Grand Ledge - Site Inspection
Michigan Army National Guard

Technical Project Planning (TPP) Meeting 1 and 2
Grand Ledge Army Aviation Support Facility (AASF) and Armory

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

12 December 2018

Agenda

- Introductions
- Safety Moment
- TPP Meeting Goals
- Army National Guard (ARNG) PA/SI Overview
- Grand Ledge PA Findings
- Grand Ledge SI Overview
- Stakeholder Involvement
- Sample Location Refinement
- Questions and Open Discussion

Introductions

- ARNG-Installation and Environment Directorate (IED), Cleanup & Restoration Branch
  - LTC James Crowley, Branch Chief
  - Captain Pamela Hess, Toxic Release Program Manager
  - Bonnie Packer, Nationwide Project Manager
- United States Army Corps of Engineers (USACE)
  - Tim Peck, Program Manager (Baltimore District)
  - Steve Gragert, Project Manager (Omaha District)
- Michigan Army National Guard (MIARNG)
  - Jonathan Edgerly, MIARNG
  - Patricia Lyman, MIARNG
- Michigan Department of Environmental Quality (MDEQ), Remediation and Redevelopment Division
  - Amy Peterson
  - Steve Slivers
- Michigan Department of Health and Human Services (MDHHS)
  - Deb MacKenzie-Taylor
- AECOM Technical Services, Inc.
  - Claire Mitchell, SI Task Manager
  - Stephanie Tjan, SI Task Support

Safety Moment

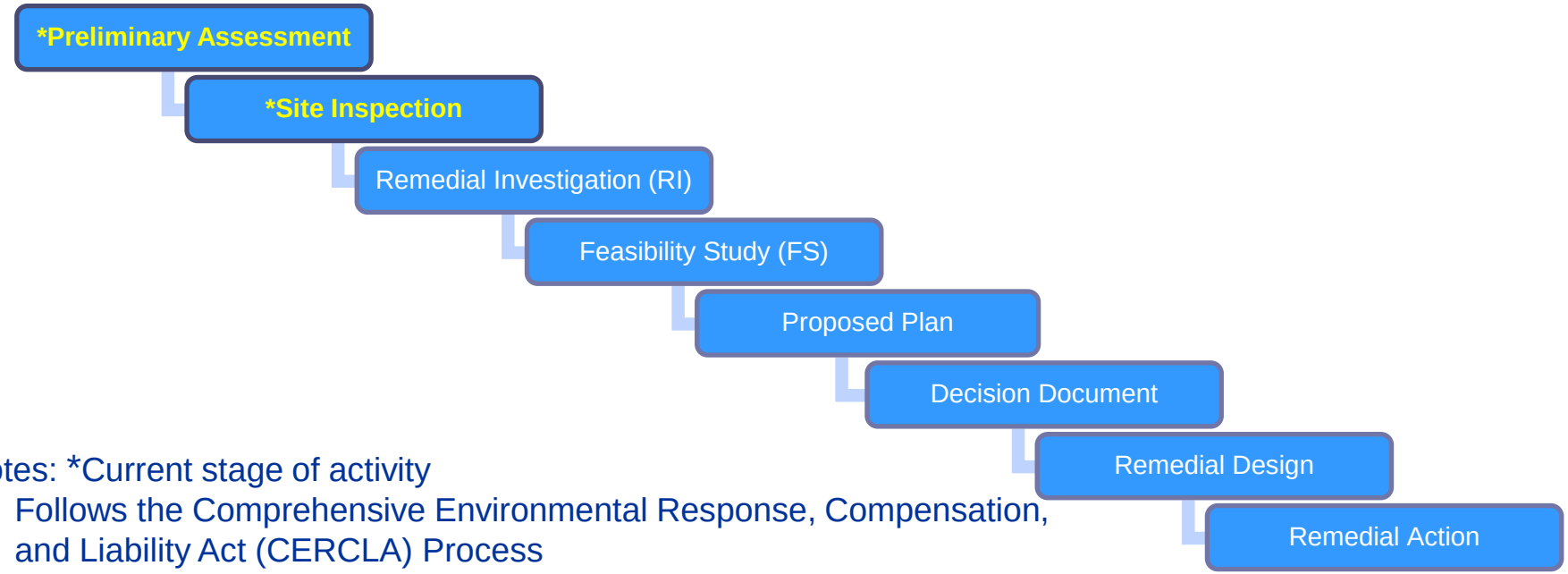
- SI will follow USACE Engineering Manual (EM) 385-1-1 requirements:
  - Accident Prevention Plan addresses all component plans for EM 385-1-1, including Construction Support during drilling operations
  - Site Specific Health and Safety Plan addresses project participants, training, and hazard identification and mitigation
- Planning documents were prepared during SI Work Plan phase

TPP Meeting Goals

- TPP1: Discuss ARNG PA/SI Program
  - Provide an overview of the ARNG PA/SI Program
  - Define objectives for SI data collection
  - Encourage stakeholder involvement
  - Review project schedule
- TPP2: Discuss proposed SI approach
  - Provide an overview of PA findings
  - Present Conceptual Site Model (CSM) and Data Quality Objectives (DQOs)
  - Present SI approach
- TPP3: Discuss SI findings
- Participants:
  - TPP1 and 2: ARNG, USACE, MDEQ, MDHHS
  - TPP3: ARNG, USACE, MDEQ, MDHHS, 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
- Restoration Advisory Board is typically solicited at RI/FS Phase

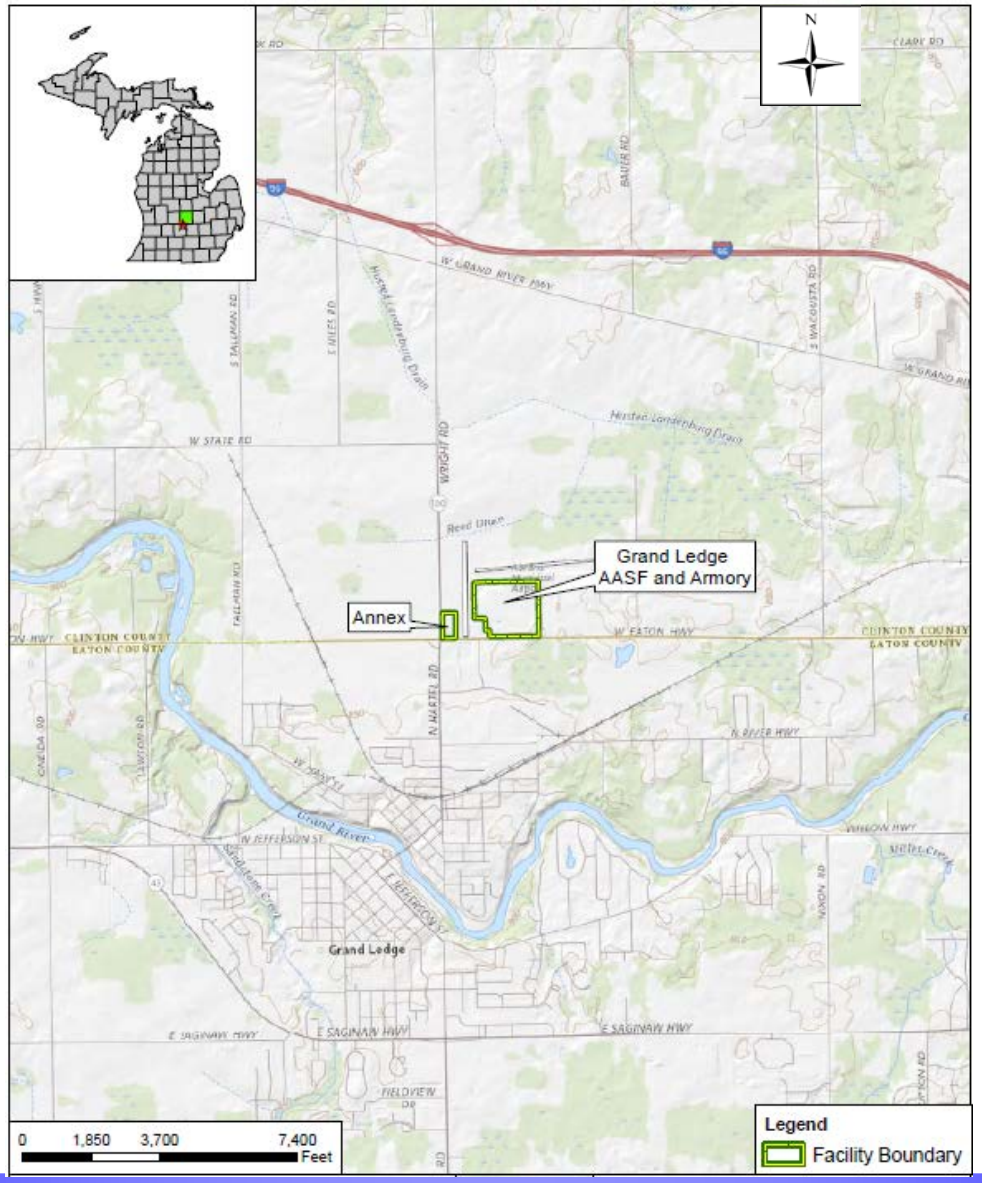
ARNG PA/SI Overview
ARNG Program

- Activities centrally contracted through USACE and managed by ARNG-IED
  - USACE Baltimore manages the contract, with project support from Sacramento and Omaha Districts
  - Project support: chemistry, geology, risk assessment
- 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
Roles in PA/SI

- State ARNG Role for the Preliminary Assessment
  - Identify potential per- and polyfluorinated alkyl substances (PFAS) release locations
  - Provide ARNG personnel and facility access
  - Gather and provide appropriate documents
  - Identify/schedule personnel to interview
  - State ARNG provides final PA to the regulatory agencies
- SI Regulatory Involvement
  - CERCLA SI conducted in conjunction with the appropriate regulatory agency

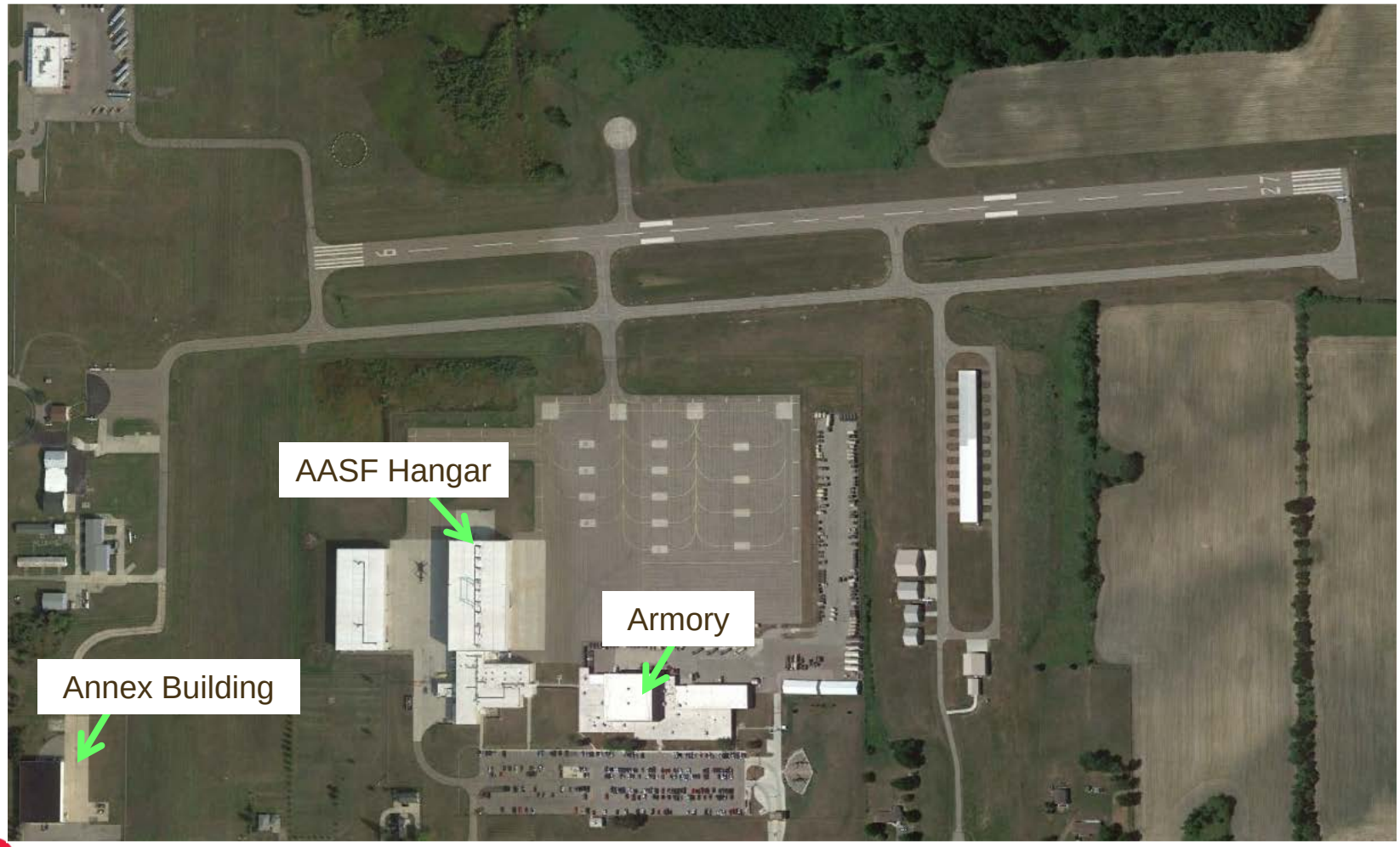
Grand Ledge PA Findings



Grand Ledge PA Findings

- Reviewed data resources to obtain information relevant to suspected PFAS releases
- Conducted a 1-day site visit that included visual site inspections at known PFAS locations on 5 December 2017, and documented with photographs
- Interviewed current Grand Ledge AASF personnel during the site visit including the Facility Manager
- Conducted follow-on interviews on 26 April 2018 with the Aircraft Mechanic Supervisor and on 7 June 2018 with additional Armory personnel

Grand Ledge PA Findings



Aerial Image Source: Google Earth

Grand Ledge PA Findings
AASF Hangar

- 700-gallon fire suppression system in AASF Hangar
  - System has not been activated intentionally or unintentionally
  - Information on contractor testing and liner replacement not available for review
  - Unintentional release of aqueous film forming foam (AFFF) during servicing is possible

Grand Ledge PA Findings
Armory

- Former location of AASF
- AASF had a firefighting unit during the 1980's which was disbanded in the early 1990's
- Fire truck stationed in garage located in the Armory building
- Fire trucks equipped with AFFF have historically had potential to leak although there were no documented releases

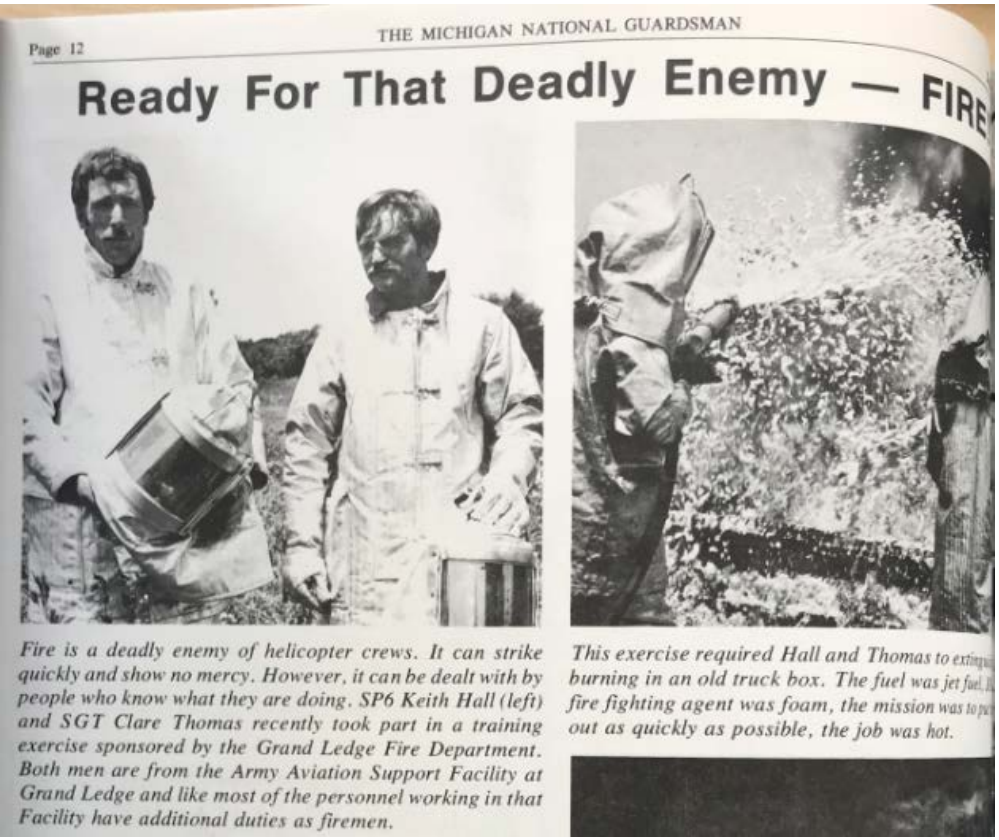
Grand Ledge PA Findings
Annex Building

- Stores approximately 1,500 gallons of AFFF and 16 empty compressed air foam portable fire suppression systems (Tri-Max 30 extinguishers)
- Little knowledge regarding historical use and activities is known
- AFFF could have been released during routine extinguisher testing/ training or transportation of AFFF

Grand Ledge PA Findings
Adjacent Sources

- Off-site adjacent sources not identified during PA interviews
- Abrams Municipal Airport located immediately north and east of AASF and Amory
- Use or presence of AFFF can not be confirmed or denied

Grand Ledge PA Findings
Uncertainty



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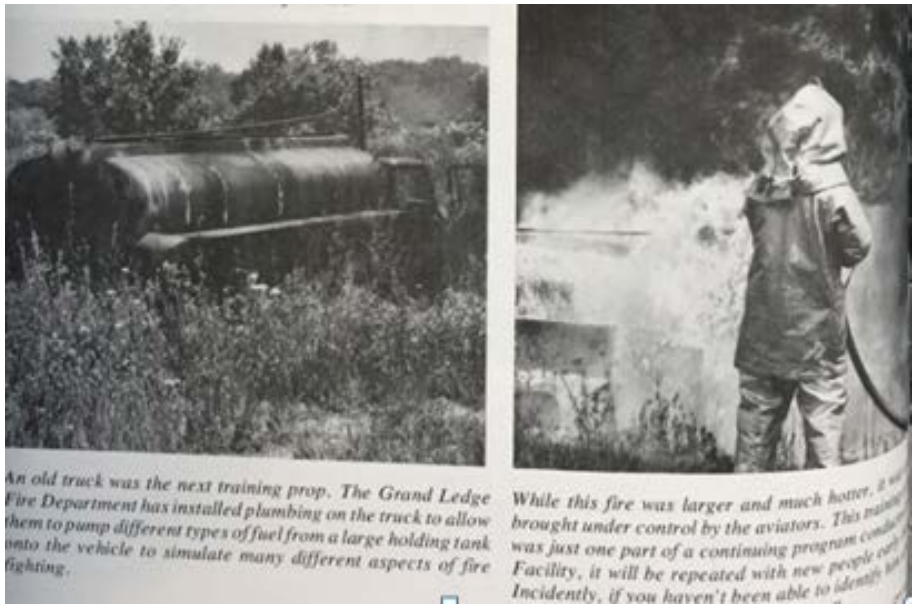
Ready For That Deadly Enemy — FIRE

Fire is a deadly enemy of helicopter crews. It can strike quickly and show no mercy. However, it can be dealt with by people who know what they are doing. SP6 Keith Hall (left) and SGT Clare Thomas recently took part in a training exercise sponsored by the Grand Ledge Fire Department. Both men are from the Army Aviation Support Facility at Grand Ledge and like most of the personnel working in that Facility have additional duties as firemen.

This exercise required Hall and Thomas to extingu burning in an old truck box. The fuel was jet fuel. fire fighting agent was foam, the mission was to pu out as quickly as possible, the job was hot.

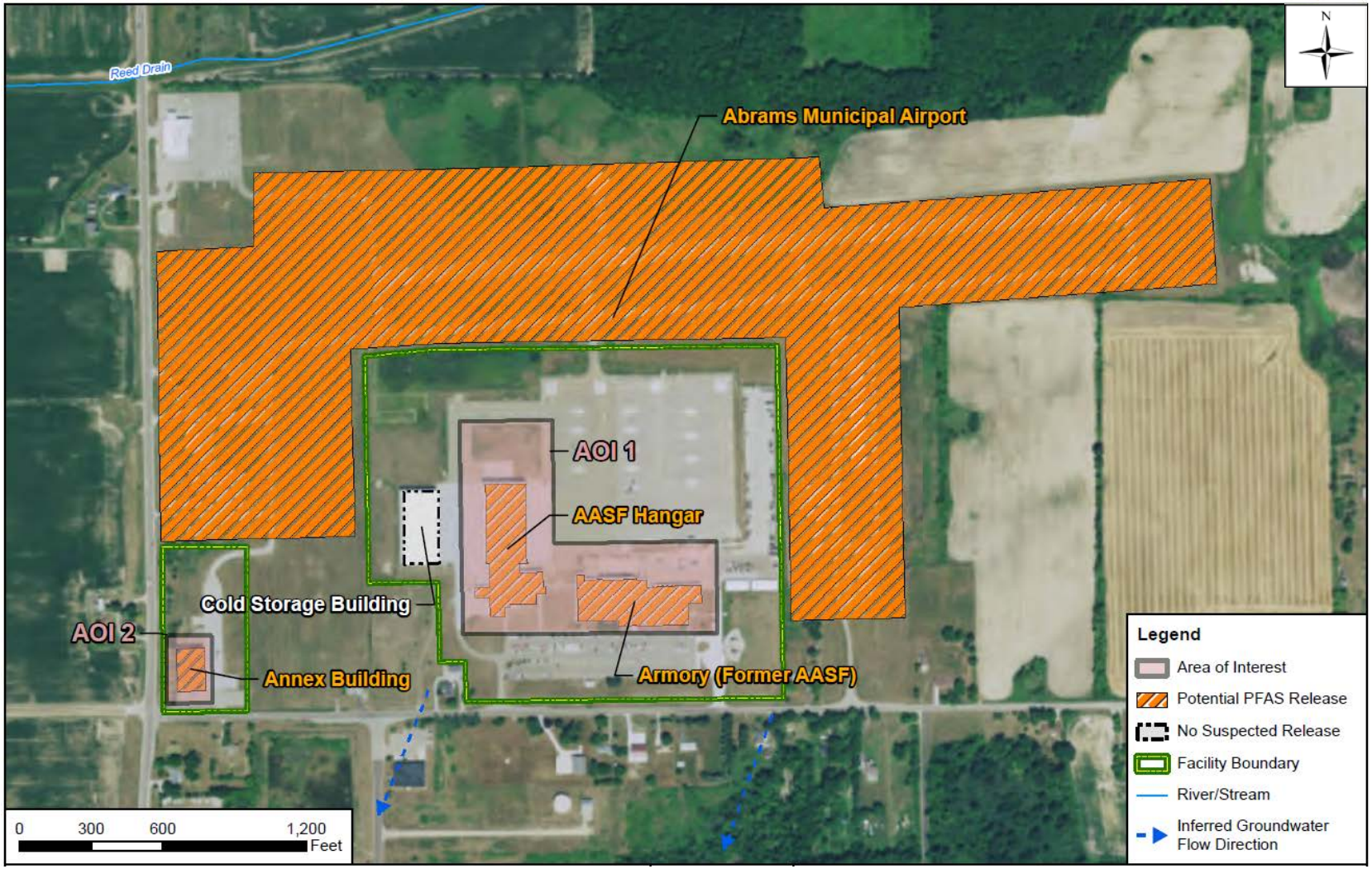


An old truck was the next training prop. The Grand Ledge Fire Department has installed plumbing on the truck to allow them to pump different types of fuel from a large holding tank onto the vehicle to simulate many different aspects of fire fighting.

While this fire was larger and much hotter, it w brought under control by the aviators. This maneu was just one part of a continuing program condu Facility, it will be repeated with new people each Incidently, if you haven't been able to identify

Grand Ledge PA Findings

Summary of Findings and AOIs

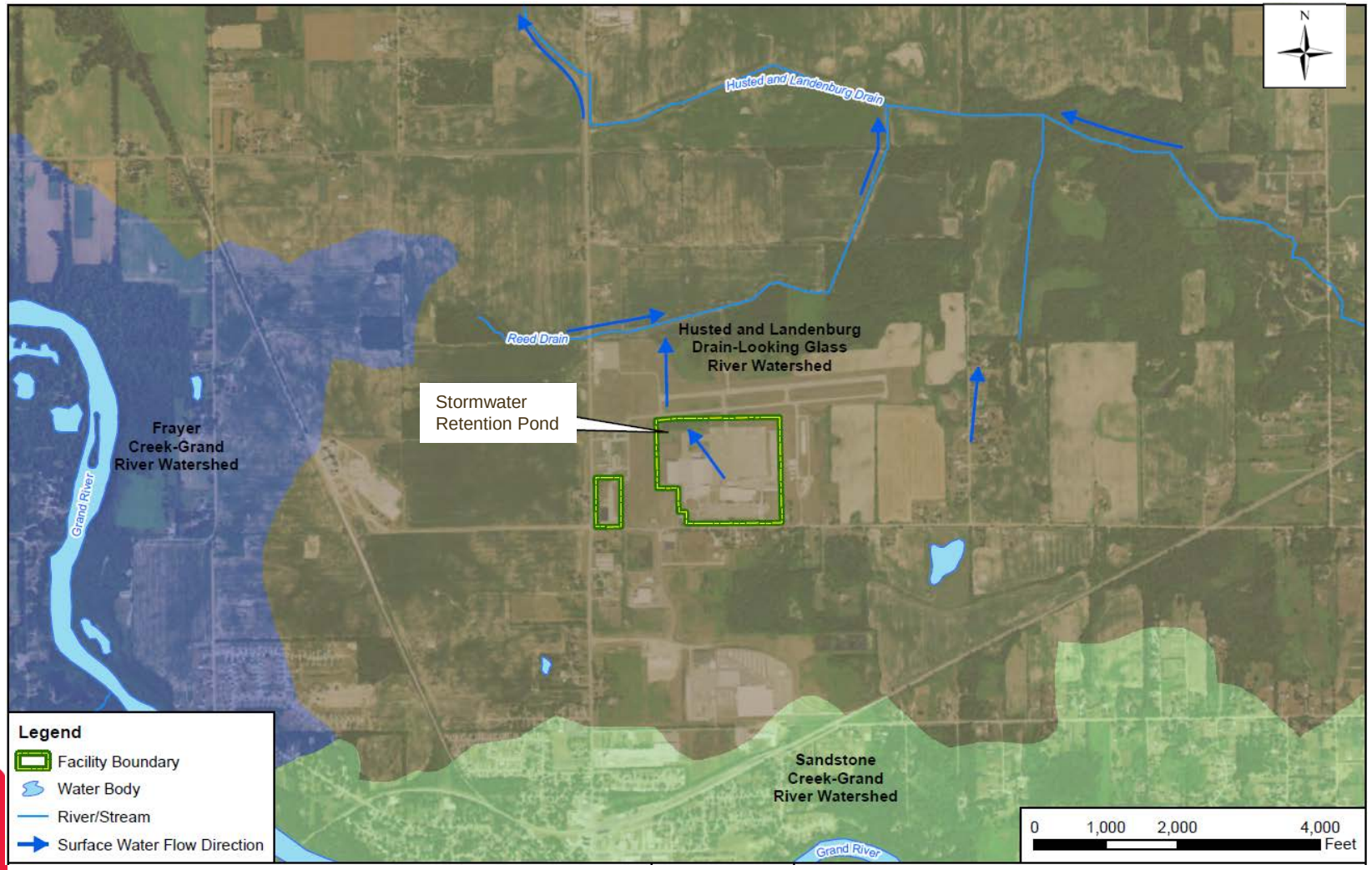


Grand Ledge SI Overview
Data Quality Objectives

- Primary SI DQOs
  - Determine the presence / absence of a release
  - Gather data for conceptual site model:
    - Source-Pathway-Receptor relationships
- Enhanced SI DQOs
  - Check for the presence/ absence at facility boundary
  - Check for alternate sources, up- or downgradient

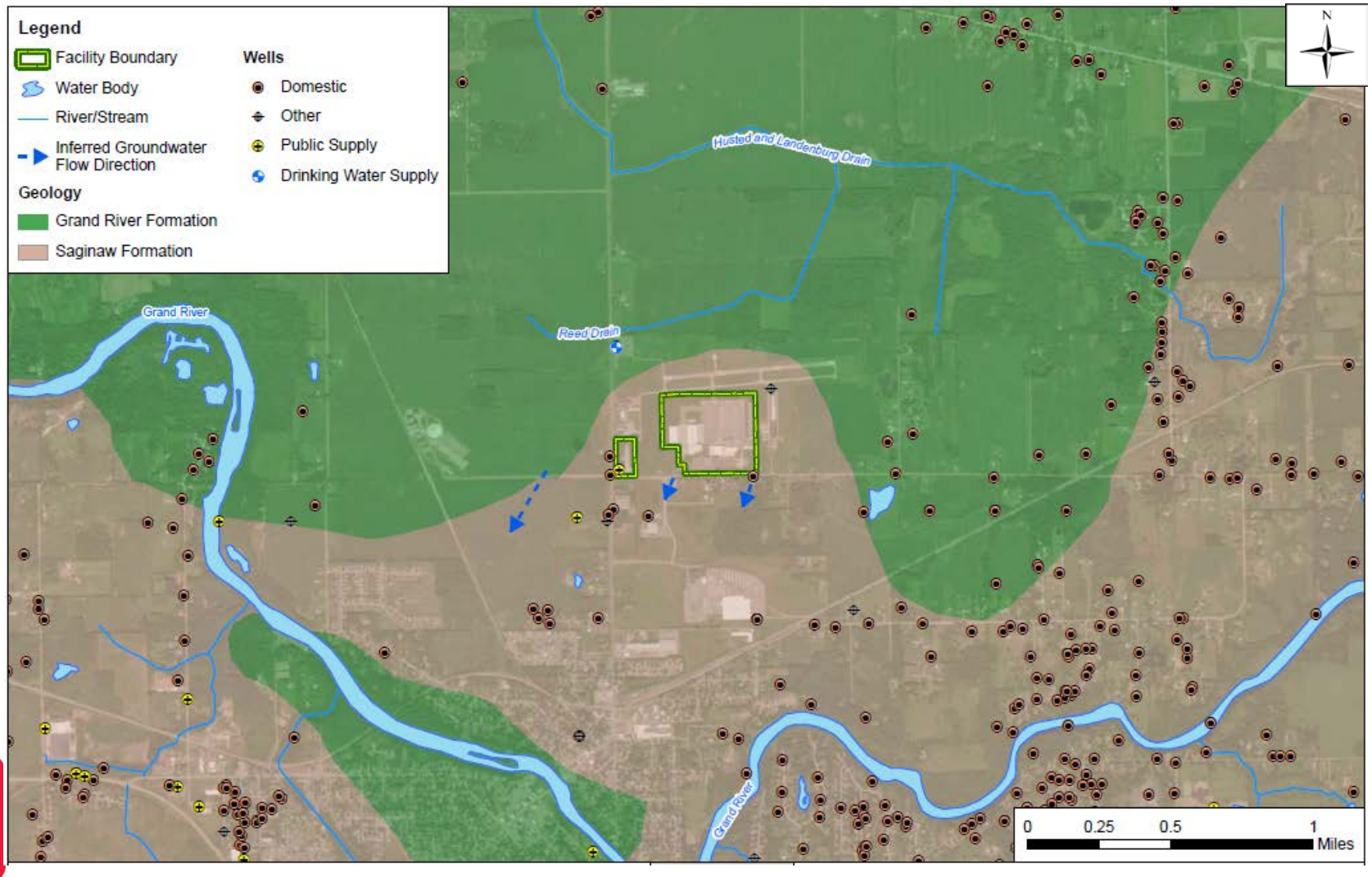
Grand Ledge SI Overview

Conceptual Site Model - Surface Water Features



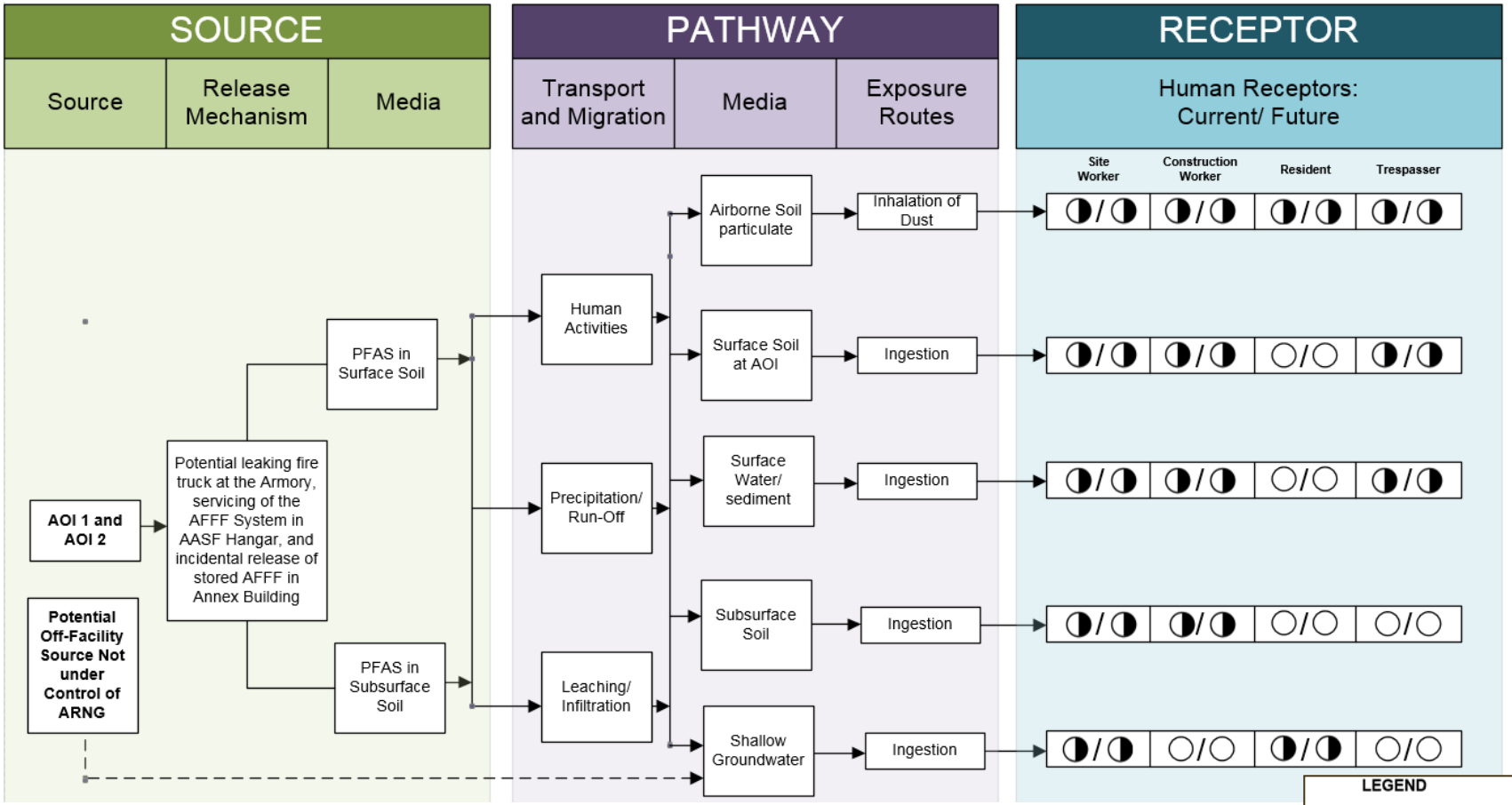
Grand Ledge SI Overview

Conceptual Site Model - Groundwater Features



Grand Ledge SI Overview

Conceptual Site Model



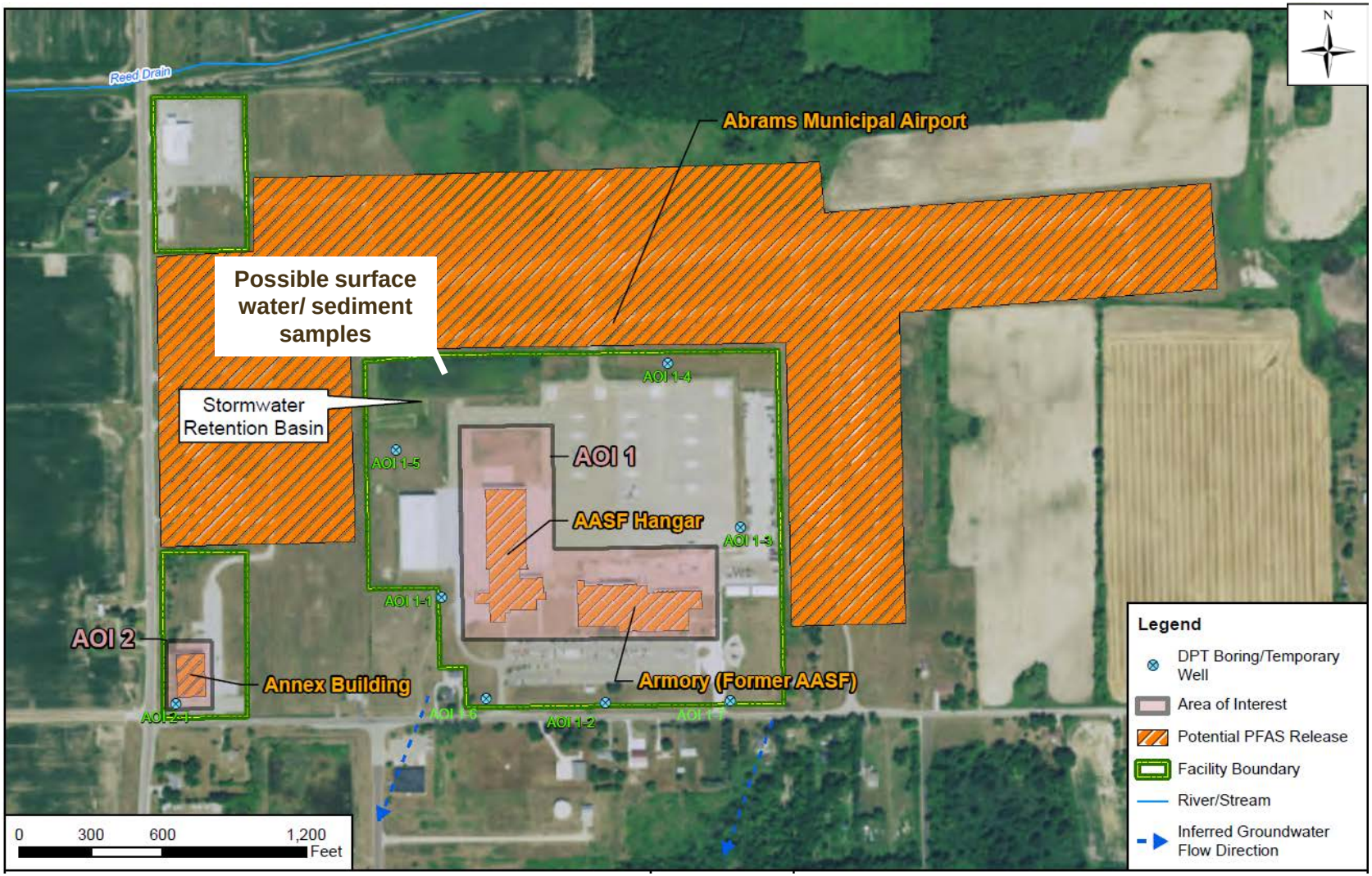
Grand Ledge SI Overview

Planning and Sampling

- Finalize Work Plan and Uniform Federal Policy-Quality Assurance Project Plan (UFP-QAPP)
- Install temporary monitoring wells downgradient of potential source areas and/or at the facility boundary
- Continuous soil cores to target depth (soil samples collected at surface, mid point, above water table)
- Collect possible surface water and sediment samples in Stormwater Retention Pond, depending on drainage

Grand Ledge SI Approach

Proposed Sampling Locations



Grand Ledge SI Overview

Planning and Sampling

AOI	# of Boring Locations	Target Depth(s) for Borings	Soi5 Samples	Target Interval(s) for GW samples	Grab Groundwater Samples	Surface Water Samples	Sediment Samples
1	7	20	21	15-20	7	TBD	TBD
2	1	20	3	15-20	1	0	0

Grand Ledge 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)

- All data will undergo Level IV data validation

Stakeholder Involvement

- Use TPPs and open communication to encourage involvement
- Key involvement topics
  - Proposed approaches
  - Document review time for MDEQ and other stakeholders
- Schedule:
  - UFP-QAPP: Draft-Final for regulatory review in January 2019
  - Field Investigation: April 2019

Sample Location Refinement

- Visual reconnaissance of sample locations
- Confirm placement is accessible and will meet DQOs
- Relocate if required, with ARNG, MIARNG, and MDEQ concurrence

Questions and Open Discussion

- Coordination
  - Data transfer
  - Report distribution (paper, electronic, portable document format)
- Schedule
  - Revision and finalization of UFP-QAPP (February 2019)
  - Field execution (April 2019)
  - SI Report preparation and review
  - TPP 3: discussion of field results with stakeholders

Acronyms

- AASF – Army Aviation Support Facility
- AFFF – aqueous film forming foam
- AOI – area of interest
- ARNG – Army National Guard
- ARNG-IED – ARNG Compliance & Cleanup Branch
- CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
- CSM – Conceptual Site Model
- DQO – Data Quality Objective
- EM – Engineering Manual
- MDEQ – Michigan Department of Environmental Quality
- MDHHS – Michigan Department of Health and Human Services
- MIARNG – Michigan ARNG
- PA – Preliminary Assessment
- PFAS – Per- and Polyfluorinated Alkyl Substances
- PFOS – Perfluorooctanesulfonic Acid
- PFOA – Perfluorooctanoic Acid
- SI – Site Inspection
- TPP – Technical Project Planning
- UFP-QAPP – Uniform Federal Policy Quality Assurance Project Plan
- USACE – United States Army Corps of Engineers

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Meeting Minutes
Grand Ledge Army Aviation Support Facility (AASF) and Armory – Site Inspection (SI)
Technical Project Planning (TPP) – Meeting 3
Preliminary Assessments and Site Inspections (PA/SIs) for Perfluorooctanesulfonic Acid (PFOS) and Perfluorooctanic Acid (PFOA) Impacted Sites
Contract No. W912DR-12-D-0014, DO W912DR17F0192
Wednesday, 21 October 2020
1100 to 1145 hrs.

Participants			
Name	**Affiliation**	**Phone**	**E-Mail**
Bonnie Packer	NGB	703-607-7977	bonnie.m.packer.ctr@mail.mil
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Patti Lyman	MIARNG	301-944-3908	patricia.b.lyman.nfg@mail.mil
Kim Sakowski	EGLE	NA	sakowskik@michigan.gov
Liz Braddock	DHHS	NA	NA
Claire Mitchell	AECOM	716-698-5705	claire.mitchell@aecom.com
Jake Wilhelm	AECOM	978-905-2100	jake.wilhelm@aecom.com
Stephanie Tjan	AECOM	317-379-6792	stephanie.tjan@aecom.com

ARNG - Army National Guard; MIARNG - Michigan Army National Guard; NA – not available; NGB - National Guard Bureau; EGLE - Michigan Department of Environment, Great Lakes and Energy; DHHS – Michigan Department of Health and Human Services; USACE - United States Army Corps of Engineers; and AECOM - AECOM Technical Services, Inc.

Jake Wilhelm (JW) (SI Task Manager, AECOM) welcomed participants and began the meeting at 1100 with a roll call and introductions. The meeting focused on the results of the Site Inspection (SI) for potential per- and polyfluoroalkyl substances (PFAS) releases at the Grand Ledge Army Aviation Support Facility (AASF) and Armory. Briefing slides are included as **Attachment A**. Key points discussed during the presentation are provided below.

JW presented a safety reminder about driving during the fall season. Potential hazards may result from the rainfall, wildlife, and falling leaves experienced during the season. It is important to be watchful of these conditions and adjust your driving accordingly.

The TPP meeting goals and overview of work phases were presented.

- TPP 1/2 reviewed the ARNG PA/SI program and SI approach
- TPP 3 discusses SI findings after the SI field effort and future actions
- The SI fieldwork occurred in two mobilizations during May 2019 and November-December 2020.
- The Draft Final SI report was transmitted to EGLE today, 21 October 2020.

PA – Summary of Findings:

- A brief overview of the PA findings was presented. During the PA, two potential source areas were identified and grouped into two AOIs: AOI 1 – AASF Hangar and Armory (Former AASF) and AOI 2 – Annex Building.
- PFAS releases were attributed to firefighting training, emergency response activities, AFFF storage, and possible unintentional releases.

- JW noted that additional interviews were conducted during the SI phase after the PA phase was completed. Additional potential source areas within the two AOIs were identified from these interviews including the motor pool, tarmac, former ditch, and wash bay.
- Potential adjacent sources are the Abrams Municipal Airport and Transfast Trucking, Inc. (Former Hangar).
    - Drinking water at the Abrams Municipal Airport was sampled for PFAS in September 2020, and there were no detections of PFAS.

SI – Data Quality Objectives/Summary of Approach:

- During the PA and SI planning phase, data quality objectives (DQOs) were established in order to collect the appropriate data to build and refine the conceptual site model (CSM).
- Mobilization 1 involved the installation of soil borings/temporary wells using direct-push technology (DPT) and the collection of soil, groundwater, sediment, and surface water samples
- Mobilization 2 involved the installation of permanent wells using rotosonic drilling technology and the collection of groundwater, surface soil, sediment, and surface water samples.
- During Mobilization 2, permanent groundwater wells were also gauged to produce a groundwater contour map that shows a southeasterly flow.
    - Monitoring well AOI 1-10 was excluded from the map, because the well is believed to be set in a deeper hydraulic unit separate from surrounding wells and may define a channel in the underlying bedrock.
    - The boring for AOI 1-10 showed an overlying fine matrix of clay nodules, silt, and sand with some gravel above the screen.
- Residential sampling was conducted at 25 residences surrounding the facility during two mobilizations.
    - Only one residential well side-gradient to AOI 2 had a minor PFOS detection.
- Data for three compounds (PFOS, PFOA, and perfluorobutanesulfonic acid [PFBS]) were compared to the Office of the Secretary of Defense (OSD) Screening Levels (SLs) for soil and groundwater. Exceedances of the OSD SLs determine if an AOI proceeds to a Remedial Investigation (RI).

SI – Summary of Findings:

- All detections in soil were below the SLs during both mobilizations.
    - Bonnie Packer (NGB) noted that there was a lot of prior construction which involved soil movement around the facility and out of the facility. Thus, although the soil samples may indicate a potential release, the results may not be indicative of the source release area, or the nature and extent of contamination.
- During Mobilization 1, PFOS and PFOA in groundwater exceeded the SL of 40 ng/L at temporary well AOI 1-5.
- During Mobilization 2, all detections in groundwater were below the SLs.
    - Deeper wells were planned during Mobilization 2 in order to target a depth similar to where the nearby residential wells are screened, due to the exceedance of the OSD SL in AOI 1-5 during Mobilization 1.
- PFAS was detected in surface water and sediment from the stormwater retention basin during both mobilizations.
    - The MIARNG is also conducting additional surface water sampling from the stormwater retention basin.
- A revised conceptual site model (CSM) was presented for AOIs 1 and 2.
    - The potential receptors are site workers, future construction workers, and residents.
    - The potential pathways are through inhalation of dust and incidental ingestion of surface soil, surface water/sediment, subsurface soil, and groundwater.

- Future construction workers could potentially be exposed to PFAS through incidental ingestion of groundwater at AOI 1, due to the exceedance of the groundwater SL at AOI 1.

Next Steps/Open Discussion:

- The Final SI report will be prepared after EGLE comments are received and addressed for the Draft Final SI report.
- The RI is planned but the timing of the RI will depend upon EGLE's input and contracting decisions.
  - Kim Sakowski (EGLE) stated she would like to review the SI report prior to making any decisions on the RI timing.
  - Kim expects that more than 30 days will be needed for a complete and formal review. However, she should be ready by mid-November for an informal discussion about scheduling.
- Liz Braddock (DHHS) stated that there is no DHHS policy about how frequently to sample a residential well when there is a possible risk to drinking water. Moreover, the current data do not suggest the need to provide an alternative water source.
- Bonnie suggested consideration about how much residential sampling should be incorporated during the RI due to the uncertainty about the clay unit and hydrologic conditions.

Attachment A- TPP3 Briefing Slides

Grand Ledge Army Aviation Support Facility and Armory Site Inspection
Michigan Army National Guard

Technical Project Planning (TPP) Meeting 3

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

21 October 2020

Agenda

- Introductions
- Safety Moment
- TPP Meeting Goals
- ARNG CERCLA Process Overview
- PA Overview
- SI Results
- Next Steps
- Questions and Open Discussion

Introductions

ARNG G9

- Dave Connolly, PFAS Program Manager
- Bonnie Packer, Nationwide Project Manager

USACE

- Tim Peck, Nationwide Program Manager
- Steve Gragert, Chemist (Omaha District)

Michigan Army National Guard (MIARNG)

- Jonathan Edgerly, Environmental Manager
- Patricia Lyman, Investigation/Remediation Manager

Michigan Department of Environment, Great Lakes and Energy (EGLE)

- Kim Sakowski, EGLE Project Manager

AECOM Technical Services, Inc.

- Claire Mitchell, Project Manager
- Jake Wilhelm, SI Task Manager
- Stephanie Tjan, SI Task Support

State and Local Health Department Attendees

- TBD

Safety Moment
Fall Driving

- Don't brake on leaves
- Avoid sun glare
- Use your rain smarts
- Be careful on bridges
- Adjust your eyes
- Watch out for deer, turkey, elk, etc.

"Safety for Life" Thanks for making safety a personal priority. Let's make this our safest year ever!

AECOM

Meeting Goals

TPP 1/2 Review

- Provide and overview of ARNG PA/SI Program
- Define objectives for SI data collection
- Encourage stakeholder involvement
- Review project schedule
- Capture action items
- Discuss proposed SI approach

TPP 3

- ARNG CERCLA program overview
- Revisit the PA findings
- Present SI Results and revised conceptual site model (CSM)
- Resolve comments/concerns and gain concurrence on presentation of findings in Draft Final SI Report
- Discuss future actions at the site

ARNG PA/SI Overview

Work Phases

Notes: *Current stage of activity

- Follows the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Process

ARNG CERCLA Status Overview

- PA for Grand Ledge AASF and Armory has been completed by ARNG
- SI fieldwork completed in May 2019 (Mobilization 1) and November-December 2020 (Mobilization 2)
- Draft Final SI Report provided to EGLE; results presented today

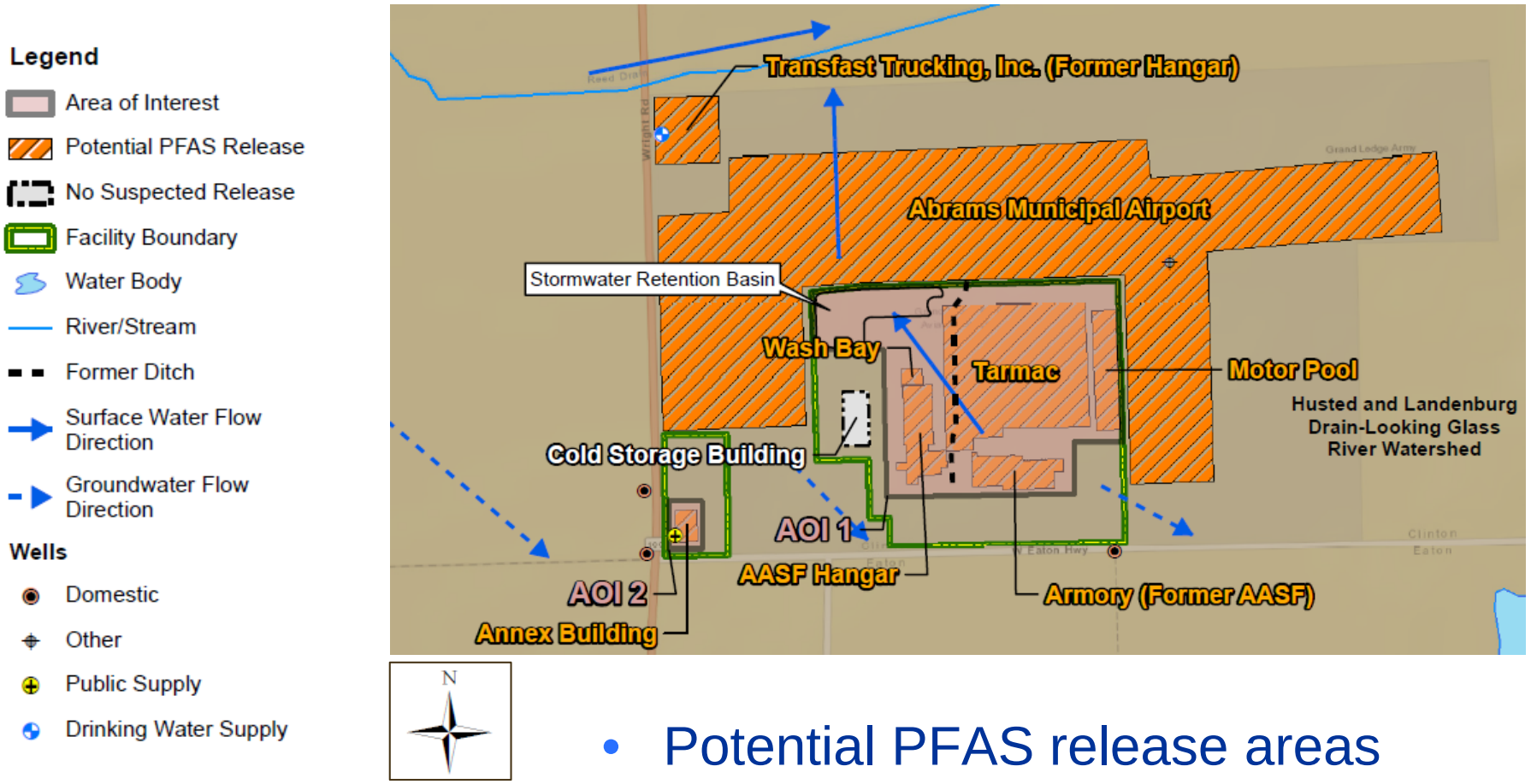
PA – Summary of Findings

- Potential Source Areas: 2 identified during the PA and grouped into 2 AOIs
- PFAS releases attributed to firefighting training, emergency response activities, AFFF storage, and possible unintentional releases

PA – Summary of Findings

- AOI 1 – AASF Hangar and Armory (Former AASF)
  - 700-gallon fire suppression system in AASF Hangar
    - System has not been activated
    - Possible unintentional AFFF release during servicing
  - Armory (Former AASF)
    - Firefighting unit in 1980s to early 1990s
    - Tri-Max 30 extinguishers used for AFFF training (tarmac, motor pool, wash bay areas)
- AOI 2 – Annex Building
  - Stores bulk and expired AFFF in 55 gal drums, 5 gal buckets
- Potential Adjacent Sources: Abrams Municipal Airport, Transfast Trucking

PA – Summary of Findings



- Potential PFAS release areas grouped into 2 AOIs

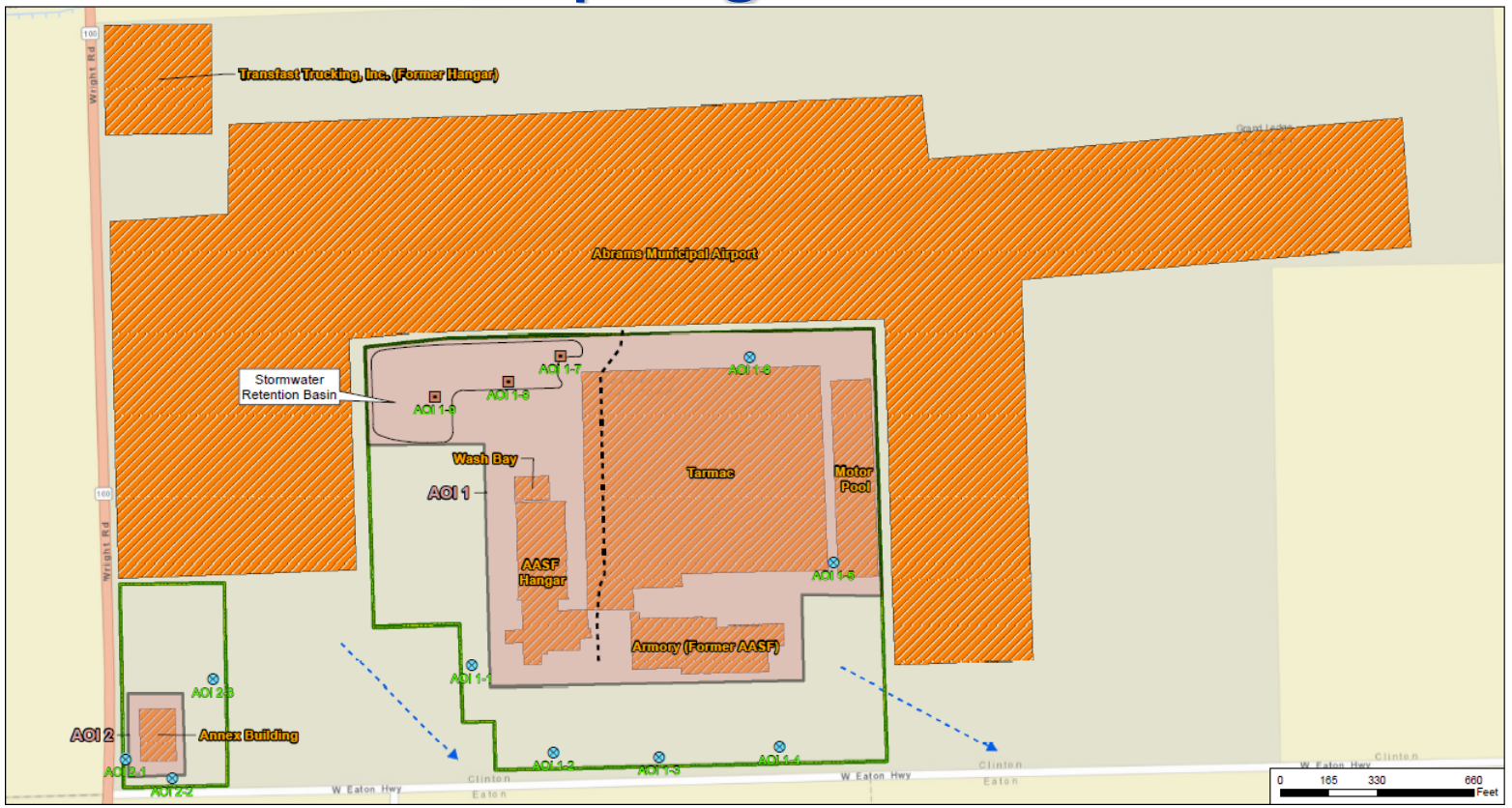
SI – Data Quality Objectives

- Primary SI DQOs
  - Confirm the presence / absence of a release at a potential source area
  - Gather data for refinement of conceptual site model:
    - Source-Pathway-Receptor relationships
- Enhanced SI DQOs
  - Determine the presence/absence at the facility boundary
  - Check for alternate sources, up- or downgradient

SI – Summary of Approach

- Mobilization 1
  - Soil samples from each location: at source (0 to 2 ft), above water table (10 to 22 ft bgs), and at mid-point, where practicable
  - Temporary monitoring wells for GW grab samples (ranging from 4 to 22 ft bgs)
  - Sediment and surface water grab samples from stormwater retention basin
- Total Samples
  - 18 soil grab samples from 9 boring locations
  - 9 GW grab samples from 9 temporary well locations
  - 3 sediment and 3 surface water samples

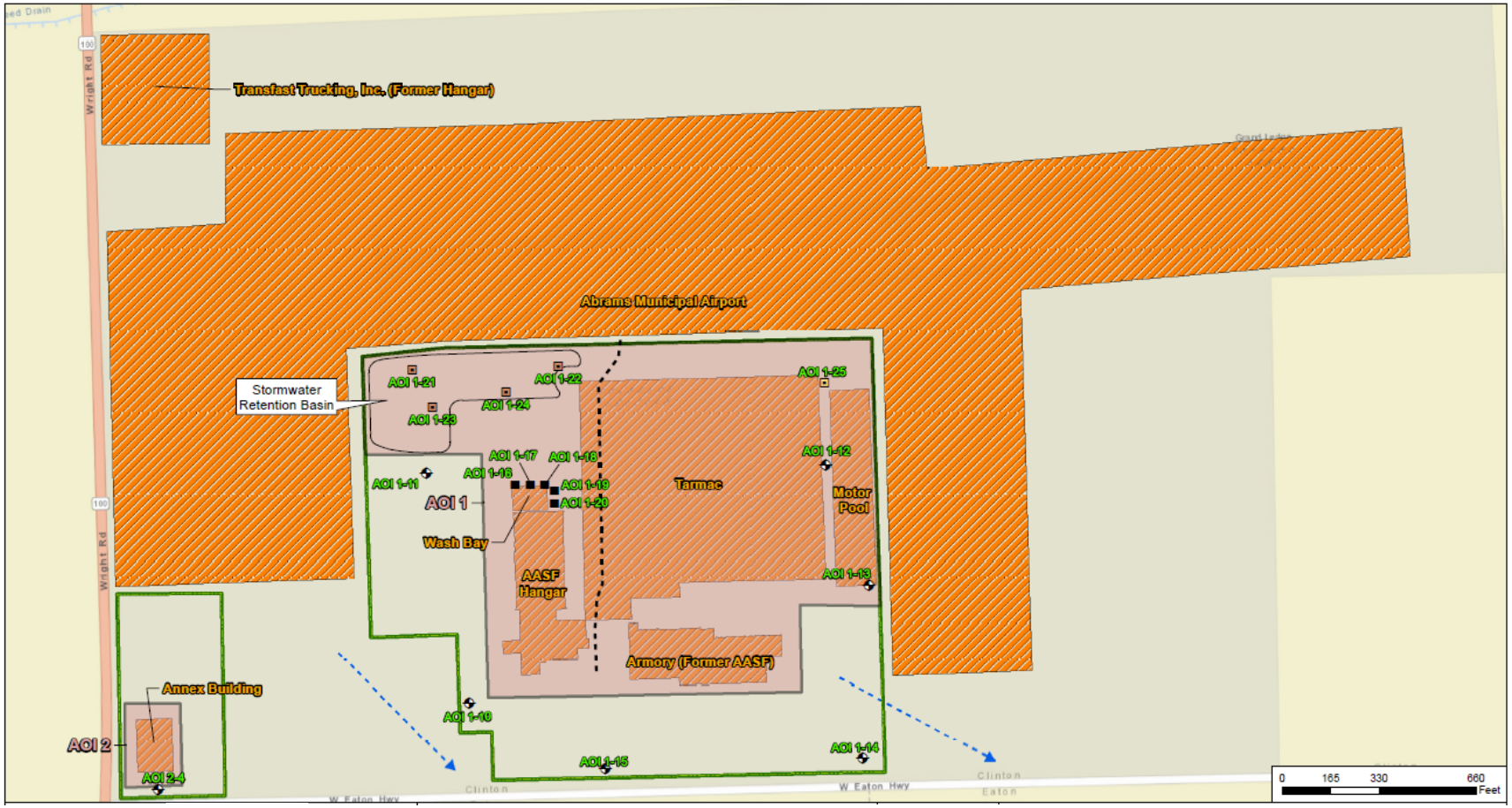
SI Mobilization 1 Sampling Locations



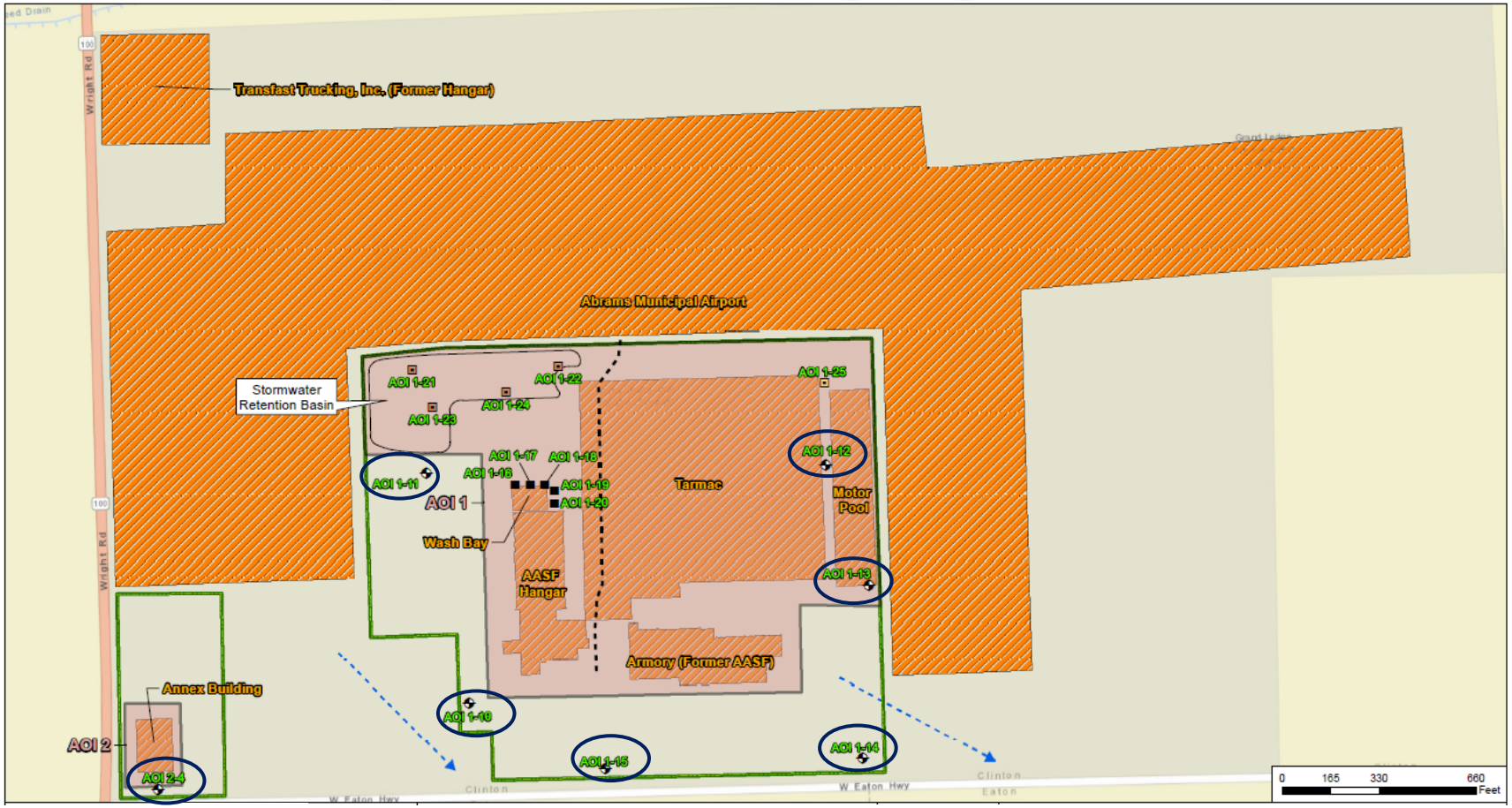
SI – Summary of Approach

- Mobilization 2
  - Surface soil samples from five locations (0 to 2 ft)
  - GW samples from permanent monitoring wells (ranging from 30 to 89 ft bgs depth)
  - Sediment and surface water grab samples from stormwater retention basin
- Total Samples
  - 5 soil grab samples from 5 locations
  - 7 GW samples from 7 permanent monitoring well locations
  - 5 sediment samples from 5 locations
  - 8 surface water samples from 4 locations

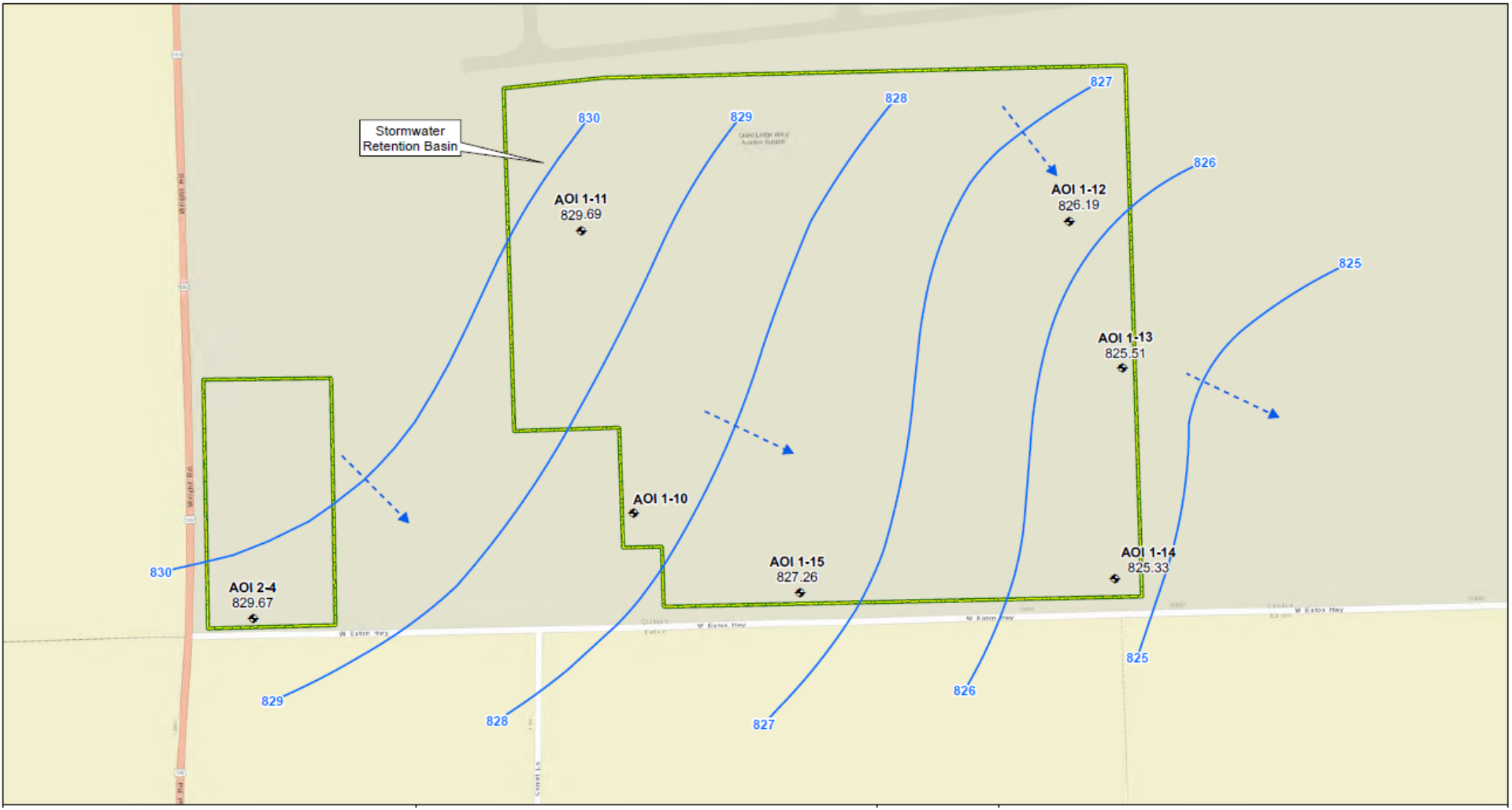
SI Mobilization 2 Sampling Locations



SI Mobilization 2
Synoptic Gauging Event



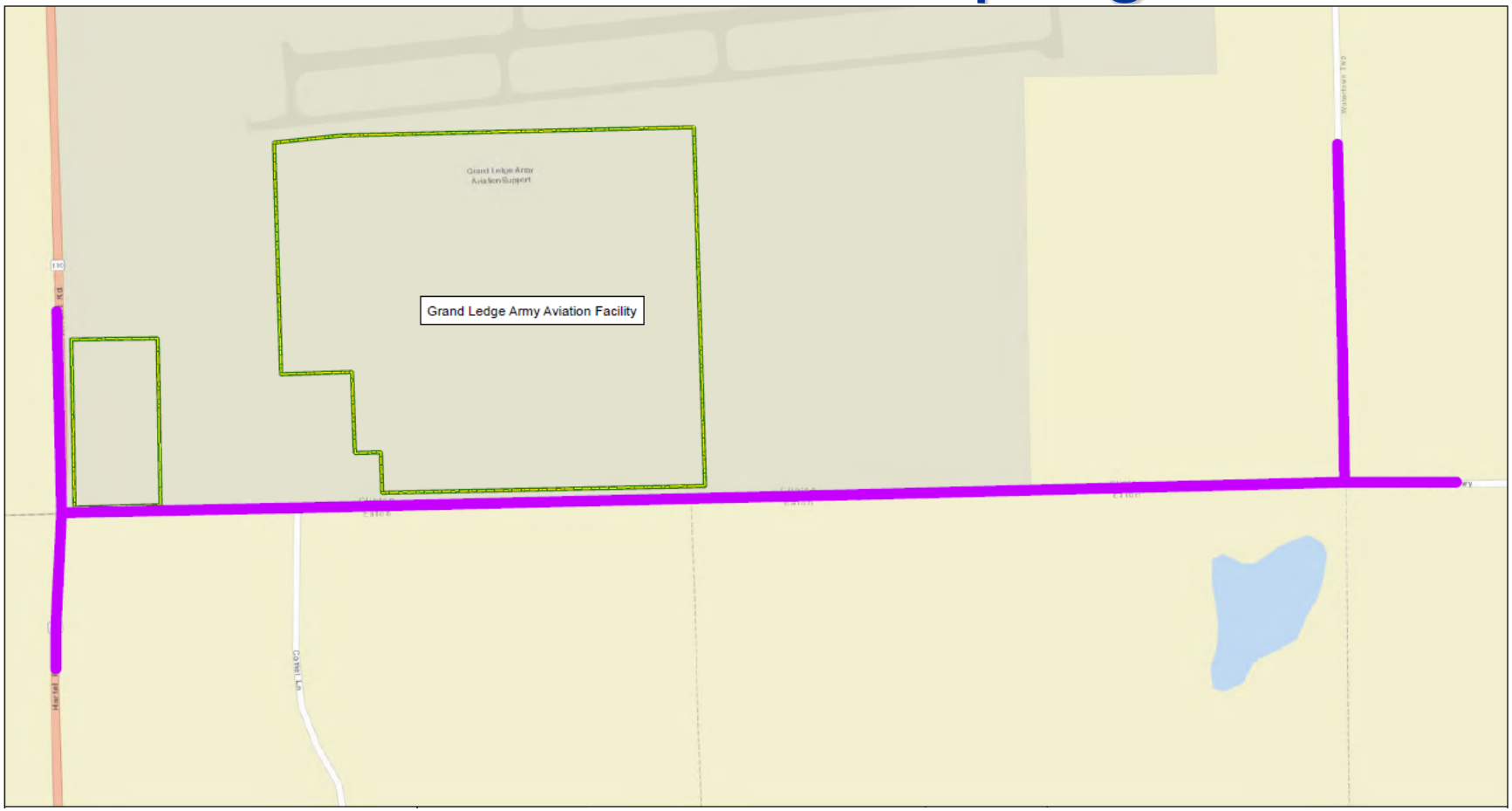
SI – Summary of Approach Groundwater Contours



SI – Summary of Approach

- Residential Sampling
  - Conducted over two mobilizations: 22-23 January, 28-29 July 2020
  - Sampled potable water from private wells via outdoor spigots
  - 25 residences located south, west, and east of the facility

SI Summary of Approach
Residential Sampling



SI – Summary of Approach

- Data compared to Office of the Secretary of Defense (OSD) Screening Levels (SLs) for soil and groundwater
  - Memorandum from the OSD dated 15 October 2019
  - OSD SLs adopted for ARNG PFAS program in June 2019, 7 months after QAPP finalization
- Sites exceeding OSD SLs will proceed to the next phase under CERCLA (i.e. Remedial Investigation)
  - Soil from 0-2 ft compared to Residential SL, 2-15 ft compared to Industrial SL, >15 ft not compared to either SL

Analyte	Residential (Soil) (µg/kg)a,b	Industrial/ Commercial Composite Worker (Soil) (µg/kg)[a,b]	Tap Water (Groundwater) (ng/L)[a,b]
PFOA	130	1,600	40
PFOS	130	1,600	40
PFBS	130,000	1,600,000	40,000

Notes:

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

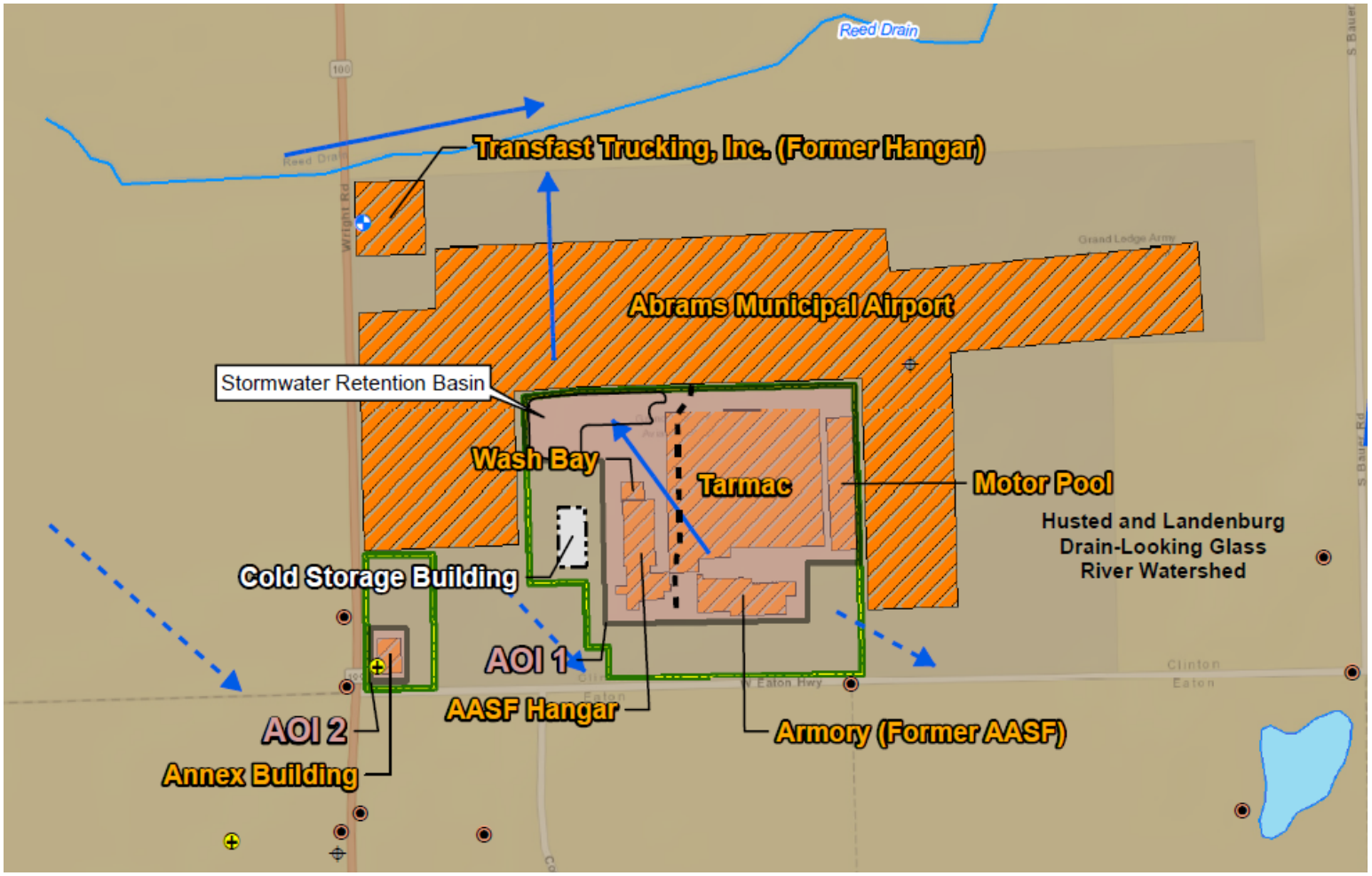
b.) If only one PFAS is present, a Hazard Quotient (HQ) of 1 applies and the values presented would increase by a factor of x10.

SI – Summary of Findings

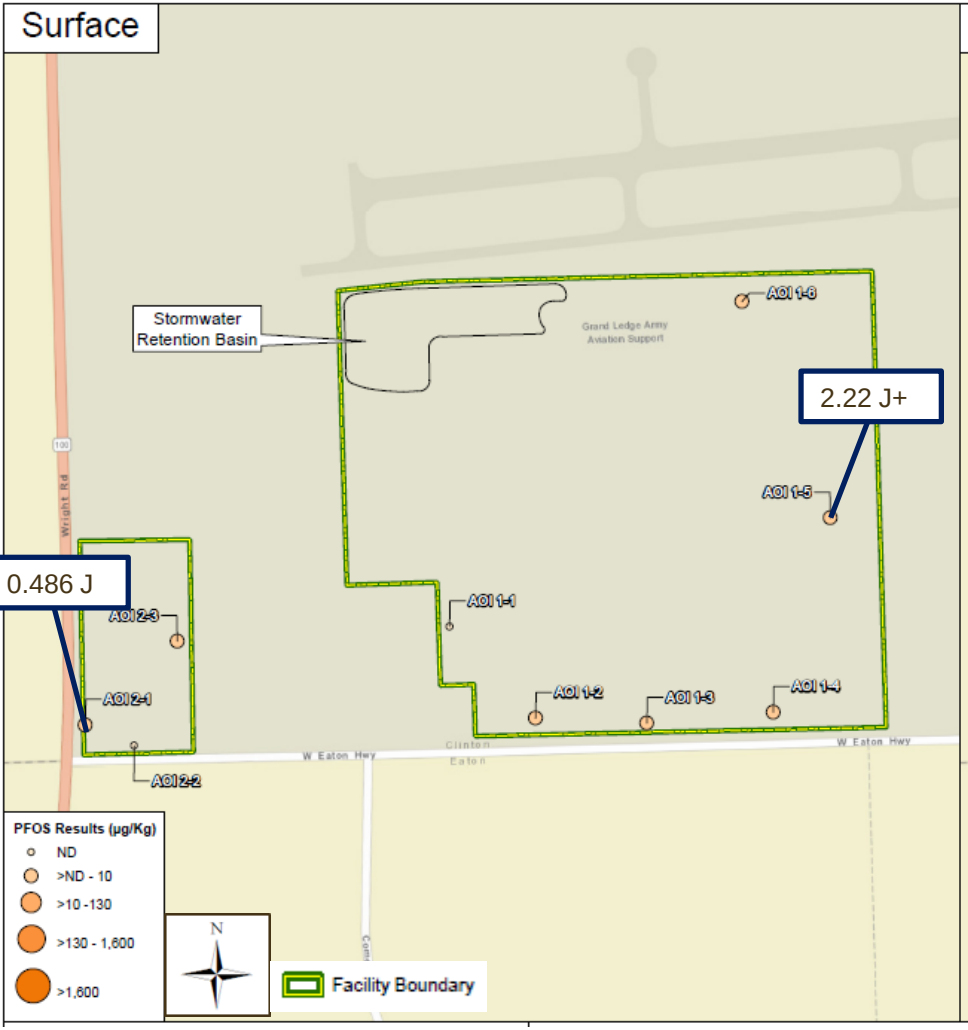
- PFOS, PFOA, PFBS detected in soil, but at concentrations more than an order of magnitude below the SLs (Mobilization 1 and 2)
- During Mobilization 1, PFOS and PFOA in GW > 40 ng/L at AOI 1-5
- During Mobilization 2, all detections of PFOA, PFOS, PFBS in GW were below SLs
- Surface water and sediment detections in stormwater retention basin during both Mobilization 1 and 2
  - Additional surface water sampling being conducted by MIARNG.

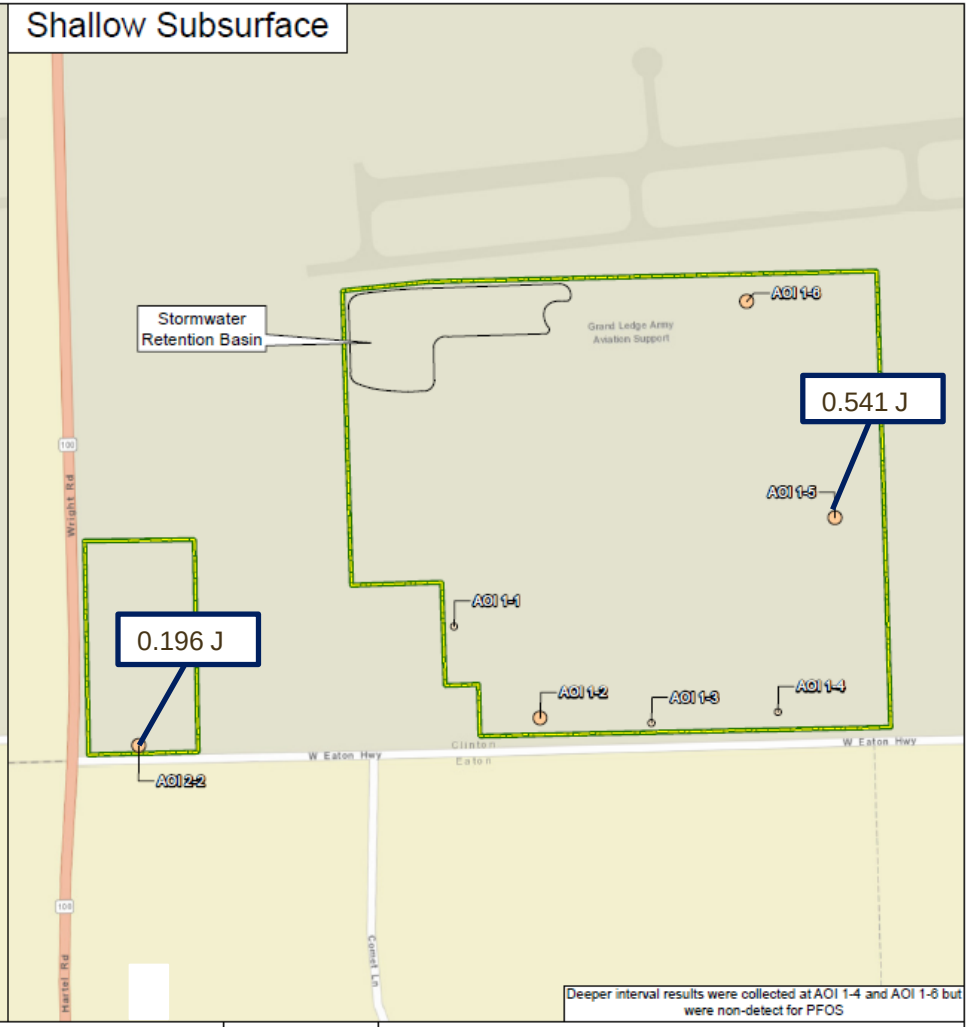
SI – Summary of Findings

AOIs and Adjacent Sources

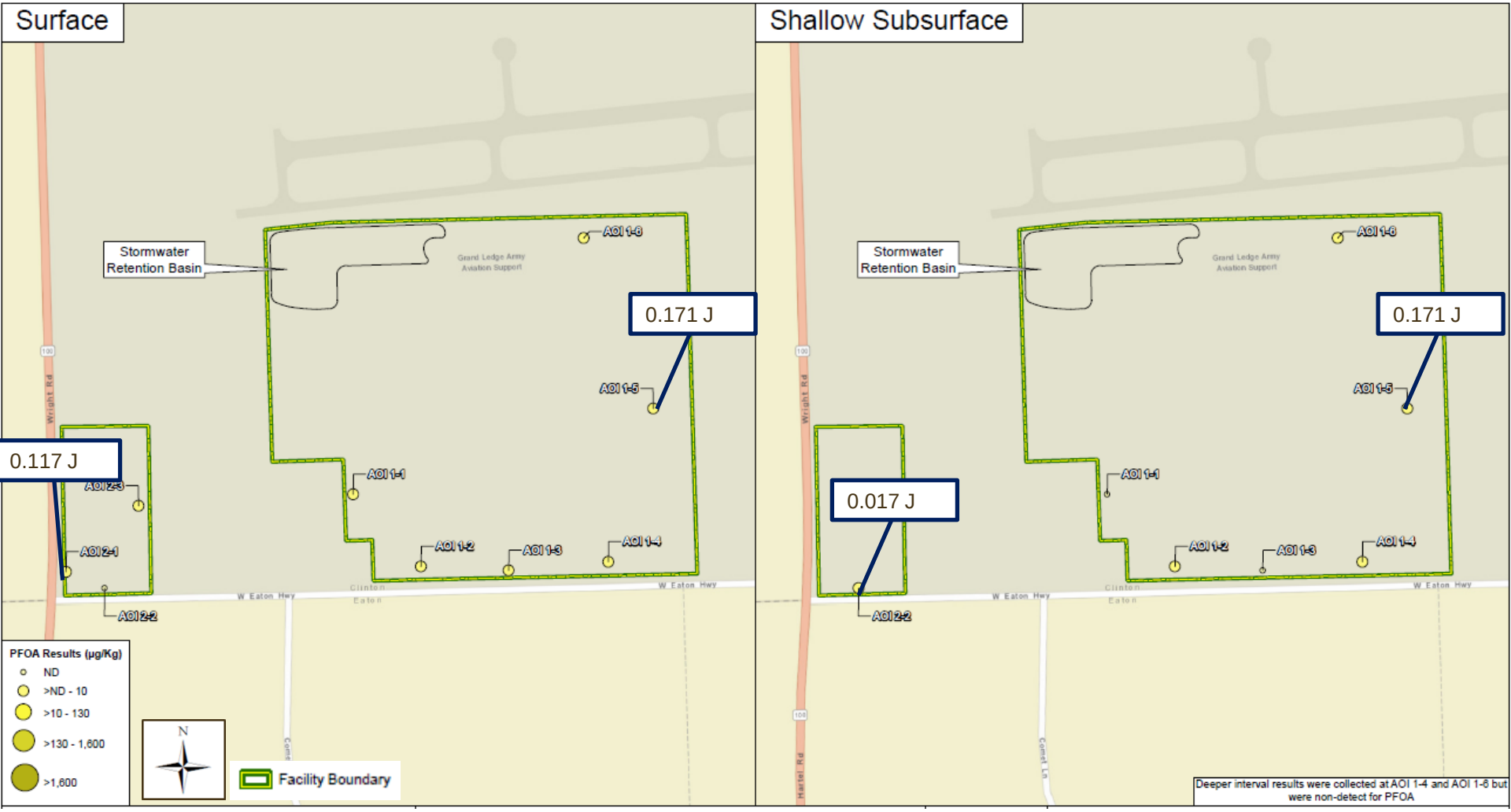


SI - Summary of Findings Mobilization 1 PFOS in Soil



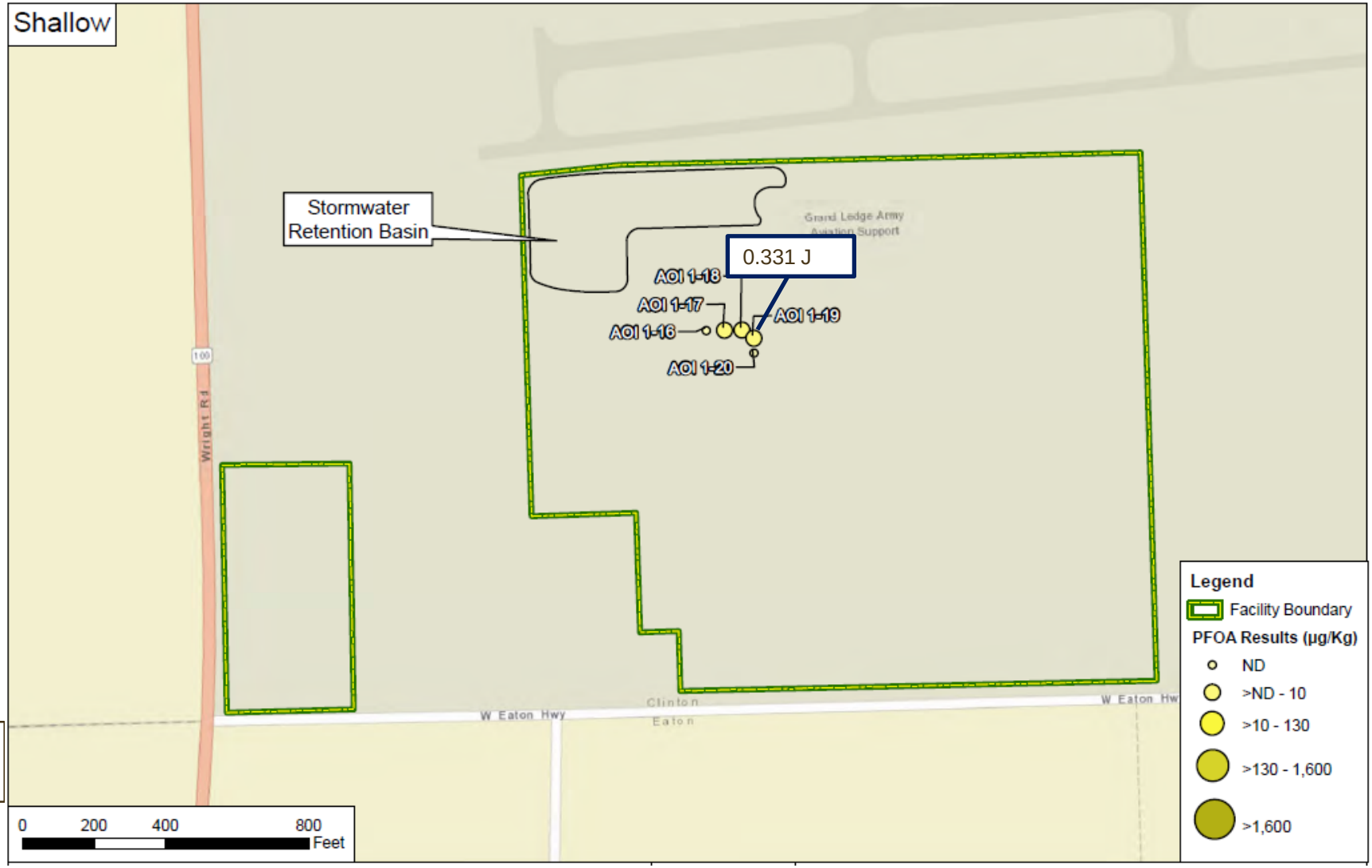


SI - Summary of Findings
Mobilization 1 PFOA in Soil

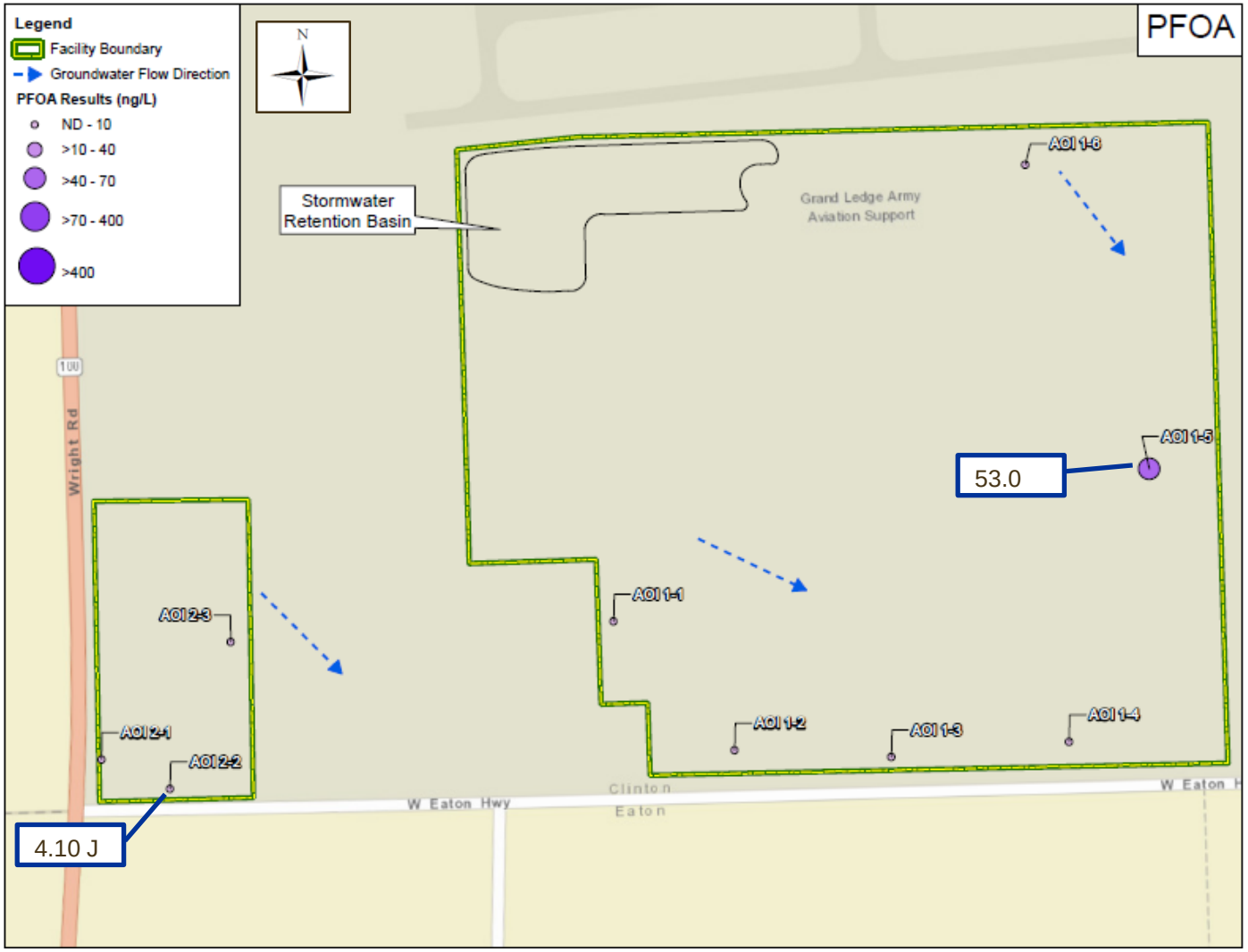


SI - Summary of Findings Mobilization 2 PFOS in Soil

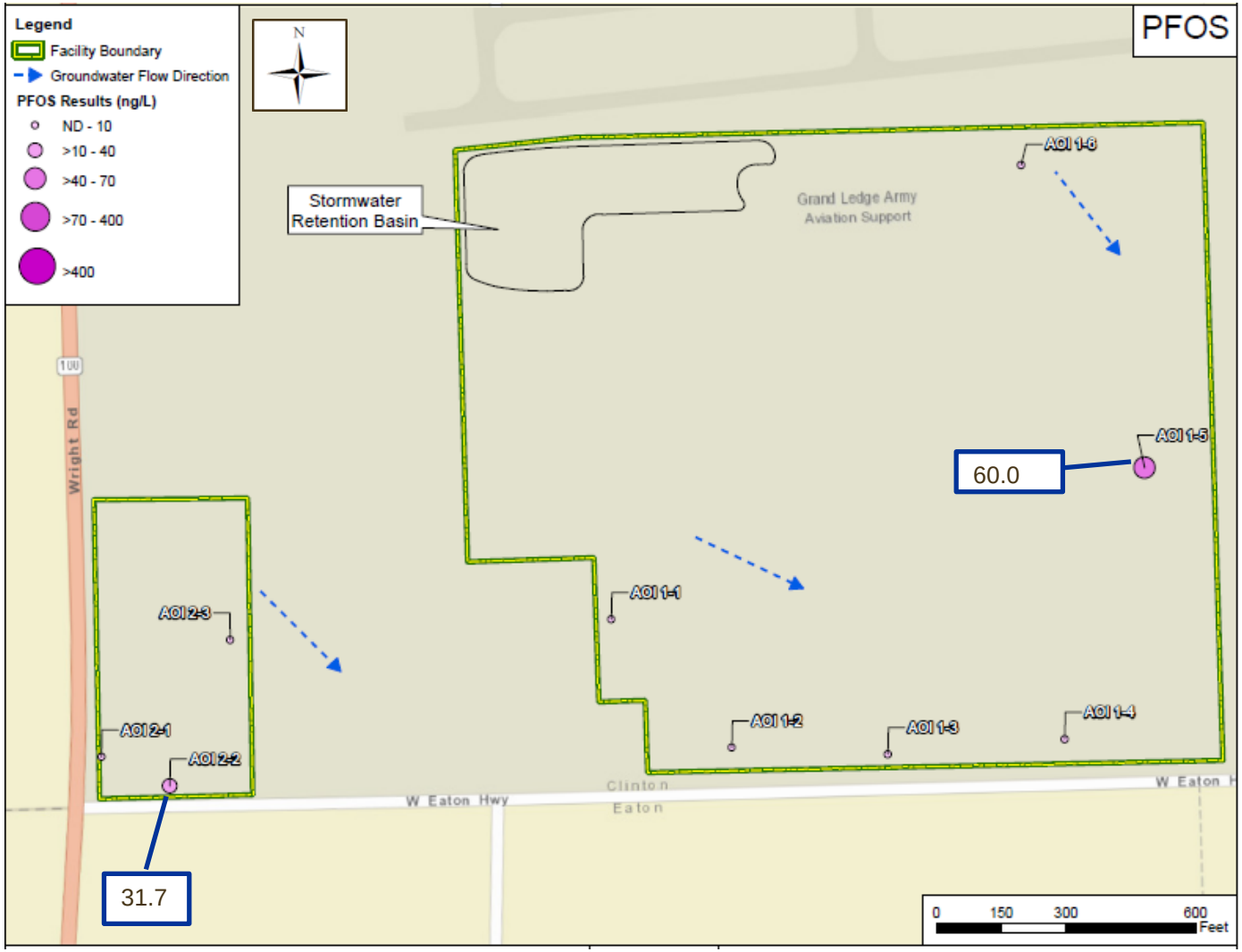
SI - Summary of Findings Mobilization 2 PFOA in Soil



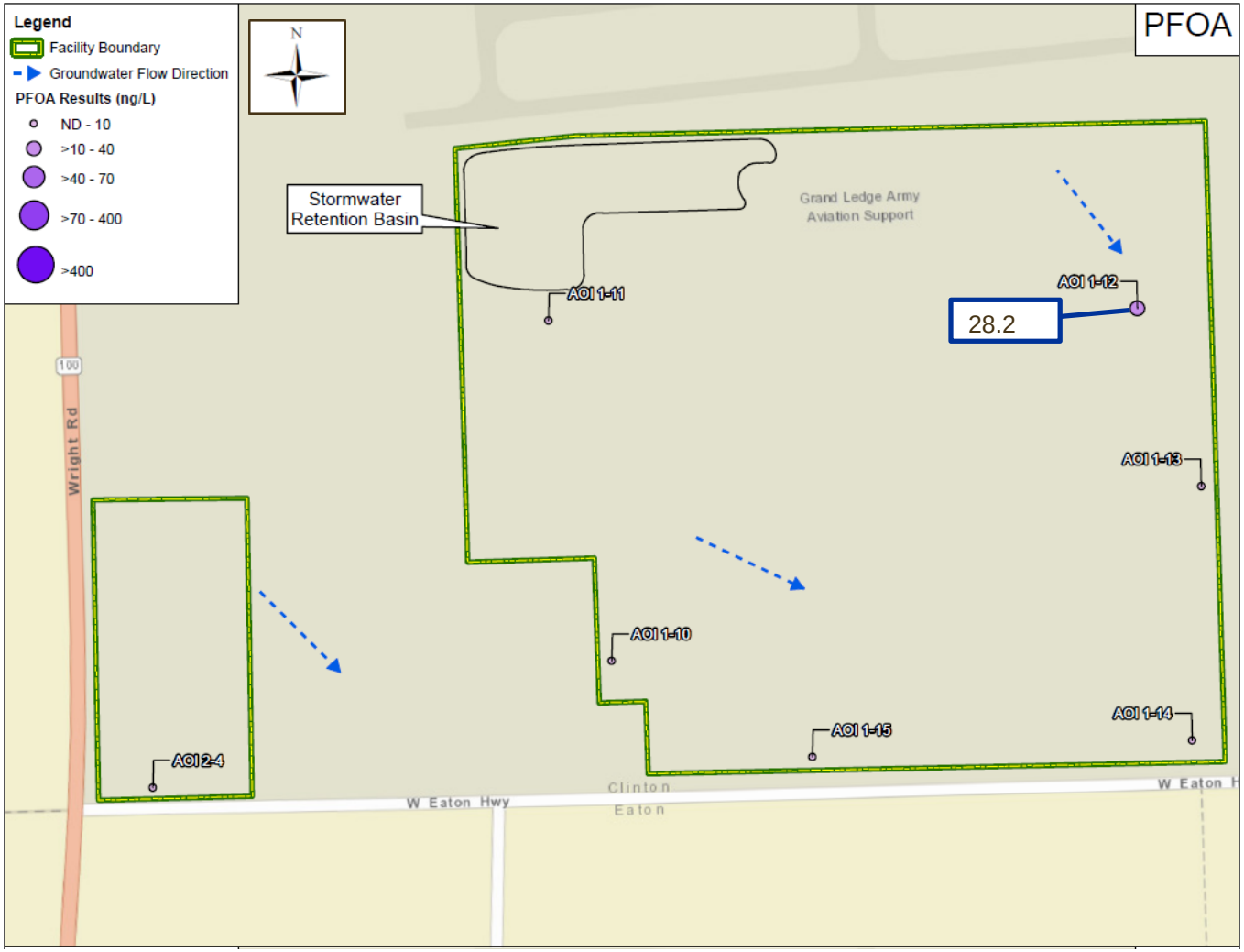
SI - Summary of Findings
Mobilization 1 PFOA in Groundwater



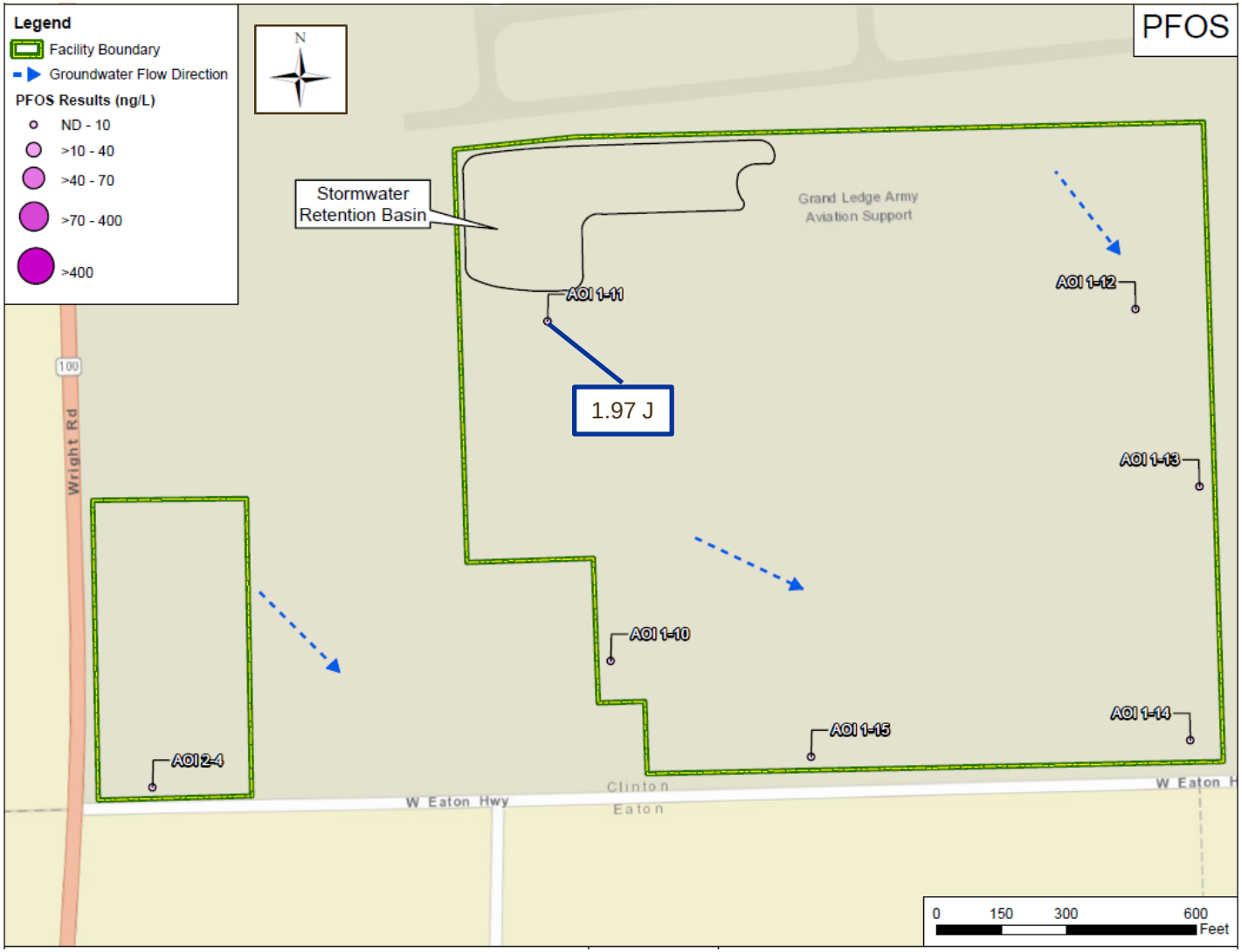
SI - Summary of Findings
Mobilization 1 PFOS in Groundwater



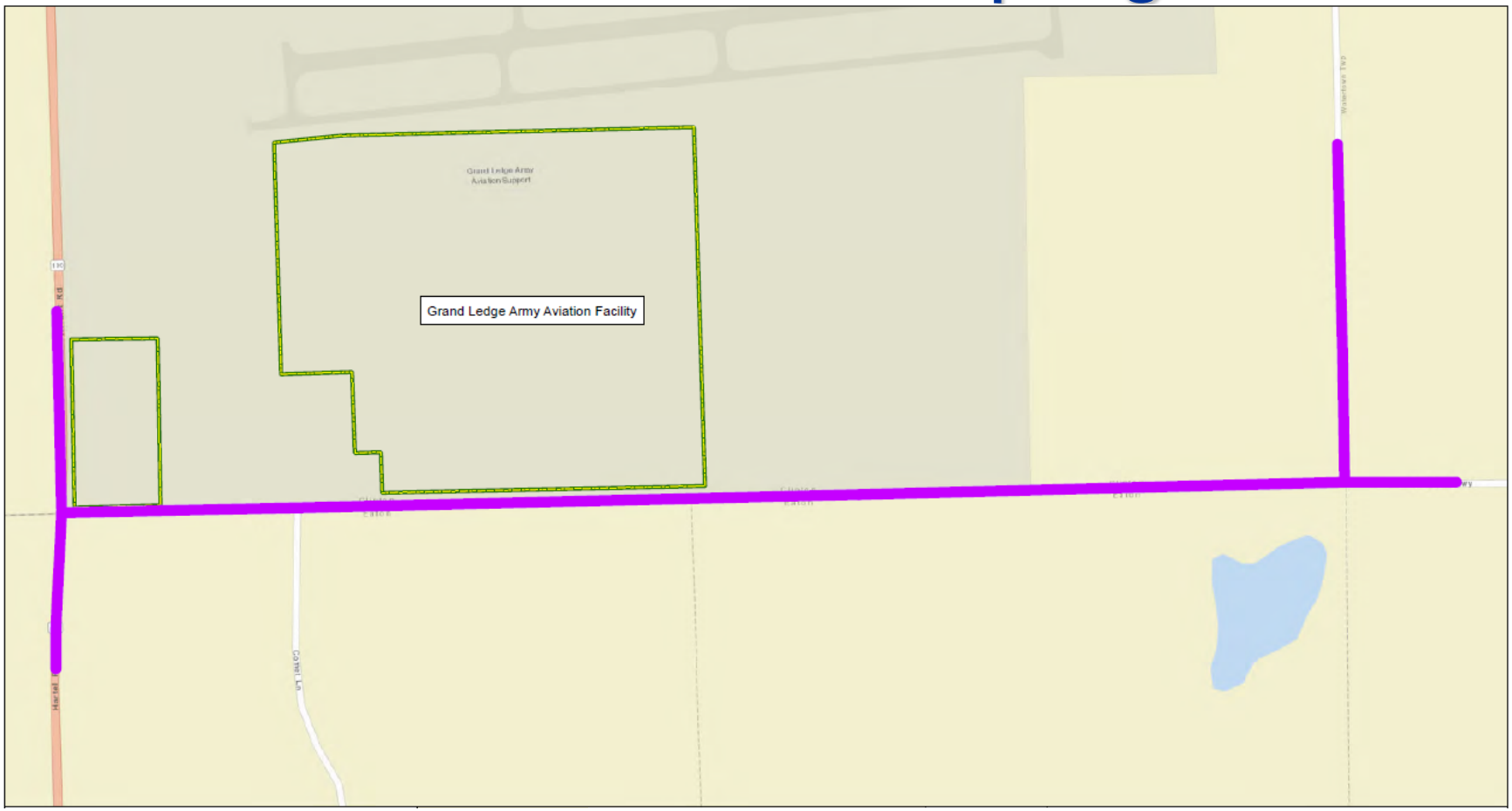
SI - Summary of Findings
Mobilization 2 PFOA in Groundwater



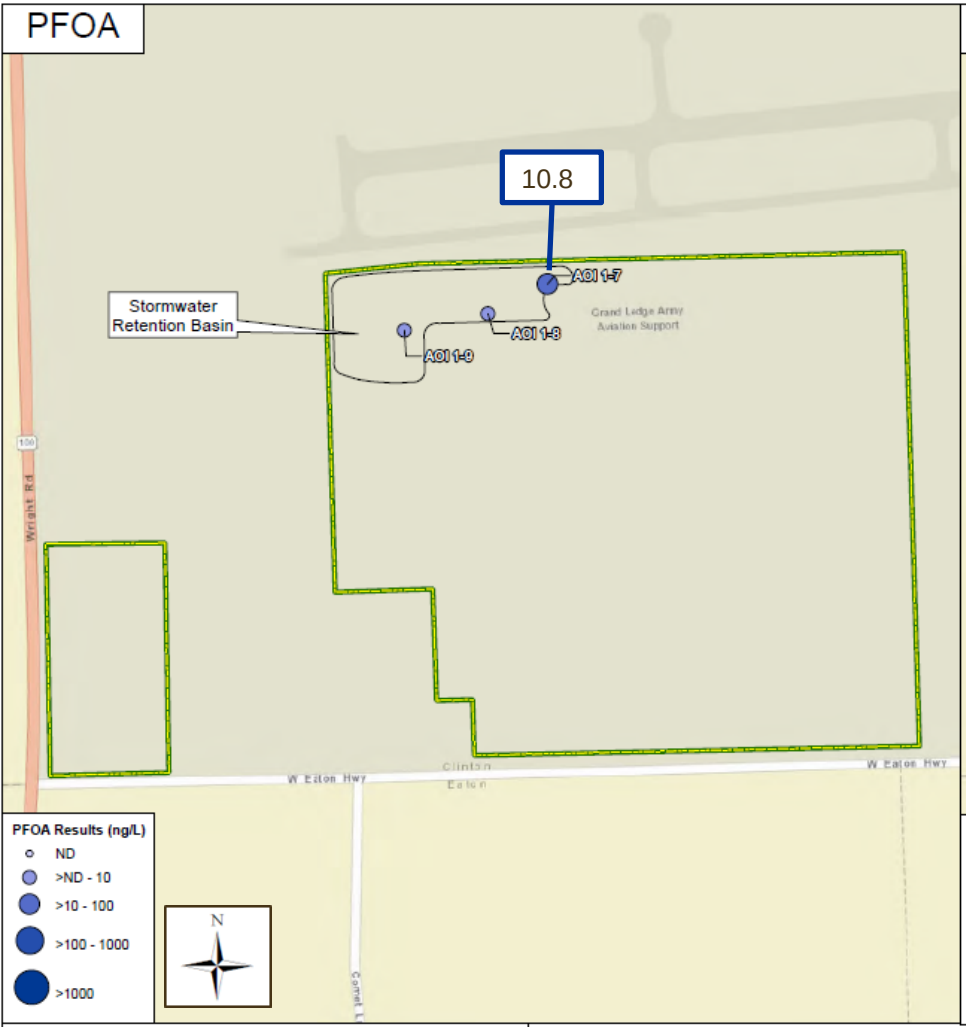
SI - Summary of Findings
Mobilization 2 PFOS in Groundwater



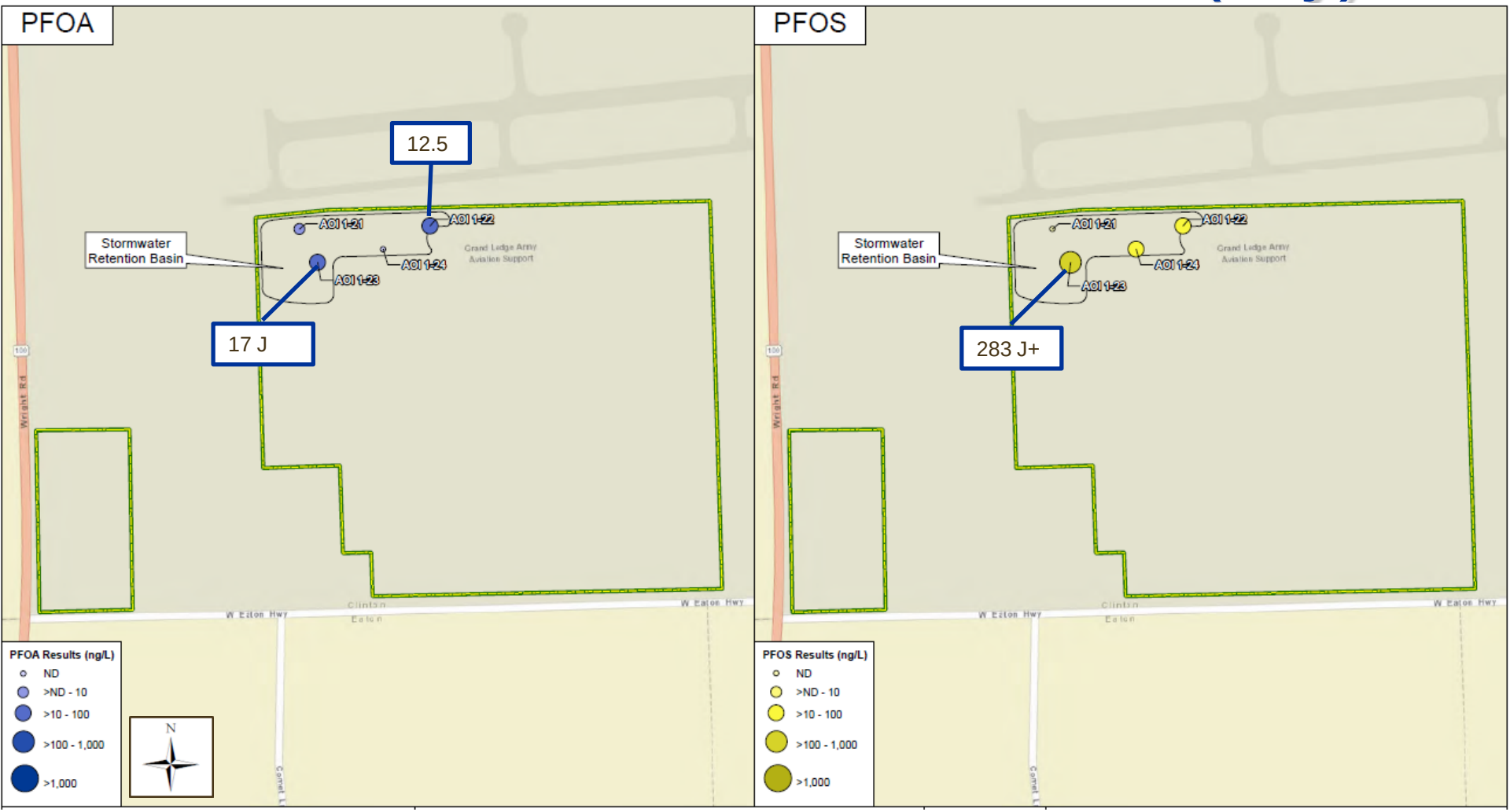
SI - Summary of Findings
Residential Sampling



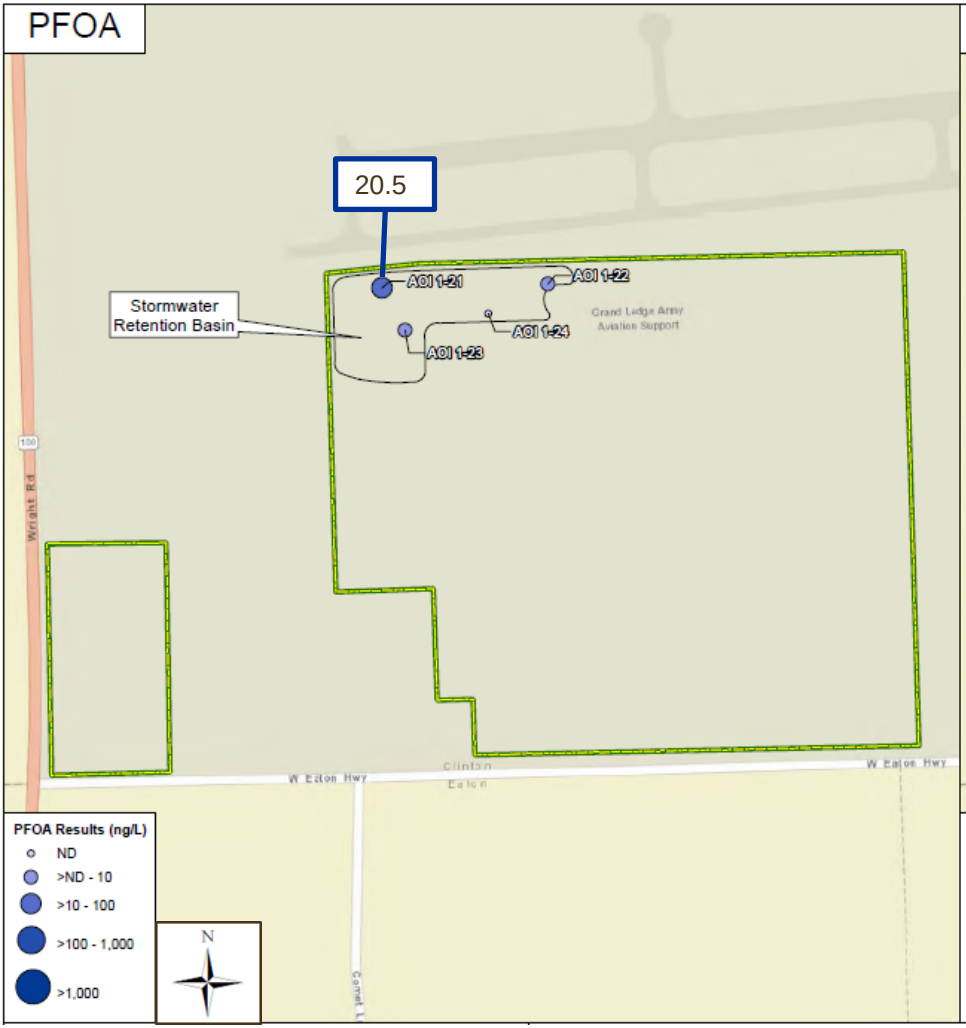
SI - Summary of Findings
Mobilization 1 Surface Water

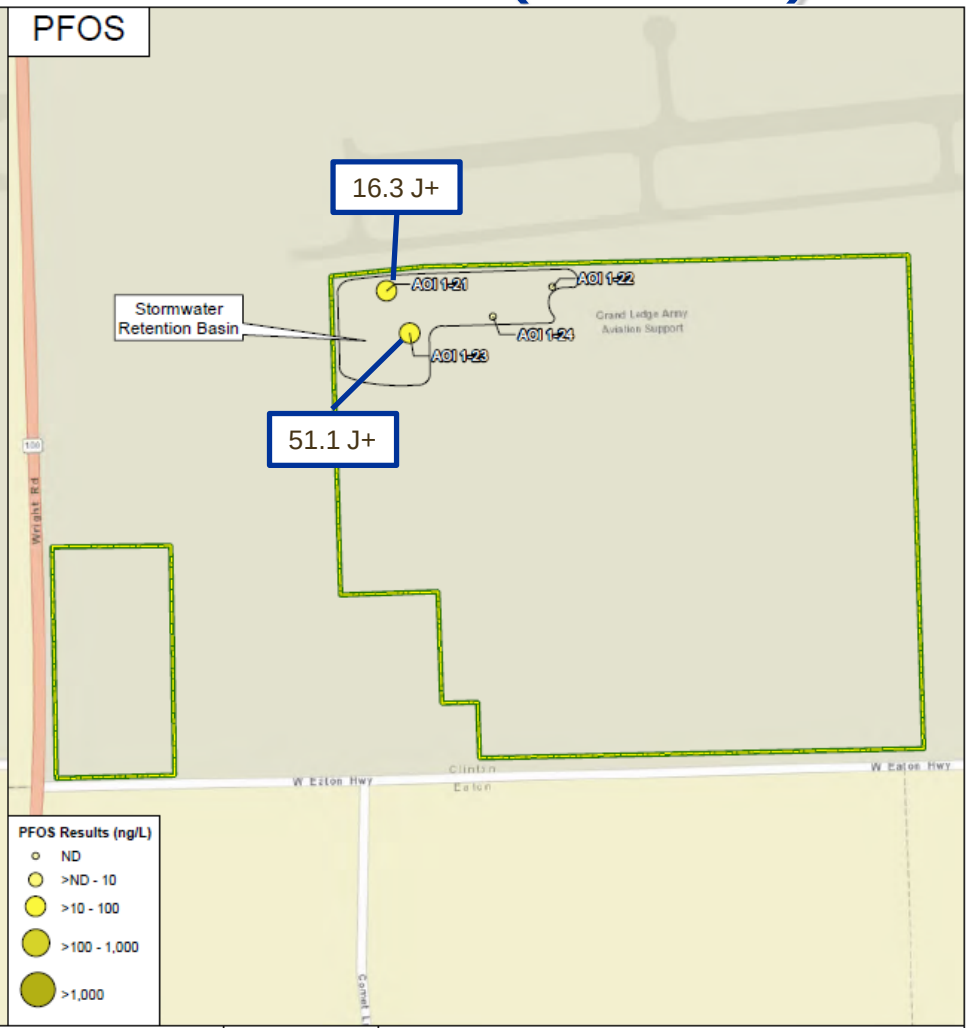


SI - Summary of Findings
Mobilization 2 Surface Water (Dry)

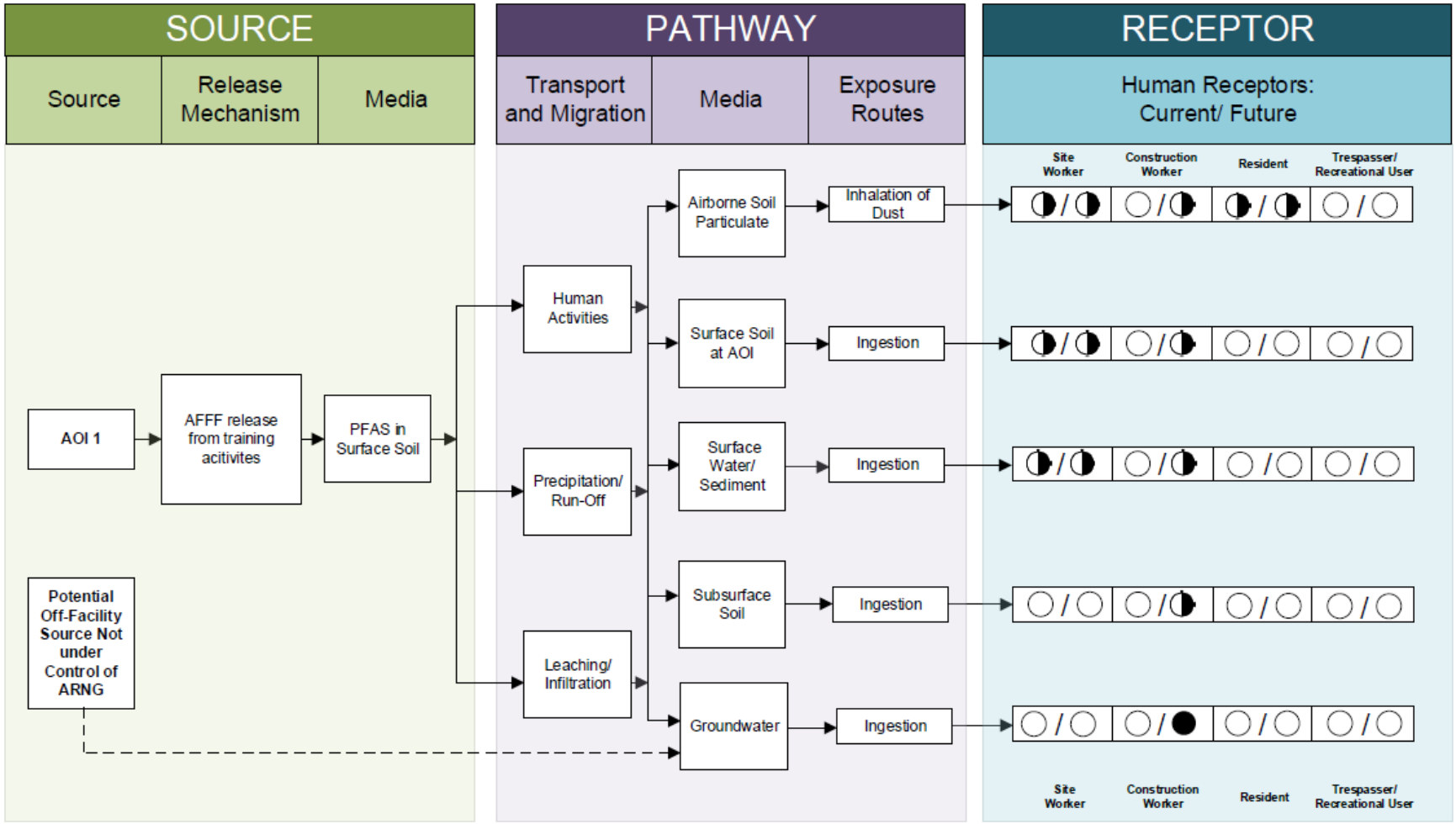


SI - Summary of Findings
Mobilization 2 Surface Water (Storm)





SI – AOI 1 CSM



LEGEND

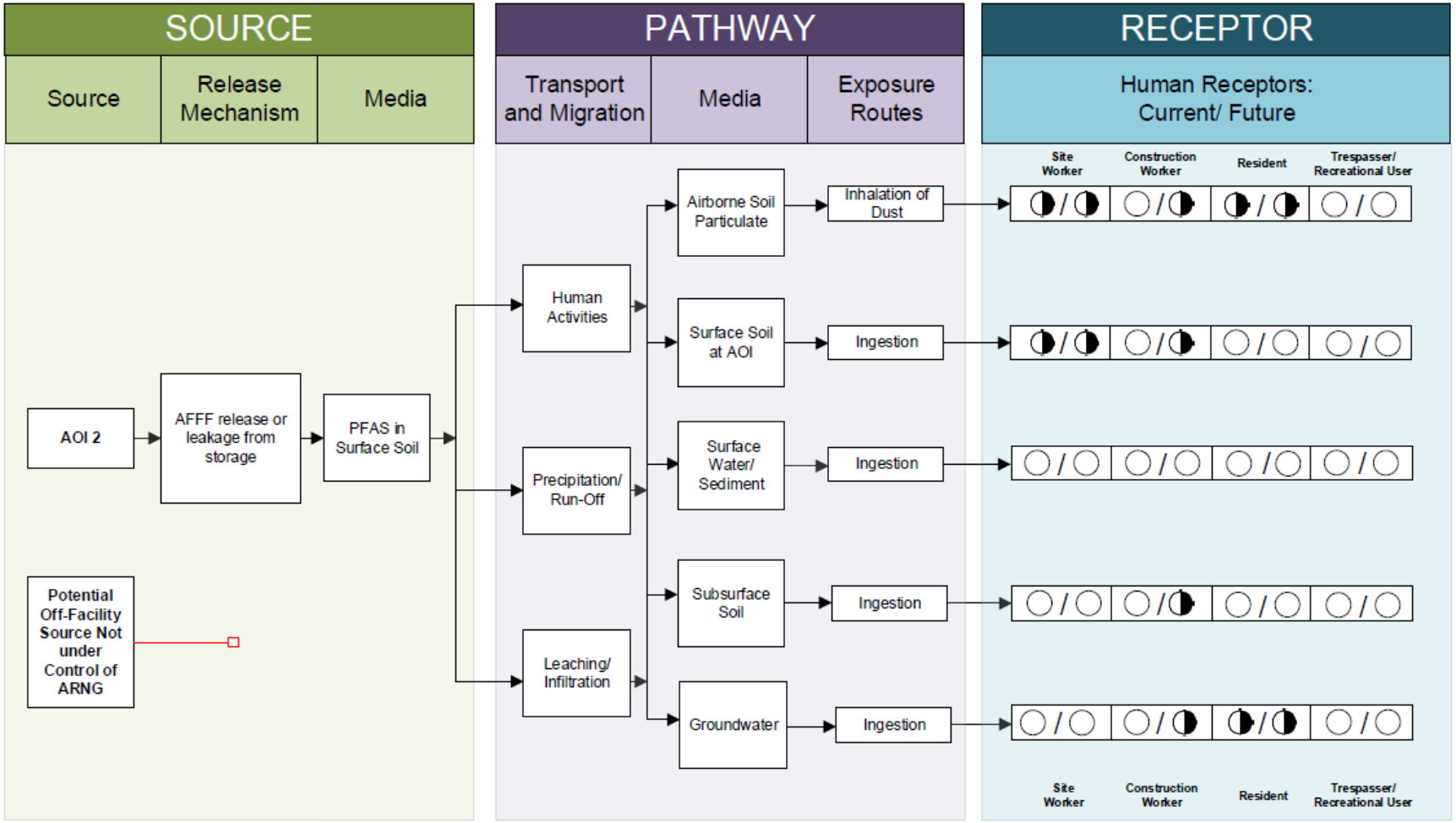
- Flow-Chart Stops
- Flow-Chart Continues
- Partial / Possible Flow

Notes:

1. The resident and recreational user receptors refer to off-site receptors. resident or recreational user.
2. Dermal contact exposure pathway is incomplete for PFAS.

- Incomplete Pathway
- Potentially Complete Pathway
- Potentially Complete Pathway with Exceedance of SL

SI – AOI 2 CSM


SOURCE
Source
Release Mechanism
Media
PATHWAY
Transport and Migration
Media
Exposure Routes
RECEPTOR
Human Receptors: Current/ Future
Site Worker
Construction Worker
Resident
Trespasser/ Recreational User
AOI 2
AFFF release or leakage from storage
PFAS in Surface Soil
Potential Off-Facility Source Not under Control of ARNG
Human Activities
Precipitation/ Run-Off
Leaching/ Infiltration
Airborne Soil Particulate
Surface Soil at AOI
Surface Water/ Sediment
Subsurface Soil
Groundwater
Inhalation of Dust
Ingestion
Ingestion
Ingestion
Ingestion
LEGEND
Flow-Chart Stops
Flow-Chart Continues
Partial / Possible Flow
Notes:
1. The resident and recreational user receptors refer to off-site receptors. resident or recreational user.
2. Dermal contact exposure pathway is incomplete for PFAS.
Incomplete Pathway
Potentially Complete Pathway
Potentially Complete Pathway with Exceedance of SL

SI – Summary of Findings

Table 8-1: Summary of Site Inspection Findings

AOI	Potential PFAS Release Area	Soil – Source Area	Groundwater – Source Area
1	AASF Hangar and Armory (Former AASF)	◐	●
2	Annex Building	◐	◐

Legend:

● = detected; exceedance of the screening levels

◐ = detected; no exceedance of the screening levels

○ = not detected

Next Steps/ Open Discussion

- Finalize SI Report
  - Address comments from EGLE
  - Schedule
- Timing of Remedial Investigation

Acronyms

- µg/kg – micrograms per kilogram
- AASF – Army Aviation Support Facility
- AFFF – aqueous film forming foam
- AOI – area of interest
- ARNG – Army National Guard
- bgs – below ground surface
- CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
- CSM – conceptual site model
- DoD – U.S. Department of Defense
- DQO – data quality objective
- EGLE – Michigan Department of Environment, Great Lakes and Energy
- ft – feet
- GW – groundwater
- MIARNG – Michigan Army National Guard
- OSD – Office of the Secretary of Defense
- NA – not applicable
- ng/L – nanograms per liter
- PA – Preliminary Assessment
- PFAS – per- and polyfluoroalkyl substances
- PFBS – perfluorobutanesulfonic acid
- PFOA – perfluorooctanoic acid
- PFOS – perfluorooctanesulfonic acid
- RI – Remedial Investigation
- SI – Site Inspection
- SL – screening level
- TBD – to be determined
- TPP – Technical Project Planning
- U.S. – United States
- UFP-QAPP – Uniform Federal Policy- Quality Assurance Project Plan
- USACE – U.S. Army Corp of Engineers

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Appendix E
Boring Logs

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WELL NUMBER AOI 1-1

AECOM AECOM

TOTAL DEPTH 20 FT BGS
PAGE 1 OF 1

CLIENT ARNG, USACE Baltimore District
PROJECT NAME Grand Ledge Army Aviation Support Facility and Armory SI
PROJECT NUMBER 60552172
SITE NAME AOI1
DATE STARTED 5/8/19 **COMPLETED** 5/8/19
EASTING N/A **NORTHING** N/A
DRILLING CONTRACTOR Cascade
GROUND ELEVATION N/A **HOLE SIZE** 2 inches
DRILLING EQUIPMENT Geoprobe
GROUND WATER LEVELS:
DRILLING METHOD Direct Push
▽ **AT TIME OF DRILLING** 7.00 ft
LOGGED BY M Glinski **CHECKED BY** N/A
AT END OF DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ENVIRONMENTAL DATA	WELL DIAGRAM
0			ML		0.0 SILT, dry, brown, very stiff, 5% fine sand, <5% rounded gravel.	AOI1-1-SB-0-2	
			CL		1.5 LEAN CLAY WITH SAND, dry, yellowish brown, medium stiff, 20% fine sand.		
5	GMAC	100					Well Casing Diameter: 1 in Top: 0 ft bgs Bottom: 7 ft bgs
10	GMAC	97			▽	AOI1-1-SB-5-7	Well Screen Type: Schedule 40 PVC Slot Size: 0.01 in Top: 7 ft bgs Bottom: 12 ft bgs
					10.0 LEAN CLAY, dry, dark gray, very stiff, <5% fine sand.		
15	GMAC	97					
20	GMAC	70			19.5 Some pulverized cobble and gravel, dark greenish gray.		

Bottom of borehole at 20.0 feet.

Notes:
1. Headspace screening values represent total volatile organic vapors (referenced to an isobutylene standard) measured with a Photoionization Detector (PID) with 10.6 eV lamp.
2. Coordinates and elevation data in NAVD88 for vertical datum and NAD83/91 for horizontal datum in Michigan State Plane.

WELL NUMBER AOI 1-2

AECOM AECOM

TOTAL DEPTH 15 FT BGS
PAGE 1 OF 1

CLIENT ARNG, USACE Baltimore District
PROJECT NAME Grand Ledge Army Aviation Support Facility and Armory SI
PROJECT NUMBER 60552172
SITE NAME AOI1
DATE STARTED 5/7/19 **COMPLETED** 5/7/19
EASTING N/A **NORTHING** N/A
DRILLING CONTRACTOR Cascade
GROUND ELEVATION N/A **HOLE SIZE** 2 inches
DRILLING EQUIPMENT Geoprobe
GROUND WATER LEVELS:
DRILLING METHOD Direct Push
AT TIME OF DRILLING ---
LOGGED BY M Glinski **CHECKED BY** N/A
AT END OF DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ENVIRONMENTAL DATA	WELL DIAGRAM
0							
	GMAC	100	ML		0.0 SANDY SILT, dry, dark grayish brown, loose, 30% fine sand, <5% fine to medium subangular gravel.	**AOI1-2-SB-0-2** **AOI1-2-SB-0-2 MS** **AOI1-2-SB-0-2 MSD** **AOI1-2-SB-2-4** **AOI1-2-SB-2-4 DUP**	**Well Casing** Diameter: 1 in Top: 0 ft bgs Bottom: 5 ft bgs
5							
	GMAC	88	CL		5.0 LEAN CLAY, dry, olive gray, stiff, 5% very fine sand. 7.0 Changes to moist, brown, 10% sand.		**Well Screen** Type: Schedule 40 PVC Slot Size: 0.01 in Top: 5 ft bgs Bottom: 10 ft bgs
10							
	GMAC	93			14.0 Changes to dark gray.		
15							

Bottom of borehole at 15.0 feet.

Notes:
1. Headspace screening values represent total volatile organic vapors (referenced to an isobutylene standard) measured with a Photoionization Detector (PID) with 10.6 eV lamp.
2. Coordinates and elevation data in NAVD88 for vertical datum and NAD83/91 for horizontal datum in Michigan State Plane.

WELL NUMBER AOI 1-3

AECOM AECOM

TOTAL DEPTH 10 FT BGS

CLIENT ARNG, USACE Baltimore District
PROJECT NAME Grand Ledge Army Aviation Support Facility and Armory SI
PROJECT NUMBER 60552172
SITE NAME AOI1
DATE STARTED 5/7/19 **COMPLETED** 5/7/19
EASTING N/A **NORTHING** N/A
DRILLING CONTRACTOR Cascade
GROUND ELEVATION N/A **HOLE SIZE** 2 inches
DRILLING EQUIPMENT Geoprobe
GROUND WATER LEVELS:
DRILLING METHOD Direct Push
AT TIME OF DRILLING ---
LOGGED BY M Glinski **CHECKED BY** N/A
AT END OF DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ENVIRONMENTAL DATA	WELL DIAGRAM
0	GMAC	100	CL		0.0 LEAN CLAY, dry, light olive brown, 10% fine sand.	AOI1-3-SB-0-2 AOI1-3-SB-2-4	**Well Casing** Diameter: 1 in Top: 0 ft bgs Bottom: 4 ft bgs
5			SC		5.0 CLAYEY SAND, wet, light yellowish brown, loose.		
	GMAC	68	CL		6.0 LEAN CLAY WITH SAND, wet, yellowish brown, medium plasticity, 15% fine sand.		**Well Screen** Type: Schedule 40 PVC Slot Size: 0.01 in Top: 4 ft bgs Bottom: 9 ft bgs
10							

Bottom of borehole at 10.0 feet.

Notes:
1. Headspace screening values represent total volatile organic vapors (referenced to an isobutylene standard) measured with a Photoionization Detector (PID) with 10.6 eV lamp.
2. Coordinates and elevation data in NAVD88 for vertical datum and NAD83/91 for horizontal datum in Michigan State Plane.

WELL NUMBER AOI 1-4

AECOM AECOM

TOTAL DEPTH 22 FT BGS
PAGE 1 OF 1

CLIENT ARNG, USACE Baltimore District
PROJECT NAME Grand Ledge Army Aviation Support Facility and Armory SI
PROJECT NUMBER 60552172
SITE NAME AOI1
DATE STARTED 5/7/19 **COMPLETED** 5/7/19
EASTING N/A **NORTHING** N/A
DRILLING CONTRACTOR Cascade
GROUND ELEVATION N/A **HOLE SIZE** 2 inches
DRILLING EQUIPMENT Geoprobe
GROUND WATER LEVELS:
DRILLING METHOD Direct Push
AT TIME OF DRILLING ---
LOGGED BY M Glinski **CHECKED BY** N/A
AT END OF DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ENVIRONMENTAL DATA	WELL DIAGRAM
0							
	GMAC	100	CL		0.0 LEAN CLAY WITH SAND, dry, very dark grayish brown, stiff, medium plasticity, 15% fine sand.	AOI1-4-SB-0-2	
5							
	GMAC	97			6.0 Changes to brown, 20% fine sand.	AOI1-4-SB-8-10	**Well Casing** Diameter: 1 in Top: 0 ft bgs Bottom: 17 ft bgs
10					9.5 Changes to contain <5% subangular fine to coarse gravel.		
	GMAC	97					
15							
	GMAC	93	CH		16.5 FAT CLAY, moist, gray, stiff, high plasticity, gradational upper boundary.	AOI1-4-SB-17-19	
			SP		19.0 POORLY GRADED SAND, wet, yellowish brown, medium dense, fine sand.		**Well Screen** Type: Schedule 40 PVC Slot Size: 0.01 in Top: 17 ft bgs Bottom: 22 ft bgs
20							
	GMAC	67	CL		21.0 LEAN CLAY WITH SAND, moist, gray, stiff, 15% fine sand.		

Bottom of borehole at 22.0 feet.

Notes:
1. Headspace screening values represent total volatile organic vapors (referenced to an isobutylene standard) measured with a Photoionization Detector (PID) with 10.6 eV lamp.
2. Coordinates and elevation data in NAVD88 for vertical datum and NAD83/91 for horizontal datum in Michigan State Plane.

WELL NUMBER AOI 1-5

AECOM AECOM

TOTAL DEPTH 10 FT BGS
PAGE 1 OF 1

CLIENT ARNG, USACE Baltimore District
PROJECT NAME Grand Ledge Army Aviation Support Facility and Armory SI
PROJECT NUMBER 60552172
SITE NAME AOI1
DATE STARTED 5/8/19 **COMPLETED** 5/8/19
EASTING N/A **NORTHING** N/A
DRILLING CONTRACTOR Cascade
GROUND ELEVATION N/A **HOLE SIZE** 2 inches
DRILLING EQUIPMENT Geoprobe
GROUND WATER LEVELS:
DRILLING METHOD Direct Push
AT TIME OF DRILLING ---
LOGGED BY M Glinski **CHECKED BY** N/A
AT END OF DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ENVIRONMENTAL DATA	WELL DIAGRAM
0	GMAC	100	ML		0.0 SILT WITH SAND, dry, yellowish brown, medium stiff, low plasticity, 25% fine sand.	**AOI1-5-SB-0-2** **AOI1-5-SB-0-2 MS** **AOI1-5-SB-0-2 MSD** **AOI1-5-SB-2-4**	**Well Casing** Diameter: 1 in Top: 0 ft bgs Bottom: 5 ft bgs
5					4.8 Changes to contain <5% fine to medium gravel.		
	GMAC	90					**Well Screen** Type: Schedule 40 PVC Slot Size: 0.01 in Top: 5 ft bgs Bottom: 10 ft bgs
10					Bottom of borehole at 10.0 feet.		

Notes:
1. Headspace screening values represent total volatile organic vapors (referenced to an isobutylene standard) measured with a Photoionization Detector (PID) with 10.6 eV lamp.
2. Coordinates and elevation data in NAVD88 for vertical datum and NAD83/91 for horizontal datum in Michigan State Plane.

WELL NUMBER AOI 1-6

AECOM AECOM

TOTAL DEPTH 20 FT BGS
PAGE 1 OF 1

CLIENT ARNG, USACE Baltimore District
PROJECT NAME Grand Ledge Army Aviation Support Facility and Armory SI
PROJECT NUMBER 60552172
SITE NAME AOI1
DATE STARTED 5/8/19 **COMPLETED** 5/8/19
EASTING N/A **NORTHING** N/A
DRILLING CONTRACTOR Cascade
GROUND ELEVATION N/A **HOLE SIZE** 2 inches
DRILLING EQUIPMENT Geoprobe
GROUND WATER LEVELS:
DRILLING METHOD Direct Push
AT TIME OF DRILLING ---
LOGGED BY M Glinski **CHECKED BY** N/A
AT END OF DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ENVIRONMENTAL DATA	WELL DIAGRAM
0							
	GMAC	100	CL		0.0 LEAN CLAY WITH SAND, dry, brown, medium stiff, low plasticity, 15% fine sand.	AOI1-6-SB-0-2	
5					3.5 Changes to dark gray.	AOI1-6-SB-2-4	
	GMAC	100	CH		7.0 FAT CLAY, dry, dark gray, stiff, high plasticity.		**Well Casing** Diameter: 1 in Top: 0 ft bgs Bottom: 15 ft bgs
10							
	GMAC	97					
15							
	GMAC	68					**Well Screen** Type: Schedule 40 PVC Slot Size: 0.01 in Top: 15 ft bgs Bottom: 20 ft bgs
			SW		18.0 WELL GRADED SAND, wet, dark gray, loose, non-cohesive.		
20							

Bottom of borehole at 20.0 feet.

Notes:
1. Headspace screening values represent total volatile organic vapors (referenced to an isobutylene standard) measured with a Photoionization Detector (PID) with 10.6 eV lamp.
2. Coordinates and elevation data in NAVD88 for vertical datum and NAD83/91 for horizontal datum in Michigan State Plane.

WELL NUMBER AOI1-10

AECOM AECOM

TOTAL DEPTH 100 FT BGS

CLIENT ARNG, USACE Baltimore District
PROJECT NAME Grand Ledge AASF
PROJECT NUMBER 60552172
SITE NAME AOI 1
DATE STARTED 11/12/19 **COMPLETED** 12/5/19
EASTING 13024496.14 **NORTHING** 463461.05
DRILLING CONTRACTOR Cascade
GROUND ELEVATION N/A **HOLE SIZE** 6 inches
DRILLING EQUIPMENT Geoprobe 8140LC
GROUND WATER LEVELS:
DRILLING METHOD Rotary Sonic
AT TIME OF DRILLING ---
LOGGED BY A. Shah **CHECKED BY** J. Hollingsworth
AT TIME OF SAMPLING 22.85 ft

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ENVIRONMENTAL DATA	WELL DIAGRAM
0			CL		0.0 TOPSOIL. 0.3 LEAN CLAY WITH SAND, moist, dark brown to brown, medium plasticity with estimated 15-25% fine- to coarse-grained sand, trace amounts of subrounded gravel, and trace organics.		**Annular Seal** Top: 0 ft bgs Bottom: 5 ft bgs
5		100					**Annular Seal** Top: 5 ft bgs Bottom: 73 ft bgs
10		100			7.0 Changes to estimated 5-10% fine subrounded gravel.		
15		120			10.0 LEAN CLAY, moist, dark brown to brown, medium to high plasticity with estimated 5-10% fine- to coarse-grained sand and trace amounts of subrounded gravel.		**Well Casing** Diameter: 2 in Top: 0 ft bgs Bottom: 80 ft bgs
20		0			15.0 NO RECOVERY.		
25		0					

ARNG SMART LOG 8.5X11_V2 - - 6/17/20 13:33 - C:\USERS\JACK.HOLLINGSWORTH\DOCUMENTS\GINT\ARNG\GRAND LEDGE\GRAND LEDGE.GPJ

(Continued Next Page)

WELL NUMBER AOI1-10

AECOM AECOM

TOTAL DEPTH 100 FT BGS

CLIENT ARNG, USACE Baltimore District **PROJECT NAME** Grand Ledge AASF

PROJECT NUMBER 60552172 **SITE NAME** AOI 1

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ENVIRONMENTAL DATA	WELL DIAGRAM
25					15.0 NO RECOVERY. *(continued)*		
30		0					
35		0					
40		0			39.5 Boulder encountered - switched to rock coring.		**Well Casing** Diameter: 2 in Top: 0 ft bgs Bottom: 80 ft bgs
45		0			45.0 NO RECOVERY, potentially indicates boulder/cobbles.		
50							
		100	GW-GM		50.0 WELL-GRADED GRAVEL WITH SILT AND SAND, wet, dark brown to black, fine to coarse, subrounded to subangular with estimated 15-25% fine- to coarse-grained sand, 15-25% fines.		

ARNG SMART LOG 8.5X11_V2 - - 6/17/20 13:33 - C:\USERS\JACK.HOLLINGSWORTH\DOCUMENTS\GINT\ARNG\GRAND LEDGE\GRAND LEDGE.GPJ

(Continued Next Page)

WELL NUMBER AOI1-10

AECOM AECOM

TOTAL DEPTH 100 FT BGS

CLIENT ARNG, USACE Baltimore District **PROJECT NAME** Grand Ledge AASF

PROJECT NUMBER 60552172 **SITE NAME** AOI 1

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ENVIRONMENTAL DATA	WELL DIAGRAM
55			GW-GM		50.0		
60		90	SM		55.0 SILTY SAND WITH GRAVEL, moist, dark brown to black, fine- to medium-grained with estimated 15-25% fines and 15-25% fine to medium, subangular gravel.		
65		100			60.0 SILTY SAND, moist, dark brown to black, fine- to medium-grained with estimated >15% fines and 5-10% fine, subangular gravel. Thin layers of poorly cemented, coarse-grained sandstone present.		
70		100			65.0 Changes to dry, dark brown. Contains 0.5" layers of coarse-grained, poorly cemented sandstone.		**Well Casing** Diameter: 2 in Top: 0 ft bgs Bottom: 80 ft bgs
75		70			70.0 Changes to moist, dark brown to dark gray with trace amounts of fine, subangular to angular gravel.		
80		100	ML		75.0 SANDY SILT, moist, dark gray, very dense with estimated 15-25% fine-grained sand and trace amounts of fine, subangular gravel. Contains light gray clay nodules and 0.5"-thick layers of poorly cemented sandstone.		**Filter Pack** Top: 77 ft bgs Bottom: 100 ft bgs
					80.5 Changes to contain 0.5-0.75" layers of coarse-grained, poorly cemented sandstone.		**Well Screen** Top: 80 ft bgs Bottom: 100 ft bgs

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WELL NUMBER AOI1-10

AECOM AECOM

TOTAL DEPTH 100 FT BGS

CLIENT ARNG, USACE Baltimore District **PROJECT NAME** Grand Ledge AASF

PROJECT NUMBER 60552172 **SITE NAME** AOI 1

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ENVIRONMENTAL DATA	WELL DIAGRAM
85		100	ML		75.0 SANDY SILT, moist, dark gray, very dense with estimated 15-25% fine-grained sand and trace amounts of fine, subangular gravel. Contains light gray clay nodules and 0.5"-thick layers of poorly cemented sandstone. *(continued)*		
90		100			85.0 Changes to contain 1-3" layers of coarse grained, poorly cemented sandstone.		
95		100			90.0 SANDSTONE, gray, coarse-grained, poorly cemented, moderately thin bedding, medium hardness, moderately to highly weathered.	**AOI1-10-GW-89**	**Well Screen** Top: 80 ft bgs Bottom: 100 ft bgs
100		100			95.0 Changes to medium- to coarse-grained, moderately weathered, hard.		

Bottom of borehole at 100.0 feet.

Notes:

1. Headspace screening values represent total volatile organic vapors (referenced to an isobutylene standard) measured with a Photoionization Detector (PID) with 10.6 eV lamp.
2. Coordinates and elevation data in NAVD88 for vertical datum and NAD83/91 for horizontal datum in Michigan State Plane.
3. No recovery from 15-50 ft bgs. Driller switched to flapper bit at 35 ft bgs. Switched to rock coring at 39.5 due to rock encounter. Switched to RQ core at 50 ft bgs.

WELL NUMBER AOI1-11

AECOM AECOM

TOTAL DEPTH 50 FT BGS

CLIENT ARNG, USACE Baltimore District
PROJECT NAME Grand Ledge AASF
PROJECT NUMBER 60552172
SITE NAME AOI 1
DATE STARTED 12/2/19 **COMPLETED** 12/5/19
EASTING 13024374.67 **NORTHING** 464250.05
DRILLING CONTRACTOR Cascade
GROUND ELEVATION N/A **HOLE SIZE** 6 inches
DRILLING EQUIPMENT Boart Longyear ProSonic T600
GROUND WATER LEVELS:
DRILLING METHOD Rotary Sonic
AT TIME OF DRILLING ---
LOGGED BY A. Shah **CHECKED BY** J. Hollingsworth
AT TIME OF SAMPLING 13.30 ft

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ENVIRONMENTAL DATA	WELL DIAGRAM
0					0.0 TOPSOIL.		
			SM		0.4 SILTY SAND WITH GRAVEL, moist, brown with estimated >15% fines, 15-25% fine to coarse, angular gravel, and trace organics.		**Annular Seal** Top: 0 ft bgs Bottom: 5 ft bgs
		100					
5			SC		5.0 CLAYEY SAND, moist, brown with estimated 15-25% fine to coarse, angular gravel.		**Annular Seal** Top: 5 ft bgs Bottom: 24 ft bgs
10			GW-GM		9.5 WELL-GRADED GRAVEL WITH SILT AND SAND, moist, brown to light brown, estimated 15-25% fines and 15-25% fine- to medium-grained sand.		**Well Casing** Diameter: 2 in Top: 0 ft bgs Bottom: 30 ft bgs
		100					
15			SM		15.0 SILTY SAND, moist, brown to dark brown with estimated 5-10% fine to medium, angular gravel.		
			CL		17.0 LEAN CLAY WITH GRAVEL, moist, brown to grayish brown, medium plasticity with estimated 15-25% fine to medium, subangular to subrounded gravel and 5-10% fine-grained sand.		
20							
		100					
					23.4 Changes to estimated 5-10% fine- to medium-grained sand.		
25							

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WELL NUMBER AOI1-11

AECOM AECOM

TOTAL DEPTH 50 FT BGS
PAGE 2 OF 2

CLIENT ARNG, USACE Baltimore District **PROJECT NAME** Grand Ledge AASF

PROJECT NUMBER 60552172 **SITE NAME** AOI 1

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ENVIRONMENTAL DATA	WELL DIAGRAM
25			CL		17.0 LEAN CLAY WITH GRAVEL, moist, brown to grayish brown, medium plasticity with estimated 15-25% fine to medium, subangular to subrounded gravel and 5-10% fine-grained sand. *(continued)*		
			SP		28.0 POORLY GRADED SAND WITH GRAVEL AND COBBLES, moist, dark brown do dark gray with estimated 15-25% fine to coarse, subrounded to rounded gravel and 2-3" cobbles.		
30			ML		31.0 SILT WITH SAND, moist, light gray with estimated 15-25% fine-grained sand and trace amounts of gravel.		
		90			33.0 SANDSTONE, dry, light gray, coarse-grained, poorly cemented, severely weathered, no bedding, weak.		
35						AOI1-11-GW-35	
					37.0 Contains medium to hard layers of sandstone to 38 ft bgs.		
40		100					
					42.0 Changes to very thin bedding.		
					43.0 Changes to dark gray with thin, contains 0.5" layers of moderately hard sandstone.		
45							
		100					
50							

Well Casing
Diameter: 2 in
Top: 0 ft bgs
Bottom: 30 ft bgs

Filter Pack
Top: 28 ft bgs
Bottom: 40 ft bgs

Well Screen
Top: 30 ft bgs
Bottom: 40 ft bgs

Backfill
Top: 40 ft bgs
Bottom: 50 ft bgs

Bottom of borehole at 50.0 feet.

Notes:
1. Headspace screening values represent total volatile organic vapors (referenced to an isobutylene standard) measured with a Photoionization Detector (PID) with 10.6 eV lamp.
2. Coordinates and elevation data in NAVD88 for vertical datum and NAD83/91 for horizontal datum in Michigan State Plane.

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WELL NUMBER AOI1-12

AECOM AECOM

TOTAL DEPTH 57 FT BGS
PAGE 1 OF 3

CLIENT ARNG, USACE Baltimore District
PROJECT NAME Grand Ledge AASF
PROJECT NUMBER 60552172
SITE NAME AOI 1
DATE STARTED 12/6/19 **COMPLETED** 12/6/19
EASTING 13025733.63 **NORTHING** 464235.8
DRILLING CONTRACTOR Cascade
GROUND ELEVATION N/A **HOLE SIZE** 6 inches
DRILLING EQUIPMENT Boart Longyear ProSonic T600
GROUND WATER LEVELS:
DRILLING METHOD Rotary Sonic
AT TIME OF DRILLING ---
LOGGED BY A. Shah **CHECKED BY** J. Hollingsworth
AT TIME OF SAMPLING 16.91 ft

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ENVIRONMENTAL DATA	WELL DIAGRAM
0			CL		0.0 TOPSOIL. 0.2 LEAN CLAY, moist, brown to light brown, low to medium plasticity with estimated 5-10% fine to coarse, subangular to subrounded gravel.		**Annular Seal** Top: 0 ft bgs Bottom: 4 ft bgs
		86					
5					4.4 LEAN CLAY WITH GRAVEL, moist, brown to light brown, medium plasticity with estimated 15-25% fine to coarse, subangular to subrounded gravel and 5-10% fine- to medium-grained sand.		**Annular Seal** Top: 4 ft bgs Bottom: 31 ft bgs
10		100			10.2 Changes to brown to dark brown.		**Well Casing** Diameter: 2 in Top: 0 ft bgs Bottom: 47 ft bgs
15					15.0 Changes to dark brown to gray.		
20		100					
25							

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WELL NUMBER AOI1-12

AECOM AECOM

TOTAL DEPTH 57 FT BGS

CLIENT ARNG, USACE Baltimore District **PROJECT NAME** Grand Ledge AASF

PROJECT NUMBER 60552172 **SITE NAME** AOI 1

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ENVIRONMENTAL DATA	WELL DIAGRAM
25					15.0 Changes to dark brown to gray. *(continued)*		
					27.6 Changes to dark brown with estimated 5-10% fine- to coarse-grained sand.		
30		100					
					33.7 LEAN CLAY, moist, brown to dark brown with estimated 5-10% fine to coarse, subangular to subrounded gravel and 5-10% fine-grained sand.		
35			ML		35.0 SILT, moist, brown, low plasticity with estimated 5-10% gravel and 5-10% fine-grained sand.		**Filter Pack** Top: 35 ft bgs Bottom: 57 ft bgs
			SP		36.5 POORLY GRADED SAND, moist, brown with estimated 5-10% fines and trace amounts of fine gravel.		**Well Casing** Diameter: 2 in Top: 0 ft bgs Bottom: 47 ft bgs
40		100				AOI1-12-GW-42	
45					44.4 Changes to estimated 5-10% fine-grained gravel.		
					46.0 SANDSTONE, gray, coarse-grained, poorly cemented, no bedding, weak, severely weathered.		
50		100					**Well Screen** Top: 47 ft bgs Bottom: 57 ft bgs

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WELL NUMBER AOI1-12

AECOM AECOM

TOTAL DEPTH 57 FT BGS

CLIENT ARNG, USACE Baltimore District **PROJECT NAME** Grand Ledge AASF

PROJECT NUMBER 60552172 **SITE NAME** AOI 1

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ENVIRONMENTAL DATA	WELL DIAGRAM
55					46.0 SANDSTONE, gray, coarse-grained, poorly cemented, no bedding, weak, severely weathered. *(continued)* 54.0 Changes to very thin bedding.		**Well Screen** Top: 47 ft bgs Bottom: 57 ft bgs

Bottom of borehole at 57.0 feet.

Notes:
1. Headspace screening values represent total volatile organic vapors (referenced to an isobutylene standard) measured with a Photoionization Detector (PID) with 10.6 eV lamp.
2. Coordinates and elevation data in NAVD88 for vertical datum and NAD83/91 for horizontal datum in Michigan State Plane.

WELL NUMBER AOI1-13

AECOM AECOM

TOTAL DEPTH 57 FT BGS

CLIENT ARNG, USACE Baltimore District
PROJECT NAME Grand Ledge AASF
PROJECT NUMBER 60552172
SITE NAME AOI 1
DATE STARTED 12/5/19 **COMPLETED** 12/6/19
EASTING 13025868.19 **NORTHING** 463821.28
DRILLING CONTRACTOR Cascade
GROUND ELEVATION N/A **HOLE SIZE** 6 inches
DRILLING EQUIPMENT Boart Longyear ProSonic T600
GROUND WATER LEVELS:
DRILLING METHOD Rotary Sonic
AT TIME OF DRILLING ---
LOGGED BY A. Shah **CHECKED BY** J. Hollingsworth
AT TIME OF SAMPLING 20.21 ft

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ENVIRONMENTAL DATA	WELL DIAGRAM
0					0.0 ASPHALT.		
			SW		0.4 WELL-GRADED SAND WITH GRAVEL, moist, brown to dark brown with estimated 15-25% fine to coarse subangular to subrounded gravel.		**Annular Seal** Top: 0 ft bgs Bottom: 4 ft bgs
			CL		2.5 LEAN CLAY WITH GRAVEL, moist, brown, low to medium-plasticity with estimated 15-25% fine to coarse, subangular to rounded gravel and 5-10% fine-grained sand.		
		100					**Annular Seal** Top: 4 ft bgs Bottom: 36 ft bgs
5							
10							
		100					**Well Casing** Diameter: 2 in Top: 0 ft bgs Bottom: 42 ft bgs
					12.4 Changes to brown to dark brown.		
15							
					17.5 Changes to dark brown.		
					19.2 Changes to medium plasticity.		
20							
					21.0 Changes to low plasticity.		
		100					
					22.4 Changes to medium plasticity.		
25							

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WELL NUMBER AOI1-13

AECOM AECOM

TOTAL DEPTH 57 FT BGS

CLIENT ARNG, USACE Baltimore District **PROJECT NAME** Grand Ledge AASF

PROJECT NUMBER 60552172 **SITE NAME** AOI 1

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ENVIRONMENTAL DATA	WELL DIAGRAM
25					17.5 Changes to dark brown. *(continued)*		
30		100			29.5 Changes to brown to dark brown.		
35					35.0 Changes to dark brown and sand becomes fine- to medium-grained.		
40		100	SP		39.5 Changes to medium to high plasticity. 42.0 POORLY GRADED SAND, moist, brown with estimated 5-10% fines and trace amounts of fine gravel.		
45			SW		44.0 Contains 1" thick lean clay lens. 44.5 WELL-GRADED SAND WITH GRAVEL, moist, brown to dark brown with estimated 15-25% fine to coarse, subangular to subrounded gravel. 46.0 Changes to estimated 30-45% gravel.	AOI1-13-GW-47	
50		100	MH		52.8		

Well Casing
Diameter: 2 in
Top: 0 ft bgs
Bottom: 42 ft bgs

Filter Pack
Top: 40 ft bgs
Bottom: 57 ft bgs

Well Screen
Top: 42 ft bgs
Bottom: 52 ft bgs

Backfill
Top: 52 ft bgs
Bottom: 57 ft bgs

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WELL NUMBER AOI1-13

AECOM AECOM

TOTAL DEPTH 57 FT BGS

CLIENT ARNG, USACE Baltimore District **PROJECT NAME** Grand Ledge AASF

PROJECT NUMBER 60552172 **SITE NAME** AOI 1

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ENVIRONMENTAL DATA	WELL DIAGRAM
55					54.0 ELASTIC SILT WITH GRAVEL, moist, brown to light gray with estimated 15-25% fine to coarse gravel. *(continued)* SANDSTONE, gray, coarse-grained, poorly cemented, weak, severly weathered, no bedding present.		

Bottom of borehole at 57.0 feet.

Notes:
1. Headspace screening values represent total volatile organic vapors (referenced to an isobutylene standard) measured with a Photoionization Detector (PID) with 10.6 eV lamp.
2. Coordinates and elevation data in NAVD88 for vertical datum and NAD83/91 for horizontal datum in Michigan State Plane.

WELL NUMBER AOI1-14

AECOM AECOM

TOTAL DEPTH 67 FT BGS

CLIENT ARNG, USACE Baltimore District
PROJECT NAME Grand Ledge AASF
PROJECT NUMBER 60552172
SITE NAME AOI 1
DATE STARTED 12/4/19 **COMPLETED** 12/6/19
EASTING 13025828.79 **NORTHING** 463236.23
DRILLING CONTRACTOR Cascade
GROUND ELEVATION N/A **HOLE SIZE** 6 inches
DRILLING EQUIPMENT Boart Longyear ProSonic T600
GROUND WATER LEVELS:
DRILLING METHOD Rotary Sonic
AT TIME OF DRILLING ---
LOGGED BY A. Shah **CHECKED BY** J. Hollingsworth
AT TIME OF SAMPLING 36.26 ft

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ENVIRONMENTAL DATA	WELL DIAGRAM
0			CL		0.0 TOPSOIL. 0.3 LEAN CLAY, moist, brown to reddish brown, low to medium plasticity with estimated 5-10% fine to medium, subrounded to rounded gravel and trace amounts of organics.		**Annular Seal** Top: 0 ft bgs Bottom: 4 ft bgs
		100					**Annular Seal** Top: 4 ft bgs Bottom: 45 ft bgs
5					4.5 LEAN CLAY WITH GRAVEL, moist, brown to dark brown, medium to high plasticity with estimated 15-25% fine to coarse, subrounded gravel and 5-10% fine-grained sand.		
10		100			12.0 Changes to brown.		**Well Casing** Diameter: 2 in Top: 0 ft bgs Bottom: 50 ft bgs
15					13.5 Changes to brown to light brown, estimated 5-10% fine- to coarse-grained sand.		
20					18.5 Changes to brown.		
		100			22.0 LEAN CLAY WITH GRAVEL AND COBBLES, moist, brown, medium to high plasticity with estimated 15-25% fine to coarse, subrounded gravel, 5-10% fine- to coarse-grained sand, and 2-4" cobbles.		
25							

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WELL NUMBER AOI1-14

AECOM AECOM

TOTAL DEPTH 67 FT BGS

CLIENT ARNG, USACE Baltimore District **PROJECT NAME** Grand Ledge AASF

PROJECT NUMBER 60552172 **SITE NAME** AOI 1

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ENVIRONMENTAL DATA	WELL DIAGRAM
25					22.0 LEAN CLAY WITH GRAVEL AND COBBLES, moist, brown, medium to high plasticity with estimated 15-25% fine to coarse, subrounded gravel, 5-10% fine- to coarse-grained sand, and 2-4" cobbles. *(continued)*		
30		100			28.5 LEAN CLAY WITH GRAVEL, moist, brown, medium to high plasticity with estimated 15-25% fine to coarse, subrounded to rounded gravel and 5-10% fine- to coarse-grained sand.		
35					30.6 LEAN CLAY WITH GRAVEL AND COBBLES, moist, brown, medium to high plasticity with estimated 15-25% fine- to coarse-grained, subrounded to rounded gravel, 5-10% fine to coarse sand, and cobbles.		**Well Casing** Diameter: 2 in Top: 0 ft bgs Bottom: 50 ft bgs
40		20					
45							**Filter Pack** Top: 48 ft bgs Bottom: 60 ft bgs
50		100	SW		50.0 WELL-GRADED SAND WITH GRAVEL, moist, brown to light gray with estimated 15-25% fine to coarse, subangular to rounded gravel.		**Well Screen** Top: 50 ft bgs Bottom: 60 ft bgs

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WELL NUMBER AOI1-14

AECOM AECOM

TOTAL DEPTH 67 FT BGS

CLIENT ARNG, USACE Baltimore District **PROJECT NAME** Grand Ledge AASF

PROJECT NUMBER 60552172 **SITE NAME** AOI 1

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ENVIRONMENTAL DATA	WELL DIAGRAM
55		100	SW		50.0 WELL-GRADED SAND WITH GRAVEL, moist, brown to light gray with estimated 15-25% fine to coarse, subangular to rounded gravel. *(continued)*	AOI1-14-GW-55	
					56.0 Changes to estimated 30-45% fine- to coarse, subrounded to rounded gravel.		**Well Screen** Top: 50 ft bgs Bottom: 60 ft bgs
60		80					**Backfill** Top: 60 ft bgs Bottom: 67 ft bgs
					62.5 Changes to estimated 15-25% fine to coarse, rounded to subrounded gravel.		
65			CL		65.0 LEAN CLAY, moist, light brown, low plasticity with estimated 5-10% fine-grained sand and trace amounts of fine gravel.		

Bottom of borehole at 67.0 feet.

Notes:
1. Headspace screening values represent total volatile organic vapors (referenced to an isobutylene standard) measured with a Photoionization Detector (PID) with 10.6 eV lamp.
2. Coordinates and elevation data in NAVD88 for vertical datum and NAD83/91 for horizontal datum in Michigan State Plane.
3. At 37 ft bgs, majority of recovery was washed out due to catcher malfunction.

WELL NUMBER AOI1-15

AECOM AECOM

TOTAL DEPTH 75 FT BGS

CLIENT ARNG, USACE Baltimore District
PROJECT NAME Grand Ledge AASF
PROJECT NUMBER 60552172
SITE NAME AOI 1
DATE STARTED 11/19/19 **COMPLETED** 12/5/19
EASTING 13024952.05 **NORTHING** 463225.07
DRILLING CONTRACTOR Cascade
GROUND ELEVATION N/A **HOLE SIZE** 6 inches
DRILLING EQUIPMENT Boart Longyear ProSonic T600
GROUND WATER LEVELS:
DRILLING METHOD Rotary Sonic
AT TIME OF DRILLING ---
LOGGED BY A. Shah **CHECKED BY** J. Hollingsworth
AT TIME OF SAMPLING 27.50 ft

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ENVIRONMENTAL DATA	WELL DIAGRAM
0			CL		0.0 TOPSOIL. 0.3 SANDY LEAN CLAY, moist, brown, low plasticity with estimated 15-25% fine- to medium-grained sand, 5-10% fine to medium, subrounded to rounded gravel, and trace amounts of organics.		**Annular Seal** Top: 0 ft bgs Bottom: 5 ft bgs
5		40			5.0 Changes to fine to coarse, rounded gravel.		**Annular Seal** Top: 5 ft bgs Bottom: 55 ft bgs
10		40			10.0 Changes to brown to dark brown, medium plasticity with estimated 15-25% fine-grained sand and trace amounts of fine to coarse, subrounded to rounded gravel and organics.		
15		60			15.0 Changes estimated 5-10% fine to coarse, subrounded gravel and contains 0.1" layers of fine- to medium-grained sand interbedded with sandy lean clay.		**Well Casing** Diameter: 2 in Top: 0 ft bgs Bottom: 60 ft bgs
20		80			20.0 Changes to low plasticity with estimated 5-10% fine to coarse, subrounded to rounded gravel.		
25		70					

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WELL NUMBER AOI1-15

AECOM AECOM

TOTAL DEPTH 75 FT BGS

CLIENT ARNG, USACE Baltimore District **PROJECT NAME** Grand Ledge AASF

PROJECT NUMBER 60552172 **SITE NAME** AOI 1

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ENVIRONMENTAL DATA	WELL DIAGRAM
25					25.0 SANDY LEAN CLAY WITH GRAVEL, moist, brown to dark brown, low to medium plasticity with estimated 15-25% fine- to medium-grained sand and 15-25% fine- to coarse-grained, subrounded to rounded gravel.		
		100					
30							
		100					
35							
		100					
40					40.0 Changes to dark brown to gray.		
45		100	SC		45.0 CLAYEY SAND WITH GRAVEL, moist, dark brown to gray, fine-grained with estimated 15-25% fines and 15-25% fine to coarse, subrounded gravel.		
50					49.5 Contains 4" of sandstone, gray, coarse-grained, poorly cemented.		
					50.0 SANDSTONE, moist, gray, medium- to coarse-grained, very poorly cemented, moderately thin bedding, no foliation, moderately hard, moderate to highly weathered.		
		100			53.0 Contains 1.5" layer of clayey sand with coarse gravel.		

Well Casing
Diameter: 2 in
Top: 0 ft bgs
Bottom: 60 ft bgs

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WELL NUMBER AOI1-15

AECOM AECOM

TOTAL DEPTH 75 FT BGS

CLIENT ARNG, USACE Baltimore District **PROJECT NAME** Grand Ledge AASF

PROJECT NUMBER 60552172 **SITE NAME** AOI 1

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ENVIRONMENTAL DATA	WELL DIAGRAM
55					50.0 SANDSTONE, moist, gray, medium- to coarse-grained, very poorly cemented, moderately thin bedding, no foliation, moderately hard, moderate to highly weathered. *(continued)*		
					55.0 Changes to dry, highly weathered.		**Well Casing** Diameter: 2 in Top: 0 ft bgs Bottom: 60 ft bgs
					57.0 Contains 1/2" to 1' layers of clayey sand with gravel from 57 to 60 feet bgs.		**Filter Pack** Top: 58 ft bgs Bottom: 75 ft bgs
60		95					
65					65.0 Changes to coarse-grained, interbedded with gray clayey sand with gravel.		
		100				AOI1-15-GW-67.50	**Well Screen** Top: 60 ft bgs Bottom: 75 ft bgs
70							
75							

Bottom of borehole at 75.0 feet.

Notes:
1. Headspace screening values represent total volatile organic vapors (referenced to an isobutylene standard) measured with a Photoionization Detector (PID) with 10.6 eV lamp.
2. Coordinates and elevation data in NAVD88 for vertical datum and NAD83/91 for horizontal datum in Michigan State Plane.

WELL NUMBER AOI 2-1

AECOM AECOM

TOTAL DEPTH 10 FT BGS

CLIENT ARNG, USACE Baltimore District
PROJECT NAME Grand Ledge Army Aviation Support Facility and Armory SI
PROJECT NUMBER 60552172
SITE NAME AOI2
DATE STARTED 5/7/19 **COMPLETED** 5/7/19
EASTING N/A **NORTHING** N/A
DRILLING CONTRACTOR Cascade
GROUND ELEVATION N/A **HOLE SIZE** 2 inches
DRILLING EQUIPMENT Geoprobe
GROUND WATER LEVELS:
DRILLING METHOD Direct Push
AT TIME OF DRILLING ---
LOGGED BY M Glinski **CHECKED BY** N/A
AT END OF DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ENVIRONMENTAL DATA	WELL DIAGRAM
0	GMAC	100	ML		0.0 SILT WITH SAND, dry, dark brown, soft, slightly cohesive, 15% fine sand.	AOI2-1-SB-0-2	**Well Casing** Diameter: 1 in Top: 0 ft bgs Bottom: 5 ft bgs
5	GMAC	97	CL		4.0 LEAN CLAY WITH SAND, dry, light yellowish brown, stiff, medium plasticity, 15% fine to medium sand.		**Well Screen** Type: Schedule 40 PVC Slot Size: 0.01 in Top: 5 ft bgs Bottom: 10 ft bgs
					7.0 Changes to brown.		
10					Bottom of borehole at 10.0 feet.		

Notes:
3. Headspace screening values represent total volatile organic vapors (referenced to an isobutylene standard) measured with a Photoionization Detector (PID) with 10.6 eV lamp.
4. Coordinates and elevation data in NAVD88 for vertical datum and NAD83/91 for horizontal datum in Michigan State Plane.

WELL NUMBER AOI 2-2

AECOM AECOM

TOTAL DEPTH 10 FT BGS
PAGE 1 OF 1

CLIENT ARNG, USACE Baltimore District
PROJECT NAME Grand Ledge Army Aviation Support Facility and Armory SI
PROJECT NUMBER 60552172
SITE NAME AOI2
DATE STARTED 5/7/19 **COMPLETED** 5/7/19
EASTING N/A **NORTHING** N/A
DRILLING CONTRACTOR Cascade
GROUND ELEVATION N/A **HOLE SIZE** 2 inches
DRILLING EQUIPMENT Geoprobe
GROUND WATER LEVELS:
DRILLING METHOD Direct Push
AT TIME OF DRILLING ---
LOGGED BY M Glinski **CHECKED BY** N/A
AT END OF DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ENVIRONMENTAL DATA	WELL DIAGRAM
0			ML		0.0 SILT WITH SAND, dry, yellowish brown, soft, 20% fine sand.	AOI2-2-SB-0-2	
			SP		1.5 POORLY GRADED SAND, dry, yellowish brown, loose, fine grained.		
	GMAC	100	CL		2.0 LEAN CLAY WITH SAND, moist, brown, 25% fine sand.	AOI2-2-SB-2-4 AOI2-2-SB-2-4 DUP	**Well Casing** Diameter: 1 in Top: 0 ft bgs Bottom: 5 ft bgs
5							
	GMAC	90	CL		5.5 LEAN CLAY, moist, brown, stiff, 10% fine sand.		**Well Screen** Type: Schedule 40 PVC Slot Size: 0.01 in Top: 5 ft bgs Bottom: 10 ft bgs
10							

Bottom of borehole at 10.0 feet.

Notes:
3. Headspace screening values represent total volatile organic vapors (referenced to an isobutylene standard) measured with a Photoionization Detector (PID) with 10.6 eV lamp.
4. Coordinates and elevation data in NAVD88 for vertical datum and NAD83/91 for horizontal datum in Michigan State Plane.

WELL NUMBER AOI 2-3

AECOM AECOM

TOTAL DEPTH 10 FT BGS

CLIENT ARNG, USACE Baltimore District
PROJECT NAME Grand Ledge Army Aviation Support Facility and Armory SI
PROJECT NUMBER 60552172
SITE NAME AOI2
DATE STARTED 5/7/19 **COMPLETED** 5/7/19
EASTING N/A **NORTHING** N/A
DRILLING CONTRACTOR Cascade
GROUND ELEVATION N/A **HOLE SIZE** 2 inches
DRILLING EQUIPMENT Geoprobe
GROUND WATER LEVELS:
DRILLING METHOD Direct Push
AT TIME OF DRILLING ---
LOGGED BY M Glinski **CHECKED BY** N/A
AT END OF DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ENVIRONMENTAL DATA	WELL DIAGRAM
0							
	GMAC	100	SC		0.0 CLAYEY SAND, dry, yellowish brown, medium dense, fine grained sand, 30% clay.	AOI2-3-SB-0-2	
					2.0 Coarsening sand.		**Well Casing** Diameter: 1 in Top: 0 ft bgs Bottom: 5 ft bgs
5			CL		4.5 LEAN CLAY WITH SAND, wet, dark grayish brown, 20% fine sand.		
	GMAC	92			7.0 Changes to 5% subangular coarse sand.		**Well Screen** Type: Schedule 40 PVC Slot Size: 0.01 in Top: 5 ft bgs Bottom: 10 ft bgs
10							

Bottom of borehole at 10.0 feet.

Notes:
3. Headspace screening values represent total volatile organic vapors (referenced to an isobutylene standard) measured with a Photoionization Detector (PID) with 10.6 eV lamp.
4. Coordinates and elevation data in NAVD88 for vertical datum and NAD83/91 for horizontal datum in Michigan State Plane.

WELL NUMBER AOI2-4

AECOM AECOM

TOTAL DEPTH 50 FT BGS

CLIENT ARNG, USACE Baltimore District
PROJECT NAME Grand Ledge AASF
PROJECT NUMBER 60552172
SITE NAME AOI 2
DATE STARTED 12/3/19 **COMPLETED** 12/5/19
EASTING 13023428.67 **NORTHING** 463202.42
DRILLING CONTRACTOR Cascade
GROUND ELEVATION N/A **HOLE SIZE** 6 inches
DRILLING EQUIPMENT Boart Longyear ProSonic T600
GROUND WATER LEVELS:
DRILLING METHOD Rotary Sonic
AT TIME OF DRILLING ---
LOGGED BY A. Shah **CHECKED BY** J. Hollingsworth
AT TIME OF SAMPLING 10.37 ft

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ENVIRONMENTAL DATA	WELL DIAGRAM
0					0.0 ASPHALT.		
			GW-GM		0.4 WELL-GRADED GRAVEL WITH SILT AND SAND, moist, dark brown with estimated 15-25% fines, 15-25% fine- to medium-grained sand, and trace amounts of asphalt fragments. Possibly fill.		**Annular Seal** Top: 0 ft bgs Bottom: 4 ft bgs
			CL		3.5 LEAN CLAY WITH GRAVEL, moist, light brown, medium plasticity with estimated 15-25% fine to medium, subrounded gravel and 5-10% fine-grained sand.		**Annular Seal** Top: 4 ft bgs Bottom: 19 ft bgs
5		100					
10							
							Well Casing Diameter: 2 in Top: 0 ft bgs Bottom: 25 ft bgs
15		100			14.0 Changes to brown, estimated 15-25% fine to coarse, subangular to subrounded gravel.		
					18.2 Changes to estimated 5-10% fine- to coarse-grained sand.		
20			MH		20.0 ELASTIC SILT WITH GRAVEL, moist, brown, low plasticity with estimated 30-45% medium to coarse, subrounded gravel.		
			CL		21.4 LEAN CLAY, moist, brown, low to medium plasticity with estimated 5-10% fine to coarse, subrounded gravel.		**Filter Pack** Top: 23 ft bgs Bottom: 35 ft bgs
25							

(Continued Next Page)

WELL NUMBER AOI2-4

AECOM AECOM

TOTAL DEPTH 50 FT BGS

CLIENT ARNG, USACE Baltimore District **PROJECT NAME** Grand Ledge AASF

PROJECT NUMBER 60552172 **SITE NAME** AOI 2

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	ENVIRONMENTAL DATA	WELL DIAGRAM
25		70			21.4		
			GW-GM		25.5 WELL-GRADED GRAVEL WITH SILT, SAND, AND COBBLES, moist, dark brown with estimated 15-25% silt, 15-25% fine- to medium-grained sand, and cobbles up to 3" in diameter.		
30					30.5 SANDSTONE, gray to dark gray, coarse-grained, poorly cemented, very thin bedding, weak, severly weathered.	AOI2-4-GW-30	**Well Screen** Top: 25 ft bgs Bottom: 35 ft bgs
			CL		32.0 LEAN CLAY WITH GRAVEL, gray with estimated 15-25% gravel.		
35		100			33.4 SANDSTONE, gray, coarse-grained, poorly cemented, very thin bedding, weak, severly weathered.		**Backfill** Top: 35 ft bgs Bottom: 50 ft bgs
40					41.0 SILTSTONE, gray, fine-grained, very thin bedding, weak, highly weathered.		
45		80			43.5 SANDSTONE, gray to dark gray, medium-grained, poorly cemented, thin bedding, weak, highly weathered.		
50					47.0 Changes to dark gray, fine- to medium-grained.		

Bottom of borehole at 50.0 feet.

Notes:
1. Headspace screening values represent total volatile organic vapors (referenced to an isobutylene standard) measured with a Photoionization Detector (PID) with 10.6 eV lamp.
2. Coordinates and elevation data in NAVD88 for vertical datum and NAD83/91 for horizontal datum in Michigan State Plane.

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Appendix F
Investigation-Derived Waste Polygons

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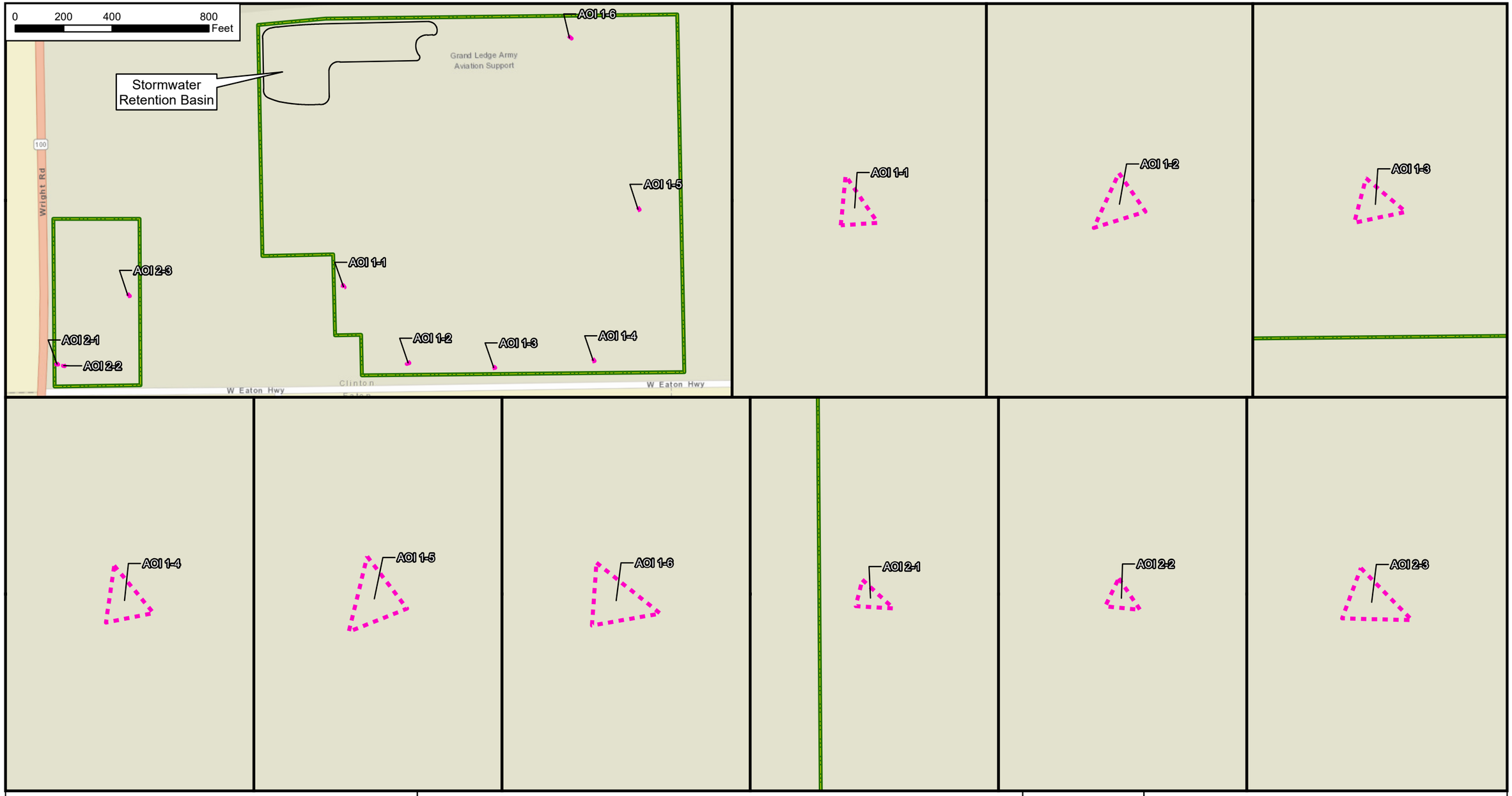

CLIENT	ARNG			
PROJECT	Site Inspection for PFAS at Grand Ledge AASF, MI			
REVISED	2/25/2020	GIS BY	MS	2/25/2020
SCALE	1:4,800	CHK BY	CM	2/25/2020
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c)		PM	RG	2/25/2020

Legend

Facility Boundary

Investigation Derived Waste Polygons

0 10 20 40 Feet

N

Mobilization 1
Investigation Derived Waste Polygons

AECOM

12420 Milestone Center Drive
Germantown, MD 20876

Appendix F

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CLIENT	ARNG			
PROJECT	Site Inspection for PFAS at Grand Ledge AASF, MI			
REVISED	2/19/2020	GIS BY	MS	2/19/2020
SCALE	1:4,800	CHK BY	CM	2/19/2020
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c)		PM	RG	2/19/2020

Legend

Facility Boundary

Investigation Derived Waste Polygons

0 10 20 40 Feet

N

Mobilization 2
Investigation Derived Waste Polygons

AECOM

12420 Milestone Center Drive
Germantown, MD 20876

Appendix F

Q:\Projects\ENV\GEARS\GEO\ARNG PFAS\900-CAD-GIS\920-GIS or Graphics\MXD\MI\Grand_Ledge_AASF\SI_Figures\SI_Results_Figures\Fig_Grand_Ledge_SI_IDW_Polygons.mxd

Appendix G
Analytical Results

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Appendix G Laboratory Data
Decontamination Water
Site Inspection Report, Grand Ledge AASF and Armory

Area of Interest	DECON				QC																							
Sample ID	GL-SPIGOT-041619				FRB-041619				FQC-EB-050719-HA				FQC-EB-050719-ROD				FQC-EB-050719-SS-1				FQC-EB-050719-SS-2				FQC-EB-050919-WL			
Sample Date	04/16/2019				04/16/2019				05/07/2019				05/07/2019				05/07/2019				05/07/2019				05/09/2019			
Analyte	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual
Water, PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ng/L)																												
6:2 FTS	1.65	3.33	8.33	J	<	3.33	8.33	U	<	3.33	8.33	U	<	4.00	10.0	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
8:2 FTS	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	4.00	10.0	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
NEtFOSAA	<	6.67	8.33	U	<	6.67	8.33	U	<	6.67	8.33	U	<	8.00	10.0	U	<	6.67	8.33	U	<	6.67	8.33	U	<	6.67	8.33	U
NMeFOSAA	<	6.67	8.33	U	<	6.67	8.33	U	<	6.67	8.33	U	<	8.00	10.0	U	<	6.67	8.33	U	<	6.67	8.33	U	<	6.67	8.33	U
PFBA	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	4.00	10.0	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
PFBS	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	4.00	10.0	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
PFDA	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	4.00	10.0	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
PFDoA	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	UJ	<	4.00	10.0	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
PFHpA	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	4.00	10.0	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
PFHxA	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	4.00	10.0	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
PFHxS	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	4.00	10.0	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
PFNA	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	4.00	10.0	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
PFOA	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	4.00	10.0	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
PFOS	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	4.00	10.0	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
PFPeA	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	4.00	10.0	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
PFTeDA	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	UJ	<	4.00	10.0	UJ	<	3.33	8.33	UJ	<	3.33	8.33	UJ	<	3.33	8.33	U
PFTrDA	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	UJ	<	4.00	10.0	UJ	<	3.33	8.33	UJ	<	3.33	8.33	UJ	<	3.33	8.33	U
PFUnDA	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	4.00	10.0	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U

Interpreted Qualifiers

J = Estimated concentration

J+ = Estimated concentration, biased high

U = The analyte was not detected at a level greater than or equal to the adjusted detection limit (DL)

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

Chemical Abbreviations

6:2 FTS	6:2 fluorotelomer sulfonate
8:2 FTS	8:2 fluorotelomer sulfonate
NEtFOSAA	N-ethyl perfluorooctane- sulfonamidoacetic acid
NMeFOSAA	N-methyl perfluorooctanesulfonamidoacetic acid
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFTeDA	perfluorotetradecanoic acid
PFTrDA	perfluorotridecanoic acid
PFUnDA	perfluoro-n-undecanoic acid

Acronyms and Abbreviations

AOI	Area of Interest
EB	Equipment blank
ERB	Equipment reagent blank
FRB	Field reagent blank
FQC	Field quality control
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
QC	Quality control
QSM	Quality Systems Manual
Qual	Interpreted Qualifier
ng/L	nanogram per liter
<	analyte not detected above the LOD

Appendix G Laboratory Data
Decontamination Water
Site Inspection Report, Grand Ledge AASF and Armory

Area of Interest	QC																							
Sample ID	EB-110619HA				FRB-110619				EB-112019BP				EB-112019WL				ERB-121819BP				FRB-121819			
Sample Date	11/06/2019				11/06/2019				11/20/2019				11/20/2019				12/18/2019				12/18/2019			
Analyte	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual
Water, PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ng/L)																								
6:2 FTS	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
8:2 FTS	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
NEtFOSAA	<	6.67	8.33	U	<	6.67	8.33	U	<	6.67	8.33	U	<	6.67	8.33	U	<	6.67	8.33	U	<	6.67	8.33	U
NMeFOSAA	<	6.67	8.33	U	<	6.67	8.33	U	<	6.67	8.33	U	<	6.67	8.33	U	<	6.67	8.33	UJ	<	6.67	8.33	UJ
PFBA	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
PFBS	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
PFDA	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
PFDoA	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	UJ	<	3.33	8.33	UJ
PFHpA	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
PFHxA	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
PFHxS	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
PFNA	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
PFOA	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
PFOS	<	3.33	8.33	U	<	3.33	8.33	U	2.37	3.33	8.33	J+	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
PFPeA	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
PFTeDA	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	UJ	3.66	3.33	8.33	J+	2.77	3.33	8.33	J+
PFTrDA	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	UJ	<	3.33	8.33	UJ	<	3.33	8.33	UJ
PFUnDA	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U

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

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8:2 FTS	8:2 fluorotelomer sulfonate
NEtFOSAA	N-ethyl perfluorooctane- sulfonamidoacetic acid
NMeFOSAA	N-methyl perfluorooctanesulfonamidoacetic acid
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFTeDA	perfluorotetradecanoic acid
PFTrDA	perfluorotridecanoic acid
PFUnDA	perfluoro-n-undecanoic acid

Acronyms and Abbreviations

AOI	Area of Interest
EB	Equipment blank
ERB	Equipment reagent blank
FRB	Field reagent blank
FQC	Field quality control
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
QC	Quality control
QSM	Quality Systems Manual
Qual	Interpreted Qualifier
ng/L	nanogram per liter
<	analyte not detected above the LOD

Appendix G Laboratory Data
Residential Drinking Water Results
Site Inspection Report, Grand Ledge AASF and Armory

Area of Interest		POTABLE																													
Sample ID		POTABLE-01				POTABLE-02				POTABLE-03				POTABLE-04				POTABLE-04-FD				POTABLE-05				POTABLE-06			
Sample Date		01/22/2020				01/22/2020				01/22/2020				01/22/2020				01/22/2020				01/22/2020				01/22/2020			
Analyte	EPA HA [a]	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual
Water, PFAS via EPA 537.1 (ng/L)																													
NEtFOSAA	-	<	8.00	10.0	UJ	<	8.00	10.0	UJ	<	8.00	10.0	UJ	<	8.00	10.0	UJ	<	8.00	10.0	U	<	8.00	10.0	UJ	<	8.00	10.0	UJ
NMeFOSAA	-	<	8.00	10.0	UJ	<	8.00	10.0	UJ	<	8.00	10.0	UJ	<	8.00	10.0	UJ	<	8.00	10.0	U	<	8.00	10.0	UJ	<	8.00	10.0	UJ
PFBS	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U
PFDA	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U
PFDoA	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U
PFHpA	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U
PFHxA	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U
PFHxS	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U
PFNA	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U
PFOA	70	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U
PFOS	70	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U
PFTeDA	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	UJ	<	4.00	10.0	U
PFTrDA	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	UJ	<	4.00	10.0	U
PFUnDA	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U
Total PFOA + PFOS	70	<	4.00		U	<	4.00		U	<	4.00		U	<	4.00		U	<	4.00		U	<	4.00		U	<	4.00		U

Grey Fill — Detected concentration exceeded EPA HA

References

a. United States Environmental Protection Agency (EPA). 2016. Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA). Office of Water (4304T). Health and Ecological Criteria Division, Washington, DC 20460. EPA Document Number: 822-R-16-005. May 2016. / EPA. 2016. Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS). Office of Water (4304T). Health and Ecological Criteria Division, Washington, DC 20460. EPA Document Number: 822-R-16-004. May 2016.

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PFDA	perfluorodecanoate
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFTeDA	perfluorotetradecanoic acid
PFTrDA	perfluorotridecanoic acid
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Acronyms and Abbreviations

AOI	Area of Interest
FD/DUP	Duplicate
EPA	United States Environmental Protection Agency
GL	Grand Ledge
HA	Health Advisory
LOD	Limit of Detection
LOQ	Limit of Quantitation
Qual	Interpreted Qualifier
ng/L	nanogram per liter
-	Not applicable
<	analyte not detected above the LOD

Appendix G Laboratory Data
Residential Drinking Water Results
Site Inspection Report, Grand Ledge AASF and Armory

Area of Interest		POTABLE																											
Sample ID		POTABLE-07				POTABLE-08				POTABLE-09				POTABLE-10				POTABLE-11				GL-POTABLE-12				GL-POTABLE-12-DUP			
Sample Date		01/22/2020				01/22/2020				01/22/2020				01/23/2020				01/23/2020				07/28/2020				07/28/2020			
Analyte	EPA HA [a]	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual
Water, PFAS via EPA 537.1 (ng/L)																													
NEtFOSAA	-	<	8.00	10.0	U	<	8.00	10.0	UJ	<	8.00	10.0	UJ	<	8.00	10.0	UJ	<	8.00	10.0	U	<	6.00	10.0	UJ	<	6.00	10.0	UJ
NMeFOSAA	-	<	8.00	10.0	U	<	8.00	10.0	UJ	<	8.00	10.0	UJ	<	8.00	10.0	UJ	<	8.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFBS	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFDA	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFDoA	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	5.00	10.0	UJ	<	5.00	10.0	UJ
PFHpA	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFHxA	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFHxS	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFNA	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFOA	70	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFOS	70	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	3.38	4.00	10.0	J	<	5.00	10.0	U	<	5.00	10.0	U
PFTeDA	-	<	4.00	10.0	U	<	4.00	10.0	UJ	<	4.00	10.0	UJ	<	4.00	10.0	U	<	4.00	10.0	U	<	5.00	10.0	UJ	<	5.00	10.0	UJ
PFTrDA	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	5.00	10.0	UJ	<	5.00	10.0	UJ
PFUnDA	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	5.00	10.0	UJ	<	5.00	10.0	UJ
Total PFOA + PFOS	70	<	4.00		U	<	4.00		U	<	4.00		U	<	4.00		U	3.38			J	<	5.00		U	<	5.00		U

Grey Fill — Detected concentration exceeded EPA HA

References

a. United States Environmental Protection Agency (EPA). 2016. Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA). Office of Water (4304T). Health and Ecological Criteria Division, Washington, DC 20460. EPA Document Number: 822-R-16-005. May 2016. / EPA. 2016. Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS). Office of Water (4304T). Health and Ecological Criteria Division, Washington, DC 20460. EPA Document Number: 822-R-16-004. May 2016.

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AOI	Area of Interest
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EPA	United States Environmental Protection Agency
GL	Grand Ledge
HA	Health Advisory
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LOQ	Limit of Quantitation
Qual	Interpreted Qualifier
ng/L	nanogram per liter
-	Not applicable
<	analyte not detected above the LOD

Appendix G Laboratory Data
Residential Drinking Water Results
Site Inspection Report, Grand Ledge AASF and Armory

Area of Interest		POTABLE																											
Sample ID		GL-POTABLE-13				GL-POTABLE-14				GL-POTABLE-15				GL-POTABLE-16				GL-POTABLE-18				GL-POTABLE-19				GL-POTABLE-20			
Sample Date		07/28/2020				07/29/2020				07/29/2020				07/28/2020				07/28/2020				07/29/2020				07/28/2020			
Analyte	EPA HA [a]	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual
Water, PFAS via EPA 537.1 (ng/L)																													
NEtFOSAA	-	<	6.00	10.0	U	<	6.00	10.0	U	<	6.00	10.0	U	<	6.00	10.0	U	<	6.00	10.0	U	<	6.00	10.0	U	<	6.00	10.0	U
NMeFOSAA	-	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFBS	-	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFDA	-	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFDoA	-	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFHpA	-	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFHxA	-	<	5.00	10.0	U	2.37	5.00	10.0	J	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFHxS	-	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFNA	-	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFOA	70	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFOS	70	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFTeDA	-	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFTrDA	-	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFUnDA	-	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
Total PFOA + PFOS	70	<	5.00		U	<	5.00		U	<	5.00		U	<	5.00		U	<	5.00		U	<	5.00		U	<	5.00		U

Grey Fill — Detected concentration exceeded EPA HA

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a. United States Environmental Protection Agency (EPA). 2016. Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA). Office of Water (4304T). Health and Ecological Criteria Division, Washington, DC 20460. EPA Document Number: 822-R-16-005. May 2016. / EPA. 2016. Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS). Office of Water (4304T). Health and Ecological Criteria Division, Washington, DC 20460. EPA Document Number: 822-R-16-004. May 2016.

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Appendix G Laboratory Data
Residential Drinking Water Results
Site Inspection Report, Grand Ledge AASF and Armory

Area of Interest		POTABLE																											
Sample ID		GL-POTABLE-21				GL-POTABLE-21-DUP				GL-POTABLE-22				GL-POTABLE-23				GL-POTABLE-24				GL-POTABLE-25				GL-POTABLE-26			
Sample Date		07/29/2020				07/29/2020				07/28/2020				07/28/2020				07/28/2020				07/29/2020				07/29/2020			
Analyte	EPA HA [a]	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual
Water, PFAS via EPA 537.1 (ng/L)																													
NEtFOSAA	-	<	6.00	10.0	U	<	6.00	10.0	U	<	6.00	10.0	U	<	6.00	10.0	U	<	6.00	10.0	U	<	6.00	10.0	U	<	6.00	10.0	U
NMeFOSAA	-	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFBS	-	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFDA	-	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFDoA	-	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFHpA	-	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFHxA	-	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFHxS	-	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFNA	-	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFOA	70	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFOS	70	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFTeDA	-	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFTrDA	-	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
PFUnDA	-	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U	<	5.00	10.0	U
Total PFOA + PFOS	70	<	5.00		U	<	5.00		U	<	5.00		U	<	5.00		U	<	5.00		U	<	5.00		U	<	5.00		U

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PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFTeDA	perfluorotetradecanoic acid
PFTrDA	perfluorotridecanoic acid
PFUnDA	perfluoro-n-undecanoic acid

Acronyms and Abbreviations

AOI	Area of Interest
FD/DUP	Duplicate
EPA	United States Environmental Protection Agency
GL	Grand Ledge
HA	Health Advisory
LOD	Limit of Detection
LOQ	Limit of Quantitation
Qual	Interpreted Qualifier
ng/L	nanogram per liter
-	Not applicable
<	analyte not detected above the LOD

Appendix G Laboratory Data
Groundwater
Site Inspection Report, Grand Ledge AASF and Armory

Area of Interest		AOI1																											
Sample ID		AOI-1-1-GW-7-12				AOI-1-2-GW-5-10				AOI-1-3-GW-4-9				AOI-1-3-GW-4-9-DUP				AOI-1-4-GW-17-22				AOI-1-5-GW-5-10				AOI-1-6-GW-15-20			
Sample Date		05/09/2019				05/08/2019				05/08/2019				05/08/2019				05/08/2019				05/09/2019				05/08/2019			
Analyte	OSD Screening Level [a]	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual
Water, PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ng/L)																													
6:2 FTS	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	UJ	<	4.00	10.0	U	<	3.33	8.33	U	<	4.00	10.0	U	87.0	4.00	10.0	
8:2 FTS	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	UJ	<	4.00	10.0	U	<	3.33	8.33	U	<	4.00	10.0	U	<	4.00	10.0	U
NEtFOSAA	-	<	8.00	10.0	U	<	8.00	10.0	U	<	8.00	10.0	UJ	<	8.00	10.0	U	<	6.67	8.33	U	<	8.00	10.0	U	<	8.00	10.0	U
NMeFOSAA	-	<	8.00	10.0	U	<	8.00	10.0	U	<	8.00	10.0	UJ	<	8.00	10.0	U	<	6.67	8.33	U	<	8.00	10.0	U	<	8.00	10.0	U
PFBA	-	28.6	4.00	10.0		154	4.00	10.0		<	4.00	10.0	UJ	<	4.00	10.0	U	3.26	3.33	8.33	J	34.0	4.00	10.0		59.2	4.00	10.0	
PFBS	40000	1.58	4.00	10.0	J	5.36	4.00	10.0	J	<	4.00	10.0	UJ	<	4.00	10.0	U	2.66	3.33	8.33	J	13.5	4.00	10.0		46.1	4.00	10.0	
PFDA	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	UJ	<	4.00	10.0	U	<	3.33	8.33	U	<	4.00	10.0	U	<	4.00	10.0	U
PFDoA	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	UJ	<	4.00	10.0	U	<	3.33	8.33	U	<	4.00	10.0	U	<	4.00	10.0	U
PFHpA	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	UJ	<	4.00	10.0	U	<	3.33	8.33	U	36.7	4.00	10.0		65.9	4.00	10.0	
PFHxA	-	<	4.00	10.0	U	6.83	4.00	10.0	J	<	4.00	10.0	UJ	<	4.00	10.0	U	<	3.33	8.33	U	42.9	4.00	10.0		168	4.00	10.0	
PFHxS	-	<	4.00	10.0	U	5.08	4.00	10.0	J	<	4.00	10.0	UJ	<	4.00	10.0	U	4.47	3.33	8.33	J	87.8	4.00	10.0		12.1	4.00	10.0	
PFNA	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	UJ	<	4.00	10.0	U	<	3.33	8.33	U	5.37	4.00	10.0	J	<	4.00	10.0	U
PFOA	40	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	UJ	<	4.00	10.0	U	<	3.33	8.33	U	53.0	4.00	10.0		<	4.00	10.0	U
PFOS	40	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	UJ	<	4.00	10.0	U	<	3.33	8.33	U	60.0	4.00	10.0		<	4.00	10.0	U
PFPeA	-	<	4.00	10.0	U	9.09	4.00	10.0	J	<	4.00	10.0	UJ	<	4.00	10.0	U	<	3.33	8.33	U	54.1	4.00	10.0		189	4.00	10.0	
PFTeDA	-	<	4.00	10.0	UJ	<	4.00	10.0	UJ	<	4.00	10.0	UJ	<	4.00	10.0	UJ	<	3.33	8.33	UJ	<	4.00	10.0	UJ	<	4.00	10.0	U
PFTrDA	-	<	4.00	10.0	UJ	<	4.00	10.0	UJ	<	4.00	10.0	UJ	<	4.00	10.0	UJ	<	3.33	8.33	UJ	<	4.00	10.0	UJ	<	4.00	10.0	U
PFUnDA	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	UJ	<	4.00	10.0	U	<	3.33	8.33	U	<	4.00	10.0	U	<	4.00	10.0	U

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2019. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 October 2019. Groundwater screening levels based on residential scenario for direct ingestion of groundwater.

Interpreted Qualifiers

J = Estimated concentration

J+ = Estimated concentration, biased high

U = The analyte was not detected at a level greater than or equal to the adjusted detection limit (DL)

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Chemical Abbreviations

6:2 FTS	6:2 fluorotelomer sulfonate
8:2 FTS	8:2 fluorotelomer sulfonate
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NMeFOSAA	N-methyl perfluorooctanesulfonamidoacetic acid
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFTeDA	perfluorotetradecanoic acid
PFTrDA	perfluorotridecanoic acid
PFUnDA	perfluoro-n-undecanoic acid

Acronyms and Abbreviations

AOI	Area of Interest
D/DUP	Duplicate
GW	Groundwater
HQ	Hazard quotient
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
OSD	Office of the Secretary of Defense
QSM	Quality Systems Manual
Qual	Interpreted Qualifier
USEPA	United States Environmental Protection Agency
ng/L	nanogram per liter
-	Not applicable
<	analyte not detected above the LOD

Appendix G Laboratory Data
Groundwater
Site Inspection Report, Grand Ledge AASF and Armory

Area of Interest		AOI1																									
Sample ID		AOI1-10-GW-89				AOI1-10-GW-89-D				AOI 1-11-GW-35				AOI 1-12-GW-42				AOI 1-13-GW-47				AOI 1-14-GW-55				AOI 1-15-GW-67.50			
Sample Date		11/19/2019				11/19/2019				12/18/2019				12/20/2019				12/19/2019				12/19/2019				12/19/2019			
Analyte	OSD Screening Level [a]	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual
Water, PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ng/L)																													
6:2 FTS	-	1.69	3.33	8.33	J+	1.73	3.33	8.33	J+	<	3.33	8.33	U	327	3.33	8.33		<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
8:2 FTS	-	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
NEtFOSAA	-	<	6.67	8.33	U	<	6.67	8.33	U	<	6.67	8.33	UJ	<	6.67	8.33	U	<	6.67	8.33	U	<	6.67	8.33	U	<	6.67	8.33	U
NMeFOSAA	-	<	6.67	8.33	U	<	6.67	8.33	U	<	6.67	8.33	UJ	<	6.67	8.33	UJ	<	6.67	8.33	UJ	<	6.67	8.33	UJ	<	6.67	8.33	UJ
PFBA	-	<	3.33	8.33	U	2.86	3.33	8.33	J	1.97	3.33	8.33	J	43.1	3.33	8.33		7.32	3.33	8.33	J	<	3.33	8.33	U	<	3.33	8.33	U
PFBS	40000	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	70.7	3.33	8.33		<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
PFDA	-	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	UJ	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
PFDoA	-	<	3.33	8.33	U	<	3.33	8.33	U	3.38	3.33	8.33	J+	<	3.33	8.33	UJ	<	3.33	8.33	UJ	<	3.33	8.33	U	<	3.33	8.33	U
PFHpA	-	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	66.6	3.33	8.33		<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
PFHxA	-	1.77	3.33	8.33	J	<	3.33	8.33	U	<	3.33	8.33	U	160	3.33	8.33		4.45	3.33	8.33	J	<	3.33	8.33	U	<	3.33	8.33	U
PFHxS	-	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	227	3.33	8.33		<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
PFNA	-	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
PFOA	40	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	28.2	3.33	8.33		<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
PFOS	40	<	3.33	8.33	U	<	3.33	8.33	U	1.97	3.33	8.33	J	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U
PFPeA	-	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	153	3.33	8.33		16.1	3.33	8.33		<	3.33	8.33	U	<	3.33	8.33	U
PFTeDA	-	<	3.33	8.33	U	<	3.33	8.33	U	40.1	3.33	8.33	J+	<	8.33	8.33	U	<	3.33	8.33	UJ	<	3.33	8.33	UJ	<	3.33	8.33	U
PFTrDA	-	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	UJ	<	3.33	8.33	UJ	<	3.33	8.33	UJ	<	3.33	8.33	UJ	<	3.33	8.33	U
PFUnDA	-	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	UJ	<	3.33	8.33	UJ	<	3.33	8.33	UJ	<	3.33	8.33	U	<	3.33	8.33	U

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2019. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 October 2019. Groundwater screening levels based on residential scenario for direct ingestion of groundwater.

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

Acronyms and Abbreviations

AOI	Area of Interest
D/DUP	Duplicate
GW	Groundwater
HQ	Hazard quotient
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
OSD	Office of the Secretary of Defense
QSM	Quality Systems Manual
Qual	Interpreted Qualifier
USEPA	United States Environmental Protection Agency
ng/L	nanogram per liter
-	Not applicable
<	analyte not detected above the LOD

Appendix G Laboratory Data
Groundwater
Site Inspection Report, Grand Ledge AASF and Armory

Area of Interest		AOI2															
Sample ID		AOI-2-1-GW-5-10				AOI-2-2-GW-5-10				AOI-2-3-GW-5-10				AOI 2-4-GW-30			
Sample Date		05/09/2019				05/09/2019				05/10/2019				12/18/2019			
Analyte	OSD Screening Level [a]	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual
Water, PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ng/L)																	
6:2 FTS	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	3.33	8.33	U
8:2 FTS	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	3.33	8.33	U
NEtFOSAA	-	<	8.00	10.0	U	<	8.00	10.0	U	<	8.00	10.0	U	<	6.67	8.33	U
NMeFOSAA	-	<	8.00	10.0	U	<	8.00	10.0	U	<	8.00	10.0	U	<	6.67	8.33	UJ
PFBA	-	2.35	4.00	10.0	J	7.40	4.00	10.0	J	6.03	4.00	10.0	J	<	3.33	8.33	U
PFBS	40000	<	4.00	10.0	U	4.21	4.00	10.0	J	<	4.00	10.0	U	<	3.33	8.33	U
PFDA	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	3.33	8.33	U
PFDoA	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	3.33	8.33	UJ
PFHpA	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	3.33	8.33	U
PFHxA	-	<	4.00	10.0	U	3.19	4.00	10.0	J	2.07	4.00	10.0	J	<	3.33	8.33	U
PFHxS	-	<	4.00	10.0	U	44.9	4.00	10.0		<	4.00	10.0	U	<	3.33	8.33	U
PFNA	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	3.33	8.33	U
PFOA	40	<	4.00	10.0	U	4.10	4.00	10.0	J	<	4.00	10.0	U	<	3.33	8.33	U
PFOS	40	3.46	4.00	10.0	J	31.7	4.00	10.0		<	4.00	10.0	U	<	3.33	8.33	U
PFPeA	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	3.33	8.33	U
PFTeDA	-	<	4.00	10.0	U	<	4.00	10.0	UJ	<	4.00	10.0	U	<	3.33	8.33	UJ
PFTrDA	-	<	4.00	10.0	U	<	4.00	10.0	UJ	<	4.00	10.0	U	<	3.33	8.33	UJ
PFUnDA	-	<	4.00	10.0	U	<	4.00	10.0	U	<	4.00	10.0	U	<	3.33	8.33	U

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2019. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 October 2019. Groundwater screening levels based on residential scenario for direct ingestion of groundwater.

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PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
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PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
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Acronyms and Abbreviations

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QSM	Quality Systems Manual
Qual	Interpreted Qualifier
USEPA	United States Environmental Protection Agency
ng/L	nanogram per liter
-	Not applicable
<	analyte not detected above the LOD

Appendix G Laboratory Data
TOC and pH
Site Inspection Report, Grand Ledge AASF and Armory

Area of Interest	AOI1																											
Sample ID	AOI-1-1-SB-0-2				AOI-1-1-SB-5-7				AOI-1-2-SB-0-2				AOI-1-2-SB-2-4				AOI-1-3-SB-0-2				AOI-1-3-SB-2-4				AOI-1-4-SB-0-2			
Sample Date	05/09/2019				05/08/2019				05/09/2019				05/09/2019				05/10/2019				05/10/2019				05/10/2019			
Depth	0 - 2 ft				5 - 7 ft				0 - 2 ft				2 - 4 ft				0 - 2 ft				2 - 4 ft				0 - 2 ft			
Analyte	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual
pH	8.09	1.00	1.00		8.28	1.00	1.00		8.09	1.00	1.00		8.03	1.00	1.00		8.02	1.00	1.00		7.92	1.00	1.00		8.04	1.00	1.00	
Total Organic Carbon (mg/kg)	1600	200	250		7400	200	250		11200	200	250		8190	200	250		8900	200	250		8540	200	250		8840	200	250	

Acronyms and Abbreviations

AOI	Area of Interest
DUP	Duplicate
ft	feet
LOD	Limit of Detection
LOQ	Limit of Quantitation
Qual	Qualifier
mg/kg	Milligrams per Kilogram
SB	Soil boring

Appendix G Laboratory Data
TOC and pH
Site Inspection Report, Grand Ledge AASF and Armory

Area of Interest	AOI1																											
Sample ID	AOI-1-4-SB-8-10				AOI-1-4-SB-17-19				AOI-1-4-SB-17-19-DUP				AOI-1-5-SB-0-2				AOI-1-5-SB-2-4				AOI-1-6-SB-0-2				AOI-1-6-SB-2-4			
Sample Date	05/07/2019				05/07/2019				05/07/2019				05/08/2019				05/08/2019				05/09/2019				05/09/2019			
Depth	8 - 10 ft				17 - 19 ft				17 - 19 ft				0 - 2 ft				2 - 4 ft				0 - 2 ft				2 - 4 ft			
Analyte	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**
pH	8.21	1.00	1.00		8.17	1.00	1.00		8.37	1.00	1.00		7.80	1.00	1.00		8.15	1.00	1.00		8.18	1.00	1.00		8.35	1.00	1.00	
Total Organic Carbon (mg/kg)	11500	200	250		14100	200	250		11500	200	250		25500	200	250		9340	200	250		8750	200	250		13200	200	250	

Acronyms and Abbreviations

AOI	Area of Interest
DUP	Duplicate
ft	feet
LOD	Limit of Detection
LOQ	Limit of Quantitation
Qual	Qualifier
mg/kg	Milligrams per Kilogram
SB	Soil boring

Appendix G Laboratory Data
TOC and pH
Site Inspection Report, Grand Ledge AASF and Armory

Area of Interest	AOI1				AOI2																			
Sample ID	AOI-1-6-SB-5-7				AOI-2-1-SB-0-2				AOI-2-2-SB-0-2				AOI-2-2-SB-2-4				AOI-2-2-SB-2-4-DUP				AOI-2-3-SB-0-2			
Sample Date	05/08/2019				05/09/2019				05/09/2019				05/09/2019				05/09/2019				05/09/2019			
Depth	5 - 7 ft				0 - 2 ft				0 - 2 ft				2 - 4 ft				2 - 4 ft				0 - 2 ft			
Analyte	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**	**Result**	**LOD**	**LOQ**	**Qual**
pH	8.45	1.00	1.00		7.88	1.00	1.00		11.0	1.00	1.00		8.36	1.00	1.00		8.85	1.00	1.00		7.00	1.00	1.00	
Total Organic Carbon (mg/kg)	14500	200	250		14100	200	250		2670	200	250		1850	200	250		3680	200	250		11100	200	250	

Acronyms and Abbreviations

AOI	Area of Interest
DUP	Duplicate
ft	feet
LOD	Limit of Detection
LOQ	Limit of Quantitation
Qual	Qualifier
mg/kg	Milligrams per Kilogram
SB	Soil boring

Appendix G Laboratory Data
Sediment
Site Inspection Report, Grand Ledge AASF and Armory

Area of Interest	AOI1																											
Sample ID	AOI-1-7-SD-0-1				AOI-1-7-SD-0-1-DUP				AOI-1-8-SD-0-1				AOI-1-8-SD-0-1 (RE)				AOI-1-9-SD-0-1				AOI 1-21-SD-0-0.5				AOI 1-22-SD-0-0.5			
Sample Date	05/07/2019				05/07/2019				05/07/2019				05/07/2019				05/07/2019				11/05/2019				11/05/2019			
Depth	0 - 1 ft				0 - 1 ft				0 - 1 ft				0 - 1 ft				0 - 1 ft				0 - 0.5 ft				0 - 0.5 ft			
Analyte	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual
Sediment, PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ug/Kg)																												
6:2 FTS	53.2	13.1	32.9		60.1	12.2	30.4	J+	0.153	1.59	3.98	J	-	-	-	-	0.049	0.445	1.11	J	<	0.457	1.14	U	1.67	1.01	2.52	J
8:2 FTS	149	13.1	32.9		158	12.2	30.4	J+	0.183	1.59	3.98	J	-	-	-	-	<	0.445	1.11	U	<	0.457	1.14	U	3.03	1.01	2.52	
NEtFOSAA	4.73	13.1	32.9	J	3.98	12.2	30.4	J+	<	1.59	3.98	U	-	-	-	-	<	0.445	1.11	U	<	0.457	1.14	U	<	1.01	2.52	U
NMeFOSAA	<	13.1	32.9	U	<	12.2	30.4	UJ	<	1.59	3.98	U	-	-	-	-	<	0.445	1.11	U	<	0.457	1.14	U	<	1.01	2.52	U
PFBA	<	13.1	32.9	U	<	12.2	30.4	UJ	0.221	1.59	3.98	J	-	-	-	-	0.077	0.445	1.11	J	<	0.457	1.14	U	<	1.01	2.52	U
PFBS	<	13.1	32.9	U	<	12.2	30.4	UJ	0.225	1.59	3.98	J	-	-	-	-	0.00473	0.445	1.11	J	<	0.457	1.14	U	<	1.01	2.52	U
PFDA	14.2	13.1	32.9	J	17.1	12.2	30.4	J+	0.164	1.59	3.98	J	-	-	-	-	<	0.445	1.11	U	<	0.457	1.14	U	<	1.01	2.52	U
PFDoA	33.0	13.1	32.9	J+	26.1	12.2	30.4	J+	<	1.59	3.98	U	-	-	-	-	<	0.445	1.11	U	<	0.457	1.14	U	0.536	1.01	2.52	J
PFHpA	<	13.1	32.9	U	<	12.2	30.4	UJ	<	1.59	3.98	U	-	-	-	-	0.00688	0.445	1.11	J	<	0.457	1.14	U	<	1.01	2.52	U
PFHxA	<	13.1	32.9	U	<	12.2	30.4	UJ	0.312	1.59	3.98	J	-	-	-	-	0.057	0.445	1.11	J	<	0.457	1.14	U	<	1.01	2.52	U
PFHxS	<	13.1	32.9	U	<	12.2	30.4	UJ	1.91	1.59	3.98	J	-	-	-	-	<	0.445	1.11	U	<	0.457	1.14	U	<	1.01	2.52	U
PFNA	<	13.1	32.9	U	<	12.2	30.4	UJ	<	1.59	3.98	U	-	-	-	-	<	0.445	1.11	U	<	0.457	1.14	U	<	1.01	2.52	U
PFOA	7.15	13.1	32.9	J	6.58	12.2	30.4	J+	0.265	1.59	3.98	J	-	-	-	-	0.030	0.445	1.11	J	<	0.457	1.14	U	<	1.01	2.52	U
PFOS	26.3	13.1	32.9	J	<	12.2	30.4	UJ	5.31	1.59	3.98	J+	-	-	-	-	6.32	0.445	1.11		<	0.457	1.14	U	0.744	1.01	2.52	J
PFPeA	<	13.1	32.9	U	<	12.2	30.4	UJ	<	1.59	3.98	U	-	-	-	-	0.047	0.445	1.11	J	<	0.457	1.14	U	<	1.01	2.52	U
PFTeDA	37.3	13.1	32.9	J+	28.2	12.2	30.4	J+	-	-	-	-	0.077	1.61	4.02	J	<	0.445	1.11	U	<	0.457	1.14	U	1.13	1.01	2.52	J+
PFTrDA	18.2	13.1	32.9	J+	10.7	12.2	30.4	J+	-	-	-	-	0.096	1.61	4.02	J	<	0.445	1.11	U	<	0.457	1.14	U	3.09	1.01	2.52	J+
PFUnDA	10.5	13.1	32.9	J+	<	12.2	30.4	UJ	<	1.59	3.98	U	-	-	-	-	<	0.445	1.11	U	<	0.457	1.14	U	<	1.01	2.52	U

Interpreted Qualifiers

J = Estimated concentration

J- = Estimated concentration, biased low

J+ = Estimated concentration, biased high

U = The analyte was not detected at a level greater than or equal to the adjusted detection limit (DL)

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

Chemical Abbreviations

6:2 FTS	6:2 fluorotelomer sulfonate
8:2 FTS	8:2 fluorotelomer sulfonate
NEtFOSAA	N-ethyl perfluorooctane- sulfonamidoacetic acid
NMeFOSAA	N-methyl perfluorooctanesulfonamidoacetic acid
PFBA	perfluorobutyrate
PFBS	perfluorobutane sulfonate
PFDA	perfluorodecanoate
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
PFPeA	perfluoropentanoic acid
PFTeDA	perfluorotetradecanoic acid
PFTrDA	perfluorotridecanoic acid
PFUnDA	perfluoro-n-undecanoic acid

Acronyms and Abbreviations

AOI	Area of Interest
D/DUP	Duplicate
ft	feet
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
QSM	Quality Systems Manual
Qual	Interpreted Qualifier
RE	Re-extracted
SD	Sediment
ug/Kg	micrograms per Kilogram
<	analyte not detected above the LOD

Appendix G Laboratory Data
Sediment
Site Inspection Report, Grand Ledge AASF and Armory

Area of Interest	AOI1															
Sample ID	AOI 1-22-SD-0-0.5D				AOI 1-23-SD-0-0.5				AOI 1-24-SD-0-0.5				AOI 1-25-SD-0-0.5			
Sample Date	11/05/2019				11/05/2019				11/05/2019				11/06/2019			
Depth	0 - 0.5 ft				0 - 0.5 ft				0 - 0.5 ft				0 - 0.5 ft			
Analyte	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual
Sediment, PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ug/Kg)																
6:2 FTS	1.40	1.20	3.01	J	<	0.485	1.21	U	<	0.592	1.48	U	<	0.457	1.14	U
8:2 FTS	2.55	1.20	3.01	J	<	0.485	1.21	U	<	0.592	1.48	U	<	0.457	1.14	U
NEtFOSAA	<	1.20	3.01	U	<	0.485	1.21	U	<	0.592	1.48	U	<	0.457	1.14	U
NMeFOSAA	<	1.20	3.01	U	<	0.485	1.21	U	<	0.592	1.48	U	<	0.457	1.14	U
PFBA	<	1.20	3.01	U	<	0.485	1.21	U	<	0.592	1.48	U	<	0.457	1.14	U
PFBS	<	1.20	3.01	U	<	0.485	1.21	U	<	0.592	1.48	U	<	0.457	1.14	U
PFDA	<	1.20	3.01	U	<	0.485	1.21	U	<	0.592	1.48	U	<	0.457	1.14	U
PFDoA	0.676	1.20	3.01	J+	<	0.485	1.21	U	<	0.592	1.48	U	<	0.457	1.14	U
PFHpA	<	1.20	3.01	U	<	0.485	1.21	U	<	0.592	1.48	U	<	0.457	1.14	U
PFHxA	<	1.20	3.01	U	<	0.485	1.21	U	<	0.592	1.48	U	<	0.457	1.14	U
PFHxS	<	1.20	3.01	U	<	0.485	1.21	U	0.233	0.592	1.48	J	<	0.457	1.14	U
PFNA	<	1.20	3.01	U	<	0.485	1.21	U	<	0.592	1.48	U	<	0.457	1.14	U
PFOA	<	1.20	3.01	U	<	0.485	1.21	U	<	0.592	1.48	U	<	0.457	1.14	U
PFOS	1.15	1.20	3.01	J	5.89	0.485	1.21	J-	<	0.592	1.48	U	<	0.457	1.14	U
PFPeA	<	1.20	3.01	U	<	0.485	1.21	U	<	0.592	1.48	U	<	0.457	1.14	U
PFTeDA	0.843	1.20	3.01	J+	<	0.485	1.21	U	<	0.592	1.48	UJ	<	0.457	1.14	U
PFTrDA	0.772	1.20	3.01	J+	<	0.485	1.21	U	<	0.592	1.48	UJ	<	0.457	1.14	U
PFUnDA	<	1.20	3.01	U	<	0.485	1.21	U	<	0.592	1.48	U	<	0.457	1.14	U

Interpreted Qualifiers

J = Estimated concentration

J- = Estimated concentration, biased low

J+ = Estimated concentration, biased high

U = The analyte was not detected at a level greater than or equal to the adjusted detection limit (DL)

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

Chemical Abbreviations

6:2 FTS	6:2 fluorotelomer sulfonate
8:2 FTS	8:2 fluorotelomer sulfonate
NEtFOSAA	N-ethyl perfluorooctane- sulfonamidoacetic acid
NMeFOSAA	N-methyl perfluorooctanesulfonamidoacetic acid
PFBA	perfluorobutyrate
PFBS	perfluorobutane sulfonate
PFDA	perfluorodecanoate
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
PFPeA	perfluoropentanoic acid
PFTeDA	perfluorotetradecanoic acid
PFTrDA	perfluorotridecanoic acid
PFUnDA	perfluoro-n-undecanoic acid

Acronyms and Abbreviations

AOI	Area of Interest
D/DUP	Duplicate
ft	feet
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
QSM	Quality Systems Manual
Qual	Interpreted Qualifier
RE	Re-extracted
SD	Sediment
ug/Kg	micrograms per Kilogram
<	analyte not detected above the LOD

Appendix G Laboratory Data
Deep Subsurface Soil
Site Inspection Report, Grand Ledge AASF and Armory

Area of Interest	AOI1							
Sample ID	AOI-1-4-SB-17-19				AOI-1-4-SB-17-19-DUP			
Sample Date	05/07/2019				05/07/2019			
Depth	17 - 19 ft				17 - 19 ft			
Analyte	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual
Soil, PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ug/Kg)								
6:2 FTS	<	0.442	1.10	U	<	0.426	1.06	U
8:2 FTS	<	0.442	1.10	U	<	0.426	1.06	U
NEtFOSAA	<	0.442	1.10	U	<	0.426	1.06	U
NMeFOSAA	<	0.442	1.10	U	<	0.426	1.06	U
PFBA	0.068	0.442	1.10	J	0.046	0.426	1.06	J
PFBS	<	0.442	1.10	U	<	0.426	1.06	U
PFDA	<	0.442	1.10	U	0.012	0.426	1.06	J
PFDoA	<	0.442	1.10	U	<	0.426	1.06	U
PFHpA	<	0.442	1.10	U	<	0.426	1.06	U
PFHxA	0.032	0.442	1.10	J	<	0.426	1.06	U
PFHxS	<	0.442	1.10	U	<	0.426	1.06	U
PFNA	<	0.442	1.10	U	<	0.426	1.06	U
PFOA	<	0.442	1.10	U	<	0.426	1.06	U
PFOS	<	0.442	1.10	U	<	0.426	1.06	U
PFPeA	<	0.442	1.10	U	<	0.426	1.06	U
PFTeDA	<	0.442	1.10	U	<	0.426	1.06	U
PFTrDA	<	0.442	1.10	U	<	0.426	1.06	U
PFUnDA	<	0.442	1.10	U	<	0.426	1.06	U

Interpreted Qualifiers

J = Estimated concentration

U = The analyte was not detected at a level greater than or equal to the adjusted detection limit (DL)

Chemical Abbreviations

6:2 FTS	6:2 fluorotelomer sulfonate
8:2 FTS	8:2 fluorotelomer sulfonate
NEtFOSAA	N-ethyl perfluorooctane- sulfonamidoacetic acid
NMeFOSAA	N-methyl perfluorooctanesulfonamidoacetic acid
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFTeDA	perfluorotetradecanoic acid
PFTrDA	perfluorotridecanoic acid
PFUnDA	perfluoro-n-undecanoic acid

Acronyms and Abbreviations

AOI	Area of Interest
D/DUP	Duplicate
ft	feet
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
QSM	Quality Systems Manual
Qual	Interpreted Qualifier
SB	soil boring
ug/Kg	micrograms per Kilogram
<	analyte not detected above the LOD

Appendix G Laboratory Data
Shallow Subsurface Soil
Site Inspection Report, Grand Ledge AASF and Armory

Area of Interest		AOI1																									
Sample ID		AOI-1-1-SB-5-7				AOI-1-2-SB-2-4				AOI-1-3-SB-2-4				AOI-1-4-SB-8-10				AOI-1-5-SB-2-4				AOI-1-6-SB-2-4				AOI-1-6-SB-5-7			
Sample Date		05/08/2019				05/09/2019				05/10/2019				05/07/2019				05/08/2019				05/09/2019				05/08/2019			
Depth		5 - 7 ft				2 - 4 ft				2 - 4 ft				8 - 10 ft				2 - 4 ft				2 - 4 ft				5 - 7 ft			
Analyte	OSD Screening Level [a]	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual
Soil, PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ug/Kg)																													
6:2 FTS	-	<	0.439	1.10	U	<	0.464	1.16	U	<	0.444	1.11	U	<	0.447	1.12	U	<	0.422	1.05	U	<	0.435	1.09	U	<	0.452	1.13	U
8:2 FTS	-	<	0.439	1.10	U	<	0.464	1.16	U	<	0.444	1.11	U	<	0.447	1.12	U	<	0.422	1.05	U	0.023	0.435	1.09	J	<	0.452	1.13	U
NEtFOSAA	-	<	0.439	1.10	U	<	0.464	1.16	U	<	0.444	1.11	U	<	0.447	1.12	U	<	0.422	1.05	U	<	0.435	1.09	U	<	0.452	1.13	U
NMeFOSAA	-	<	0.439	1.10	U	<	0.464	1.16	U	<	0.444	1.11	U	<	0.447	1.12	U	<	0.422	1.05	U	<	0.435	1.09	U	<	0.452	1.13	U
PFBA	-	0.033	0.439	1.10	J	0.052	0.464	1.16	J	0.032	0.444	1.11	J	0.055	0.447	1.12	J	0.130	0.422	1.05	J	0.029	0.435	1.09	J	0.040	0.452	1.13	J
PFBS	1600000	<	0.439	1.10	U	<	0.464	1.16	U	<	0.444	1.11	U	<	0.447	1.12	U	0.00917	0.422	1.05	J	<	0.435	1.09	U	<	0.452	1.13	U
PFDA	-	<	0.439	1.10	U	0.016	0.464	1.16	J	<	0.444	1.11	U	0.00876	0.447	1.12	J	0.013	0.422	1.05	J	<	0.435	1.09	U	<	0.452	1.13	U
PFDoA	-	<	0.439	1.10	U	<	0.464	1.16	U	<	0.444	1.11	U	<	0.447	1.12	U	<	0.422	1.05	U	0.010	0.435	1.09	J	<	0.452	1.13	U
PFHpA	-	<	0.439	1.10	U	<	0.464	1.16	U	0.00825	0.444	1.11	J	<	0.447	1.12	U	0.179	0.422	1.05	J	0.018	0.435	1.09	J	<	0.452	1.13	U
PFHxA	-	<	0.439	1.10	U	0.043	0.464	1.16	J	<	0.444	1.11	U	0.028	0.447	1.12	J	0.261	0.422	1.05	J	0.064	0.435	1.09	J	0.038	0.452	1.13	J
PFHxS	-	<	0.439	1.10	U	<	0.464	1.16	U	<	0.444	1.11	U	<	0.447	1.12	U	0.199	0.422	1.05	J	<	0.435	1.09	U	<	0.452	1.13	U
PFNA	-	<	0.439	1.10	U	<	0.464	1.16	U	<	0.444	1.11	U	<	0.447	1.12	U	0.062	0.422	1.05	J	<	0.435	1.09	U	<	0.452	1.13	U
PFOA	1600	<	0.439	1.10	U	0.031	0.464	1.16	J	<	0.444	1.11	U	0.00784	0.447	1.12	J	0.171	0.422	1.05	J	0.017	0.435	1.09	J	<	0.452	1.13	U
PFOS	1600	<	0.439	1.10	U	0.285	0.464	1.16	J	<	0.444	1.11	U	<	0.447	1.12	U	0.541	0.422	1.05	J	0.018	0.435	1.09	J	<	0.452	1.13	U
PFPeA	-	<	0.439	1.10	U	<	0.464	1.16	U	<	0.444	1.11	U	<	0.447	1.12	U	0.321	0.422	1.05	J	<	0.435	1.09	U	<	0.452	1.13	U
PFTeDA	-	<	0.439	1.10	U	0.014	0.464	1.16	J	<	0.444	1.11	U	<	0.447	1.12	U	<	0.422	1.05	U	<	0.435	1.09	U	<	0.452	1.13	U
PFTrDA	-	<	0.439	1.10	U	<	0.464	1.16	U	<	0.444	1.11	U	<	0.447	1.12	U	<	0.422	1.05	U	<	0.435	1.09	U	<	0.452	1.13	U
PFUnDA	-	0.00497	0.439	1.10	J	0.00847	0.464	1.16	J	<	0.444	1.11	U	<	0.447	1.12	U	<	0.422	1.05	U	<	0.435	1.09	U	<	0.452	1.13	U

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2019. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 October 2019. Soil screening levels based on industrial/commercial composite worker scenario for incidental ingestion of contaminated soil.

Interpreted Qualifiers

J = Estimated concentration

U = The analyte was not detected at a level greater than or equal to the adjusted detection limit (DL)

Chemical Abbreviations

6:2 FTS	6:2 fluorotelomer sulfonate
8:2 FTS	8:2 fluorotelomer sulfonate
NEtFOSAA	N-ethyl perfluorooctane- sulfonamidoacetic acid
NMeFOSAA	N-methyl perfluorooctanesulfonamidoacetic acid
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFTeDA	perfluorotetradecanoic acid
PFTrDA	perfluorotridecanoic acid
PFUnDA	perfluoro-n-undecanoic acid

Acronyms and Abbreviations

AOI	Area of Interest
DUP	Duplicate
ft	feet
HQ	Hazard quotient
LCMSMS	Liquid Chromatography Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
OSD	Office of the Secretary of Defense
QSM	Quality Systems Manual
Qual	Interpreted Qualifier
SB	Soil boring
USEPA	United States Environmental Protection Agency
ug/Kg	micrograms per Kilogram
-	Not applicable
<	analyte not detected above the LOD

	Area of Interest	AOI2							
	Sample ID	AOI-2-2-SB-2-4				AOI-2-2-SB-2-4-DUP			
	Sample Date	05/09/2019				05/09/2019			
	Depth	2 - 4 ft				2 - 4 ft			
Analyte	OSD Screening Level [a]	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual
Soil, PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ug/Kg)									
6:2 FTS	-	<	0.466	1.17	U	<	0.457	1.14	U
8:2 FTS	-	<	0.466	1.17	U	<	0.457	1.14	U
NEtFOSAA	-	<	0.466	1.17	U	<	0.457	1.14	U
NMeFOSAA	-	<	0.466	1.17	U	<	0.457	1.14	U
PFBA	-	0.033	0.466	1.17	J	0.035	0.457	1.14	J
PFBS	1600000	<	0.466	1.17	U	<	0.457	1.14	U
PFDA	-	<	0.466	1.17	U	0.013	0.457	1.14	J
PFDoA	-	<	0.466	1.17	U	<	0.457	1.14	U
PFHpA	-	<	0.466	1.17	U	<	0.457	1.14	U
PFHxA	-	<	0.466	1.17	U	0.040	0.457	1.14	J
PFHxS	-	<	0.466	1.17	U	0.011	0.457	1.14	J
PFNA	-	<	0.466	1.17	U	<	0.457	1.14	U
PFOA	1600	0.017	0.466	1.17	J	0.016	0.457	1.14	J
PFOS	1600	0.196	0.466	1.17	J	0.123	0.457	1.14	J
PFPeA	-	<	0.466	1.17	U	<	0.457	1.14	U
PFTeDA	-	<	0.466	1.17	U	<	0.457	1.14	U
PFTrDA	-	<	0.466	1.17	U	<	0.457	1.14	U
PFUnDA	-	<	0.466	1.17	U	<	0.457	1.14	U

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2019. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 October 2019. Soil screening levels based on industrial/commercial composite worker scenario for incidental ingestion of contaminated soil.

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NMeFOSAA	N-methyl perfluorooctanesulfonamidoacetic acid
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFTeDA	perfluorotetradecanoic acid
PFTrDA	perfluorotridecanoic acid
PFUnDA	perfluoro-n-undecanoic acid

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DUP	Duplicate
ft	feet
HQ	Hazard quotient
LCMSMS	Liquid Chromatography Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
OSD	Office of the Secretary of Defense
QSM	Quality Systems Manual
Qual	Interpreted Qualifier
SB	Soil boring
USEPA	United States Environmental Protection Agency
ug/Kg	micrograms per Kilogram
-	Not applicable
<	analyte not detected above the LOD

Appendix G Laboratory Data
Surface Soil
Site Inspection Report, Grand Ledge AASF and Armory

Area of Interest		AOI1																											
Sample ID		AOI-1-1-SB-0-2				AOI-1-2-SB-0-2				AOI-1-3-SB-0-2				AOI-1-4-SB-0-2				AOI-1-5-SB-0-2				AOI-1-6-SB-0-2				AOI 1-16-SS-0-2			
Sample Date		05/09/2019				05/09/2019				05/10/2019				05/10/2019				05/08/2019				05/09/2019				11/06/2019			
Depth		0 - 2 ft				0 - 2 ft				0 - 2 ft				0 - 2 ft				0 - 2 ft				0 - 2 ft				0 - 2 ft			
Analyte	OSD Screening Level [a]	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual
Soil, PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ug/Kg)																													
6:2 FTS	-	<	0.470	1.17	U	<	0.443	1.11	U	<	0.442	1.10	U	<	0.450	1.13	U	<	0.445	1.11	U	<	0.436	1.09	U	<	0.491	1.23	U
8:2 FTS	-	<	0.470	1.17	U	<	0.443	1.11	U	<	0.442	1.10	U	<	0.450	1.13	U	<	0.445	1.11	U	<	0.436	1.09	U	<	0.491	1.23	U
NEtFOSAA	-	<	0.470	1.17	U	<	0.443	1.11	U	<	0.442	1.10	U	<	0.450	1.13	U	0.030	0.445	1.11	J	<	0.436	1.09	U	<	0.491	1.23	U
NMeFOSAA	-	<	0.470	1.17	U	<	0.443	1.11	U	0.00530	0.442	1.10	J	<	0.450	1.13	U	0.028	0.445	1.11	J	<	0.436	1.09	U	<	0.491	1.23	U
PFBA	-	0.129	0.470	1.17	J	0.116	0.443	1.11	J	0.046	0.442	1.10	J	0.204	0.450	1.13	J	0.098	0.445	1.11	J	0.051	0.436	1.09	J	<	0.491	1.23	U
PFBS	130000	0.00424	0.470	1.17	J	<	0.443	1.11	U	<	0.442	1.10	U	<	0.450	1.13	U	<	0.445	1.11	U	<	0.436	1.09	U	<	0.491	1.23	U
PFDA	-	<	0.470	1.17	U	0.031	0.443	1.11	J	<	0.442	1.10	U	0.045	0.450	1.13	J	<	0.445	1.11	U	<	0.436	1.09	U	<	0.491	1.23	U
PFDoA	-	<	0.470	1.17	U	<	0.443	1.11	U	<	0.442	1.10	U	<	0.450	1.13	U	<	0.445	1.11	U	<	0.436	1.09	U	<	0.491	1.23	U
PFHpA	-	<	0.470	1.17	U	0.057	0.443	1.11	J	0.011	0.442	1.10	J	0.056	0.450	1.13	J	0.057	0.445	1.11	J	0.027	0.436	1.09	J	<	0.491	1.23	U
PFHxA	-	0.044	0.470	1.17	J	0.085	0.443	1.11	J	0.043	0.442	1.10	J	0.105	0.450	1.13	J	0.078	0.445	1.11	J	0.048	0.436	1.09	J	<	0.491	1.23	U
PFHxS	-	<	0.470	1.17	U	<	0.443	1.11	U	<	0.442	1.10	U	0.043	0.450	1.13	J	<	0.445	1.11	U	0.032	0.436	1.09	J	0.213	0.491	1.23	J
PFNA	-	<	0.470	1.17	U	0.052	0.443	1.11	J	<	0.442	1.10	U	0.097	0.450	1.13	J	0.152	0.445	1.11	J	<	0.436	1.09	U	<	0.491	1.23	U
PFOA	130	0.015	0.470	1.17	J	0.123	0.443	1.11	J	0.018	0.442	1.10	J	0.157	0.450	1.13	J	0.171	0.445	1.11	J	0.039	0.436	1.09	J	<	0.491	1.23	U
PFOS	130	<	0.470	1.17	U	0.936	0.443	1.11	J	0.033	0.442	1.10	J	0.444	0.450	1.13	J	2.22	0.445	1.11	J+	0.032	0.436	1.09	J	0.802	0.491	1.23	J
PFPeA	-	<	0.470	1.17	U	<	0.443	1.11	U	<	0.442	1.10	U	<	0.450	1.13	U	<	0.445	1.11	U	<	0.436	1.09	U	<	0.491	1.23	U
PFTeDA	-	<	0.470	1.17	U	<	0.443	1.11	U	<	0.442	1.10	U	<	0.450	1.13	U	<	0.445	1.11	U	<	0.436	1.09	U	<	0.491	1.23	U
PFTrDA	-	<	0.470	1.17	U	<	0.443	1.11	U	<	0.442	1.10	U	<	0.450	1.13	U	<	0.445	1.11	U	<	0.436	1.09	U	<	0.491	1.23	U
PFUnDA	-	0.00519	0.470	1.17	J	0.019	0.443	1.11	J	<	0.442	1.10	U	0.031	0.450	1.13	J	0.012	0.445	1.11	J	<	0.436	1.09	U	<	0.491	1.23	U

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, 2019. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 October 2019. Soil screening levels based on residential scenario for direct ingestion of contaminated soil.

Interpreted Qualifiers

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J+ = Estimated concentration, biased high

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

Acronyms and Abbreviations

AOI	Area of Interest
D	Duplicate
ft	feet
HQ	Hazard quotient
LCMSMS	Liquid Chromatography Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
OSD	Office of the Secretary of Defense
QSM	Quality Systems Manual
Qual	Interpreted Qualifier
SB	Soil boring
SS	Surface Soil
USEPA	United States Environmental Protection Agency
ug/Kg	micrograms per Kilogram
-	Not applicable
<	analyte not detected above the LOD

Appendix G Laboratory Data
Surface Soil
Site Inspection Report, Grand Ledge AASF and Armory

Area of Interest		AOI1																				AOI2							
Sample ID		AOI 1-17-SS-0-2				AOI 1-18-SS-0-2				AOI 1-18-SS-0-2D				AOI 1-19-SS-0-2				AOI 1-20-SS-0-2				AOI-2-1-SB-0-2				AOI-2-2-SB-0-2			
Sample Date		11/06/2019				11/06/2019				11/06/2019				11/06/2019				11/06/2019				05/09/2019				05/09/2019			
Depth		0 - 2 ft				0 - 2 ft				0 - 2 ft				0 - 2 ft				0 - 2 ft				0 - 2 ft				0 - 2 ft			
Analyte	OSD Screening Level [a]	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual
Soil, PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ug/Kg)																													
6:2 FTS	-	<	0.476	1.19	U	<	0.471	1.18	U	<	0.474	1.18	U	<	0.503	1.26	U	<	0.467	1.17	U	<	0.469	1.17	U	<	0.440	1.10	U
8:2 FTS	-	<	0.476	1.19	U	<	0.471	1.18	U	<	0.474	1.18	U	<	0.503	1.26	U	<	0.467	1.17	U	<	0.469	1.17	U	<	0.440	1.10	U
NEtFOSAA	-	<	0.476	1.19	U	<	0.471	1.18	U	<	0.474	1.18	U	<	0.503	1.26	U	<	0.467	1.17	U	<	0.469	1.17	U	0.026	0.440	1.10	J
NMeFOSAA	-	<	0.476	1.19	U	<	0.471	1.18	U	<	0.474	1.18	U	<	0.503	1.26	U	<	0.467	1.17	U	<	0.469	1.17	U	<	0.440	1.10	U
PFBA	-	<	0.476	1.19	U	<	0.471	1.18	U	<	0.474	1.18	U	0.186	0.503	1.26	J	<	0.467	1.17	U	0.095	0.469	1.17	J	0.046	0.440	1.10	J
PFBS	130000	<	0.476	1.19	U	<	0.471	1.18	U	<	0.474	1.18	U	<	0.503	1.26	U	<	0.467	1.17	U	0.014	0.469	1.17	J	<	0.440	1.10	U
PFDA	-	<	0.476	1.19	U	<	0.471	1.18	U	<	0.474	1.18	U	<	0.503	1.26	U	<	0.467	1.17	U	<	0.469	1.17	U	0.018	0.440	1.10	J
PFDoA	-	<	0.476	1.19	U	<	0.471	1.18	U	<	0.474	1.18	U	<	0.503	1.26	U	<	0.467	1.17	U	<	0.469	1.17	U	<	0.440	1.10	U
PFHpA	-	<	0.476	1.19	U	<	0.471	1.18	U	<	0.474	1.18	U	0.225	0.503	1.26	J	<	0.467	1.17	U	0.045	0.469	1.17	J	<	0.440	1.10	U
PFHxA	-	0.282	0.476	1.19	J	0.209	0.471	1.18	J	<	0.474	1.18	U	0.492	0.503	1.26	J	0.237	0.467	1.17	J	0.094	0.469	1.17	J	<	0.440	1.10	U
PFHxS	-	1.09	0.476	1.19	J	0.223	0.471	1.18	J	0.216	0.474	1.18	J	2.01	0.503	1.26		0.372	0.467	1.17	J	0.041	0.469	1.17	J	<	0.440	1.10	U
PFNA	-	<	0.476	1.19	U	0.113	0.471	1.18	J	<	0.474	1.18	U	0.175	0.503	1.26	J	<	0.467	1.17	U	0.029	0.469	1.17	J	<	0.440	1.10	U
PFOA	130	0.212	0.476	1.19	J	0.182	0.471	1.18	J	0.181	0.474	1.18	J	0.331	0.503	1.26	J	<	0.467	1.17	U	0.117	0.469	1.17	J	<	0.440	1.10	U
PFOS	130	4.27	0.476	1.19		3.62	0.471	1.18		2.73	0.474	1.18		11.0	0.503	1.26		1.09	0.467	1.17	J	0.486	0.469	1.17	J	<	0.440	1.10	U
PFPeA	-	<	0.476	1.19	U	<	0.471	1.18	U	<	0.474	1.18	U	<	1.26	1.26	U	<	0.467	1.17	U	0.078	0.469	1.17	J	<	0.440	1.10	U
PFTeDA	-	<	0.476	1.19	U	<	0.471	1.18	U	<	0.474	1.18	U	<	0.503	1.26	U	<	0.467	1.17	U	0.019	0.469	1.17	J	<	0.440	1.10	U
PFTrDA	-	<	0.476	1.19	U	<	0.471	1.18	U	<	0.474	1.18	U	<	0.503	1.26	U	<	0.467	1.17	U	<	0.469	1.17	U	<	0.440	1.10	U
PFUnDA	-	<	0.476	1.19	U	<	0.471	1.18	U	<	0.474	1.18	U	<	0.503	1.26	U	<	0.467	1.17	U	0.016	0.469	1.17	J	<	0.440	1.10	U

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

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PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFTeDA	perfluorotetradecanoic acid
PFTrDA	perfluorotridecanoic acid
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OSD	Office of the Secretary of Defense
QSM	Quality Systems Manual
Qual	Interpreted Qualifier
SB	Soil boring
SS	Surface Soil
USEPA	United States Environmental Protection Agency
ug/Kg	micrograms per Kilogram
-	Not applicable
<	analyte not detected above the LOD

	Area of Interest	AOI2			
	Sample ID	AOI-2-3-SB-0-2			
	Sample Date	05/09/2019			
	Depth	0 - 2 ft			
Analyte	OSD Screening Level [a]	Result	LOD	LOQ	Qual
Soil, PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ug/Kg)					
6:2 FTS	-	<	0.451	1.13	U
8:2 FTS	-	<	0.451	1.13	U
NEtFOSAA	-	<	0.451	1.13	U
NMeFOSAA	-	<	0.451	1.13	U
PFBA	-	0.110	0.451	1.13	J
PFBS	130000	0.011	0.451	1.13	J
PFDA	-	0.028	0.451	1.13	J
PFDoA	-	<	0.451	1.13	U
PFHpA	-	0.028	0.451	1.13	J
PFHxA	-	0.056	0.451	1.13	J
PFHxS	-	0.011	0.451	1.13	J
PFNA	-	0.048	0.451	1.13	J
PFOA	130	0.069	0.451	1.13	J
PFOS	130	0.175	0.451	1.13	J
PFPeA	-	<	0.451	1.13	U
PFTeDA	-	<	0.451	1.13	U
PFTrDA	-	0.014	0.451	1.13	J
PFUnDA	-	0.018	0.451	1.13	J

Grey Fill — Detected concentration exceeded OSD Screening Levels

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a. Assistant Secretary of Defense, 2019. Risk Based Screening Levels Calculated for PFOS, PFOA, PFBS in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1. 15 October 2019. Soil screening levels based on residential scenario for direct ingestion of contaminated soil.

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NMeFOSAA	N-methyl perfluorooctanesulfonamidoacetic acid
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFTeDA	perfluorotetradecanoic acid
PFTrDA	perfluorotridecanoic acid
PFUnDA	perfluoro-n-undecanoic acid

Acronyms and Abbreviations

AOI	Area of Interest
D	Duplicate
ft	feet
HQ	Hazard quotient
LCMSMS	Liquid Chromatography Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
OSD	Office of the Secretary of Defense
QSM	Quality Systems Manual
Qual	Interpreted Qualifier
SB	Soil boring
SS	Surface Soil
USEPA	United States Environmental Protection Agency
ug/Kg	micrograms per Kilogram
-	Not applicable
<	analyte not detected above the LOD

Appendix G Laboratory Data
Surface Water
Site Inspection Report, Grand Ledge AASF and Armory

Area of Interest	AOI1																											
Sample ID	AOI-1-7-SW-0-1				AOI-1-7-SW-0-1-DUP				AOI-1-8-SW-0-1				AOI-1-9-SW-0-1				AOI 1-21-SW-0-0.5				AOI1-21-SW-0-0.5				AOI 1-22-SW-0-0.5			
Sample Date	05/07/2019				05/07/2019				05/07/2019				05/07/2019				11/05/2019				11/21/2019				11/05/2019			
Analyte	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual
Water, PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ng/L)																												
6:2 FTS	143	3.33	8.33		146	3.33	8.33		<	3.33	8.33	U	35.5	3.33	8.33		10.1	3.33	8.33		27.9	3.33	8.33	J+	189	3.33	8.33	
8:2 FTS	7.99	3.33	8.33	J	9.64	3.33	8.33		<	3.33	8.33	U	7.64	3.33	8.33	J	<	3.33	8.33	U	3.14	3.33	8.33	J+	2.89	3.33	8.33	J
NEtFOSAA	<	6.67	8.33	U	<	6.67	8.33	U	<	6.67	8.33	U	<	6.67	8.33	U	<	6.67	8.33	U	<	6.67	8.33	U	<	6.67	8.33	U
NMeFOSAA	<	6.67	8.33	U	<	6.67	8.33	U	<	6.67	8.33	U	<	6.67	8.33	U	<	6.67	8.33	U	<	6.67	8.33	U	<	6.67	8.33	U
PFBA	16.0	3.33	8.33		17.3	3.33	8.33		19.8	3.33	8.33	J-	9.28	3.33	8.33	J+	14.1	3.33	8.33		18.6	3.33	8.33		20.0	3.33	8.33	
PFBS	3.39	3.33	8.33	J	3.87	3.33	8.33	J	6.66	3.33	8.33	J	1.82	3.33	8.33	J	6.22	3.33	8.33	J	3.56	3.33	8.33	J	3.75	3.33	8.33	J
PFDA	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	5.54	3.33	8.33	J	<	3.33	8.33	U
PFDoA	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	UJ	<	3.33	8.33	U	<	3.33	8.33	UJ	<	3.33	8.33	U	<	3.33	8.33	U
PFHpA	18.2	3.33	8.33		18.6	3.33	8.33		<	3.33	8.33	U	4.85	3.33	8.33	J	18.9	3.33	8.33		23.1	3.33	8.33		24.0	3.33	8.33	
PFHxA	34.1	3.33	8.33		35.2	3.33	8.33		7.34	3.33	8.33	J	11.2	3.33	8.33		43.4	3.33	8.33		50.1	3.33	8.33		44.2	3.33	8.33	
PFHxS	19.5	3.33	8.33		19.0	3.33	8.33		12.6	3.33	8.33		18.1	3.33	8.33		17.7	3.33	8.33		13.2	3.33	8.33		23.5	3.33	8.33	
PFNA	1.44	3.33	8.33	J	1.84	3.33	8.33	J	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	2.72	3.33	8.33	J	<	1.57	8.33	U
PFOA	10.6	3.33	8.33		10.8	3.33	8.33		1.64	3.33	8.33	J	5.59	3.33	8.33	J	8.69	3.33	8.33		20.5	3.33	8.33		12.5	3.33	8.33	
PFOS	21.2	3.33	8.33		20.6	3.33	8.33		4.66	3.33	8.33	J	141	3.33	8.33		<	10.9	8.33	U	16.3	3.33	8.33	J+	19.0	3.33	8.33	
PFPeA	58.0	3.33	8.33		60.2	3.33	8.33		4.05	3.33	8.33	J	8.29	3.33	8.33	J	97.2	3.33	8.33		101	3.33	8.33		81.6	3.33	8.33	
PFTeDA	<	3.33	8.33	UJ	<	3.33	8.33	U	<	3.33	8.33	UJ	<	3.33	8.33	U	<	3.33	8.33	UJ	<	3.33	8.33	U	<	3.33	8.33	UJ
PFTrDA	<	3.33	8.33	UJ	<	3.33	8.33	U	<	3.33	8.33	UJ	<	3.33	8.33	U	<	3.33	8.33	UJ	<	3.33	8.33	U	<	3.33	8.33	UJ
PFUnDA	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U	<	3.33	8.33	U

Interpreted Qualifiers

J = Estimated concentration

J- = Estimated concentration, biased low

J+ = Estimated concentration, biased high

U = The analyte was not detected at a level greater than or equal to the adjusted detection limit (DL)

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

Chemical Abbreviations

6:2 FTS	6:2 fluorotelomer sulfonate
8:2 FTS	8:2 fluorotelomer sulfonate
NEtFOSAA	N-ethyl perfluorooctane- sulfonamidoacetic acid
NMeFOSAA	N-methyl perfluorooctanesulfonamidoacetic acid
PFBA	perfluorobutanoic acid
PFBS	perfluorobutanesulfonic acid
PFDA	perfluorodecanoic acid
PFDoA	perfluorododecanoic acid
PFHpA	perfluoroheptanoic acid
PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
PFTeDA	perfluorotetradecanoic acid
PFTrDA	perfluorotridecanoic acid
PFUnDA	perfluoro-n-undecanoic acid

Acronyms and Abbreviations

AOI	Area of Interest
D/DUP	Duplicate
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
QSM	Quality Systems Manual
Qual	Interpreted Qualifier
ng/L	nanogram per liter
SW	Surface water
<	analyte not detected above the LOD

Appendix G Laboratory Data
Surface Water
Site Inspection Report, Grand Ledge AASF and Armory

Area of Interest	AOI1																							
Sample ID	AOI 1-22-SW-0-0.5D				AOI1-22-SW-0-0.5				AOI 1-23-SW-0-0.5				AOI1-23-SW-0-0.5				AOI 1-24-SW-0-0.5				AOI1-24-SW-0-0.5			
Sample Date	11/05/2019				11/21/2019				11/05/2019				11/21/2019				11/05/2019				11/21/2019			
Analyte	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual	Result	LOD	LOQ	Qual
Water, PFAS by LCMSMS Compliant with QSM 5.1 Table B-15 (ng/L)																								
6:2 FTS	201	3.33	8.33		15.8	3.33	8.33	J+	122	16.7	41.7		17.7	3.33	8.33	J+	<	16.7	41.7	U	<	3.33	8.33	U
8:2 FTS	3.23	3.33	8.33	J	<	3.33	8.33	U	20.8	16.7	41.7	J	9.35	3.33	8.33	J+	<	16.7	41.7	U	<	3.33	8.33	U
NEtFOSAA	<	6.67	8.33	UJ	<	6.67	8.33	U	<	33.3	41.7	U	<	6.67	8.33	U	<	33.3	41.7	UJ	<	6.67	8.33	U
NMeFOSAA	<	6.67	8.33	U	<	6.67	8.33	U	<	33.3	41.7	U	<	6.67	8.33	U	<	33.3	41.7	U	<	6.67	8.33	U
PFBA	20.5	3.33	8.33		3.63	3.33	8.33	J	26.0	16.7	41.7	J-	3.05	3.33	8.33	J	<	16.7	41.7	U	4.06	3.33	8.33	J
PFBS	4.10	3.33	8.33	J	<	3.33	8.33	U	<	16.7	41.7	U	<	3.33	8.33	U	<	16.7	41.7	U	1.41	3.33	8.33	J
PFDA	<	3.33	8.33	U	<	3.33	8.33	U	<	16.7	41.7	U	1.53	3.33	8.33	J	<	16.7	41.7	U	3.51	3.33	8.33	J
PFDoA	<	3.33	8.33	UJ	<	3.33	8.33	U	<	16.7	41.7	U	<	3.33	8.33	U	<	16.7	41.7	UJ	<	3.33	8.33	U
PFHpA	23.2	3.33	8.33		3.29	3.33	8.33	J	34.8	16.7	41.7	J-	2.07	3.33	8.33	J	<	16.7	41.7	U	<	3.33	8.33	U
PFHxA	45.6	3.33	8.33		6.78	3.33	8.33	J	43.4	16.7	41.7	J+	4.45	3.33	8.33	J	<	16.7	41.7	U	2.49	3.33	8.33	J
PFHxS	27.3	3.33	8.33		3.56	3.33	8.33	J	45.1	16.7	41.7		4.64	3.33	8.33	J	8.95	16.7	41.7	J	3.33	3.33	8.33	J
PFNA	<	3.33	8.33	U	<	3.33	8.33	U	<	16.7	41.7	U	<	3.33	8.33	U	7.48	16.7	41.7	J	<	3.33	8.33	U
PFOA	13.2	3.33	8.33		1.85	3.33	8.33	J	17.0	16.7	41.7	J	2.05	3.33	8.33	J	<	16.7	41.7	U	<	3.33	8.33	U
PFOS	23.2	3.33	8.33		<	8.33	8.33	U	283	16.7	41.7	J+	51.1	3.33	8.33	J+	53.2	16.7	41.7		<	8.33	8.33	U
PFPeA	76.2	3.33	8.33		8.64	3.33	8.33		82.4	16.7	41.7		2.09	3.33	8.33	J	<	16.7	41.7	U	<	3.33	8.33	U
PFTeDA	<	3.33	8.33	UJ	3.14	3.33	8.33	J	<	16.7	41.7	U	<	3.33	8.33	U	<	16.7	41.7	UJ	<	3.33	8.33	U
PFTrDA	<	3.33	8.33	UJ	2.62	3.33	8.33	J	<	16.7	41.7	U	<	3.33	8.33	U	<	16.7	41.7	UJ	<	3.33	8.33	U
PFUnDA	<	3.33	8.33	UJ	<	3.33	8.33	U	8.79	16.7	41.7	J	<	3.33	8.33	U	<	16.7	41.7	U	<	3.33	8.33	U

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PFHxA	perfluorohexanoic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PFPeA	perfluoropentanoic acid
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LOQ	Limit of Quantitation
QSM	Quality Systems Manual
Qual	Interpreted Qualifier
ng/L	nanogram per liter
SW	Surface water
<	analyte not detected above the LOD

Appendix H
Laboratory Reports

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Due to file size, laboratory reports are provided electronically (CD) or can be requested.

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