **Table 17-1**. Temporary monitoring wells will be installed where PFAS were potentially released and downgradient of the potential source areas.

In instances where deviations from this sampling design and rationale are made due to unforeseen Site conditions, a Field Change Request Form will be generated to document the change and request feedback from the AECOM Task and Project Managers, USACE, and ARNG.

Sampling Tasks

The field program will include tasks as detailed in the following Worksheet elements:

- **Worksheet #17a** - Mobilization
- **Worksheet #17b** - Direct Push Boring Installation and Soil Sampling
- **Worksheet #17c** - Temporary Groundwater Monitoring Well Installation and Grab Groundwater Sampling
- **Worksheet #17d** - Synoptic Water Level Measurements
- **Worksheet #17e** - Surveying

- **Worksheet #17f** - Investigation-Derived Waste Management

Table 17-1: Site Inspection Sample Count

AOI	Potential PFAS Release Area	# of DPT Borings	# HA Locations	Approximate Depth (feet bgs)	Groundwater Samples	Soil Samples
1	AASF Hangar/ Fire Response Unit	7	2	20	7	21
2	Garbage Truck Fire	4	0	20	4	10
3	Stockpiled Soil	2	5	20	2	16
Total (not including QC)		13	7	--	13	47

Notes:
1) All samples will be analyzed for PFAS.
2) One soil sample per AOI will be analyzed for pH and TOC from a location in the source area. Grain size analysis will be performed in up to one soil sample per AOI where extensive horizontal and vertical clay units are identified by the field geologist, if these conditions are encountered in the field.

AOI = area of interest
bgs = below ground surface
DPT = direct push technology
HA = hand auger
QC = quality control

QAPP Worksheet #17a
Sampling Design and Rationale
Mobilization

Site Preparation

The site preparation activities for the SI field investigation operations include mobilization of field team personnel and equipment. No vegetation clearance is planned during field investigation activities.

PFAS Site Water Supply Sampling and Sampling Equipment Acceptability

A sample from the potable water source (i.e., decontamination water) will be collected prior to mobilization to confirm that it is acceptable for use for during field activities (i.e., equipment decontamination). The water source is acceptable for use if the detected concentration is less than 1/5 the SL. If the decontamination water has concentrations greater than 1/5 the SL, the project team will determine whether the water is acceptable for its intended use based on site-specific factors (i.e., drilling methodology, relevant sample media). If the water is deemed unacceptable, water will be brought onsite from another source confirmed to be PFAS-free through sampling. Quality control (QC) samples will not be collected for the decontamination water sample.

All materials being purchased or rented for field work will be confirmed as acceptable for use in the PFAS sampling environment. A summary of acceptability of materials for use in the PFAS sampling environment is provided in SOP 3-41 (**Appendix B**). As an additional layer of control, prior to the start of field work each day, a PFAS Sampling Checklist will be completed (SOP 3-41, **Appendix B**). The checklist will serve as a reminder to each field team member regarding the allowable materials within the sampling environment. An example of the checklist is provided below.

Example PFAS Daily Sampling Checklist

Team Members		
Yes	No	Description
		Has AECOM PFAS Sampling guidance been reviewed by all team members?
		Comments:
Yes	No	Has AECOM field sampling staff received needed training certification?
		Comments:
Yes	No	Was a briefing held for field sampling staff?
		Comments:
Yes	No	Were additional PFAS sampling instructions given to field sampling staff?
		Comments:
Yes	No	Have personal clothing and PPE requirements been followed by all field sampling staff?
		Comments:
Yes	No	Were lotions and sunscreen used for field sampling staff?
		Comment:
Sample Collection		
Yes	No	Has a PFAS-free water source been identified?
		Comment
		Source of PFAS-free water:
Yes	No	Have all sampling items, parts and equipment been inspected to be free of PFAS?
		Comment:
Yes	No	Has sampling location sequence been communicated to avoid cross-contaminations?
		Comment:
Yes	No	Have drilling fluids been evaluated and shown to be free of PFAS?
		Comment:
Yes	No	Use of PFAS-free decontamination solution?
		Brand name of decontamination solution:
Yes	No	Have all field logs, notebooks, pens, labels been inspected, and do they meet AECOM PFAS sampling guidance requirements?
		Comment:
Yes	No	Have all sample shipping materials (ice, Ziploc® bags) been inspected, and do they meet AECOM PFAS sampling guidance requirements?
		Comment:
Yes	No	Have all blanks arrived at the site and will they be collected to verify cross-contamination?
		Comment:
Document Control		
Yes	No	Have all variances from sampling guidance been documented?
		Comment:
Other Comments:		

Personnel Qualifications

All personnel mobilized to the site will meet applicable Occupational Safety and Health Administration (OSHA) training requirements including hazardous waste operations and emergency response (HAZWOPER) training and medical surveillance requirements as specified in the Accident Prevention Plan (APP) and Site Safety and Health Plan (SSHP). Personnel will be required to complete the DoD's *Operations Security Awareness for Military Members, DoD Employees, and Contractors* and *Level 1 Antiterrorism Awareness Training*. Additionally, all AECOM employees that will be performing field work will take an internal PFAS sampling guidance training.

Permits and Notifications

Utility clearance will be conducted by NYARNG with input from the AECOM field team. A minimum of two weeks to coordinate the clearance will be required. AECOM or its drilling subcontractor will contact New York 811, the local one-call utility location system. AECOM and the drilling subcontractor will participate in an Albany AASF #3 orientation prior to initiating work, if required. The determination of the orientation requirement will be made after final intrusive investigation locations are determined. AECOM will also contact the ARNG Environmental Manager at least five business days prior to the scheduled start of the field activities. A site walk will be scheduled with the appropriate ARNG personnel to mark out locations of the subsurface utilities. As a precaution, the first 5 feet of each boring will be pre-cleared using hand tools (e.g., post-hole diggers, augers, etc.) or air knifing methods. All field work will be coordinated with the ARNG Environmental Manager and/or his/her designee.

Health and Safety Requirements

Health and safety requirements for SI field activities are provided in the APP. Field personnel will wear PFAS-free Level D personal protective equipment (PPE). Detailed Activity Hazard Analyses identifying the physical, chemical, and biological hazards that may be encountered at the site and the associated mitigation methods are presented in the SSHP.

All onsite personnel who may be exposed to hazardous conditions will be required to meet training requirements identified in Federal Regulation 29 CFR 1910.120 (HAZWOPER). At least two personnel trained in first aid and cardiopulmonary resuscitation (CPR) will be onsite during field activities. Training certificates for personnel (HAZWOPER 40-hour training; current HAZWOPER 8-hour refresher training; and first aid/CPR) will be maintained onsite by the Site Supervisor.

Personnel and visitors who enter the site will be required to review the APP and SSHP and sign the acknowledgement form. Site workers will be required to sign the daily tailgate safety meeting form and fill out daily Activity Hazard Analysis forms. Safety issues that arise during implementation of field activities will be addressed during tailgate safety meetings held daily before the workday and will be documented in the daily tailgate safety meeting form.

Community Air Monitoring

Community air monitoring will be performed in accordance with the New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan (CAMP), Attachment 1A of the NYSDEC Division of Environmental Remediation-10 Technical Guidance for Site Investigation and Remediation (**Appendix C**). Air monitoring activities will be implemented to protect the community from any potential airborne releases that could result from field activities associated with the SI (NYSDEC, 2010).

Continuous air monitoring will be performed in the vicinity of the drill rig when intrusive activities are underway. Air monitoring will consist of a dust monitor placed on a tripod adjacent to the work areas, in a downwind location. Background (upwind) levels will be measured each day prior to start-up of site activities and periodically throughout the day. If particulate levels (PM10) are greater than 100 micrograms per cubic meter (µg/m^3) above background for a 15-minute period, or if airborne dust is observed leaving the work area, dust suppression techniques will be employed. Work will continue with these suppression techniques provided that PM10 levels do not exceed 150 µg/m^3 above background and no visible dust is migrating from the work area. If PM10 exceeds 150 µg/m^3 over background, work will be stopped, and a re-evaluation of activities will be initiated.

QAPP Worksheet #17b
Sampling Design and Rationale
Direct-Push Boring Installation and Soil Sampling

Borings will be advanced via hand auger and DPT (SOP 3-17). Borings will be advanced using DPT at all locations for soil sample collection; however, hand augers will be used to clear the top 5 feet of the boring in accordance with AECOM utility clearance protocols. A GeoProbe® DT45 or DT60 dual-tube sampling system (or equivalent) will be used to collect continuous soil cores to the target depth. In general, DPT will be used to collect three soil samples per boring, if possible: one surface soil sample (0 to 2 feet bgs), one subsurface soil sample approximately 2 feet above the groundwater table, and one subsurface soil sample at the mid-point between the surface and the groundwater table, if the depth to water is up to 30 feet bgs or shallower, or from 13 to 15 feet bgs if the depth to water is greater than 30 feet deep. If refusal is encountered before the desired depth of sample location, one additional attempt will be made adjacent to the original location (within 10 feet of the original boring) to collect a soil sample at the desired depth. If refusal is encountered at 6 feet bgs or shallower, only two samples will be collected per boring: one surface

soil sample (0 to 2 feet bgs) and one sample approximately 2 feet above refusal. All drilling materials will be PFAS-free. At downgradient borings along the facility boundary (AOI01-07 and AOI02-04), only one subsurface soil sample will be collected approximately 2 feet above the groundwater table.

The proposed sample locations are shown on **Figure 17-1** through **Figure 17-4** and described in **Worksheet #18**. The soil sample rationale and target depths for the borings are provided in **Table 17-2** below. During construction of the new cold storage hangars and associated subsurface infrastructure in 2020, soil may have been disturbed within the footprint of the potential PFAS release area at AOI 1, as described above in the CSM (**Worksheet #10**). Because the exact extent of the construction activities could not be confirmed during the SI planning phase, field staff will coordinate with NYARNG staff to place samples collected from AOI 1 in undisturbed areas to the extent possible. Additional details are provided in **Table 17-2** below.

Table 17-2: Soil Sample Rationale and Target Depths for Borings

AOI	Number of Borings	Sample Collection Method	Target Depth (feet bgs)	Rationale
AOI 1	7	DPT	20	- One boring (AOI01-02) along the southwestern drainage ditch adjacent to the stormwater system discharge location from the OWS/ hangar drains and one boring (AOI01-01) further downgradient along the drainage ditch. - One boring upgradient of (AOI01-03), one boring downgradient of (AOI01-05), and one boring within suspected fire suppression system release area (AOI01-04). Field staff will coordinate with NYARNG staff to place the samples in areas that were not disturbed by recent construction to the extent possible. - One boring downgradient of the Fire Response Unit (AOI01-06). - One boring downgradient at the facility boundary (AOI01-07); only one subsurface soil sample will be collected at the groundwater interface.
	2	HA	2	- Two surface soil samples (AOI01-08 and AOI01-09; 0 to 2 feet bgs) within the suspected fire suppression system release area. Field staff will coordinate with NYARNG staff to place the samples in areas that were not disturbed by recent construction.
AOI 2	4	DPT	20	- One boring (AOI02-01) upgradient of, one boring (AOI02-03) downgradient of, and one boring (AOI02-02) within suspected release area. - One boring at the facility boundary, upgradient of the Crushed Stone Area (AOI02-04); only one subsurface soil sample will be collected at the groundwater interface.
AOI 3	2	DPT	20	- One boring (AOI03-01) upgradient of and one boring (AOI03-02) downgradient of the stockpiled soil.
	5	HA	4	- Five hand auger locations within soil stockpiles. Soil samples will be collected from 0 to 2 feet bgs and 2 to 4 feet bgs.

Notes:
AOI = area of interest
bgs = below ground surface
DPT = direct push technology
HA = hand auger

The soil cores will be continuously logged for lithological descriptions by a field geologist using the Unified Soil Classification System (USCS) per SOP 3-16. A photoionization detector (PID) will be used to screen the breathing zone during boring activities. Observations and measurements will be recorded on field forms and in a non-treated field logbook. Photographs will also be taken of the boring cores. At a minimum, depth interval, recovery thickness, PID concentrations, moisture, relative density, color (using a Munsell soil color chart), and texture (using the USCS) will be recorded. Additional observations to be recorded may include groundwater or perched water depth, organic material, or cultural debris. If a clay layer is observed in a boring with a thickness in excess of 3 feet, boring activities will be terminated in order to avoid completely penetrating a competent clay layer.

It is anticipated that all borings will be advanced in areas without surface cover; however, if a boring is required in asphalt, it will be abandoned by backfilling with bentonite chips to approximately 6 inches bgs, and the remainder of the borehole will be patched with an asphalt cold patch. Borings into concrete will be avoided, if possible; however, if borings are advanced into concrete, the borings will be abandoned by backfilling with bentonite chips to approximately 6 inches bgs, and the remainder of the borehole will be filled with concrete to provide as flush a surface as possible. The surface at each location will be restored to match the surrounding area.

QC samples will be collected in accordance with **Worksheet #20**. Field duplicate samples will be collected at a rate of 10 percent (%) and analyzed for the same parameters as the accompanying samples. Matrix spikes/ matrix spike duplicates (MS/MSDs) will be collected at the rate of 5 %t and analyzed for the same parameters as the accompanying samples. One Field Reagent Blank (FRB) will be collected per sampling event and will be analyzed for PFAS. For non-dedicated sampling equipment, decontamination will be completed after each use (i.e., downhole tool and hand auger decontaminated between intervals sampled for laboratory analysis), and associated equipment rinsate blanks (ERBs) will be collected at a rate of one per twenty samples. ERBs will be analyzed for the same analytes as the associated samples. A temperature blank will be placed in each cooler to ensure that samples are preserved at or below 6 degrees Celsius (˚C) during shipment.

Each sample will be collected into laboratory-supplied bottleware and submitted to the laboratory for analysis of selected parameters. Samples will be analyzed for PFAS by liquid chromatography tandem mass spectrometry (LC/MS/MS) compliant with Quality Systems Manual (QSM) 5.3 Table B-15. Additionally, one soil sample per AOI from a location in the source area will be analyzed for total organic carbon (TOC) (USEPA Method 9060A/ Lloyd Kahn) and pH (USEPA Method 9045D). Additionally, up to one soil sample per AOI will be submitted for grain size analysis with sieve and hydrometer (American Society for Testing and Materials [ASTM] D-422) (i.e., clay content). The grain size analysis will be performed where extensive horizontal and vertical clay units are identified by the field geologist, if these conditions are encountered in the field. All sample containers will be PFAS-free. The laboratory method detection limits (DLs) for these analytes are presented in **Worksheet #15**. Samples will be packaged on ice and transported daily via overnight commercial carrier under standard chain of custody (CoC) procedures to the laboratory (see SOP 3-04).

QAPP Worksheet #17c
Sampling Design and Rationale
Temporary Groundwater Monitoring Well Installation and Grab Groundwater Sampling

Boreholes for temporary wells will be created using a Geoprobe® DT325 or DT60 dual-tube sampling system (or equivalent). Once the borehole has been advanced to the specified depth, the temporary well will be constructed of a 5-foot section of 1-inch Schedule 40 poly-vinyl chloride (PVC) screen with sufficient casing to reach ground surface. New PVC pipe will be used for each sampling location. The target screen interval for each location will be the top of the groundwater

table, which expected to be encountered no deeper than 15 feet. The target screen intervals and rationale for the sampling locations are described in **Table 17-3**.

Table 17-3: Groundwater Sample Rationale and Proposed Screen Intervals

AOI	# Temporary wells	Target Screen Interval (feet bgs)	Rationale
AOI 1	7	Top of groundwater table (est. 15-20)	- Seven temporary wells proposed: One boring (AOI01-02) along the southwestern drainage ditch adjacent to the stormwater system discharge location from the OWS/ hangar drains and one boring (AOI01-01) further downgradient along the drainage ditch. - One boring upgradient of (AOI01-03), one boring downgradient of (AOI01-05), and one boring within suspected fire suppression system release area (AOI01-04). - One boring downgradient of the Fire Response Unit (AOI01-06). - One boring downgradient at the facility boundary (AOI01-07). - Target depth of borings was determined by the likelihood of encountering groundwater.
AOI 2	4	Top of groundwater table (est. 15-20)	- Four temporary wells proposed: One boring upgradient of (AOI02-01), one boring downgradient of (AOI02-03), and one boring within suspected release area (AOI02-02). - One boring at the facility boundary, upgradient of the Crushed Stone Area (AOI02-04). - Target depth of borings was determined by the likelihood of encountering groundwater.
AOI 3	2	Top of groundwater table (est. 15-20)	- Two temporary wells proposed: One boring (AOI03-01) upgradient of and one boring (AOI03-02) downgradient of the stockpiled soil.

Notes:
AOI = area of interest
bgs = below ground surface

A grab groundwater sample will be collected at each temporary well using a peristaltic pump with tubing that has been determined to be PFAS free (i.e. high-density polyethylene [HDPE] or other PFAS-free material). If the peristaltic pump cannot generate enough hydraulic lift to bring the groundwater to the surface, groundwater samples will be collected using a PFAS-free 0.85-inch Geotech Bladder pump or other sampling device. Prior to sampling, the temporary well will be purged in order to remove sediment to the extent reasonable in an effort to minimize the turbidity of the sample, with no more than 20 minutes of purging (see SOP 3-37: Grab Groundwater Sampling Techniques for additional details). Purging will be dependent on groundwater recharge within the well. If sufficient groundwater recharge is observed, the well will be purged until turbidity is ≤ 25 nephelometric turbidity units (NTU) is achieved or for 20 minutes, whichever occurs first. In wells with limited groundwater recharge, the sample will be collected using the available groundwater.

Water quality parameters (e.g., temperature, specific conductance, pH, dissolved oxygen [DO], oxidation-reduction potential [ORP], and turbidity) will be measured and recorded on the field sampling form every 5 minutes until the above criteria are met. Water quality parameters will be measured using a water quality meter and flow-through cell. See SOP 3-14: Monitoring Well Sampling and SOP 3-24: Water Quality Parameter Testing for more details. In addition, a subsample of each groundwater sample will be collected in a separate container and undergo a

shaker test to identify if there is any foaming. If foaming is observed, the observation will be noted on the CoC to notify the laboratory prior to analysis. Any non-dedicated sampling materials will be decontaminated between boring locations.

Each sample will be collected into laboratory-supplied bottleware and submitted to the laboratory for analysis of selected parameters (PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15) (DoD, 2019a) as per SOP 3-41. The laboratory method DLs for these analytes are presented in **Worksheet #15**. QC samples will be collected in accordance with **Worksheet #20**. ERBs will not be prepared or analyzed unless a deviation from this plan requires sample handling using non-dedicated equipment. If non-dedicated sampling equipment is used, ERBs will be collected at a rate of one per twenty samples and will be analyzed for the same analytes as the associated samples. Sample containers will be PFAS free and the aqueous samples will not be filtered. Samples will be packaged on ice and transported daily via overnight commercial carrier under standard CoC procedures to the laboratory (SOP 3-04). Temporary wells will be abandoned using bentonite chips at completion of sampling activities and surveying.

QAPP Worksheet #17d
Sampling Design and Rationale
Synoptic Water Level Measurements

Groundwater levels will be used to monitor site-wide groundwater elevations and assess groundwater flow. Synoptic water level elevation measurements will be collected from the newly-installed temporary monitoring wells. The wells will be surveyed, and the water level measurement will be taken from the survey mark on the northern side of the well casing.

QAPP Worksheet #17e
Sampling Design and Rationale
Surveying

A small notch will be cut on the northern side of the well casing, which will be surveyed by a state-licensed surveyor (see SOP 3-07). The top of casing and ground surface elevation will be surveyed for each newly installed well. Survey data will be collected in the applicable Universal Transverse Mercator zone projection with WGS84 datum (horizontal) and North American Vertical Datum 1988 (vertical).

QAPP Worksheet #17f
Sampling Design and Rationale
Investigation-Derived Waste Management

Currently, the disposal of PFAS investigation-derived waste (IDW) is not regulated. As such, the IDW will be managed as follows.

Non-hazardous solid IDW (i.e., soil cuttings) generated during SI activities with no evidence of contamination (e.g., no visual or olfactory evidence of contamination, no elevated readings on the PID) will be returned to the ground surface on the downgradient side of the borehole. The solid IDW will not be sampled and will assume the PFAS characteristics of the associated soil samples.

Although not anticipated, if elevated PID readings are observed, or if visual or olfactory evidence of petroleum contamination is observed, the soil IDW from the select boring location with impacts will be containerized in properly labeled 55-gallon drums (see SOP 3-05). The containerized IDW will be temporarily stored within the fenced boundary of Albany AASF#3 at a location designated by the Environmental Manager and the NYARNG. ARNG will manage disposal of the solid IDW and will coordinate with NYSDEC to ensure proper disposal in accordance with Section 6 of New York Codes, Rules, and Regulations (NYCRR) Part 364.

Liquid IDW (i.e., purge water and decontamination fluids) generated during SI activities will be containerized in properly-labeled 55-gallon drums (see SOP 3-05). The liquid IDW will not be

sampled and will assume the PFAS characteristics of the associated groundwater samples collected from the source locations. The containerized IDW will be temporarily stored within the fenced boundary of Albany AASF#3 at a location designated by NYARNG until the analytical results for the associated groundwater samples are available. Liquid IDW drums will only be filled 75% full to account for freeze/thaw cycles. ARNG will manage and dispose of the liquid IDW under a separate contract in accordance with *SOP No. 042A for Treating Liquid Investigation-Derived Material (Purge water, drilling water, and decontamination fluids)* (EA Engineering, Science, and Technology, Inc., 2021). ARNG will further coordinate with the NYSDEC to ensure proper disposal is in accordance with Section 6 NYCRR Part 364 the Army Guidance for Addressing Releases of PFAS, Q18 (DA, 2018).

At locations where soil IDW is returned to the ground surface, AECOM will collect global positioning system (GPS) points (i.e., polygons) around the location where the IDW was placed. The polygon will be included in the reporting phase for future use, if required.

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

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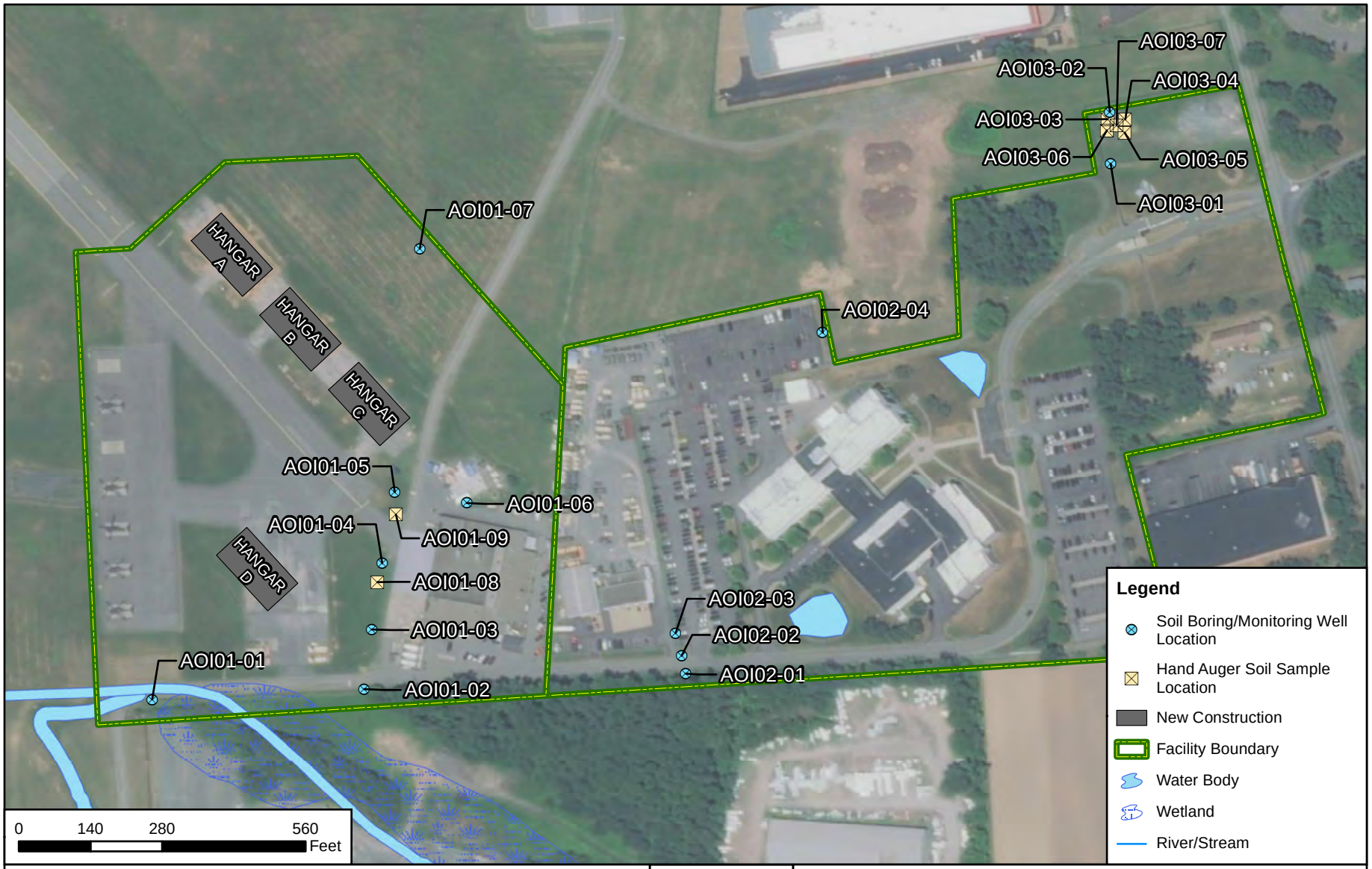

CLIENT	ARNG			
PROJECT	Site Inspection for PFAS at Albany AASF #3, NY			
REVISED	6/23/2021	GIS BY	MS	6/23/2021
SCALE	1:3,360	CHK BY	AM	6/23/2021
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	CM	6/23/2021

N

TITLE

Site Inspection Sample Locations

AECOM

12420 Milestone Center Drive
Germantown, MD 20876

Figure 17-1

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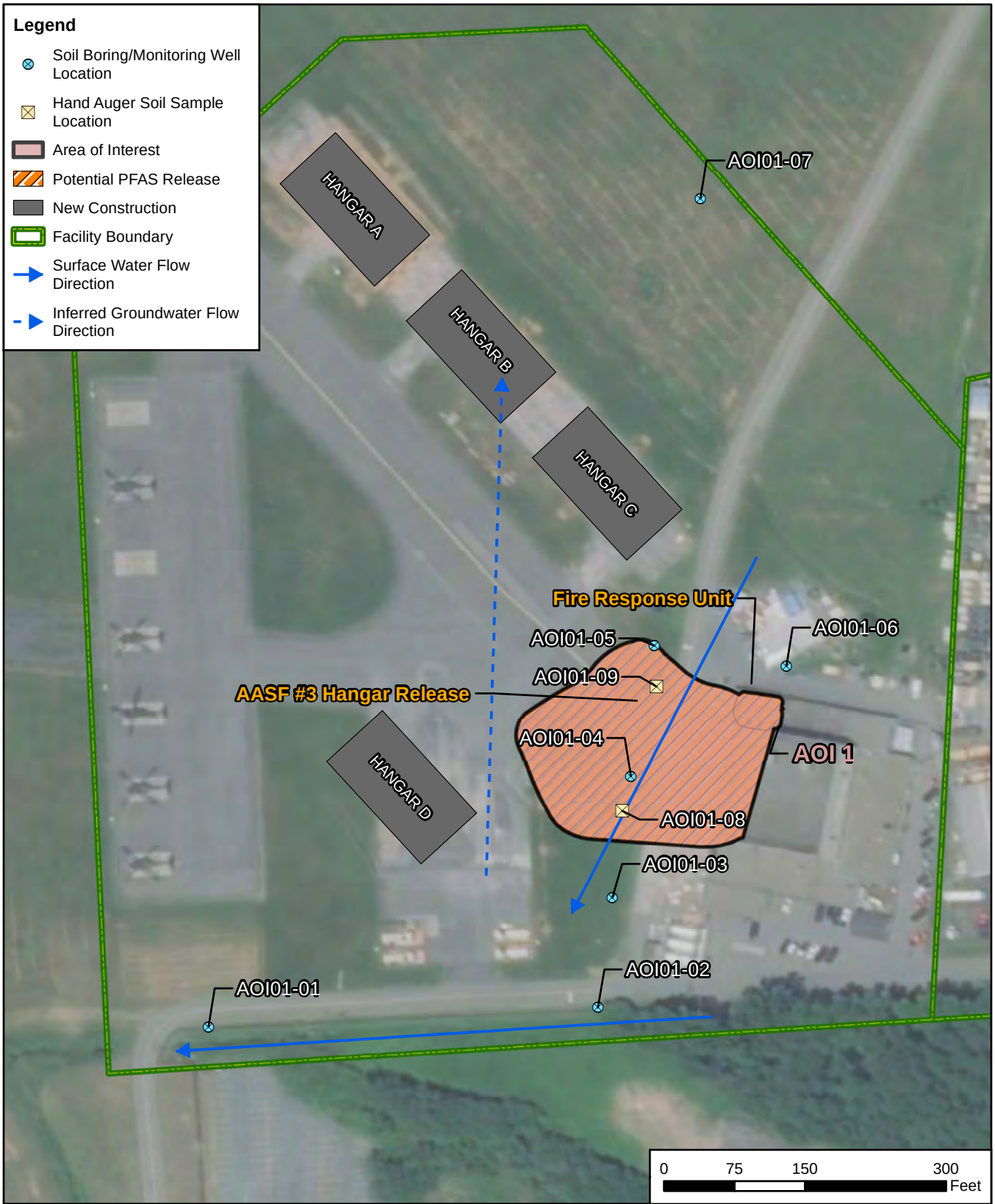


CLIENT	ARNG			
NOTES	Site Inspection for PFAS at Albany AASF #3, NY			
REVISED	5/14/2021	GIS BY	MS	5/14/2021
SCALE	1:1,800	CHK BY	AM	5/14/2021
Base Map: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,		PM	CM	5/14/2021

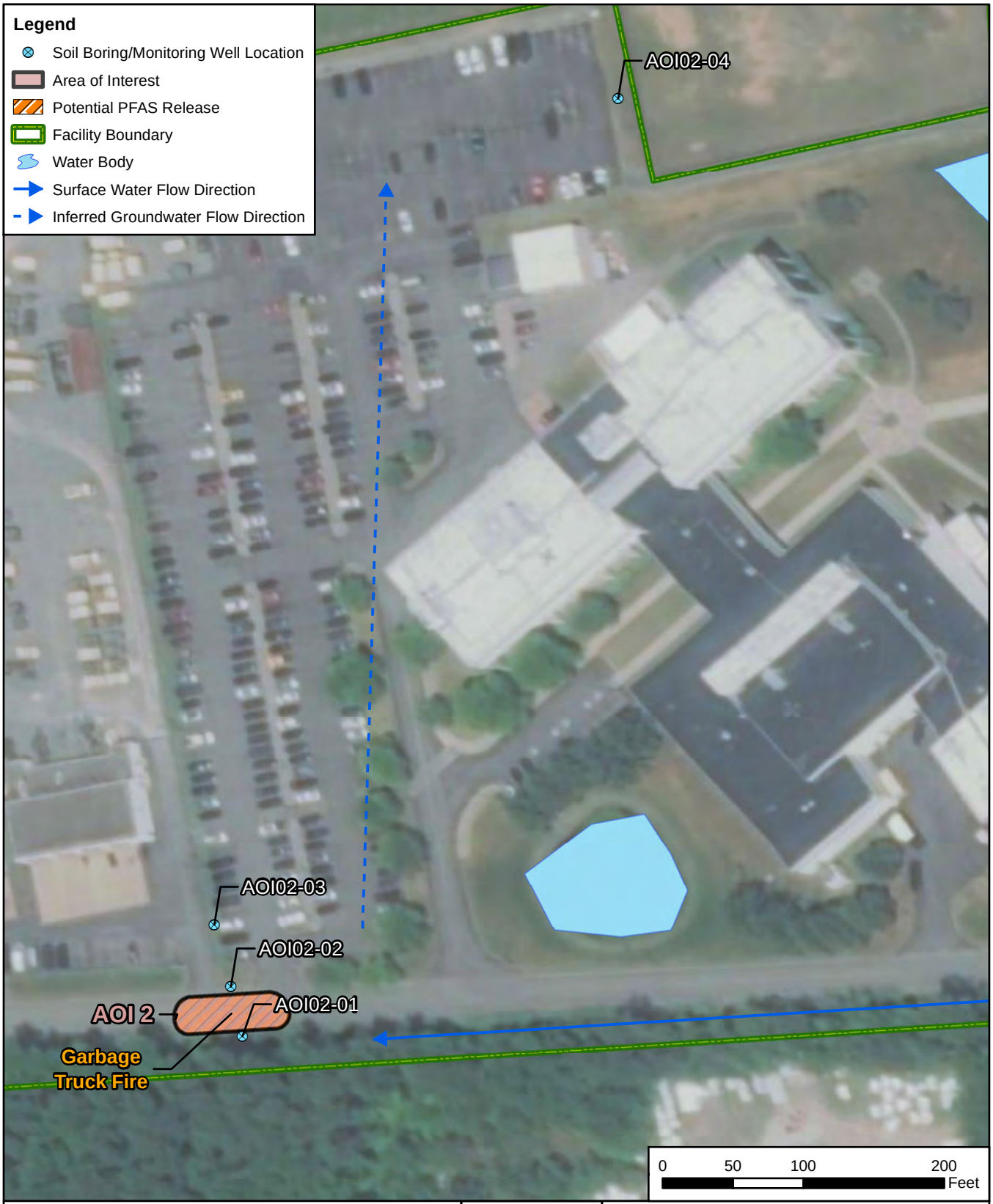
N

Site Inspection
Sample Locations - AOI 1

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 17-2

Q:\Projects\ENV\GEARS\GEO\MAES 2012 Unrestricted\Fort Meade\E. Data Management\GIS\MXDs\Chisholm_6th\March2017\ Fig_17-2_Albany_AASF_SI_Sample_Locations - AOI 1.mxd



CLIENT	ARNG			
NOTES	Site Inspection for PFAS at Albany AASF #3, NY			
REVISED	6/23/2021	GIS BY	MS	6/23/2021
SCALE	1:1,200	CHK BY	AM	6/23/2021
Base Map: NYS Digital Ortho-imagery Program (NYSDOP), 2016		PM	CM	6/23/2021

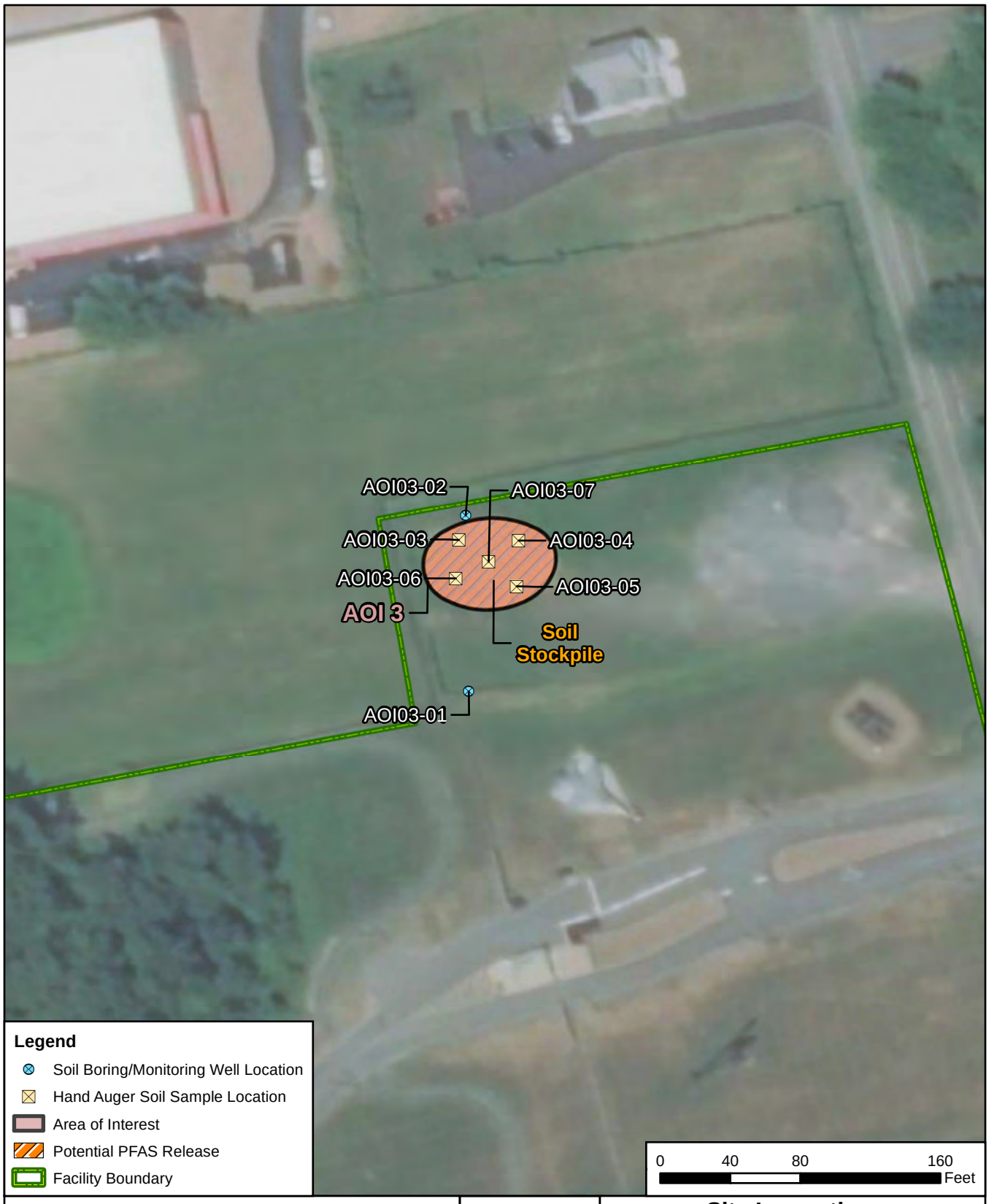
N

Site Inspection
Sample Locations - AOI 2

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 17-3

Q:\Projects\ENV\GEARS\GEO\MAES 2012 Unrestricted\Fort Meade\E. Data Management\GIS\MXDs\Chisholm_6th\March2017\ Fig_17-3_Albany_AASF_SI_Sample_Locations - AOI 2.mxd



CLIENT	ARNG			
NOTES	Site Inspection for PFAS at Albany AASF #3, NY			
REVISED	5/25/2021	GIS BY	MS	5/25/2021
SCALE	1:960	CHK BY	AM	5/25/2021
Base Map: NYS Digital Ortho-imagery Program (NYSDOP), 2016		PM	CM	5/25/2021

N

Site Inspection
Sample Locations - AOI 3

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 17-4

Q:\Projects\ENV\GEARS\GEO\MAES 2012 Unrestricted\Fort Meade\E. Data Management\GIS\MXDs\Chisholm_6th\March2017\ Fig_17-4_Albany_AASF_SI_Sample_Locations - AOI 3.mxd

QAPP Worksheet #18: Sampling Locations and Methods

The table below describes the samples that will be collected during the SI. Sampling SOPs can be found in **Appendix B**.

AOI	Location Identifier	Sample Identifier	Matrix	Depth (feet bgs)	Type (Sampling Tool)	Analyte/Analytical Group	Sampling SOP
Soil Samples							
All	AOI01-01 AOI01-02 AOI01-03 AOI01-04 AOI01-05 AOI01-06 AOI01-08 AOI01-09 AOI02-01 AOI02-02 AOI02-03 AOI03-01 AOI03-02 AOI03-03 AOI03-04 AOI03-05 AOI03-06 AOI03-07	AOI01-01-SB-[Depth] AOI01-02-SB-[Depth] AOI01-03-SB-[Depth] AOI01-04-SB-[Depth] AOI01-05-SB-[Depth] AOI01-06-SB-[Depth] AOI01-08-SB-[Depth] AOI01-09-SB-[Depth] AOI02-01-SB-[Depth] AOI02-02-SB-[Depth] AOI02-03-SB-[Depth] AOI03-01-SB-[Depth] AOI03-02-SB-[Depth] AOI03-03-SB-[Depth] AOI03-04-SB-[Depth] AOI03-05-SB-[Depth] AOI03-06-SB-[Depth] AOI03-07-SB-[Depth]	Surface Soil	0-2 feet bgs	Hand Auger	PFAS (LC/MS/MS compliant with QSM 5.3 Table B-15) Limited Sample Selection (one sample per AOI): TOC (USEPA Method 9060A/ Lloyd Kahn) pH (USEPA Method 9045D) Limited Sample Selection (up to one sample per AOI): Grain Size/Clay Content (ASTM D-422)	3-21
All	AOI01-01 AOI01-02 AOI01-03 AOI01-04 AOI01-05 AOI01-06 AOI02-01 AOI02-02 AOI02-03 AOI03-01 AOI03-02 AOI03-03 AOI03-04 AOI03-05 AOI03-06 AOI03-07	AOI01-01-SB-[Depth] AOI01-02-SB-[Depth] AOI01-03-SB-[Depth] AOI01-04-SB-[Depth] AOI01-05-SB-[Depth] AOI01-06-SB-[Depth] AOI02-01-SB-[Depth] AOI02-02-SB-[Depth] AOI02-03-SB-[Depth] AOI03-01-SB-[Depth] AOI03-02-SB-[Depth] AOI03-03-SB-[Depth] AOI03-04-SB-[Depth] AOI03-05-SB-[Depth] AOI03-06-SB-[Depth] AOI03-07-SB-[Depth]	Subsurface Soil	Soil Borings: mid-point or 13-15 feet bgs AOI 3 Hand Auger locations: 2-4 feet bgs	Geoprobe® Dual-tube Sampling System	See Above	3-21

AOI	Location Identifier	Sample Identifier	Matrix	Depth (feet bgs)	Type (Sampling Tool)	Analyte/Analytical Group	Sampling SOP
All	AOI01-01 AOI01-02 AOI01-03 AOI01-04 AOI01-05 AOI01-06 AOI01-07 AOI02-01 AOI02-02 AOI02-03 AOI02-04 AOI03-01 AOI03-02	AOI01-01-SB-[Depth] AOI01-02-SB-[Depth] AOI01-03-SB-[Depth] AOI01-04-SB-[Depth] AOI01-05-SB-[Depth] AOI01-06-SB-[Depth] AOI01-07-SB-[Depth] AOI02-01-SB-[Depth] AOI02-02-SB-[Depth] AOI02-03-SB-[Depth] AOI02-04-SB-[Depth] AOI03-01-SB-[Depth] AOI03-02-SB-[Depth]	Subsurface Soil	Above groundwater table or bottom of boring	See Above	See Above	3-21
Groundwater Samples							
All	AOI01-01 AOI01-02 AOI01-03 AOI01-04 AOI01-05 AOI01-06 AOI01-07 AOI02-01 AOI02-02 AOI02-03 AOI02-04 AOI03-01 AOI03-02	AOI01-01-GW AOI01-02-GW AOI01-03-GW AOI01-04-GW AOI01-05-GW AOI01-06-GW AOI01-07-GW AOI02-01-GW AOI02-02-GW AOI02-03-GW AOI02-04-GW AOI03-01-GW AOI03-02-GW	Groundwater	Mid-screen	Peristaltic pump	PFAS (LC/MS/MS compliant with QSM 5.3 Table B-15)	3-14
QA/QC Samples							
All	AOI[TBD]-[TBD]*	AOI[TBD]-[TBD]-SB-[Depth]-D* AOI[TBD]-[TBD]-SB-[Depth]-MS* AOI[TBD]-[TBD]-SB-[Depth]-MSD*	Solid (Soil)	TBD	Hand Auger; Geoprobe® Dual-tube Sampling System	PFAS (LC/MS/MS compliant with QSM 5.3 Table B-15) Limited Sample Selection (one sample per AOI): TOC (USEPA Method 9060A) pH (USEPA Method 9045D)	3-21

AOI	Location Identifier	Sample Identifier	Matrix	Depth (feet bgs)	Type (Sampling Tool)	Analyte/Analytical Group	Sampling SOP
All	AOI[TBD]-[TBD]*	AOI[TBD]-[TBD]-GW-D* AOI[TBD]-[TBD]-GW-MS* AOI[TBD]-[TBD]-GW-MSD*	Aqueous (Groundwater and Surface Water)	Mid-screen	Peristaltic pump	PFAS (LC/MS/MS compliant with QSM 5.3 Table B-15)	3-14
NA	NA	ALB-FRB-01	Water Quality	NA	NA (Pour laboratory-supplied PFAS-free water)	PFAS (LC/MS/MS compliant with QSM 5.3 Table B-15)	3-10
NA	NA	ALB-ERB-01 ALB-ERB-02 ALB-ERB-03 ALB-ERB-04	Water Quality	NA	NA (Pour laboratory-supplied PFAS-free water)	PFAS (LC/MS/MS compliant with QSM 5.3 Table B-15)	3-10
NA	NA	ALB-DECON-01	Decontamination Water Source	NA	NA (collect from tap or hose)	PFAS (LC/MS/MS compliant with QSM 5.3 Table B-15)	3-10

Notes:
* Locations of field quality control samples (duplicates and MS/ MSDs) will be selected in the field at the rates specified in Worksheet #20 of this SI QAPP Addendum. The location and sample identifiers listed in Worksheet #18 are included as examples only.

AOI = area of interest
ASTM = American Society for Testing and Materials
bgs = below ground surface
D = duplicate
ERB = equipment rinsate blank
FRB = field regent blank
GW = groundwater
LC/MS/MS = liquid chromatography-tandem mass spectrometry
MS = matrix spike
MSD = matrix spike duplicate
NA = not applicable
PFAS = per- and polyfluoroalkyl substances
PW = potable water
QA = quality assurance
QC = quality control
QSM = Quality Systems Manual
SB = soil boring
SOP = standard operating procedure
TBD = to be determined
TOC = total organic carbon
USEPA = United States Environmental Protection Agency

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Final PQAPP Worksheet #19 & #30: Sample Containers, Preservation, and Hold Times

Laboratory: Pace Gulf Coast, Pace Green Bay
7979 Innovation Park Dr.
Baton Rouge, Louisiana 70820
(225) 769-4900
List any required accreditations/certifications: DoD/ELAP; applicable state certification
Back-up Laboratory: NA
Sample Delivery Method: FedEx

Analyte/ Analyte Group	Matrix	Method/SOP	Accreditation Expiration Date	Container(s) (number, size & type per sample)	Preservation	Preparation Holding Time	Analytical Holding Time	Data Package Turnaround
PFAS	Aqueous	QSM 5.3 Table B-15/ SOP LCMS-011 (BRTO-0111)	ELAP-01/31/2023 NELAP-6/30/2021	HDPE w/ HDPE screw cap 2 x 125mL	Cool, 0-6°C	14 days from collection to extraction	28 days from extraction to analysis	28 days
PFAS	Solid	QSM 5.3 Table B-15/ SOP LCMS-011 (BRTO-0111)	ELAP-01/31/2023 NELAP-6/30/2021	HDPE w/ HDPE screw cap 1 x 125 mL	Cool, 0-6°C	14 days from collection to extraction	28 days from extraction to analysis	28 days
Total Organic Carbon	Solid	NYSDOH certified USEPA 9060A, SM 5310 B-2011/WL-057	ELAP-01/31/2023 NELAP-6/30/2021	Polyethylene, Glass 1 x 2oz	Cool, 0-6ºC	30 days to extraction	7 days from extraction to analysis	28 days
pH	Solid	USEPA 9045D/EXT-032	ELAP-01/31/2023 NELAP-6/30/2021	Polyethylene, Glass 1 x 2oz	None	NA	Immediate	28 days
Grain Size	Solid	ASTM D422 / CA-551	02/01/2022	Polyethylene, Glass 1 x 8oz	Cool, 0-6ºC	None	None	28 days

Notes:
1.) TOC and pH are important for evaluating transport through the soil medium.

°C = degrees Celsius
ASTM = American Society for Testing and Materials
DoD = Department of Defense
ELAP = Environmental Laboratory Accreditation Program
USEPA = United States Environmental Protection Agency

HDPE = high-density polyethylene
LCMS = liquid chromatography/ mass spectrometry
mL = milliliter
NA = not applicable
NELAP = National Environmental Laboratory Accreditation Program

NYSDOH = New York State Department of Health
oz = ounce
PFAS = per- and polyfluoroalkyl substances
QSM = Quality Systems Manual
SOP = standard operating procedure

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Final PQAPP Worksheet #20: Field Quality Control Summary

Matrix	Analytical Group	Field Samples	Field Duplicates	Matrix Spikes	Matrix Spike Duplicates	Field Reagent Blanks	Equipment Rinsate Blanks*	Total Samples
Groundwater	PFAS	13	2	1	1	1	1	19
Soil	PFAS	47	5	3	3	0	2**	60**
	pH, TOC	3	1	1	1	0	0	6
	Grain Size	3	0	0	0	0	0	3
Decontamination Water	PFAS	1	0	0	0	0	0	1

Notes:
*Applies only if use of non-dedicated sampling equipment is necessary
** Equipment rinsate blanks for solid matrices are aqueous samples

PFAS = per- and polyfluoroalkyl substances
TOC = total organic carbon

Measurement Performance Criteria Table — Field Quality Control Samples				
QC Sample	**Analytical Group**	**Frequency**	**Data Quality Indicators**	**MPC**
Matrix: Groundwater and Surface Water				
Field Duplicate	PFAS	One per 10 field samples	Precision	Values > 5X LOQ: RPD must be ≤30% Values ≤ 5X LOQ: Absolute difference ≤ 2x the LOQ
Matrix Spike/Matrix Spike Duplicate	PFAS	One per 20 field samples[1]	Bias/Accuracy/Precision (lab)	RPD ≤ 30%; Refer to Worksheet #28 for recovery criteria
Equipment Rinsate Blank	PFAS	One per 20 field samples per type of reusable equipment used[2]	Accuracy/ Bias	No target analytes ≥ ½ LOQ, unless target analytes in field samples are > 10x those in rinsate blank. Laboratory-certified PFAS-free water will be used to collect ERBs.
Reagent Blank	PFAS	One per sampling event[3]	Accuracy/ Bias	No target analytes ≥ ½ LOQ, unless target analytes in field samples are > 10x those in rinsate blank
Cooler Temperature Blank	PFAS	One per cooler	Representativeness	Temperature must be above freezing and ≤ 6 °C
Matrix: Solid (Soil and Sediment)				
Field Duplicate	PFAS, TOC	One per 10 field samples	Precision	Values > 5X LOQ: RPD must be ≤30% Values ≤ 5X LOQ: Absolute difference ≤ 2x the LOQ
Matrix Spike/Matrix Spike Duplicate	PFAS, TOC	One per 20 field samples[1]	Bias/Accuracy/Precision (lab)	RPD ≤ 30%; Refer to Worksheet #28 for recovery criteria
Reagent Blank	PFAS	One per sampling event[3]	Accuracy/ Bias	No target analytes ≥ ½ LOQ, unless target analytes in field samples are > 10x those in rinsate blank
Equipment Rinsate Blank	PFAS	One per 20 field samples per type of reusable equipment used[2]	Accuracy/ Bias	No target analytes ≥ ½ LOQ, unless target analytes in field samples are > 10x those in rinsate blank
Cooler Temperature Blank	PFAS	One per cooler	Representativeness	Temperature must be above freezing and ≤ 6°C

Notes:
1.) Analyzed more frequently than one per twenty samples or per sample delivery group.
2.) Only for re-usable equipment, not for disposable equipment/ supplies.
3.) Regardless of matrix.

% = percent
≤ = less than or equal to
≥ = greater than or equal to
°C = degrees Celsius
FRB = field reagent blank
LOQ = limit of quantitation
MPC = measurement performance criteria
PFAS = per- and polyfluoroalkyl substances
QC = quality control
RPD = relative percent difference
TOC = total organic carbon

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Final PQAPP Worksheet #21: Field Standard Operating Procedures

A summary of SOPs is provided in the table below, which can be found in **Appendix B**. All field staff will be trained through AECOM's internal PFAS Sampling Training prior to performing any sampling activities. A summary of the acceptability of certain materials for use in the PFAS sampling environment and a PFAS sampling checklist to be completed daily is provided in SOP 3-41.

Reference Number	Title, Revision Date, and/or Number	Originating Organization	Modified for Project Work?	Comments
3-01	*Utility Clearance*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-02	*Logbooks*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-03	*Recordkeeping, Sample Labeling and Chain of Custody*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-04	*Sample Handling, Storage, and Shipping*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-05	*Investigation-Derived Waste Management*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-06	*Equipment Decontamination*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-07	*Land Surveying*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-09	*Geophysics*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-12	*Monitoring Well Installation*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-13	*Monitoring Well Development*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-14	*Monitoring Well Sampling*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-15	*Monitoring Well and Borehole Abandonment*	AECOM	N	See SOP for detailed procedures

Reference Number	Title, Revision Date, and/or Number	Originating Organization	Modified for Project Work?	Comments
3-16	*Soil and Rock Classification*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-17	*Direct Push Sampling Techniques*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-20	*Operation and Calibration of Photoionization Detector*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-21	*Surface and Subsurface Soil Sampling Procedures*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-24	*Water Quality Parameter Testing for Groundwater Sampling*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-33	*Subsurface Soil Sampling by Split Spoon*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-35	*In-Situ Hydraulic Conductivity Testing via Rising or Falling Head Slug Testing*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-37	*Grab Groundwater Sampling Techniques*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-41	*Per- and Polyfluoroalkyl Substance Field Sampling Protocol*	AECOM	Y	See SOP for detailed procedures

Notes:
AECOM = AECOM Technical Services, Inc.
N = no
NA = not applicable
PFAS = per- and polyfluoroalkyl substances
SOP = standard operating procedure
Y = yes

Final PQAPP Worksheet #22: Field Equipment Calibration, Maintenance, Testing, and Inspection

Field Equipment	Calibration Activity	Maintenance Activity	SOP Reference	Testing Activity	Inspection Activity	Title or Position of Responsible Person	Frequency	Calibration Acceptance Criteria	Corrective Action
Horiba U-52 Water Quality Standards (pH, ORP, DO, Conductivity, Temperature, Turbidity)	Calibrate with standard solutions	Per page 8 of SOP 3-24	SOP 3-24	Operational equipment check and calibration	Visually inspect for cleanliness and obvious defects (broken/missing parts)	Field Technician Lead	Prior to use	pH: ± 0.01 pH units Conductivity: ± 0.01 µS/cm Turbidity: ± 0.01 NTU DO: ± 0.01 mg/L Temp: ± 0.01 °C	Minor: Repair Major: Replace instrument
MiniRAE 2000 (PID)	Calibrate with fresh air and isobutylene calibration gas	Per page 4 of SOP 3-20	SOP 3-20	Operational equipment check and calibration	Visually inspect for cleanliness and obvious defects (broken/missing parts)	Field Technician Lead	Prior to use	0-99 ppm ± 0.1 ppm 100-1,999 ppm ± 1.0 ppm 2000-10,000 ppm ± 10 ppm	Minor: Repair Major: Replace instrument
QED MP10 Controller (Bladder Pump Controller Box)	NA	--	SOP 3-14	Operational equipment check	Visually inspect for cleanliness and obvious defects (broken/missing parts)	Field Technician Lead	Prior to use	NA	Minor: Repair Major: Replace instrument
QED SamplePro (Stainless Steel Submersible Bladder Pump)	NA	Per page 7 of SOP 3-14	SOP 3-14	Operational equipment check	Visually inspect for cleanliness and obvious defects (broken/missing parts)	Field Technician Lead	Prior to use	NA	Minor: Repair Major: Replace instrument

Field Equipment	Calibration Activity	Maintenance Activity	SOP Reference	Testing Activity	Inspection Activity	Title or Position of Responsible Person	Frequency	Calibration Acceptance Criteria	Corrective Action
Solinst 101 (Water Level Meter)	NA	Per page 5 of SOP 3-14	SOP 3-14	Operational equipment check	Visually inspect for cleanliness and obvious defects (broken/missing parts)	Field Technician Lead	Prior to use	NA	Minor: Repair Major: Replace instrument
Geotech GeoPump (Peristaltic Pump)	NA	NA	SOP 3-14	Operational equipment check	Visually inspect for cleanliness and obvious defects (broken/missing parts)	Field Technician Lead	Prior to use	NA	Minor: Repair Major: Replace instrument

Notes:
°C = degrees Celsius
DO = dissolved oxygen
mg/L = milligrams per liter
NA = not applicable
NTU = nephelometric turbidity unit
ORP = oxidation-reduction potential
PID = photoionization detector
ppm = parts per million
SOP = standard operating procedure
Temp = temperature
µS/cm = micro Siemens per centimeter

Final PQAPP Worksheet #23: Analytical Standard Operating Procedures

Lab SOP Number	Title, Revision Date, and / or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
LCMS-011 (BRTO-0111)	*Analysis of PFAS, 04/15/20, Revision 07*	Definitive	Water/PFAS Solid/PFAS	Agilent 6460 Triple Quad LC/MS/MS	Pace Gulf Coast	N
EXT-032	*pH in Aqueous and Soil/Waste Samples, 10/26/17, Revision 18*	Definitive	Solid/pH	Orion 720A pH Meter, Combination Electrode	Pace Gulf Coast	N
CA-551	*Grain Size Analysis, 04/19, Revision 2.*	Definitive	Solid/Grain Size	Sieve	Katahdin Analytical Services, Inc.	N
ENV-SOP-GBAY-0051	*SOP for TOC, 09/19, Revision 01*	Definitive	Solid/TOC	TOC analyzer (Multi EA4000 with NDIR detector)	Pace Gulf Coast/ Pace Green Bay	N

Notes:
LCMS = liquid chromatography/ mass spectrometry
LC/MS/MS = liquid chromatography-tandem mass spectrometry
N = no
NDIR = non-dispersive infrared detection
PFAA = perfluorinated alkyl acids
PFAS = per- and polyfluoroalkyl substances
SOP = standard operating procedure
TOC = total organic carbon
Y = yes

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Final PQAPP Worksheet #24: Analytical Instrument Calibrations

Instrument/ Equipment	Calibration Procedure	Calibration Range	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person(s) Responsible for CA	SOP Reference
LC/MS/MS	Calibration Standards	NA	Prior to sample analysis	For analytes which have both linear and branched isomers and have standards available containing both linear and branched isomers, the analytes are calibrated and quantitated using a single continuous baseline to integrate all identifiable isomers.	NA	Analyst, Supervisor, QA Manager	LCMS-011 (BRTO-0111)
LC/MS/MS	Tune Check	NA	When the masses fall outside of the ±0.5 amu of the true value (as determined by the product ion formulas).	Mass assignments of tuning standard within 0.5 amu of true value.	Retune instrument and verify. If the tuning will not meet acceptance criteria, an instrument mass calibration must be performed and the tune check repeated.	Analyst, Supervisor, QA Manager	LCMS-011 (BRTO-0111)

Instrument/ Equipment	Calibration Procedure	Calibration Range	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person(s) Responsible for CA	SOP Reference
LC/MS/MS	Minimum five-point initial calibration for all analytes (ICAL)	5.0 – 100 ppb on column	Initial calibration prior to sample analysis	The isotopically labeled analog of an analyte (Extracted Internal Standard Analyte) must be used for quantitation if commercially available (Isotope Dilution Quantitation). Commercial PFAS standards available as salts are acceptable providing the measured mass is corrected to the neutral acid concentration. Results shall be reported as the neutral acid with appropriate CAS number. If a labeled analog is not commercially available, the Extracted Internal Standard Analyte with the closest retention time or chemical similarity to the analyte must be used for quantitation. (Internal Standard Quantitation) Analytes must be within 70-130% of their true value for each calibration standard. ICAL must meet one of the two options below: Option 1: The RSD of the RFs for all analytes must be ≤ 20%. Option 2: Linear or nonlinear calibrations must have $r_2 \geq 0.99$ for each analyte.	Repeat calibration if criterion is not met	Analyst, Supervisor, QA Manager	LCMS-011 (BRTO-0111)
LC/MS/MS	Second source calibration verification	50 ppb on column	Once after each initial calibration	All analytes must calculate to be within 70-130% of true value and extracted internal standard must calculate to be within 50-150% of true value.	Remake standard, recalibrate if necessary	Analyst, Supervisor, QA Manager	LCMS-011 (BRTO-0111)
LC/MS/MS	Retention Time Windows	NA	Prior to sample analysis	Established with the first CCV of the day or the average of the ICAL on days when calibration is performed. See Table 3 of LCMS-011 for RT Windows.	Perform maintenance on pump or column. Recalibrate, if necessary, to re-establish retention times.	Analyst, Supervisor, QA Manager	LCMS-011 (BRTO-0111)

Instrument/ Equipment	Calibration Procedure	Calibration Range	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person(s) Responsible for CA	SOP Reference
LC/MS/MS	Tune check	Agilent ESI-L Low Concentration Tuning Mix	Daily, prior to sample analysis, only once per analytical batch. No time constraints.	Manufacturer recommended criteria which include delta and FWHM tolerance checks of 6 m/z's over the spectrum of the detector.	Retune instrument and repeat check tune. Maintenance may be required.	Analyst, Supervisor, QA Manager	LCMS-011 (BRTO-0111)
LC/MS/MS	LOD/LOQ verification	Various, see Table 3 of LCMS-010	Quarterly	LOD meets method qualitative requirements or is at least 3x higher than noise; LOQ is recovered within LCS criteria.	Perform instrument maintenance and repeat failed LOD or LOQ study passing two consecutive tests or perform new DL study.	Analyst, Supervisor, QA Manager	LCMS-011 (BRTO-0111)
LC/MS/MS	ICV	NA	Once after each ICAL, analysis of a second source standard prior to sample analysis.	Analyte concentrations must be within ±30% of their true value.	Correct problem, rerun ICV. If problem persists, repeat ICAL.	Analyst, Supervisor, QA Manager	LCMS-011 (BRTO-0111)
LC/MS/MS	CCV	5ppb and 50ppb on column	Prior to sample analysis, after every 10 field samples, and at the end of the analytical sequence.	Concentration of analytes must range from the LOQ to the mid-level calibration concentration. Analyte concentrations must be within ±30% of their true value.	Immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, or if two consecutive CCVs cannot be run, perform corrective action(s) and repeat CCV and all associated samples since last successful CCV. Alternately, recalibrate if necessary; then reanalyze all associated samples since the last acceptable CCV.	Analyst, Supervisor, QA Manager	LCMS-011 (BRTO-0111)

Instrument/ Equipment	Calibration Procedure	Calibration Range	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person(s) Responsible for CA	SOP Reference
LC/MS/MS	Mass Spectral Acquisition Rate	NA	Each analyte, Extracted Internal Standard (EIS) Analyte.	Calibrate the mass scale of the MS with calibration compounds and procedures described by the manufacturer. Mass calibration range must bracket the ion masses of interest. The most recent mass calibration must be used for every acquisition in an analytical run. Mass calibration must be verified to be ±0.5 amu of the true value, by acquiring a full scan continuum mass spectrum of a PFASstock standard.	NA	Analyst, Supervisor, QA Manager	LCMS-011 (BRTO-0111)
LC/MS/MS	Calibration, Calibration Verification, and Spiking Standards	5ppb and 50ppb on column	Instrument must have a valid mass calibration prior to any sample analysis. Mass calibration is verified after each mass calibration, prior to initial calibration (ICAL).	Standards containing both branched and linear isomers must be used when commercially available. PFAS method analytes may consist of both branched and linear isomers, but quantitative standards that contain the linear and branched isomers do not exist for all method analytes. For PFAS that do not have a quantitative branched and linear standard, identify the branched isomers by analyzing a qualitative standard that includes both linear and branched isomers and determine retention times, transitions and transition ion ratios. Quantitate samples by integrating the total response (i.e., accounting for peaks that are identified as linear and branched isomers) and relying on the initial calibration that uses the linear isomer quantitative standard.	NA	Analyst, Supervisor, QA Manager	LCMS-011 (BRTO-0111)
LC/MS/MS	ISC	NA	Prior to analysis and at least once every 12 hours.	Analyte concentrations must be at LOQ; concentrations must be within ±30% of their true values.	Correct problem, rerun ISC. If problem persists, repeat ICAL.	Analyst, Supervisor, QA Manager	LCMS-011 (BRTO-0111)

Instrument/ Equipment	Calibration Procedure	Calibration Range	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person(s) Responsible for CA	SOP Reference
LC/MS/MS	Instrument Blanks	NA	Immediately following the highest standard analyzed and daily prior to sample analysis.	Concentration of each analyte must be ≤ ½ the LOQ. Instrument Blank must contain EIS to enable quantitation of contamination.	If acceptance criteria are not met after the highest calibration standard, calibration must be performed using a lower concentration for the highest standard until acceptance criteria is met. If sample concentrations exceed the highest allowed standard and the sample(s) following exceed this acceptance criteria (>1/2 LOQ), they must be reanalyzed.	Analyst, Supervisor, QA Manager	LCMS-011 (BRTO-0111)
LC/MS/MS	Retention Time Window	NA	Once per ICAL and at the beginning of the analytical sequence.	Position shall be set using the midpoint standard of the ICAL curve when ICAL is performed. On days when ICAL is not performed, the initial CCV is used.	NA	Analyst, Supervisor, QA Manager	LCMS-011 (BRTO-0111)
LC/MS/MS	Retention Time (RT Window Width	NA	Every field sample, standard, blank, and QC sample	RT of each analyte and EIS analyte must fall within 0.4 minutes of the predicted retention times from the daily calibration verification or, on days when ICAL is performed, from the midpoint standard of the ICAL. Analytes must elute within 0.1 minutes of the associated EIS. This criterion applies only to analyte and labeled analog pairs.	Correct problem and reanalyze samples.	Analyst, Supervisor, QA Manager	LCMS-011 (BRTO-0111)

Instrument/ Equipment	Calibration Procedure	Calibration Range	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person(s) Responsible for CA	SOP Reference
LC/MS/MS	Ion Transitions (Precursor →Product)	NA	Every field sample, standard, blank, and QC sample	In order to avoid biasing results high due to known interferences for some transitions, the following transitions must be used for the quantification of the following analytes: PFOA: 413 → 369 PFOS: 499 → 80 PFHxS: 399 → 80 PFBS: 299 → 80 4:2 FTS: 327 → 307 6:2 FTS: 427 → 407 8:2 FTS: 527 → 507 NEtFOSAA: 584 → 419 NMeFOSAA: 570 → 419 If these transitions are not used, the reason must be technically justified and documented (e.g., alternate transition was used due to observed interferences).	NA	NA	LCMS-011 (BRTO-0111)
TOC analyzer (Multi EA4000 with NDIR detector)	ICAL	Various	Analyzed and evaluated before any result can be quantitated.	The correlation coefficient must be 0.995 or greater	Correct problem; recalibrate instrument, new calibration verified	Analyst, Supervisor, QA Manager	ENV-SOP-GBAY-0051
TOC analyzer (Multi EA4000 with NDIR detector)	ICV	10,000 µg & 20,000 µg	Immediately following the ICAL	±10% (90-110% of true value)	Instrument maintenance, reanalysis of ICV or initial calibration or re-preparation of the standards	Analyst, Supervisor, QA Manager	ENV-SOP-GBAY-0051

Instrument/ Equipment	Calibration Procedure	Calibration Range	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person(s) Responsible for CA	SOP Reference
TOC analyzer (Multi EA4000 with NDIR detector)	CCV	10,000 µg	Each day that an ICAL is not performed a CCV must be performed before sample analysis. Also analyze every 10 samples ant at the end of analytical batch	±10 % (90-110% of true value)	Instrument maintenance, reanalysis of ICV or initial calibration or re-preparation of the standards	Analyst, Supervisor, QA Manager	ENV-SOP-GBAY-0051
TOC analyzer (Multi EA4000 with NDIR detector)	CCB	<250 mg/kg	Analyzed after every 10 samples or more frequently and at the end of analytical batch	Concentration must be less than the LOQ	Correct problem; recalibrate instrument	Analyst, Supervisor, QA Manager	ENV-SOP-GBAY-0051
TOC analyzer (Multi EA4000 with NDIR detector)	ICAL	Various	Analyzed and evaluated before any result can be quantitated.	The correlation coefficient must be 0.995 or greater	Correct problem; recalibrate instrument, new calibration verified	Analyst, Supervisor, QA Manager	ENV-SOP-GBAY-0051
Orion 720 pH Meter	Calibrate meter	1.00-13.00	Daily before use	92-108%	Recalibrate meter	Analyst, Supervisor QA Manager	EXT-032
Orion 720 pH Meter	QC Check Buffer	8.00	Immediately after calibration and with every 20 samples	0.05 pH units of the true value	Recalibrate meter	Analyst, Supervisor, QA Manager	EXT-032

Notes:
% = percent
µg = micrograms
amu = atomic mass unit
CCB = continuing calibration blank
CCV = continuing calibration verification
DL = detection limit
ESI = electrospray Ionization
ICAL = initial calibration
ICV = independent calibration verification
ISC = instrument sensitivity check
LCMS = liquid chromatography/ mass spectrometry
LC/MS/MS = liquid chromatography-tandem mass spectrometry
LCS = laboratory control spike
LOD = limit of detection
LOQ = limit of quantitation
mg/kg = milligram per kilogram
NDIR = non-dispersive infrared detection
NA = not applicable
OSD = Office of the Secretary of Defense
PFOA = perfluorooctanoic acid
PFOS = perfluorooctanesulfonic acid
ppb = parts per billion
QA = quality assurance
QC = quality control
RSD = relative standard deviation
SL = screening level
SOP = standard operating procedure
S/N = signal to noise
TOC = total organic analyzer

Final PQAPP Worksheet #25: Analytical Instrument and Equipment Maintenance, Testing and Inspection

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
LC/MS/MS	Clean ESI Chamber	NA	NA	Weekly or as needed	NA	NA	Analyst	LCMS-011
LC/MS/MS	Backflush Analytical Column and Hold Column for Solvent Cleaning	NA	Peak Assymetry	As needed	NA	NA	Analyst	LCMS-011
TOC analyzer (Multi EA4000 with NDIR detector)	Change injection needle, change catalyst	TOC	Monitor instrument performance via Continuing Calibration Verification	As needed or replace as necessary, loss of sensitivity or failing resolutions, erratic response	No maintenance is required as long as instrument QC meets criteria	Perform instrument maintenance, clean injection needle, change catalyst	Analyst, Supervisor, QA Manager	ENV-SOP-GBAY-0051

Notes:
ESI = electrospray ionization
LCMS = liquid chromatography/ mass spectrometry
LC/MS/MS = liquid chromatography-tandem mass spectrometry
NA = not applicable
NDIR = non-dispersive infrared detection
QC = quality control
SOP = standard operating procedure
TOC = total organic carbon

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Final PQAPP Worksheet #26 & #27: Sample Handling, Custody, and Disposal

Sampling Organization: AECOM
Laboratory: Pace Gulf Coast
Method of sample delivery (shipper/carrier): FedEx
Number of days from reporting until sample disposal: 60 Days

Activity	Organization and title or position of person responsible for the activity	SOP reference
Sample labeling	AECOM	SOP 3-03 *Recordkeeping, Sample Labeling and Chain of Custody*
CoC form completion	AECOM	
Packaging	AECOM	SOP 3-04 *Sample Handling, Storage, and Shipping*
Shipping coordination	AECOM	
Sample receipt, inspection, & log-in	Pace Gulf Coast	SAD-001 *Sample Receiving and LIMS Log-In*
Sample custody and storage	Pace Gulf Coast	SAD-002 *Sample Chain of Custody and Sample Integrity*
Sample disposal	Pace Gulf Coast	GEN-009 *Waste Collection, Storage, Disposal*

Notes:
AECOM = AECOM Technical Services, Inc.
CoC = chain of custody
GEN = Quality Control Standard Operating Procedure
LIMS = Laboratory Information Management System
SAD = Sample Administration Standard Operating Procedure
SOP = Standard Operating Procedure

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Final PQAPP Worksheet #28: Analytical Quality Control and Corrective Actions

Matrix: Soil & Aqueous
Analytical Group: PFAS
Analytical Method: PFAS by LC/MS/MS Compliant with QSM 5.3 Table B-15
SOP Reference: LCMS-011 (BRTO-0111)
Certification Status: DoD/ELAP Certification

QC Sample	Frequency/ Number	Method/SOP Acceptance Limits	Corrective Action	Person(s) Responsible	Measurement Performance Criteria
Aqueous Sample Preparation	Each sample and associated batch QC samples.	SPE must be used unless samples are known to contain high PFAS concentrations e.g., Aqueous Film Forming Foam (AFFF). Inline SPE is acceptable. Entire sample plus bottle rinsate must be extracted using SPE. Known high PFAS concentration samples require serial dilution be performed in duplicate. Documented project approval is needed for samples prepared by serial dilution as opposed to SPE.	NA	Analyst, Supervisor, QA Manager	As per Table B-15
Solid Sample Preparation	Each sample and associated batch QC samples.	Entire sample received by the laboratory must be homogenized prior to subsampling.	NA	NA	As per Table B-15
Sample Cleanup Procedure	Each sample and associated batch QC samples. Not applicable to AFFF and AFFF Mixture Samples	ENVI-Carb™ or equivalent must be used on each sample and batch QC sample	NA	NA	As per Table B-15

QC Sample	Frequency/ Number	Method/SOP Acceptance Limits	Corrective Action	Person(s) Responsible	Measurement Performance Criteria
Method Blank	One per preparatory batch, maximum of 20 samples	No analytes detected > ½ LOQ or > 1/10th the amount measured in any sample or 1/10th the regulatory limit, whichever is greater.	Correct problem. If required, re-extract and reanalyze MB and all QC samples and field samples processed with the contaminated blank. Samples may be reextracted and analyzed outside of hold times, as necessary for corrective action associated with QC failure. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch.	Analyst, Supervisor, QA Manager	As per Table B-15
LCS	One per preparatory batch, maximum of 20 samples	Blank spiked with all analytes at a concentration ≥ LOQ and ≤ the mid-level calibration concentration. As Per Worksheet #15 and Table C-44 and 45 of QSM 5.3	Correct problem, then re-extract and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes if sufficient sample material is available. Samples may be reextracted and analyzed outside of hold times, as necessary for corrective action associated with QC failure.	Analyst, Supervisor, QA Manager	As per Table B-15
Matrix Spike	One per preparatory batch. Not required for aqueous samples prepared by serial dilution instead of SPE.	Sample spiked with all analytes at a concentration ≥ LOQ and ≤ the mid-level calibration concentration. All targets spiked and within the QC limits included in Worksheet #15.	Evaluate the data to determine if the failed criteria are due to sample matrix or laboratory error. Re-prep if sufficient sample is available when lab error is suspected, otherwise, qualify data with narrative.	Analyst, Supervisor, QA Manager	As per Table B-15

QC Sample	Frequency/ Number	Method/SOP Acceptance Limits	Corrective Action	Person(s) Responsible	Measurement Performance Criteria
MSD or MD	For MSD: One per preparatory batch. For MD: Each aqueous sample prepared by serial dilution instead of SPE.	For MSD: Sample spiked with all analytes at a concentration ≥ LOQ and ≤ the mid-level calibration concentration. For MSD: All targets spiked and within the QC limits included in Worksheet #15. RPD ≤ 30% (between MS and MSD or sample and MD).	The data shall be evaluated to determine the source of difference. For Sample/MD: RPD criteria only apply to analytes whose concentration in the sample is greater than or equal to the LOQ. The MD is a second aliquot of the field sample that has been prepared by serial dilution.	Analyst, Supervisor, QA Manager	As per Table B-15
Extracted Internal Standards	Every field sample, standard, blank, and QC sample.	Added to solid sample prior to extraction. Added to aqueous samples, into the original container, prior to extraction. For aqueous samples prepared by serial dilution instead of SPE, added to final dilution of samples prior to analysis. Extracted Internal Standard Analyte recoveries must be within 50% to 150% of ICAL midpoint standard area or area measured in the initial CCV on days when an ICAL is not performed.	If recoveries are acceptable for QC samples, but not field samples, the field samples must be re-prepped and reanalyzed (greater dilution may be needed). If recoveries are unacceptable for QC samples, correct problem, and reanalyze all associated failed field samples.	Analyst, Supervisor, QA Manager	As per Table B-15
Instrument Internal Standard Analytes (Used for quantitation of drinking water results)	Every field sample, standard, blank, and QC sample.	Added to aliquot of sample dilutions, QC samples, and standards just prior to analysis. Peak areas must be within -50% to +50% of the area measured in the ICAL midpoint standard. On days when ICAL is not performed, the peak areas must be within -50% to +50% of the peak area measured in daily initial CCV.	If peak areas are unacceptable, analyze a second aliquot of the extract or sample if enough extract remains. If there is not enough extract, reanalyze the first aliquot. If second analysis meets acceptance criteria, report the second analysis. If it fails, either analysis may be reported with the appropriate flags.	Analyst, Supervisor, QA Manager	As per Table B-15

QC Sample	Frequency/ Number	Method/SOP Acceptance Limits	Corrective Action	Person(s) Responsible	Measurement Performance Criteria
Post Spike Sample	Only applies to aqueous samples prepared by serial dilution instead of SPE that have reported value of "<LOQ" for analyte(s).	Spike aliquot(s) of sample at the final dilution(s) reported for sample with all analytes that have reported value of "<LOQ" in the final dilution. The spike must be at the LOQ concentration to be reported with the sample (the "<LOQ" value). When analyte concentrations are calculated as "<LOQ", the spike must recover within 70-130% of its true value.	When analyte concentrations are calculated as "<LOQ", and the spike recovery does not meet the 70-130% acceptance criteria, the sample, sample duplicate, and post spike sample must be reanalyzed at consecutively higher dilutions until the criteria is met.	Analyst, Supervisor, QA Manager	As per Table B-15

QC Sample	Frequency/ Number	Method/SOP Acceptance Limits	Corrective Action	Person(s) Responsible	Measurement Performance Criteria
Sample PFAS Identification	All analytes detected in a sample.	The chemical derivation of the ion transitions must be documented. A minimum of two ion transitions (Precursor → quant ion and precursor → confirmation ion) and the ion transitions ratio per analyte are required for confirmation. Exception is made for analytes where two transitions do not exist (PFBA and PFPeA). Documentation of the primary and confirmation transitions and the ion ratio is required. In-house acceptance criteria for evaluation of ion ratios must be used and must not exceed 50-150%. Signal to Noise Ratio (S/N) must be ≥ 10 for all ions used for quantification and must be ≥ 3 for all ions used for confirmation. Quant ion and confirmation ion must be present and must maximize simultaneously (±2 seconds).	NA	Analyst, Supervisor, QA Manager	As per Table B-15

Notes:
% = percent
< = less than
> = greater than
≤ = less than or equal to
≥ = greater than or equal to
AFFF = aqueous film forming foam
CCV = continuing calibration verification
ICAL = initial calibration
LC/MS/MS = liquid chromatography tandem mass spectrometry
LCS = laboratory control spike
LOD = limit of detection
LOQ = limit of quantitation
MD = matrix duplicate
MS/MSD = matrix spike/matrix spike duplicate
NA = not applicable
QA = quality assurance
QC = quality control
RPD = relative percent difference
SOP = standard operating procedure
SPE = solid phase extraction

Matrix: Soil
Analytical Group: Total Organic Carbon
Analytical Method: USEPA 9060A (Lloyd Kahn)
SOP Reference: ENV-SOP-GBAY-0051
Certification Status: DoD/ELAP Certification and NYSDOH

QC Sample	Frequency/Number	Method/SOP Acceptance Limits	Corrective Action	Person(s) Responsible	Measurement Performance Criteria
Method Blank	One per preparatory batch, maximum of 20 samples	Concentration shall not be > 1/2 the LOQ or 1/10 the amount of sample	The source of contamination should be investigated and samples should be reanalyzed. If, additional sample is not available, report with narrative.	Analyst, Supervisor, QA Manager	As per method
LCS	One per preparatory batch, maximum of 20 samples	90-110%	If LCS fails to meet lab criteria, the source of inaccuracy should be investigated and samples reanalyzed. If additional sample is not available, report in a narrative.	Analyst, Supervisor, QA Manager	As per method
MS	One pair per batch (assuming sufficient volume exists) or as specified by client request.	80-120%	If recovery is outside control limits and a lab error suspected, repeat the MS determination. If the LCS is within control limits and the matrix interference is indicated, analyze a post digestion spike and report results with a narrative.	Analyst, Supervisor, QA Manager	As per method
Duplicate/ MSD	One pair per batch (assuming sufficient volume exists) or as specified by client request.	RPD should be ≤20	Investigate the source of the precision error. A source of precision error in the duplicate /MSD may be the homogenous nature of the sample. If lab error is suspected, repeat analysis. If matrix issue is indicated, report with a narrative.	Analyst, Supervisor, QA Manager	As per method

Notes:
% = percent
< = less than
≤ = less than or equal to
DoD = Department of Defense
ELAP = Environmental Laboratory Accreditation Program
LCS = laboratory control spike
LOQ = limit of quantitation
MS/MSD = matrix spike/matrix spike duplicate
QA = quality assurance
QC = quality control
RPD = relative percent difference
SOP = standard operating procedure

Matrix: Soil
Analytical Group: pH
Analytical Method: USEPA 6045D
SOP Reference: EXT-032
Certification Status: DoD/ELAP Certification

QC Sample	Frequency/Number	Method/SOP Acceptance Limits	Corrective Action	Person(s) Responsible	Measurement Performance Criteria
QC Check Buffer	Before sample analysis, after every 20 samples and at the end of analysis	Within ±0.05 pH of true value	Do not analyze samples without a daily LCS that meets criteria.	Analyst, Supervisor, QA Manager	As per method
Duplicate	One per batch, maximum of 20 samples	Within 0.1 pH unit	Repeat if sample volume allows or narrate results	Analyst, Supervisor, QA Manage	As per method

Notes:
% = percent
DoD = Department of Defense
ELAP = Environmental Laboratory Accreditation Program
LCS = laboratory control spike
QA = quality assurance
QC = quality control
SOP = standard operating procedure

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Final PQAPP Worksheet #29: Project Documents and Records

Sample Collection Documents and Records	Onsite Analysis Documents and Records	Offsite Analysis Documents and Records	Data Assessment Documents and Records	Other
Field Logbook	Field Logbook	Sample receipt, custody, and tracking records	Field sampling audit records	NA
CoC Records	Field Sampling Forms	Sample prep logs	Laboratory audit records	
Air Bills	Equipment Inspection Forms	Equipment calibration logs	Data validation reports	
Custody Seals	Boring Logs	Run logs	Data usability assessment reports	
Corrective Action Forms	Corrective Action Forms	Equipment maintenance test, and inspection logs	Corrective Action Forms	
Field Sampling Forms	Daily Tailgate SH&E Sign In Sheet	Corrective Action Forms	Field Change Request Form	
Sample location and depth data	APP/SSHP Acknowledgement	Reported analytical results		
Field equipment calibration logs	Dig Permits	Data package completeness checklists		
		Sample disposal records		
		Extraction/cleanup records		
		Raw data		
		EQuIS™		
		ROE Agreements		
		Photographic Logs		

Notes:
APP/SSHP = Accident Prevention Plan/ Site Safety and Health Plan
CoC = chain of custody
EQuIS = Environmental Quality Information System
SH&E = Safety, Health, and Environment
NA = not applicable
ROE = right of entry

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Final PQAPP Worksheet #31, #32 & #33: Assessments and Corrective Action

This worksheet is used to document responsibilities for conducting project assessments, responding to assessment findings, and implementing corrective action. Appropriately scheduled assessments allow management to implement corrective action in a timely manner, thereby correcting non-conformances and minimizing their impact on DQOs/Project Quality Objectives.

Assessments:

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment	Person(s) Responsible for Responding to Assessment Findings	Person(s) Responsible for Identifying and Implementing Corrective Action	Person(s) Responsible for Monitoring Effectiveness of Corrective Action
Project Manager Review	Monthly (for field efforts that are longer than one month)	Internal	AECOM	Project Manager/ AECOM	Field Sampling Team Leader/ AECOM	Field Sampling Team Leader/ AECOM	Project Manager/ AECOM
Review of CoC forms	Daily	Internal	AECOM	Project Chemist/ AECOM	Field Sampling Team Leader/ AECOM	Field Sampling Team Leader/ AECOM	Project Chemist/ AECOM
Laboratory Data Assessment (validation)	Once	Internal	AECOM	Data Validator	Project Chemist/ AECOM	Data Validator	Project Chemist/ AECOM
Daily Quality Control Audits	Daily	Internal	AECOM	Field Sampling Team Leader/ AECOM	Field Sampling Team Leader/ AECOM	Field Sampling Team Leader/ AECOM	QA Officer/ AECOM
Field TSAs	Daily	Internal	AECOM	Field Sampling Team Leader/ AECOM	Field Sampling Team Leader/ AECOM	Field Sampling Team Leader/ AECOM	QA Officer/ AECOM
Field Performance Audits	Weekly	Internal	AECOM	Project Manager/ AECOM or representative	Field Sampling Team Leader/ AECOM	Field Sampling Team Leader/ AECOM	Project Manager/ AECOM

Assessment Response and Corrective Action:

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response	Timeframe for Response
Field Sampling Audit	Email	Field Sampling Team Leader/AECOM Project Manager	Immediate	Daily QC Report/ Email	Project Quality Manager/ Project Manager	24 hours after notification
Project Manager Review	Email	Field Sampling Team Leader/ AECOM	Immediate	Daily QC Report/ Email	AECOM Project Manager	24 hours after notification
Review of CoC forms	Email	Field Sampling Team Leader/AECOM Project Manager	Immediate	Daily QC Report/ Email	Project Chemist	24 hours after notification
Laboratory Data Assessment (validation)	Written Audit Report	Laboratory QA Manager; AECOM Project Chemist	Within 24 hours after audit	Email	Data Validator	Up to 1 week after notification
Daily Quality Control Audits	Email/ Daily QC Report	Field Sampling Team Leader/AECOM Project Manager	Immediate	Daily QC Report/ Email	AECOM Project Manager	24 hours after notification
Field TSAs	Email/ Daily QC Report	Field Sampling Team Leader/AECOM Project Manager	Immediate	Daily QC Report/ Email	AECOM Project Manager	24 hours after notification
Field Performance Audits	Email	Field Sampling Team Leader	Immediate	Daily QC Report/ Email	AECOM Project Manager	24 hours after notification

Laboratory Assessments: Pace Gulf Coast

Assessment Type	Responsible Party & Organization	Number/Frequency	Estimated Dates	Assessment Deliverable	Deliverable Due Date
DoD/ELAP Accreditation	PJLA	Every Two Years	NA	Certification	NA
PT samples	Laboratory QAM	Accreditation	Per Accrediting Authority	Per Accrediting Authority	Per Accrediting Authority
Data Review	Naoum Tavantzis, AECOM	Once	45 days after receipt of data	Validation Report	45 days after receipt of data
External Laboratory Audit	PJLA	Bi-annually	NA	Written Audit Report	NA
Internal Laboratory Audit	Pace Gulf Coast	Annually	NA	Written Audit Report	NA

Notes:
AECOM = AECOM Technical Services, Inc.
CoC = chain of custody
DoD = Department of Defense
ELAP = Environmental Laboratory Accreditation Program
NA = not applicable
PJLA = Perry Johnson Laboratories Accreditation
PT = proficiency testing
QA = quality assurance
QAM = Quality Assurance Manager
QC = quality control
TSA = technical system audit

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Final PQAPP Worksheet #34: Data Verification and Validation Inputs

Item	Description	Verification (Completeness)	Validation (Conformance to Specifications)
Planning Documents/Records			
1	Approved QAPP	X	
2	Contract	X	
4	Field SOPs	X	
5	Laboratory SOPs	X	
Field Records			
6	Field logbooks	X	
7	Equipment calibration records	X	
8	CoC Forms	X	X
9	Sampling diagrams/surveys	X	
10	Drilling logs	X	
11	Relevant correspondence	X	
12	Change orders/deviations	X	
13	Field audit reports	X	
14	Field change request forms	X	
Analytical Data Package			
16	Cover sheet (laboratory identifying information)	X	X
17	Case narrative	X	X
18	Internal laboratory CoC	X	X
19	Sample receipt records	X	X
20	Sample chronology (i.e., dates and times of receipt, preparation, and analysis)	X	X
21	Communication records	X	
22	LOD/LOQ establishment and verification	X	
23	Standards traceability	X	
24	Instrument calibration records	X	X
25	Definition of laboratory qualifiers	X	
26	Results reporting forms	X	X
27	QC sample results	X	X
28	Corrective action reports	X	X
29	Raw data	X	X
30	Electronic data deliverable	X	X

Notes:
CoC = chain of custody
LOD = limit of detection
LOQ = limit of quantitation
QAPP = Quality Assurance Project Plan
QC = quality control
SOP = standard operating procedure

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Final PQAPP Worksheet #35: Data Verification Procedure

This worksheet documents procedures that will be used to verify project data. The procedures apply to both field and laboratory records. Data verification is a completeness check to confirm that all required activities were conducted, all specified records are present, and the contents of the records are complete. As illustrated in the following example, verification often is performed at more than one step by more than one person.

Records Reviewed	Requirement Documents	Process Description	Responsible Person, Organization
CoC forms and shipping forms	CoC, Shipping Documents	CoC forms and shipping documentation will be reviewed internally upon their completion and verified against the packed sample coolers they represent. The shipper's signature on the CoC should be initialled by the reviewer, a copy of the CoC retained in the site file, and the original and remaining copies taped inside the cooler for shipment.	Appropriate Field Sampling Team Leaders for the individual medias
Review of field logbooks	Field Logbooks	Review for completeness and accuracy.	Appropriate field Sampling Team Leaders
Field sampling TSAs	TSA Reports	Assessment of field sampling process prior to start of, or as close to the start of sampling as possible.	QA Manager or designee
Fixed laboratory analytical data review	Laboratory Data Package	Data controls are compared to this QAPP and DoD QSM v 5.3 (and PFAS by LC/MS/MS compliant with QSM 5.3 Table B-15) in a Three-Tiered process using a minimum 100% peer review.	PM or QA Manager
Fixed laboratory TSAs	Laboratory Data Package	ELAP audit and internal quality audits.	QA Manager
Fixed laboratory data verification	Data Validation Reports	100% data verification/validation for water and soil.	AECOM Project Chemist
Fixed laboratory data validation	Data Validation Reports	Calculate and assess laboratory DQIs.	QA Manager, or designee

Notes:
AECOM = AECOM Technical Services, Inc.
CoC = chain of custody
DoD = Department of Defense
DQI = data quality indicator
ELAP = Environmental Laboratory Accreditation Program
PFAS = per- and polyfluoroalkyl substances
PM = Project Manager
QA = quality assurance
QAPP = Quality Assurance Project Plan
QSM = Quality Systems Manual
TSA = technical system audit
USEPA = United States Environmental Protection Agency

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Final PQAPP Worksheet #36: Data Validation Procedures

Data Validator: AECOM

Analytical Group/Method	All Analytical Data
Analytical specifications	WS#24, WS #28 & Laboratory SOPs
Measurement performance criteria	WS #12, WS#15, and WS#28
Percent of data packages to be validated	100%
Percent of raw data reviewed	100%
Percent of results to be recalculated	0%
Validation procedure and qualification	National Functional Guidelines for Organic Superfund Data Review, January 2017 (USEPA, 2017b); Department of Defense General Data Validation Guidelines, November 2019 (DoD, 2019b); Data Validation Guidelines Module 3: Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by QSM Table B-15 (DoD, 2020).
Validation code	S2bVEM/S2bVM
Electronic validation program/version	AECOM EarthSoft EQuIS™ Automated Validation Assistant

Notes:
% = percent
AECOM = AECOM Technical Services, Inc.
DoD = Department of Defense
EQuIS = Environmental Quality Information System
SOP = standard operating procedure
USEPA = United States Environmental Protection Agency
WS = worksheet

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Final PQAPP Worksheet #37: Data Usability Assessment

The Data Usability Assessment (DUA) is an evaluation at the conclusion of data collection activities that uses the results of both data verification and validation in the context of the overall project decisions or objectives. Using both quantitative and qualitative methods, the assessment will determine whether project execution and the resulting data the DQOs established in **Worksheet #11** were achieved. Both sampling and analytical activities will be considered with the ultimate goal to assess whether the final, qualified results support the decisions to be made with the data.

The following personnel are responsible for participating in the DUA:

- AECOM Project Manager: Claire Mitchell
- AECOM Project Chemist: Naoum Tavantzis
- AECOM SI Task Manager: Amanda Martin

The DUA will be documented as a discussion within the SI report and refer to the Data Validation Report that will appear in an appendix of the SI Report. The Data Validation Report will follow the procedures given in **Worksheet #36**.

The following steps summarize the processes used to determine whether the collected data are of the right type, quality, and quantity to support the environmental decision-making for ARNG related to PFAS contamination at certain installations and describe how data quality issues will be addressed and how limitations on the use of the data will be handled.

Step 1	**Review the project's objectives and sampling design.** The key components established in the DQOs (**Worksheet #11**) will be reviewed to ensure that they are still applicable. Also, the sampling design and how it was implemented in the field will be reviewed for consistency with the stated objectives. For example, this step in the DUA will: • Reevaluate whether comparison criteria (i.e., SL; **Worksheet #15**) were updated since PQAPP generation and if laboratory quantitation limits (QLs) were sensitive enough for those changes (e.g., QLs remain lower than new criteria). It is important to note several states are in various stages of developing or finalizing limits for PFAS chemicals for different media; therefore, it is critical that SLs are regularly evaluated over the course of the project to ensure the SLs remain current. Additionally, project data must meet the measurement performance criteria (MPC) for sensitivity and project QLs specified in **Worksheets #15 & 28**. • Discuss the limitations and impact on the use of project data if validation reports indicate that project specific sensitivity goals or QLs were not achieved for a specific sampling or laboratory group, dataset or sample delivery group (SDG), matrix, analytical group, or concentration level.
Step 2	**Review the data verification and data validation outputs** Available Quality Assurance (QA) reports, including both field and laboratory generated forms, will be reviewed for deviations from planned activities identified in Step 1 (e.g., number and locations of samples, holding time exceedances, damaged samples, non-compliant proficiency testing sample results, and SOP deviations) and determine their impacts on the data usability. Validated data will be summarized and/or compiled to identify patterns, trends, and anomalies as they relate to the Data Quality Indicators (DQIs) precision, accuracy/bias, representativeness, comparability, completeness, and sensitivity. Descriptions of each DQI and examples of how each may be incorporated into the usability report follow.

Step 2 (cont.)	**Precision** Precision is the degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves. Precision is usually expressed as standard deviation, variance, percent difference, or range, in either absolute or relative terms. Quality Control (QC) measures for precision include field duplicates, laboratory duplicates, MSDs, analytical replicates, and surrogates. To meet the needs of the data users, SI project data must meet the MPC for precision specified in **Worksheet #12** of this QAPP. Precision errors may be the result of one or more of the following: PFAS cross-contamination, field instrument variation, analytical measurement variation, poor sampling technique, sample transport problems, or spatial variation (heterogeneous sample matrices). To identify the cause of imprecision, the field sampling design rationale and sampling techniques will be evaluated by the reviewer, and both field and analytical duplicate/replicate sample results will be compared. For example, if poor precision is indicated in both the field and analytical duplicates/replicates, then the laboratory may be the source of error. If poor precision is limited to the field duplicate/replicate results, then the sampling technique, PFAS contamination, field instrument variation, sample transport, medium inhomogeneity, or spatial variability may be the source of error. If data validation reports indicate that analytical imprecision exists for a particular dataset or SDG, then the impact of that imprecision on usability will be discussed in the usability report.
	Accuracy/Bias Accuracy is the degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) due to sampling and analytical operations. Examples of QC measures for accuracy include Matrix Spikes, Laboratory Control Samples, and ERBs. A measurement is accurate when the reported value does not differ from the true value or known concentration of the spike or standard. To meet the needs of the data users, project data must meet the MPC for accuracy/bias specified in **Worksheet #12** of this QAPP. The usability report for each installation will: • Discuss and compare data on contamination and accuracy/bias (when bias is observable) for each matrix, analytical group, and concentration level. • Describe the limitations on the use of project data if extensive contamination, inaccuracy, or bias exists, or when inaccuracy is limited to a specific sampling or laboratory group, dataset or SDG, matrix, or concentration level. • Discuss the impact of any qualitative and quantitative trends in bias on the sample data.
	Representativeness Representativeness is the measure of the degree to which data accurately and precisely represent a characteristic of a population, a parameter variation at a sampling point, a process condition, or an environmental condition, and it is achieved through a well-designed sampling program and by using standardized sampling strategies, techniques, and analytical procedures. To meet the needs of the data users, project data must meet the MPC for sample representativeness specified in **Worksheet #12** of this QAPP. **Worksheet #28 & 35** discusses how the QA/QC activities (e.g., review of sampling design and SOPs, field sampling Technical System Audits (TSAs), and analysis audits) and QC sample data will be reviewed to assess sample representativeness. For example, if field duplicate precision checks indicate potential spatial variability, additional scoping meetings and subsequent resampling may be needed to collect data that are more representative of a nonhomogeneous site. The usability report for each installation will: • Discuss the impact of field duplicate imprecision on site representativeness. For example, when data variability is high among field duplicate datasets (i.e., high relative standard deviation), calculation of the 95% upper confidence limit (UCL) of the population mean is more likely to overestimate the true mean and therefore achieve better statistical coverage. • Discuss the impact of laboratory and field sampling methods on sampling results and how they reflect site conditions. • Discuss the effect of site heterogeneity on sampling results in light of sampling methods used.

	• Describe the limitations on the use of project data when sampling results are non-representative for all data or for a specific sampling, group, dataset or SDG, matrix, analytical group, or concentration level.
Step 2 (cont.)	**Comparability** Comparability is the degree to which different methods, datasets, and decisions agree or can be represented as similar. Comparability describes the confidence (expressed qualitatively or quantitatively) that two datasets can contribute to a common analysis and interpolation. The SI results will be used as benchmarks for determining comparability for data collected during any future sampling events at the various installations using the same or similar sampling and analytical SOPs. At this time, data will not be compared to other datasets or data using different sampling or analytical SOPs. To ensure future comparability of data generated for the installations, standard sample collection procedures and approved analytical methods will be used. Sample analyses will be performed by the laboratory using approved methods and procedures. Comparability criteria will be considered met for the project if, based on data reviewed, the sample collection and analytical procedures (such as use of alternate preparation if indicated by a positive field shake test) are determined to have been followed or defined to show that variations did not affect the values reported. Deviations to sampling scope will be documented in sampling nonconformance reports which may contain some of the discussion of comparability. The usability reports will describe the limitations on the use of project data when project-required data comparability is not achieved for the overall project or is limited to a specific sampling or laboratory group, dataset or SDG, matrix, analytical group, or concentration level.
	Completeness Completeness is a measure of the amount of valid data obtained from a measurement system compared with the amount that was expected to be obtained under correct, normal circumstances. To meet the needs of the data users, project data must meet the MPC for data completeness. Completeness criteria will be considered met if 100% of all planned sample data are collected. As applicable, the usability report may also: • Describe how the amount of valid data will be determined as a percentage of the number of valid measurements for each matrix, analytical group, and concentration level. • Describe how critical data were assessed for completeness when certain sample locations or analytes and matrices are more critical than others in making project decisions. • Evaluate the impact of missing information. Ensure that enough information was obtained for the data to be usable to meet the DQOs (**Worksheet #11**).
Step 2 (cont.)	**Sensitivity** Sensitivity is the capability of a test method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest. Examples of QC measures for determining sensitivity include laboratory fortified blanks, a DL study, Limit of Detection (LOD)/Limit of Quantitation (LOQ) Verifications, and Instrument Sensitivity Checks (ISC). To meet the needs of the data users, project data must meet the MPC for sensitivity and project QLs specified in **Worksheets #15 & 28** of this QAPP. If appropriate, the usability report may also: • Discuss and compare sensitivity and DL/LOD/LOQ from the datasets collected for the project for each matrix, analytical group, and concentration level. • Discuss the impact of a lack of sensitivity or higher DL/LOD/LOQ on data usability, if validation reports indicate that sensitivity goals or DL/LOD/LOQ goals were not achieved. Describe the limitations on the use of project data if project-required sensitivity goals and DL/LOD/LOQ are not achieved for all project data, or when sensitivity is limited to a specific sampling or laboratory group, dataset or SDG, matrix, analytical group, or concentration level

Step 3	**Verify the assumptions of the selected statistical method** The use of statistical methods for data assessment for this project will be limited to estimating a 95% UCL (or mean as appropriate for the analyte) for the assessment of risks.
Step 4	**Implement the statistical method** Where statistical methods are used, the underlying assumptions will be assessed during the DUA. The consequences of selecting the incorrect alternative will be discussed, and uncertainty tolerances will be considered.
Step 5	**Document data usability and draw conclusions** The DUA will determine and document whether the data can be used as intended given any deviations and corrective actions that may have occurred. Limitations on data use will be considered and discussed as appropriate, and the performance of the sampling design assessed. Conclusions will be drawn taking any data limitations into consideration and documented in the SI report.

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Appendix A – Technical Project Planning Meeting Minutes (TPP1 and TPP2)

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Meeting Minutes
Albany AASF #3 – Site Inspection (SI)
Technical Project Planning (TPP) – Meeting 1 and 2
Preliminary Assessments and Site Inspections (PA/SIs) for Perfluorooctanesulfonic Acid (PFOS) and Perfluorooctanoic Acid (PFOA) Impacted Sites
Contract No. W912DR-12-D-0014, DO W912DR17F0192
Thursday, 3 September 2020
1300-1400

Participants			
Name	**Affiliation***	**Phone**	**E-Mail**
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Steves Vanderpool	NYARNG	518-786-4367	steves.vanderpool.mil@mail.mil
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Richard Mustico	NYSDEC	518-357-2273	richard.mustico@dec.ny.gov
Joshua Haugh	NYSDEC	518-357-2045	joshua.haugh@dec.ny.gov
Steven Karpinski	NYSDOH	518-402-7860	steven.karpinski@health.ny.gov
Amanda Martin	AECOM	978-905-2486	amanda.martin@aecom.com
Andrew Borden	AECOM	978-905-2405	andrew.borden@aecom.com

** Notes: ARNG-G9 - Army National Guard-G9; USACE- United States Army Corps of Engineers; NYARNG- New York Army National Guard; NYSDEC- New York State Department of Environmental Conservation; NYSDOH- New York State Department of Health*

Ms. Amanda Martin (AECOM) welcomed participants and reviewed the purpose of the meeting, outlined the agenda, and led a roundtable of introductions for everyone on the virtual Technical Project Planning (TPP) meeting. The meeting was a combination of TPP1 and TPP2 with the purpose of discussing the Army National Guard (ARNG) Per- and Polyfluoroalkyl Substance (PFAS) Preliminary Assessment (PA)/Site Inspection (SI) program, the Albany Army Aviation Support Facility (AASF) #3 PA findings, and proposed SI approach.

Presentation slides were provided to participants prior to the meeting and are included in **Attachment A**. Key points that supplement the presentation are summarized below.

A safety moment was provided to the participants which covered the safety procedures established in the United States Army Corps of Engineers (USACE) Engineering Manual (EM) 385-1-1. A Programmatic Accident Prevention Plan (APP) and Site Safety and Health Plan (SSHP) have been prepared in accordance with EM 385-1-1. The site-specific SSHP was developed concurrently with the Uniform Federal Policy-Quality Assurance Project Plan (UFP-QAPP) so that as risks related to the proposed sampling approach were identified, mitigation strategies were developed and documented in the SSHP. Additionally, pandemic awareness and safety protocols have been incorporated into the SSHP to address field work being completed during the Coronavirus Disease 2019 (COVID-19) pandemic.

Programmatic Discussion (Slides 5–8):

- The ARNG PA/SI program is contracted through the Baltimore District of the USACE with support from other districts, but is managed by the ARNG.
- The program follows the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) progress.
- The first step in the CERCLA process is the PA, which has been finalized for this facility. The ARNG has performed PAs at approximately 200 facilities across the country to determine the likelihood of release and whether any complete pathways existed to drinking water receptors. The final results of the PAs determine whether a specific site would move to the SI-phase or be recommended for No Further Action, per the CERCLA process.

- The primary goal of the SI is to determine the presence or absence of PFAS at the source areas and facility boundary; nature and extent would be determined during a Remedial Investigation (RI).
- Participants for TPP1 and TPP2 included ARNG, USACE, New York ARNG (NYARNG), New York State Department of Environmental Conservation (NYSDEC), New York State Department of Health (NYSDOH), and AECOM; participants for the future TPP3 meeting will include the addition of other local stakeholders to be determined once the SI reporting phase has begun.

Albany AASF #3 PA Findings (Slides 9-14):

- The PA findings for the Albany AASF #3 were presented. Information reported in the PA was collected through in-person interviews and a visual site inspection during a site visit. Two Areas of Interest (AOIs) were identified, which contained three potential PFAS release areas related to a hangar fire suppression deluge system, an aqueous film forming foam (AFFF)-equipped fire truck storage area, and an emergency response area.
- The first potential release area at AOI 1 was the result of the initial AFFF fire suppression system test. During initial testing in 2012, the hangar was completely filled with AFFF. The hangar doors were opened and the foam spilled out onto the tarmac and grass. The exact quantity of AFFF released is unknown.
- AOI 1 also includes the former Fire Response Unit which housed a firetruck with a 150-gallon AFFF tank. Currently, the room houses a 500-gallon 3% AFFF tank connected to the hangar deluge system.
- AOI 2 includes a potential release area associated with an emergency response to a garbage truck fire. The fire occurred in May 2017 southeast of AASF #3. At the time of the preparation of the PA, it was unknown if AFFF was used during the emergency response. However, a photograph provided by NYARNG a couple days before this TPP meeting indicated that fire-fighting foam was used on the fire.
- Five potential adjacent PFAS release areas were identified during the PA, including:
    - The Town of Colonie Fire Department Training Area, where live fire training was historically conducted by a dozen local fire departments with AFFF. Information on the dates of the training was not available during the PA interviews.
    - The former and current Albany Fire Stations, which house a 1,500-gallon 3% AFFF tank and three firetrucks, each of which hold 450 gallons of AFFF.
    - The Crushed Stone Area, where, according to interviews, the Albany Fire Department (AFD) performed joint fire training with NYARNG's Fire Response Unit from 1983 to 1992. The AFD still performs fire training here, but currently, only water is used
    - Private Hangars to the west of the facility at the Albany International Airport, which have housed high expansion foam for past 10 years at least, according to interviews. However, no information was available on the type or amount of AFFF used.
    - A Helicopter Crash, which occurred in the early 1980s approximately 0.45 miles north of the facility; however, there was reportedly no AFFF was used in the response to the crash so it is not considered a potential adjacent source.

Albany AASF #3 Overview (Slides 15-18):

- Data quality objectives (DQOs) were presented for the SI. The primary DQOs were to confirm the presence or absence of a PFAS release at a potential release areas and to gather data to refine the conceptual site model (CSM). Secondary goals are to determine the presence/absence at the ARNG facility boundary.
- The preliminary CSM presented the regional surface water flow which is anticipated to be generally to the north towards the Mohawk River, based on available information. Within the facility, surface water travels southwest via a tributary to Ann Lee Pond and then north to the Mohawk River.
- Similarly, the preliminary CSM presented the inferred groundwater flow direction to the north. Several potable wells were identified downgradient of the facility.
- The current understanding of the CSM is that there are potentially complete pathways between the potential source areas and human receptors (site workers, construction workers, trespassers, and nearby off-site recreational users) via inhalation of dust and ingestion of surface soil. Additionally, there is a potentially complete pathway for construction workers for the ingestion of subsurface soil surface. A potentially complete pathway also exists for off-facility residents via ingestion of shallow groundwater.

Albany AASF #3 SI Approach (Slides 19-23):

- The proposed scope of work for the SI was presented. Soil borings will be installed via direct push drilling methods at locations within the facility boundary, at locations within and surrounding AOI 1 and AOI 2. Six soil borings were proposed, which will be converted to temporary monitoring wells. Both soil and groundwater samples will be collected. No surface water and sediment samples are proposed.
- The PFAS analyte list, which includes 18 PFAS compounds, was presented. Analysis will be completed by an Environmental Laboratory Accreditation (ELAP)/National Environmental Laboratory Accreditation Program (NELAP)-certified laboratory. Data will undergo Level III data review.
- A general outline of the schedule was presented. The Final UFP-QAPP will be provided with the responses to NYSDEC comments in September 2020. The field investigation is tentatively planned for late October 2020, pending the receipt of comments from NYSDEC and NYSDOH.
- Under normal circumstances, the team would field verify the proposed locations during a site reconnaissance walk conducted after the TPP meeting; however, that is not possible given the current travel restrictions due to the COVID-19 pandemic. Instead, the site walk will be performed during the mark-out and utility clearing. Mr. Brian Jankauskas (NYSDEC) indicated he would like to be present during the site walk/utility clearing.

Open Discussion (Slide 24):

- Mr. Jankauskas indicated the NYSDEC would be requesting adjustments to the sample locations, including the following:
    - Collecting a sample at AOI 2 within the retention basin, where fluids would have collected;
    - Shifting the proposed downgradient boring/temporary well at AOI 1 further east to coincide with the presumed groundwater flow direction;
    - Reallocating the surface and intermediate soil samples from borings not located within the release areas to add more surface soil samples within the release area to provide more coverage;
    - Adding another boring downgradient of the former Fire Response Unit;
    - Potentially adding surface soil samples near drainage basins.
    - Mr. Jankauskas requested further information on the inside the former Fire Response Unit floor drains be provided to better understand where potential releases AFFF may potentially have transported via drains.
- Ms. Amanda Sullivan (ARNG G9) suggested adding another boring along the northern facility boundary adjacent to the Crushed Stone Area.
- Mr. Jankauskas requested the surface soil interval be collected from 0-2 inches (per New York state guidance) and not the proposed 0-2 feet.
- Mr. Jankauskas indicated that New York State has a requirement for a NYSDOH ELAP-certified laboratory for PFAS analysis. He noted that Pace Analytical Gulf Coast has comparatively higher detection limits than those requested by the NYSDOH ELAP certification. Additionally, NYSDEC would like to see 21 PFAS analyzed, rather than the 18 stated in the Draft Final QAPP Addendum. Dr. Bonnie Packer (ARNG G9) indicated that programmatically, the Department of Defense (DoD) is evaluating only the stated 18 PFAS during the SI phase.
- Mr. Jankauskas stated that NYSDEC requests that environmental data to be submitted electronically via the Environmental Information Management System (EIMS). The EIMS uses the database software application EQuIS™ (EQuIS) from EarthSoft® Inc. (EarthSoft). There is a standardized electronic data deliverable (EDD) format that is required for all data submitted. Data must be formatted to meet the guidelines specified by NYSDEC.
- Mr. Jankauskas and Mr. Steven Karpinski (NYSDOH) indicated that a Community Air Monitoring Plan (CAMP) must be developed and implemented to monitoring dust due to drilling activities, in accordance with New York policy.
- The NYSDEC and NYSDOH will submit their requests in writing for ARNG consideration and response. NYSDEC/ NYSDOH anticipate submitting comments to the ARNG on 4 September 2020.
- The project team discussed the management of investigation-derived waste (IDW). Solid and liquid IDW will be containerized in 55-gallon drums and stored within the fenced boundary of Albany AASF #3, at a location designated by NYARNG. ARNG will coordinate waste profiling, transportation, and disposal of the IDW.

The presentation ended at 1400 and the phone line was closed.

Attachment A - TPP 1 & 2 Briefing Slides

Albany Army Aviation Support Facility (AASF) #3
Latham, NY
Site Inspection
New York Army National Guard

Technical Project Planning (TPP) Meeting 1 & 2

Preliminary Assessments and Site Inspections (PA/SI) for Perfluorooctanesulfonic Acid (PFOS) and Perfluorooctanoic Acid (PFOA) Impacted Sites

3 September 2020

Agenda

- Introductions
- Safety Moment
- TPP Meeting Goals
- Army National Guard (ARNG) PA/SI Overview
- Albany AASF #3 ARNG PA Results
- Albany AASF #3 SI Overview
- Stakeholder Involvement
- Questions and Open Discussion

Introductions

- ARNG G9
  - Dave Connolly, PFAS Program Manager
  - Bonnie Packer, Nationwide Project Manager
  - Amanda Sullivan, SI Project Manager
- United States Army Corps of Engineers (USACE)
  - Tim Peck, Program Manager/SI Project Manager
- New York Army National Guard (NYARNG)
  - Peter Jensen, Environmental Branch Chief
  - Greg Austin, Senior Environmental Analyst
  - Steves Vanderpool
- New York State Department of Environmental Conservation (NYSDEC)
  - Brian Jankauskas
  - John Swartwout
  - Richard Mustico
  - Andrew Fleck
- New York State Department of Health (NYSDOH)
  - Steven Karpinski
- AECOM Technical Services, Inc.
  - Amanda Martin, SI Task Manager
  - Andrew Borden, SI Geologist

Safety Moment
Site Safety Procedures

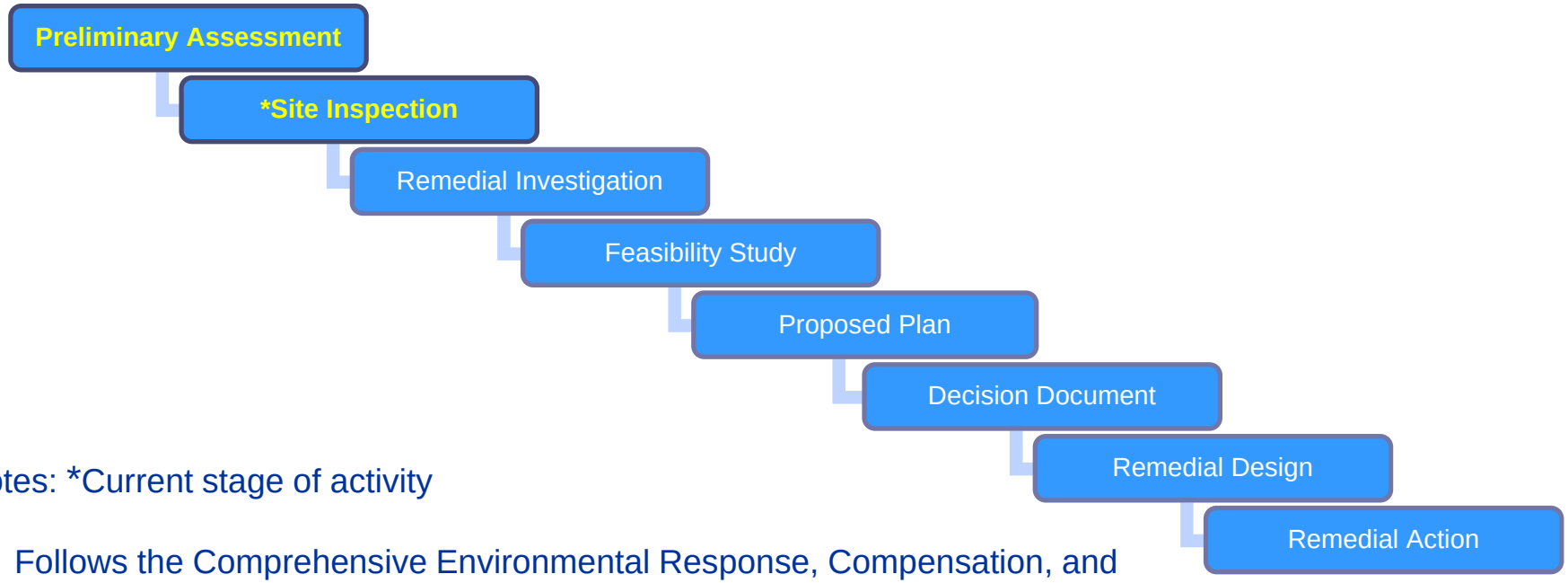
- SI will follow USACE Engineering Manual (EM) 385-1-1 requirements:
  - Accident Prevention Plan addresses all component plans for EM 385-1-1, including Construction Support during drilling operations
  - Site Safety and Health Plan (SSHP) addresses project participants, training, and hazard identification and mitigation
- Health and safety documents prepared during SI planning phase
  - SSHP has been revised to incorporate COVID-19 updates and protective measures

TPP Meeting Goals

- TPP1:
  - Provide an overview of the ARNG PA/SI Program
    - Regulatory framework
  - Discuss PA Findings
  - Define objectives for SI data collection
  - Encourage stakeholder involvement
  - Review project schedule
  - Capture action items
- TPP2: Discuss proposed SI approach
- TPP3: Discuss SI findings
- Participants:
  - TPP1 and 2: ARNG, USACE, NYSDEC, NYSDOH
  - TPP3: ARNG, USACE, NYSDEC, NYSDOH, other local stakeholders

ARNG PA/SI Overview

Work Phases



Notes: *Current stage of activity

- Follows the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Process
- An interim removal action can be conducted or a No Further Action determination can be made at any phase

ARNG PA/SI Overview

- Activities centrally contracted through USACE and managed by ARNG G9
  - USACE Baltimore manages the contract, with technical project support from Louisville, Omaha, Sacramento, Jacksonville, and Seattle Districts
  - Project support: chemistry, geology, risk screening
- PA ranking (~200 facilities) - state ARNG input
  - Likelihood of release
  - Complete pathway to drinking water receptor
- Priority assigned to facilities with highest likelihood of release near drinking water intake
- PA – facility-wide; SI – areas of interest (AOIs)

ARNG PA/SI Overview

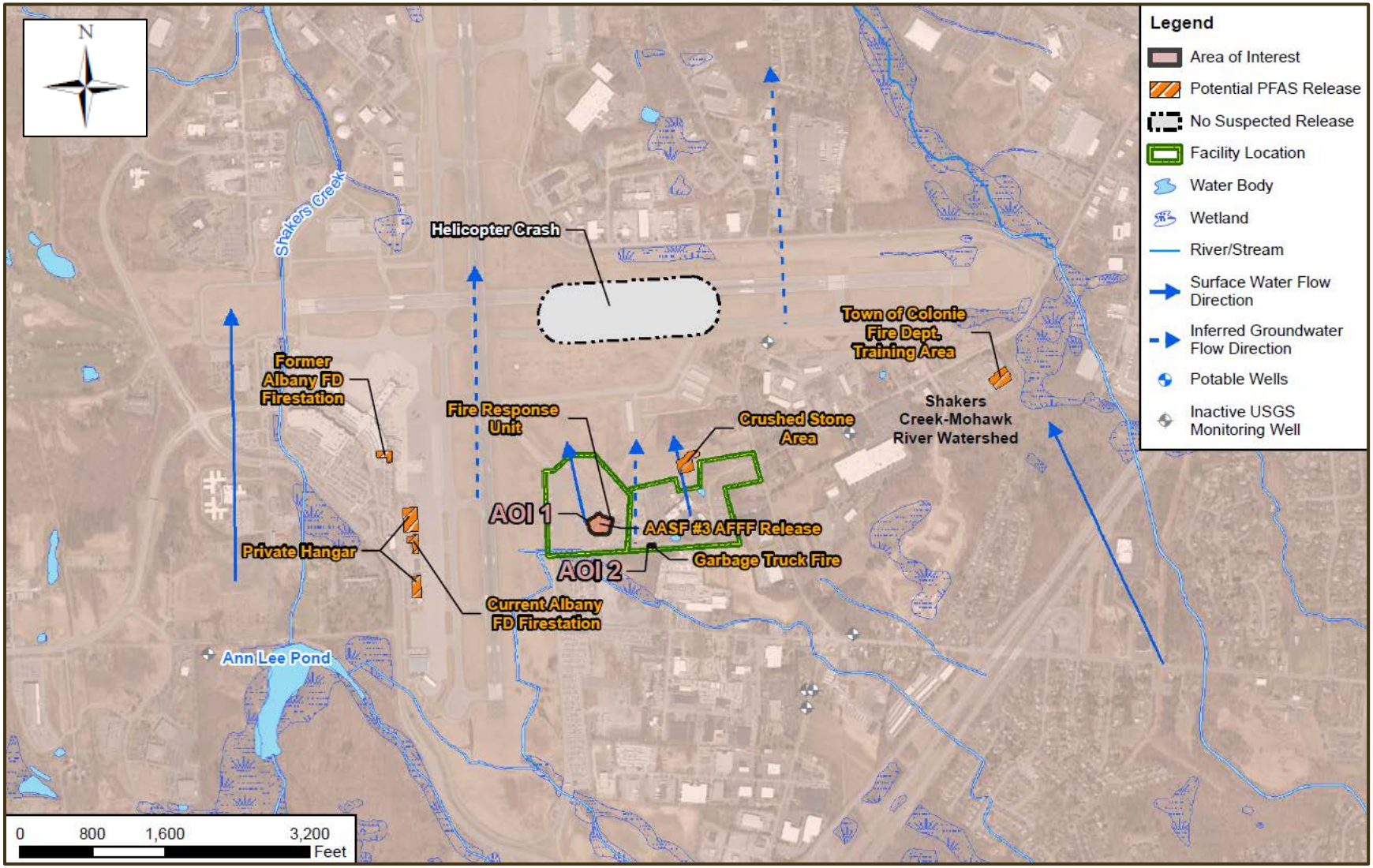
- ARNG / NYARNG
  - Identify potential per- and polyfluoroalkyl substances (PFAS) release locations
  - Provide facility access and points of contact
  - Gather and provide appropriate documents
  - Identify/schedule personnel to interview
  - Supply final PA to the regulatory agencies
- SI Regulatory Involvement
  - CERCLA SI conducted in conjunction with the appropriate regulatory agency

Albany AASF#3
ARNG PA Results

- Potential PFAS release areas: 3 identified during the PA and grouped into 2 AOIs
- AOI 1: AASF #3 Hangar Release / Fire Response Unit
  - Fire suppression deluge system installed and tested in 2012, releasing Aqueous Film Forming Foam (AFFF)
  - Former Fire Response Unit room housed AFFF-equipped firetruck. Room currently holds 500-gallon AFFF tank
- AOI 2: Garbage Truck Fire
  - In May 2017, a fire occurred in the back of a garbage truck
  - Emergency response provided, but the use of AFFF is unknown

Albany AASF #3

Summary of Findings and AOIs

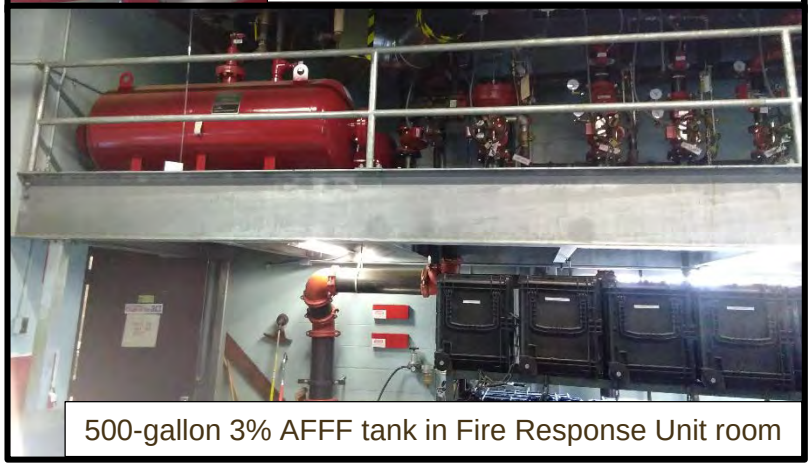


Albany AASF #3 PA Findings

AOI 1: AASF #3 Hangar Release / Fire Response Unit

- Initial testing in 2012 led to hangar being completely filled with AFFF
  - AFFF spilled out onto tarmac and grass and was cleaned up by a contractor
  - Unknown amount of AFFF spilled
  - One 35-gallon 3% AFFF tank in hangar
- Former Fire Response Unit had firetruck with 150-gallon AFFF tank and a 400-gallon Purple K tank
  - Former Fire Response Unit room now houses a 500-gallon 3% AFFF tank
  - AFFF tank currently connected to hangar deluge system

35-gallon 3% AFFF tank in Hangar



500-gallon 3% AFFF tank in Fire Response Unit room

Albany AASF #3 PA Findings

AOI 2: Garbage Truck Fire

- Fire in the back of a garbage truck, May 2017
  - Located southeast of AASF #3 Hangar
  - Unknown if AFFF was used in the emergency response

Albany AASF #3 PA Findings
Adjacent Sources

- Town of Colonie Fire Department Training Area
  - Live fire training historically conducted by a dozen local fire departments with AFFF
- Albany Fire Station – Former and Current
  - Former and current stations housed 1,500-gallon 3% AFFF tank and three firetrucks, which hold 450 gallons of AFFF each
- Crushed Stone Area
  - Albany Fire Department (AFD) performed joint fire training with NYARNG's Fire Response Unit from 1983 to 1992. The AFD still performs fire training. Currently, only water is used during these activities
- Private Hangars
  - Has housed high expansion foam for past 10 years at least. Type, amount, and usage is unknown
- Helicopter Crash
  - In early 1980s, a helicopter crashed 0.45 miles north of the facility. No AFFF was used

Albany AASF #3 PA Findings

Adjacent Sources

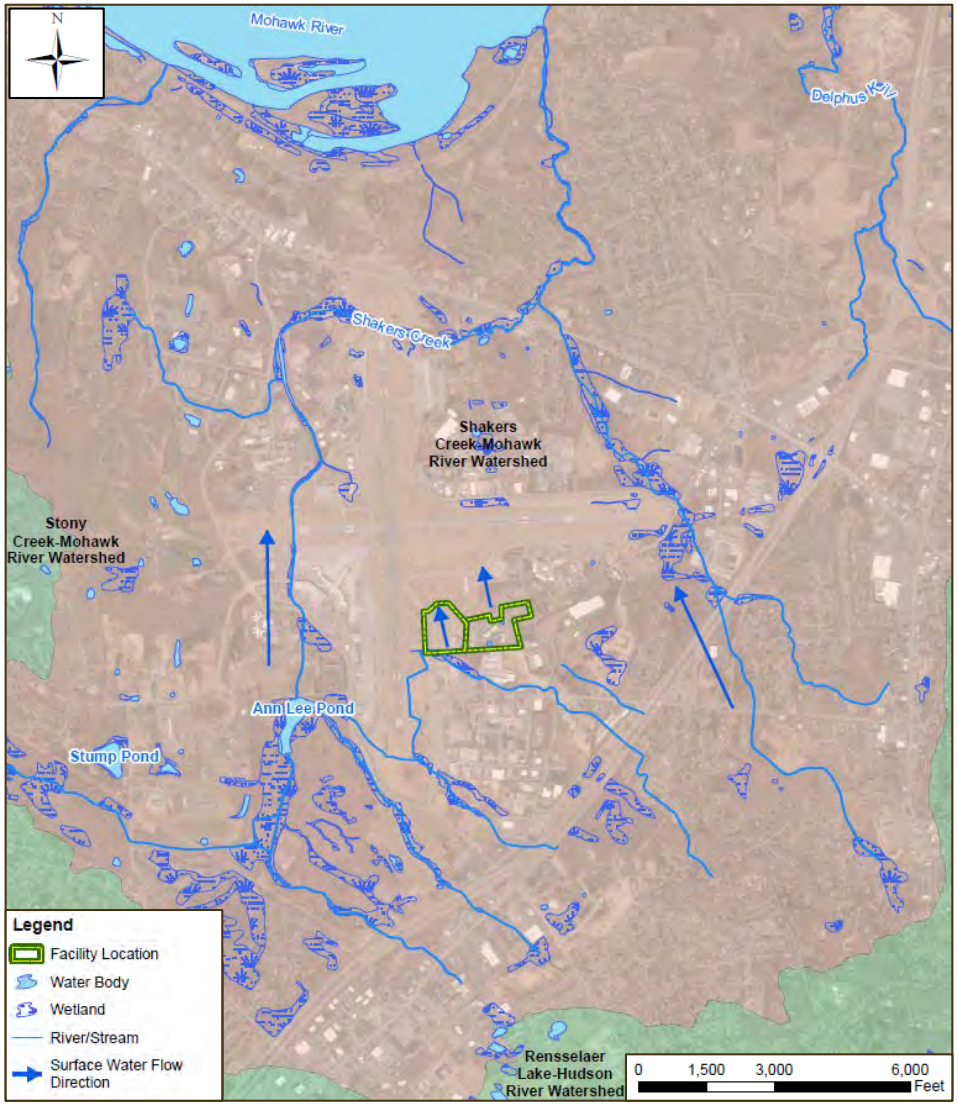
Albany AASF #3 SI Overview
Data Quality Objectives (DQOs)

- Primary SI DQOs
  - Confirm the presence/absence of a release
  - Gather data for conceptual site model (CSM):

    Understanding of Source-Pathway-Receptor relationships required for establishing sampling strategy
- Extended SI DQOs
  - Determine the presence/absence at facility boundary
  - Check for alternate sources, up- or downgradient
  - Measure PFAS at/near receptor, if warranted

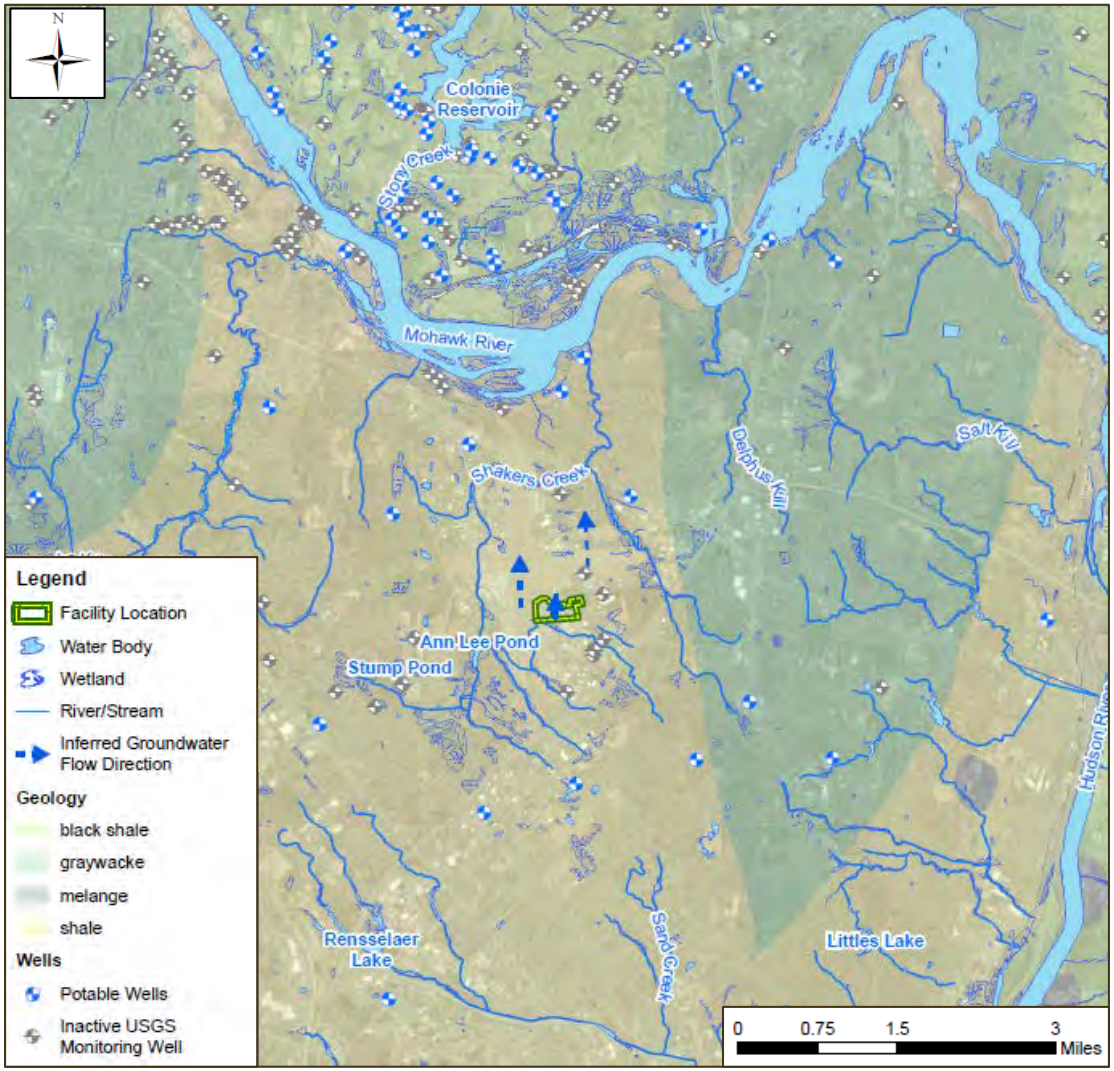
Albany AASF #3 SI Overview

CSM – Surface Water Features

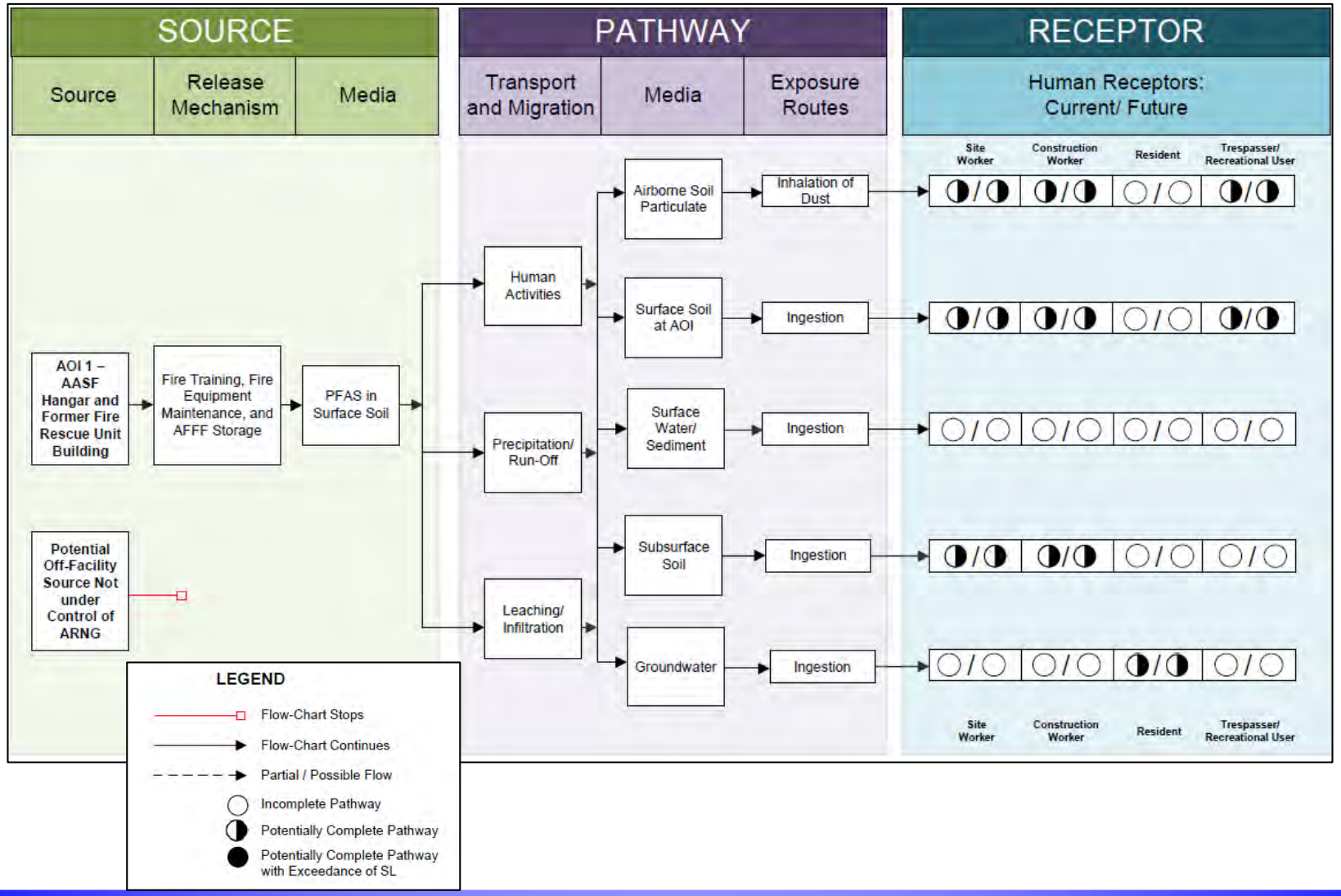


Albany AASF #3 SI Overview

CSM – Groundwater Features



Albany AASF #3 SI Overview CSM



Albany AASF #3 SI Overview
Planning and Sampling

- Finalize Uniform Federal Policy-Quality Assurance Project Plan (UFP-QAPP) Addendum
  - Draft Final submitted on 31 July 2020
  - Final to be submitted following the TPP 1&2 meeting
- Continuous soil cores to target depth
  - Soil samples collected at surface, mid point, above water table for temporary well locations
- Collect a groundwater sample from each temporary well

Albany AASF #3 SI Overview

Proposed Sampling Locations

Albany AASF #3 SI Overview

AOI	# of Boring Locations	Target Depth(s) for Borings	Soil Samples	Target Interval(s) for GW samples	Groundwater Samples	Decontamination Water Samples
1	4	20 ft	12	Mid-screen	4	1
2	2	20 ft	6	Mid-screen	2	0
Total	**6**	**---**	**18**	**---**	**6**	**1**

- Sample locations will be refined in the field
  - Confirm placement is accessible and will meet DQOs prior to the utility mark-out and locate

Albany AASF #3 SI Overview

Analytical Parameters

Perfluorooctanesulfonic acid (PFOS)	Perfluoroheptanoic acid (PFHpA)
Perfluorohexanesulfonic acid (PFHxS)	Perfluorononanoic acid (PFNA)
Perfluorooctanoic acid (PFOA)	Perfluorobutanesulfonic acid (PFBS)
Perfluorobutanoic acid (PFBA)	Perfluoropentanoic acid (PFPA)
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)
Perfluorodecanoic acid (PFDA)	Perfluorotetradecanoic acid (PFTA)
Perfluorododecanoic acid (PFDoA)	Perfluorohexanoic acid (PFHxA)
Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
6:2 Fluorotelomer sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonate (8:2 FTS)

- Analysis completed by ELAP/NELAP-certified laboratory
- Requirement for state-certified laboratory?
- Data will undergo Level III data validation

Stakeholder Involvement

- Use TPPs and open communication to encourage stakeholder involvement
- Key involvement topics
  - Proposed approaches
  - Document review time for NYSDEC and other stakeholders
- Schedule:
  - Address remaining comments and issue Final UFP-QAPP Addendum: September 2020
  - Field Investigation: October 2020

Questions and Open Discussion

- Coordination
  - Data transfer
  - Utility mark-out and utility clearance procedures
  - Report distribution (paper, electronic, portable document format)
  - IDW Handling
  - Site Walk
  - Stakeholder relations
- Schedule
- PA findings

Acronyms

- AASF – Army Aviation Support Facility
- AFD – Albany Fire Department
- AFFF – Aqueous Film Forming Foam
- AOI – Areas of Interest
- ARNG – Army National Guard
- CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
- COVID-19 – Coronavirus Disease 2019
- CSM – Conceptual Site Model
- DQO – Data Quality Objective
- ELAP – Environmental Laboratory Accreditation Program
- EM – Engineering Manual
- NELAP – National Environmental Laboratory Accreditation Program
- NYARNG – New York Army National Guard
- NYSDEC – New York State Department of Environmental Conservation
- NYSDOH – New York State Department of Health
- PA – Preliminary Assessment
- PFAS – Per- and Polyfluorinated Alkyl Substances
- PFOS – Perfluorooctanesulfonic Acid
- PFOA – Perfluorooctanoic Acid
- SI – Site Inspection
- SSHP – Site Safety and Health Plan
- TPP – Technical Project Planning
- UFP-QAPP – Uniform Federal Policy-Quality Assurance Project Plan
- USACE – United States Army Corps of Engineers

Appendix B – Standard Operating Procedures

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Appendix C – Community Air Monitoring Plan

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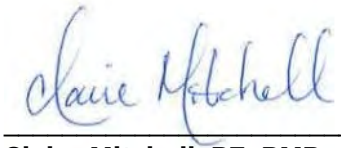
Memorandum for Appendix C: Community Air Monitoring Plan
Supplemental Site Inspection
Quality Assurance Project Plan Addendum
Camp Smith, Cortlandt, New York
Perfluorooctanesulfonic Acid (PFOS) and Perfluorooctanoic Acid (PFOA) Impacted Sites, ARNG Installations, Nationwide

To protect the community from any potential airborne releases that could result from field activities associated with the Site Inspection, community air monitoring will be performed in general accordance with the New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan (CAMP), Attachment 1A of the New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation (DER)-10 Technical Guidance for Site Investigation and Remediation, as attached to this Memorandum (NYSDEC, 2010). A CAMP is required by the NYSDEC whenever intrusive work is conducted as part of an environmental investigation or remediation.

Per DER-10, continuous air monitoring will be performed in the vicinity of the drill rig when intrusive activities are underway. Air monitoring will consist of a dust monitor placed on a tripod adjacent to the work areas, in a downwind location. Background (upwind) levels will be measured each day prior to start-up of site activities and periodically throughout the day. Per the NYSDOH Generic CAMP, the following actions will be taken if acceptable levels of air impacts are exceeded:

- If particulate levels (PM10) are greater than 100 micrograms per cubic meter ($\mu g/m^3$) above background for a 15 minute period, or if airborne dust is observed leaving the work area, dust suppression techniques will be employed. Work will continue with these suppression techniques provided that PM10 levels do not exceed 150 $\mu g/m^3$ above background and no visible dust is migrating from the work area. If PM10 exceeds 150 $\mu g/m^3$ over background, work will be stopped, and a re-evaluation of activities will be initiated.

Signed:



Claire Mitchell, PE, PMP
Project Manager
AECOM Technical Services, Inc.

New York State Department of Health
Generic Community Air Monitoring Plan
(Appendix 1A of the NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation)

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009

Appendix D – Photographic Log

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APPENDIX F – Photographic Log

Site Inspection for PFAS	Albany AASF #3	Albany, New York

Photograph No. 1

Description:

Emergency response of the Albany AASF #3 garbage truck fire, facing northeast. Booms and socks were used to prevent flow into the adjacent stormwater drop inlet. May 2017.

Photograph No. 2

Description:

Emergency response of the Albany AASF #3 garbage truck fire, facing southeast. May 2017.

Site Inspection for PFAS	Albany AASF #3	Albany, New York

Photograph No. 3

Description:

Soil from construction of the four cold storage hangars (at/ near the AOI 1 potential PFAS release area) stockpiled at AOI 3, facing southwest.

Photograph No. 4

Description:

Soil from construction of the four cold storage hangars (at/ near the AOI 1 potential PFAS release area) stockpiled at AOI 3, facing southwest.

Site Inspection for PFAS	Albany AASF #3	Albany, New York

Photograph No. 5

Description:

Soil from construction of the four cold storage hangars (at/ near the AOI 1 potential PFAS release area) stockpiled at AOI 3 (inside the fence), facing west.

Photograph No. 6

Description:

Soil from construction of the four cold storage hangars (at/ near the AOI 1 potential PFAS release area) stockpiled at AOI 3, facing north.

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