



Former Naval Air Warfare Center (NAWC) Warminster

Technical Review Committee (TRC) Meeting

January 29, 2020

Outline



- Welcome
- Environmental Restoration Status
- Per- and polyfluoroalkyl substances (PFAS)
- Questions
- Closing remarks

Background Information



- A Technical Review Committee (TRC) is a stakeholder group that meets on a regular basis to discuss environmental restoration at a specific property that is either currently or was formerly owned by DoD, but where DoD oversees the environmental restoration process.
- TRCs enable people interested in the environmental cleanup at a specific installation to exchange information with representatives of regulatory agencies, the installation, and the community.
- TRCs may only address issues associated with environmental restoration activities.
- Health related issues are not addressed by the TRC. Health information links are provided at the end of the presentation.

Source: DoD RAB Rule Handbook

Environmental Restoration Program

Remedial Action Summary



- Operable Units 1A (OU-1A), 3 (OU-3) and 4 (OU-4) have LUCs and a groundwater extraction and treatment system to remove Volatile Organic Compounds (VOCs). The system extracts groundwater from areas A, C, and D and uses air stripping and granular activated carbon to process up to 202,000 gallons-per-day, or 140 gallons-per-minute (gpm). The treated water is discharged to a tributary of Little Neshaminy Creek.
- Operable Units 7 (OU-7) and 9 (OU-9) have land-use controls (LUCs) which are monitored annually.
- The remaining Operable Units - OU-1B, OU-2, OU-5, OU-6, and OU-8 - have no further action.

The remedies are operating properly and successfully.

Monitoring Activities and Reports Update



- Recent Monitoring Activities:
 - Fall 2019 groundwater sampling event performed in November 2019:
 - Area A – 24 wells sampled for select VOCs.
 - Area C – 13 wells sampled for select VOCs.
 - Area D – 9 wells sampled for select VOCs.
 - Area A, Area C, and Area D extraction wells sampled for select PFAS and Cr+6.
 - Analytical data pending. Report to follow.
- Planned Monitoring Activities:
 - Spring 2020 groundwater sampling event scheduled for May 2020.

Groundwater monitoring provides information to evaluate the protectiveness of the remedies.

Groundwater Treatment System



- Effective flowrates for November 2019: 115.3 gpm (gpm = gallons-per-minute)
 - 58.3 gpm from Area A
 - 24.4 gpm from Area C
 - 32.5 gpm from Area D
- Through November 2019, over 1.17 billion gallons of groundwater have been treated, removing over five thousand pounds of VOCs, since the treatment plant began operating in 1996.
- Beginning in 2014, additional extraction wells were turned on and new granular activated carbon was added to treat for PFOA and PFOS.

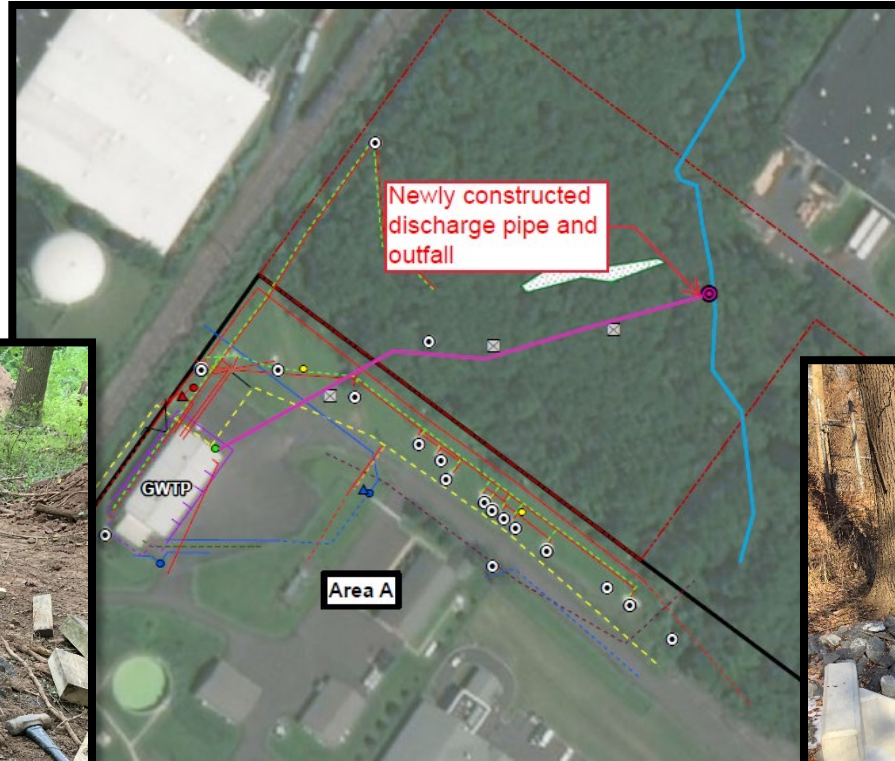
Additional information about the remedial actions and the Groundwater Treatment System can be found in BACKUP

Groundwater Treatment System Discharge Outfall



- Existing discharge pipe and outfall, discharging to tributary of Little Neshaminy, north of Bristol Road, created maintenance challenges.
- Work Plan approved by regulators in June 2019 to install new discharge pipe and relocate outfall to government-owned property adjacent to groundwater treatment plant.
- Construction of new discharge pipe and outfall completed in Fall 2019.
- Updated discharge permits are required before use of the new outfall. Draft application to be submitted to PADEP in February 2020.

Groundwater Treatment System Discharge Outfall



Per- and Poly-Fluoroalkyl Substances (PFAS)

Municipal Drinking Water Actions



- The Navy has established a cooperative agreement with Warminster Township Municipal Authority (WTMA) to provide treatment at municipal wells (#2, 10, 13, and 26) to remove PFOA/PFOS concentrations above the HA level of PFOA and PFOS. WTMA has finished construction on all four wells.
- The Navy has established cooperative agreements to provide municipal connections for private drinking water wells with groundwater exceeding the HA of PFOA and PFOS due to historical activities at former NAWC Warminster:
 - Warwick Township Water and Sewer Authority (WTWSA)
 - Northampton Bucks County Municipal Authority (NBCMA)
 - Warminster Township Municipal Authority (WTMA)
- Total funding provided is over \$18 million.

Private Drinking Water Well Sampling Area



Private drinking water well sampling for PFOA/PFOS and provision of bottled drinking water is being performed by Tetra Tech, a U.S. Navy contractor.

Point-of-contact is:

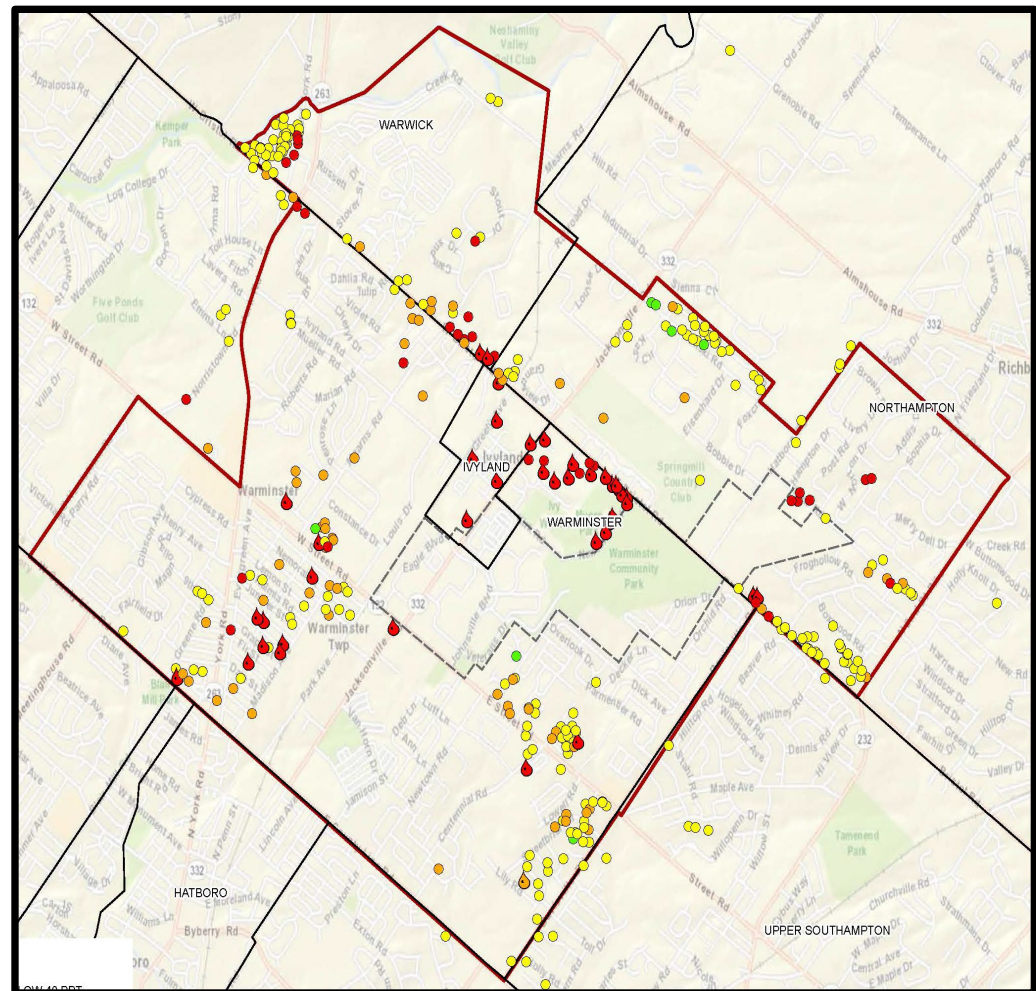
Tricia Moore

Tetra Tech Project Manager

tricia.moore@tetrattech.com

Phone: (610) 382-1171

Current figure available on Navy BRAC PMO website



LEGEND

- PFOA & PFOS BELOW DETECTION LIMITS
- SUM OF PFOA & PFOS CONCENTRATIONS AT OR BELOW 40 PPT
- SUM OF PFOA & PFOS CONCENTRATIONS BETWEEN 40 PPT AND 70 PPT
- SUM OF PFOA & PFOS CONCENTRATIONS ABOVE 70 PPT
- 💧 PUBLIC WATER CONNECTION (SOME NOT BY NAVY)

▭ SAMPLING AREA

▭ FORMER NAWC WARMINSTER

▭ TOWNSHIP BOUNDARY

Private Drinking Water Well Sampling



- The Navy is re-sampling most private drinking water wells, within the sampling area, that are not being regularly monitored.
 - Obtains updated information and to ensure protectiveness.
 - The wells closest to NAWC Warminster were sampled first.
 - Tetra Tech is contacting property owners to schedule sampling.
 - Re-sampling expected to complete in early 2020.

| Private well sampling summary | Current |
|--|---------|
| Private wells sampled for PFOA/PFOS | 369 |
| Private wells above lifetime HA (>70 ppt) | 73 |
| Private wells below HA/monitored (>40 ppt) | 62 |
| Private wells connected to municipal water by Navy | 44 |

Private Drinking Water Well PFAS Sampling (cont.)



PFAS Laboratory accreditation

- The Navy uses laboratories that are both accredited by the Department of Defense and Pennsylvania Department of Environmental Protection (PADEP) for EPA method 537, for drinking water.
- In September 2019, the laboratory was suspended by PADEP for method 537. Preliminary results from sampling from September 2019 through October 2019 did not show exceedances of the PFOA and PFOS LHA levels of 70 ppt.
- The Navy selected different laboratories, properly accredited with the new EPA method 537.1, in November 2019. The Navy will use EPA method 537.1 for all future sampling. The Navy is re-sampling private drinking water wells impacted by the suspended accreditation. A letter is being provided to impacted property owners.

For more information:

<https://www.epa.gov/pfas/epa-drinking-water-laboratory-method-537-qa>

<https://www.denix.osd.mil/edqw/accreditation/home/>

<https://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx>

Other Warminster / Warrington Township Private Wells



- Actions at public and private wells in Warrington Township and western Warminster Township, near the Horsham Air National Station, are addressed separately by the Air Force/ Air National Guard.
- Contact:
 - Mr. Keith Freihofer
 - Environmental Restoration Program Manager
 - 3501 Fetchet Ave - Shepperd Hall
 - Joint Base Andrews, MD 20762-5157
 - Phone (240) 612-8762
 - e-mail: keith.e.freihofer.civ@mail.mil

PFAS Remedial Investigation (RI) Action Background



- Sampling and analysis plans (SAP) and addendums prepared in 2015 – 2019. Plans are available in the administrative record.
- Surface water/sediment sampling – Oct 2016
- Groundwater sampling from existing wells – Apr/May 2017
- Surface water/sediment sampling – May 2017
- Soil sampling (within potential PFAS source areas) – Jun 2017

Additional information about NAWC Warminster PFAS RI investigation performed can be found in BACKUP

PFAS Remedial Investigation (RI) Actions Background (cont.)



- Inactive municipal production well profiling – Apr 2018 – Sep 2019
- Groundwater monitoring well installation – May 2018 – March 2019
- Groundwater sampling from Hazardous Sites Cleanup Act (HSCA) site monitoring wells – Aug 2018
- Supplemental soil sampling (within suspected PFAS source area) – Sep 2018
- Groundwater sampling from newly installed monitoring wells – March 2019

The NAWC Warminster PFAS RI data is available on the BRAC PMO website

PFAS RI – Additional Groundwater Well Sampling



- Inactive municipal production well profiling – USGS
 - Discrete sampling depths based on video logs and geophysical testing data
 - Between 4 and 9 zones sampled per well
 - Nine wells profiled to date; NAWC-10, NHBCMA-15, WMA-25, WMA-28, WMA-36, WTWSA-8, -9, -10, and -11
- Groundwater sampling from HSCA site monitoring wells
 - Railroad and Jacksonville TCE HSCA sites, located north of the NAWC, have wells used to monitor unrelated TCE plumes
 - Four well clusters (12 wells total) sampled after obtaining access agreements

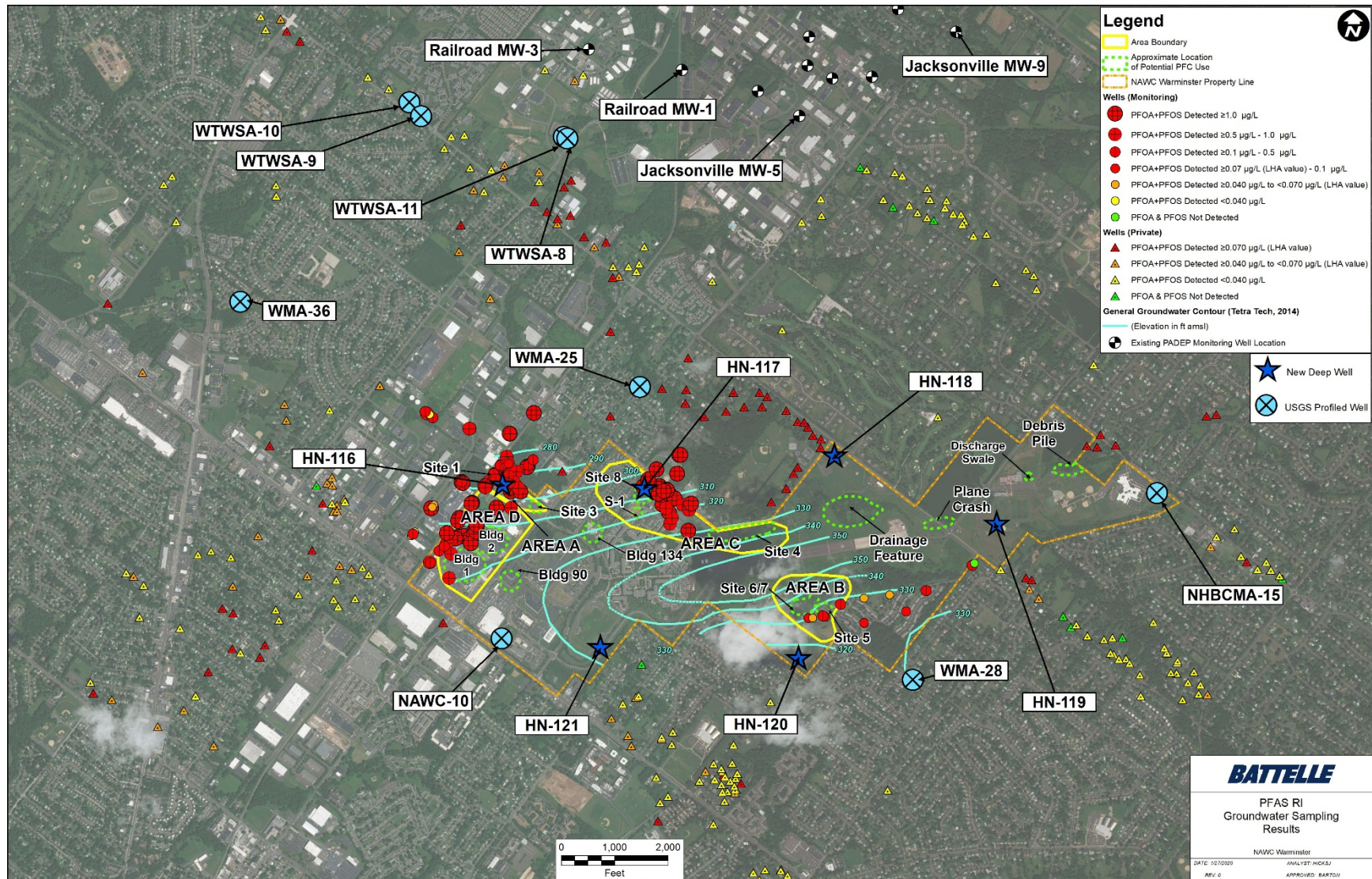
PFAS RI – New Groundwater Well Installation and Sampling



- On-Site deep groundwater monitoring well installation
 - Six (6) deep on-site wells were constructed to evaluate vertical and spatial PFAS distribution – total depth up to 600 feet, consistent with deepest former NAWC Warminster drinking water production wells
 - 21 total monitoring wells installed at six locations. Sampled for PFAS in March 2019
 - Results will be provided in RI report.

The groundwater sampling provides valuable data for understanding potential PFAS migration pathways and data gaps for future investigation.

PFAS RI – Groundwater Sample Locations



PFAS RI - Path Forward



- Draft Phase I RI report anticipated in late Spring or Early Summer 2020
- Further investigation, known as Phase II, expected to initiate in Fall 2020

PFAS Information and Resources



Department of the Navy (DON) Perfluorinated Compounds (PFC)/PFAS website

<http://www.secnave.navy.mil/eie/pages/pfc-pfas.aspx#>

NAVFAC BRAC PMO Websites (includes links to environmental information and the administrative record):

http://bracpmo.navy.mil/brac_bases/northeast/reserve_base_willow_grove/documents.html

http://bracpmo.navy.mil/brac_bases/northeast/former_warfare_center_warminster/documents.html

A subscription service is available on the BRAC PMO websites to receive e-mail notification of new information.

PFAS Information and Resources (continued)



Environmental Protection Agency

<https://www.epa.gov/pfas>

Agency for Toxic Substances and Disease Registry

<https://www.atsdr.cdc.gov/pfc/index.html>

Pennsylvania Department of Environmental Protection

http://www.dep.pa.gov/Citizens/My-Water/drinking_water/Pages/default.aspx

Horsham Township

<http://www.Horsham.org/default.aspx>

Warminster Township

<http://warminstertownship.org/information-on-perfluorinated-chemicals-pfoa-and-pfos/>

PFAS Information and Resources (continued)



Horsham Water and Sewer Authority

<https://www.horshamwater-sewer.com>

Warminster Township Municipal Authority

<https://www.warminsterauthority.com/>

Pennsylvania Department of Health

<http://www.health.pa.gov/My%20Health/Environmental%20Health/Pages/default.aspx>

Questions?



- Questions or comments from the TRC?
- Questions or comments from the community?
- Next Meetings
 - Summer 2020, time/date TBD
- Closing Remarks

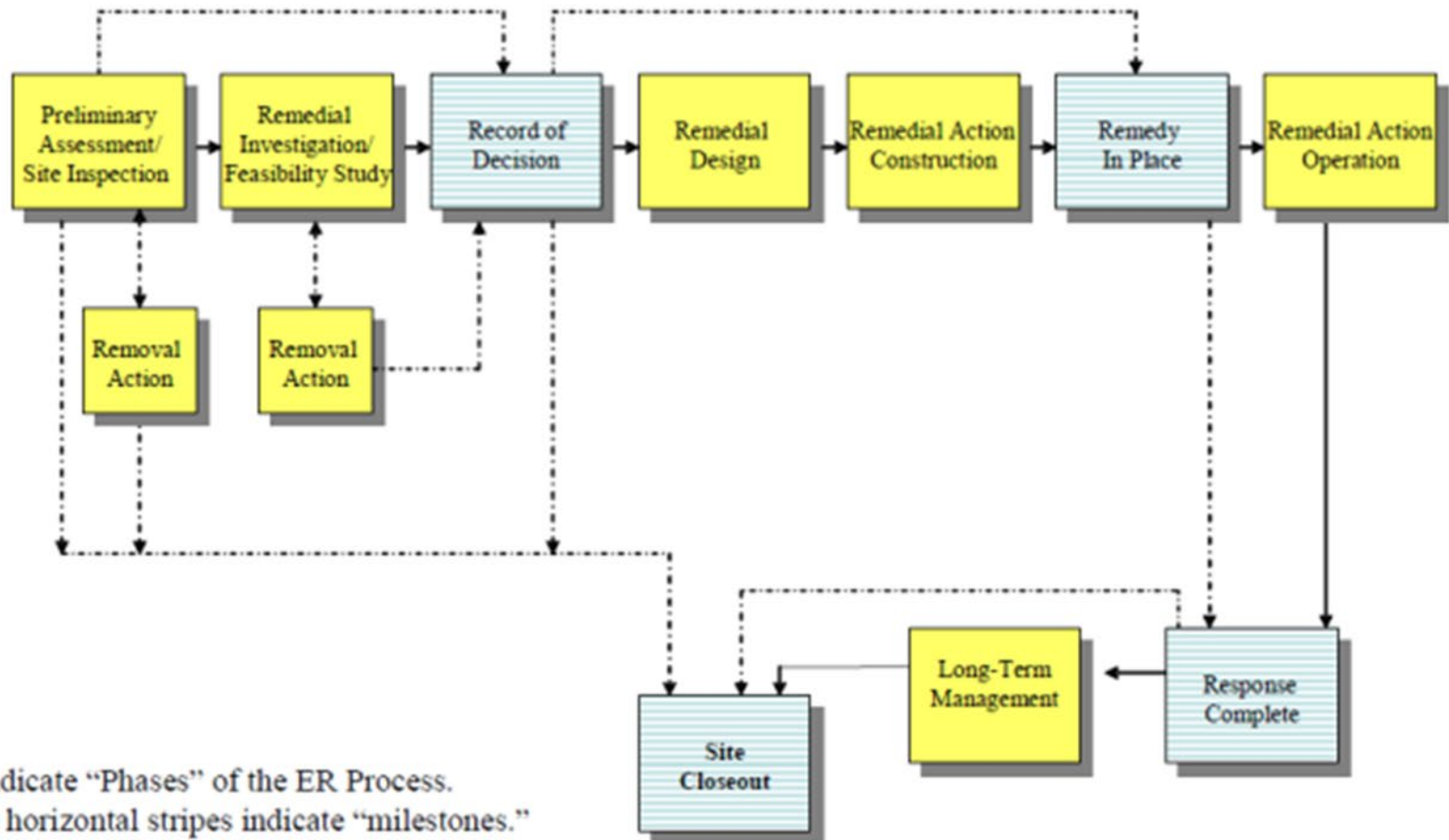
BACK UP / ADDITIONAL INFORMATION

NAWC Warminster History



- Originally site of Brewster Aeronautical Corporation, acquired by the U.S. Government in 1944.
- Designated Naval Air Development Center (NADC) in 1949
- Was also known as Johnsville Naval Air Station.
- Listed in National Priorities List (NPL) in 1989 as Naval Air Development Center Warminster (Eight Waste Areas)
- Became Naval Air Warfare Center (NAWC) in January 1993.
- Closed by Base Realignment and Closure (BRAC) in 1995.
- Operations ceased in 1997, Naval Facilities Engineering Command became responsible for property disposal and environmental restoration.
- All property transferred by 2000. Former housing areas, Jacksonville Road and Shenandoah Woods, transferred to NASJRB Willow Grove.

Environmental Restoration Program

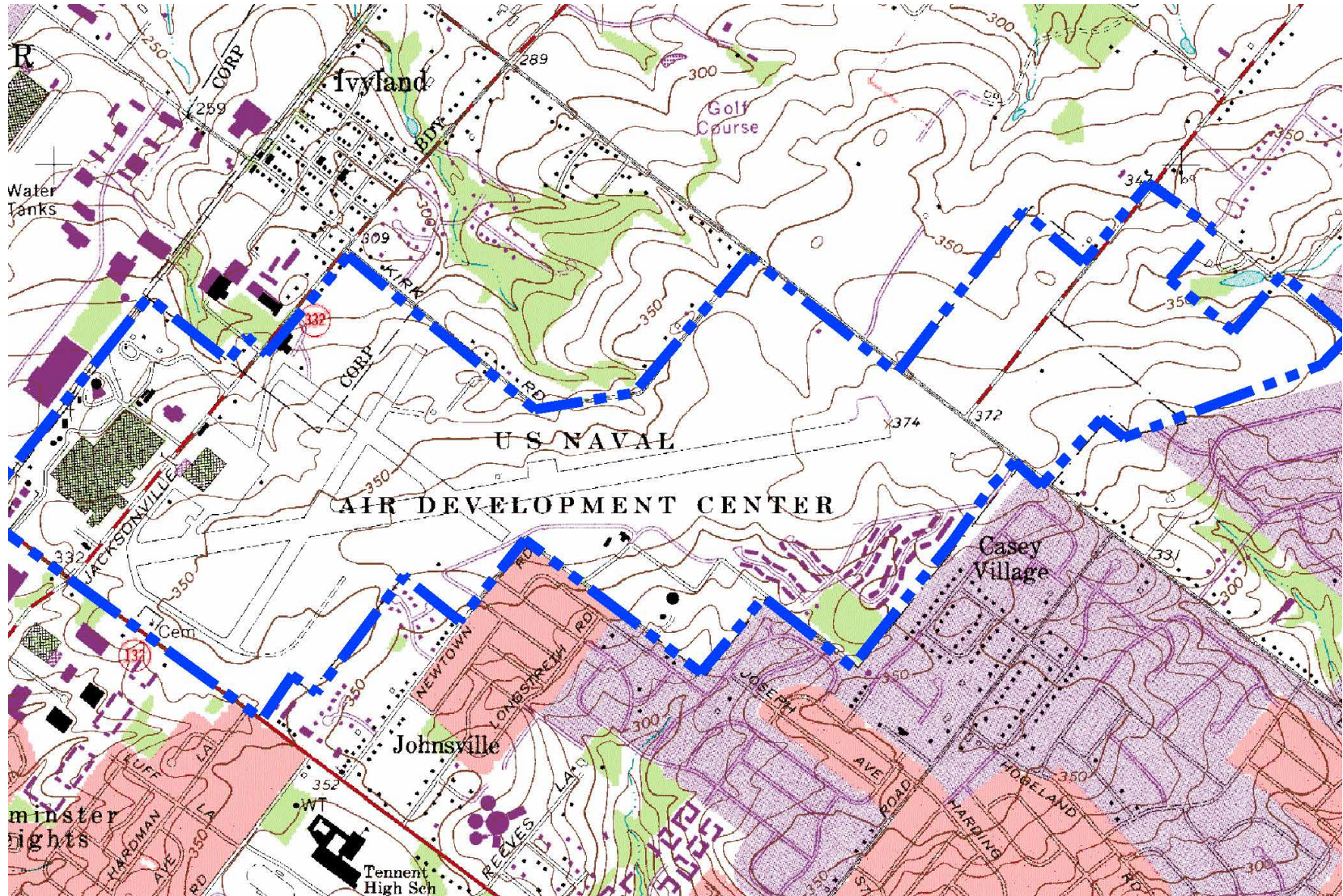


Notes:

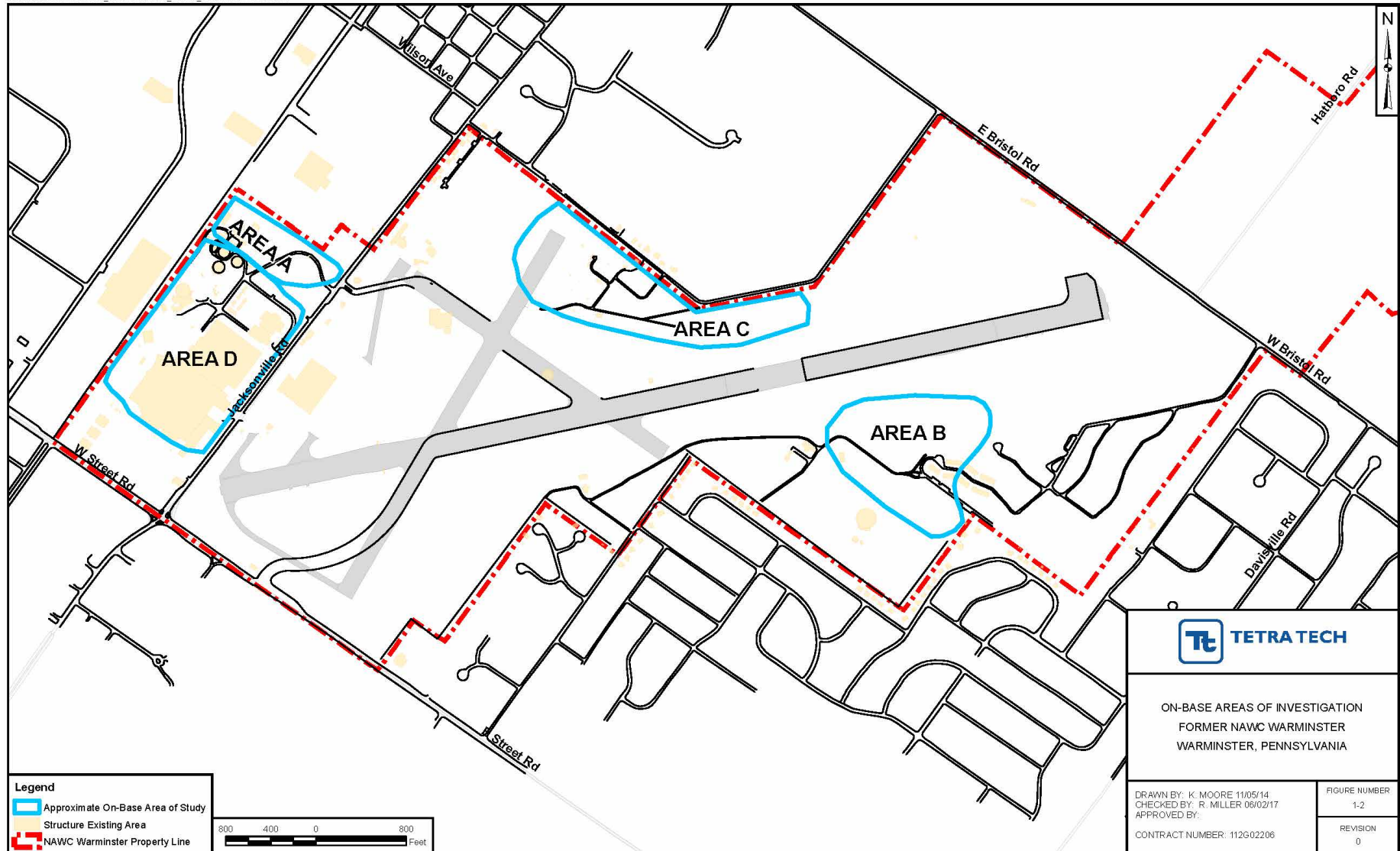
Yellow boxes indicate "Phases" of the ER Process.

Boxes with blue horizontal stripes indicate "milestones."

Environmental Restoration Site Location



Environmental Restoration Site Location



Environmental Restoration Sites



| AREA | SITES | OPERABLE UNITS | SITE DESCRIPTION | STATUS |
|------|------------------|---|--|--|
| A | 1 | OU-1A (Groundwater) OU-9 (Soil, sediment, surface water) | Waste disposal | Groundwater (OU-1A) ROD Sept. 2000 Soil (OU-9) ROD June 2000. |
| | 2 | OU-1A (Groundwater) OU-9 (Soil, sediment, surface water) | Sludge disposal pit | Groundwater (OU-1A) ROD Sept. 2000 Soil (OU-9) ROD June 2000. |
| | 3 | OU-1A (Groundwater) OU-9 (Soil, sediment, surface water) | Waste disposal | Groundwater (OU-1A) ROD Sept. 2000 Soil (OU-9) ROD June 2000. |
| | Impoundment Area | OU-1A (Groundwater) OU-9 (Soil, sediment, surface water) | Unlined wastewater sludge impoundment areas | Groundwater (OU-1A) ROD Sept. 2000 Soil (OU-9) ROD June 2000. |
| B | 5 | OU-1B (Groundwater) OU-10 (Soil, sediment, surface water) | Landfills | Groundwater (OU-1B) NFA ROD Sept. 2000 Soil (OU-10) NFA ROD signed Sept. 2000 |
| | 6 | OU-1B (Groundwater) OU-7 (Soils and wastes) | Waste disposal | Groundwater (OU-1B) NFA ROD Sept. 2000 Soil (OU-7) ROD signed June 2000 |
| | 7 | OU-1B (Groundwater) OU-7 (Soils and wastes) | Sludge disposal pit | Groundwater (OU-1B) NFA ROD Sept. 2000 Soil (OU-7) ROD signed June 2000 |
| | NA | OU-2 (Groundwater) | Off-base drinking water, Areas B and C | No ROD. Emergency action 1993-1994 |
| C | 4 | OU-3 (Groundwater) OU-6 (Soil, sediment, surface water) | Landfills | Groundwater (OU-3) ROD March 1995 OU-3 ESD Sept. 1999 Soil (OU-6) NFA ROD June 2000 |
| | 8 | OU-3 (Groundwater) OU-5 (Soil, sediment, Surface Water) | Fire Training Area | Groundwater (OU-3) ROD March 1995 OU-3 ESD Sept. 1999 Soil (OU-5) NFA ROD Sept. 1999 |
| D | NA | OU-4 (Groundwater) OU-8 (Soils) | Industrial Area | Groundwater (OU-4) ROD June 2000 Soil (OU-8) NFA ROD June 2000 |

Groundwater Treatment Plant Discharge Permits



- DRBC (Delaware River Basin Commission) Docket:
 - Docket renewal effective on 13 December 2017.
 - Valid for 5 years / mirrors NPDES (expires 2023).
- PADEP issued NPDES (National Pollutant Discharge Elimination System) permit:
 - Permit renewed on 1 August 2018. Removal of PFOA and PFOS to below 70 ppt is now required.
 - Valid for 5 years (expires 31 July 2023).

Monitoring Activities and Reports Update

- Fall 2019 LUC (Land-Use-Controls) Inspection:
 - On-site inspection completed on 6 November 2019.
 - No issues/ deficiencies observed during inspection.
 - Document search and LUC Report in progress.

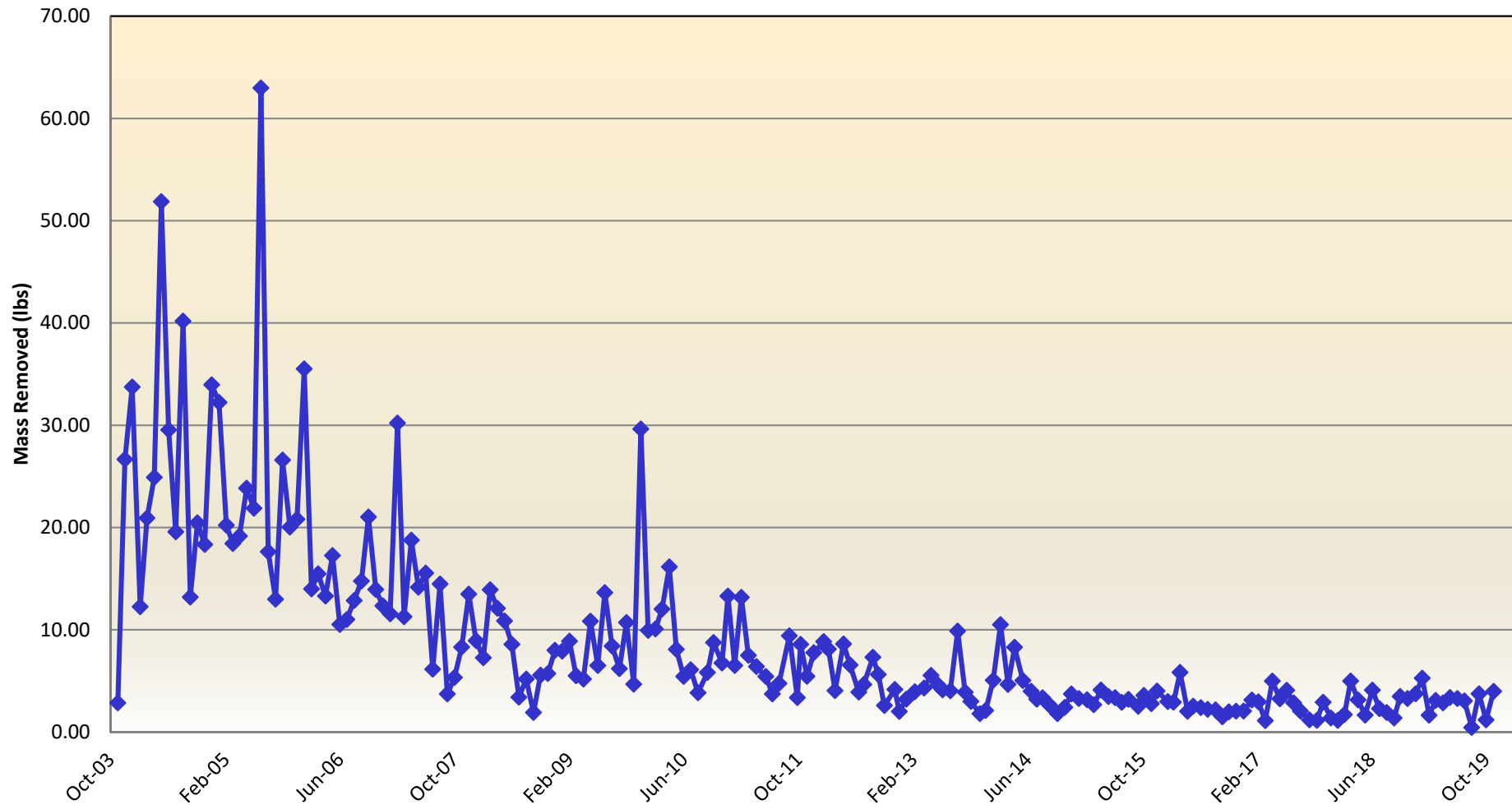


Treatment System – VOC Removal

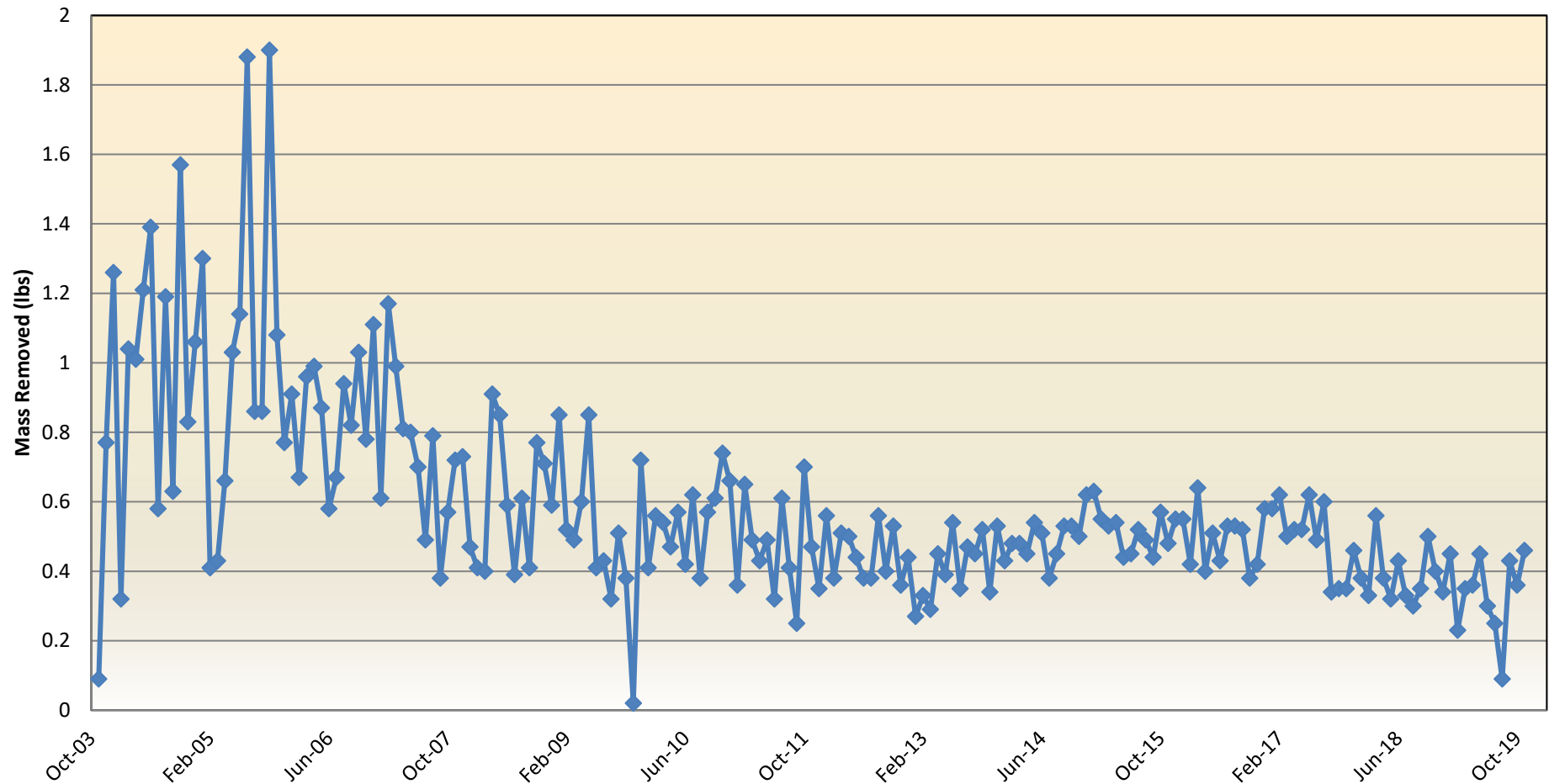


- Cumulative dissolved-phase VOC recovery through November 2019 reporting period (all Areas):
 - Trichloroethene (TCE) – 4,989 pounds (3.98 lbs in 11/19)
 - Tetrachloroethene (PCE) – 179 pounds (0.46 lbs in 11/19)
 - Carbon Tetrachloride (CCl₄) – 170 pounds (0.09 lbs in 11/19)
- Majority of VOC recovery is from Area A (3.96 lbs TCE, 0.36 lbs PCE, and 0.09 lbs CCl₄ in 11/19)
 - Remainder of TCE recovery from Area D (0.02 lbs in 11/19)
 - Remainder of PCE recovery from Area C (0.08 lbs in 11/19) and Area D (0.01 lbs in 11/19).

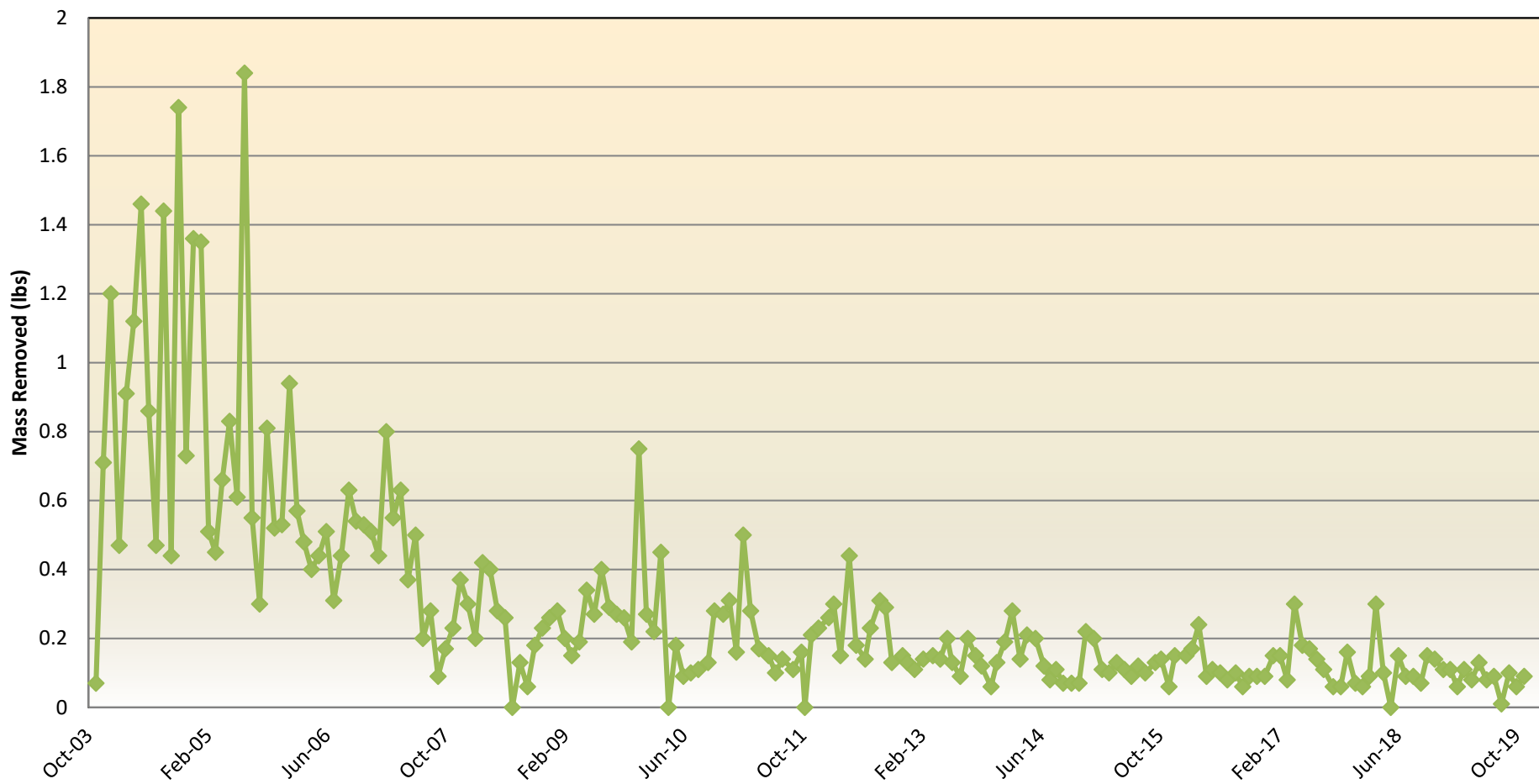
VOC Removal Evaluation – TCE Recovery Rate



VOC Removal Evaluation – PCE Recovery Rate



VOC Removal Evaluation - CCl₄ Recovery Rate



PFAS Background Information



- In mid-2014, PFAS known as Perfluorooctanoic Acid (PFOA) and Perfluorooctane Sulfonate (PFOS) were found in public drinking water wells near NAWC Warminster through an EPA program known as the Unregulated Contaminant Monitoring Rule (UCMR).
- The health advisory levels at that time were 0.4 micrograms per liter ($\mu\text{g/L}$), or 400 parts-per trillion (ppt), for PFOA and 0.2 $\mu\text{g/L}$, or 200 ppt, for PFOS.
- PFOA/PFOS are man-made chemicals found in a wide variety of consumer products and also in fire-fighting solution known as aqueous film-forming foam (AFFF), which was used at NAWC Warminster.
- In the summer of 2014, the Navy began sampling for PFOA/PFOS in private drinking water wells and worked with Warminster Municipal Authority (WTMA) on the municipal drinking water wells.

PFAS Background Information (continued)

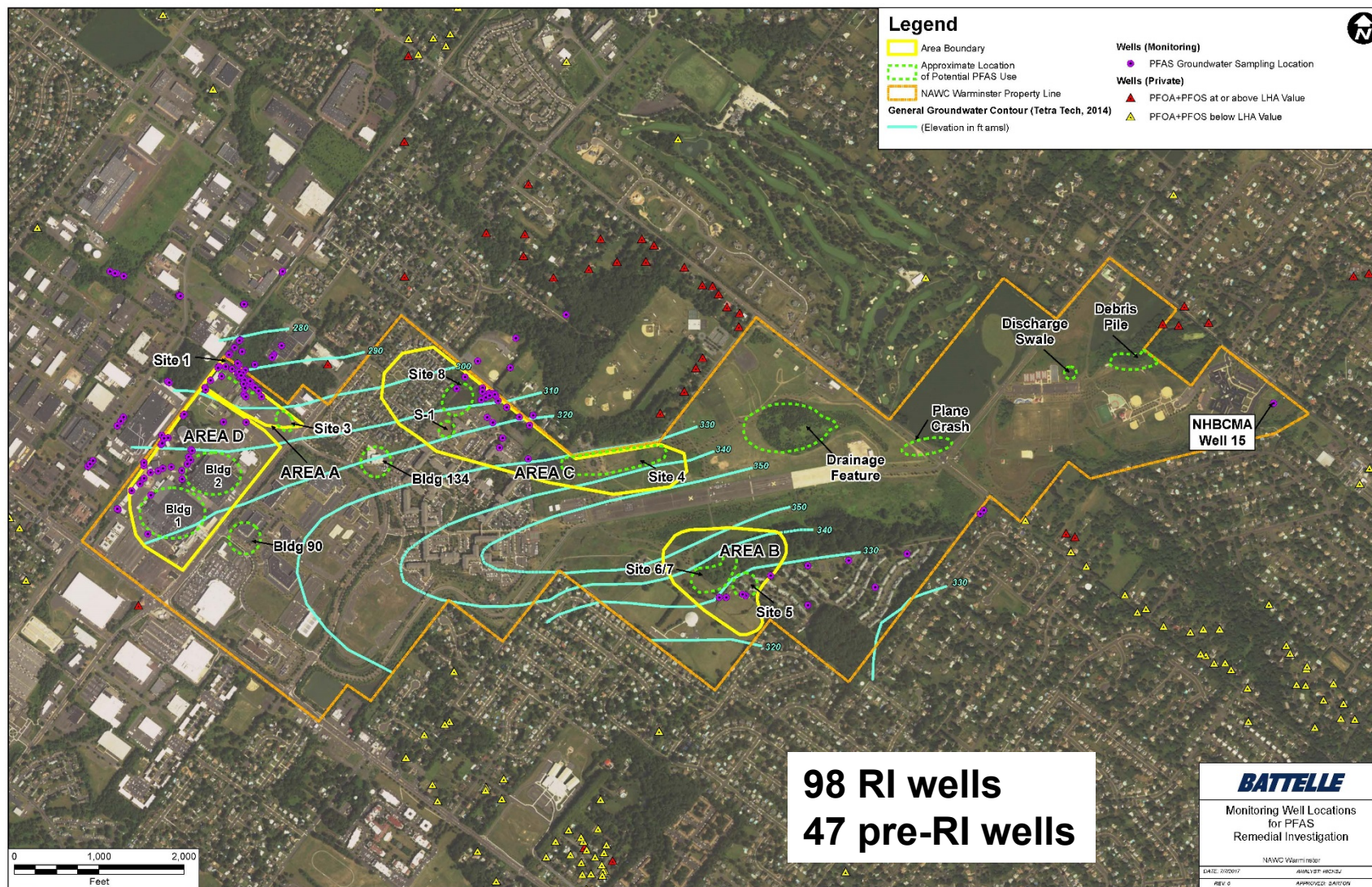


- In May 2016, the Environmental Protection Agency established a lifetime Drinking Water Health Advisory (HA) level of 70 parts-per-trillion (0.07 $\mu\text{g/L}$) for combined PFOA and PFOS.
- The Navy's priority continues to be eliminating exposure to PFOA/PFOS above health advisory levels in drinking water.
- Any health concerns should be addressed with your health professional. Health information weblinks are provided at the end of this presentation.

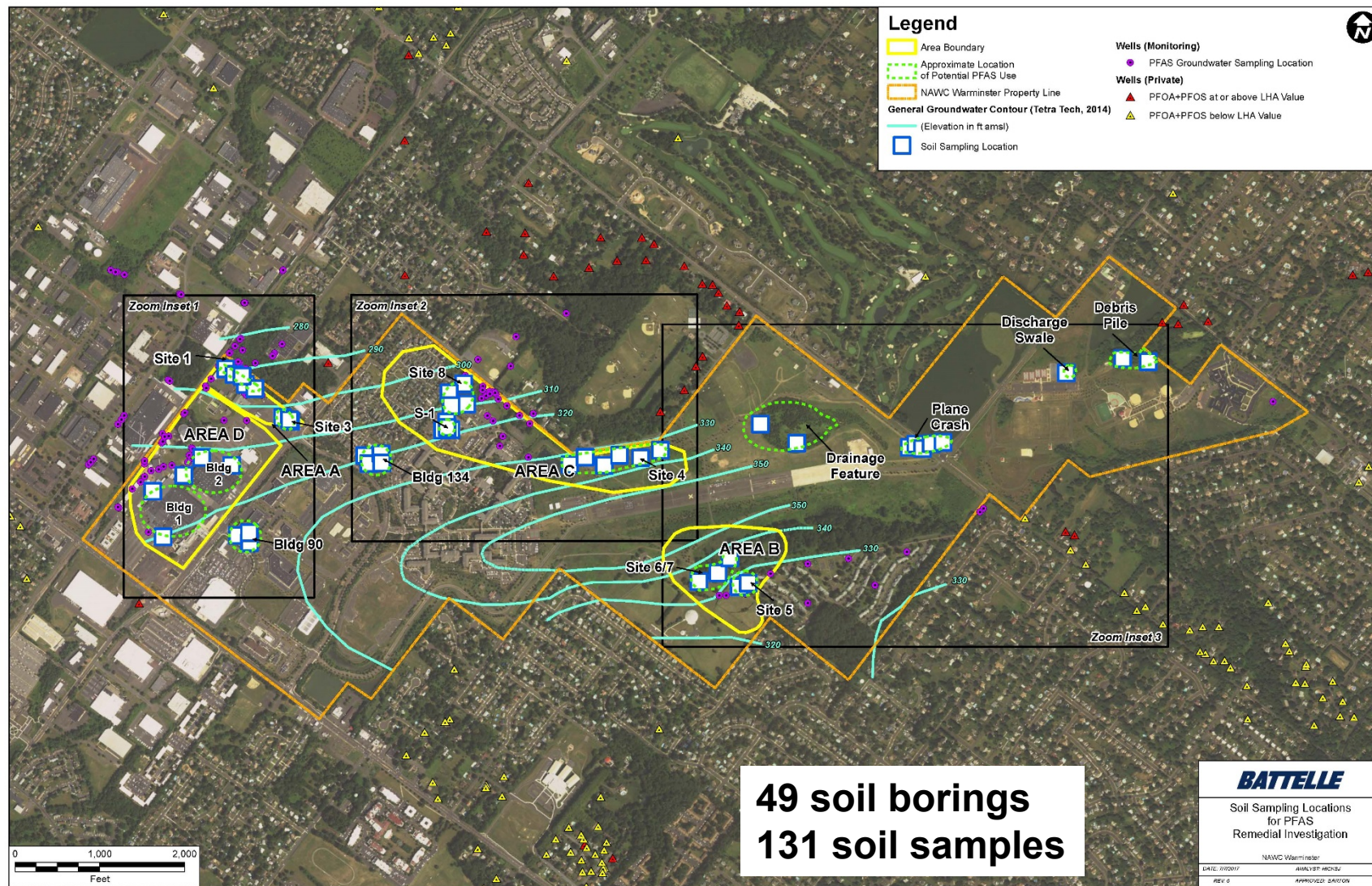
Warminster Potential PFAS Source Areas



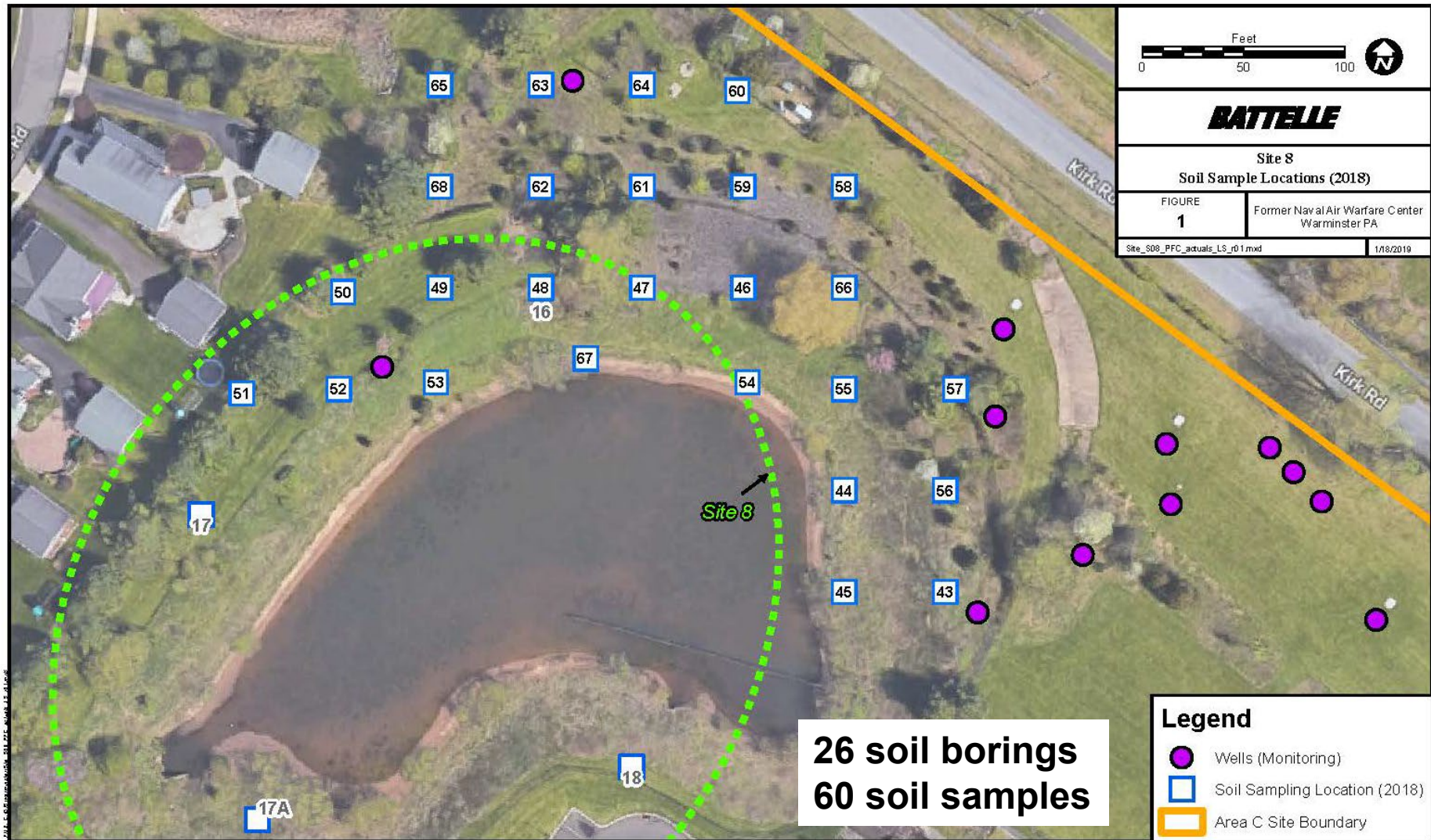
PFAS RI Groundwater Sampling Locations



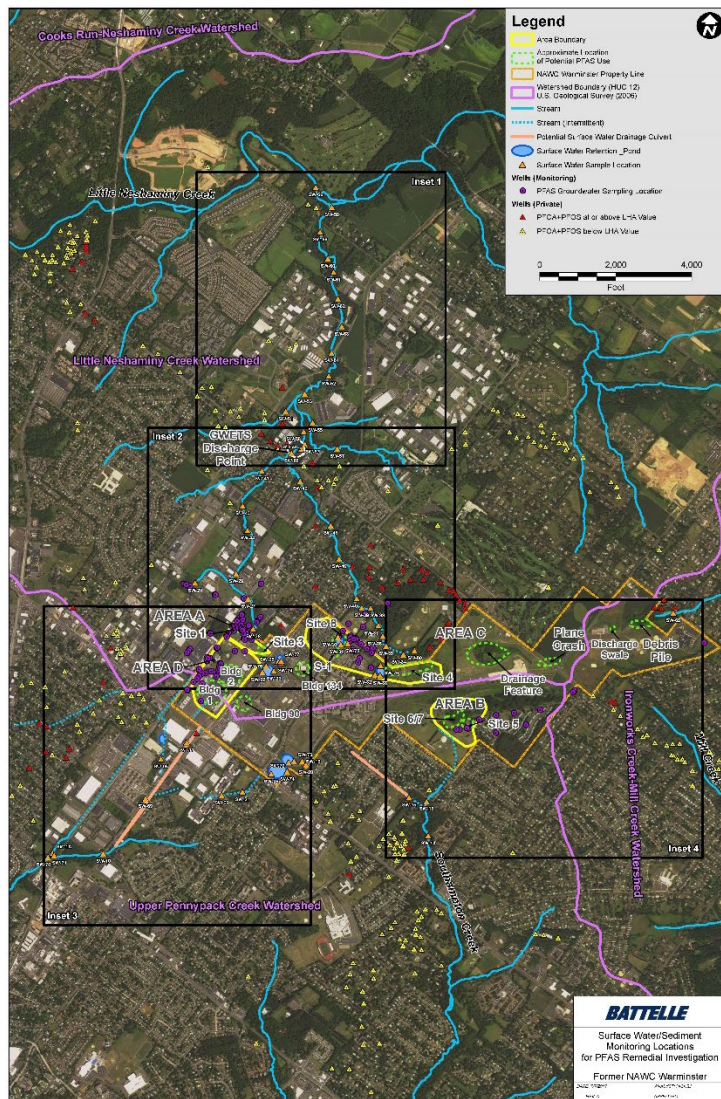
PFAS RI – Initial Soil Sample Locations



PFAS RI – Supplemental Soil Sample Locations



PFAS RI - Surface Water/Sediment Sampling



| Date | No. of Samples | |
|----------|----------------|----------|
| | Surface Water | Sediment |
| Oct 2016 | 66 | 52 |
| May 2017 | 72 | 59 |

Participation in DoD Funded PFAS Research



- SERDP/ESTCP are DoD-funded environmental research programs.
- NASJRB Willow Grove is supporting ~\$5.12M of SERDP funded research investigating new PFAS assessment and remediation technologies being performed by nationwide, and local, universities and contractors.
- Will continue to seek participation in additional SERDP/ESTCP, or NESDI (Navy funded) research at NASJRB Willow Grove or NAWC Warminster.
- Project list with Universities or Companies leading the research:

Soil or Groundwater Treatment

- ER18-1306 – Clarkson University
- ER18-1599 – Clemson University
- ER18-1515 – Auburn University
- ER18-1570 – Drexel University
- ER18-1593 – Geosyntec Consultants
- ER18-1603 – Jacobs Engineering
- ER18-1545 – Univ. of Rhode Island
- ER18-1620 – Texas A&M Univ.
- ER18-1300 – College of Wooster

Passive stormwater treatment

- ER18-1230 – Oregon State Univ.

Surface water fate and transport

- ER19-1073 – Academy of Natural Sciences/Drexel Univ. (**New Start**)

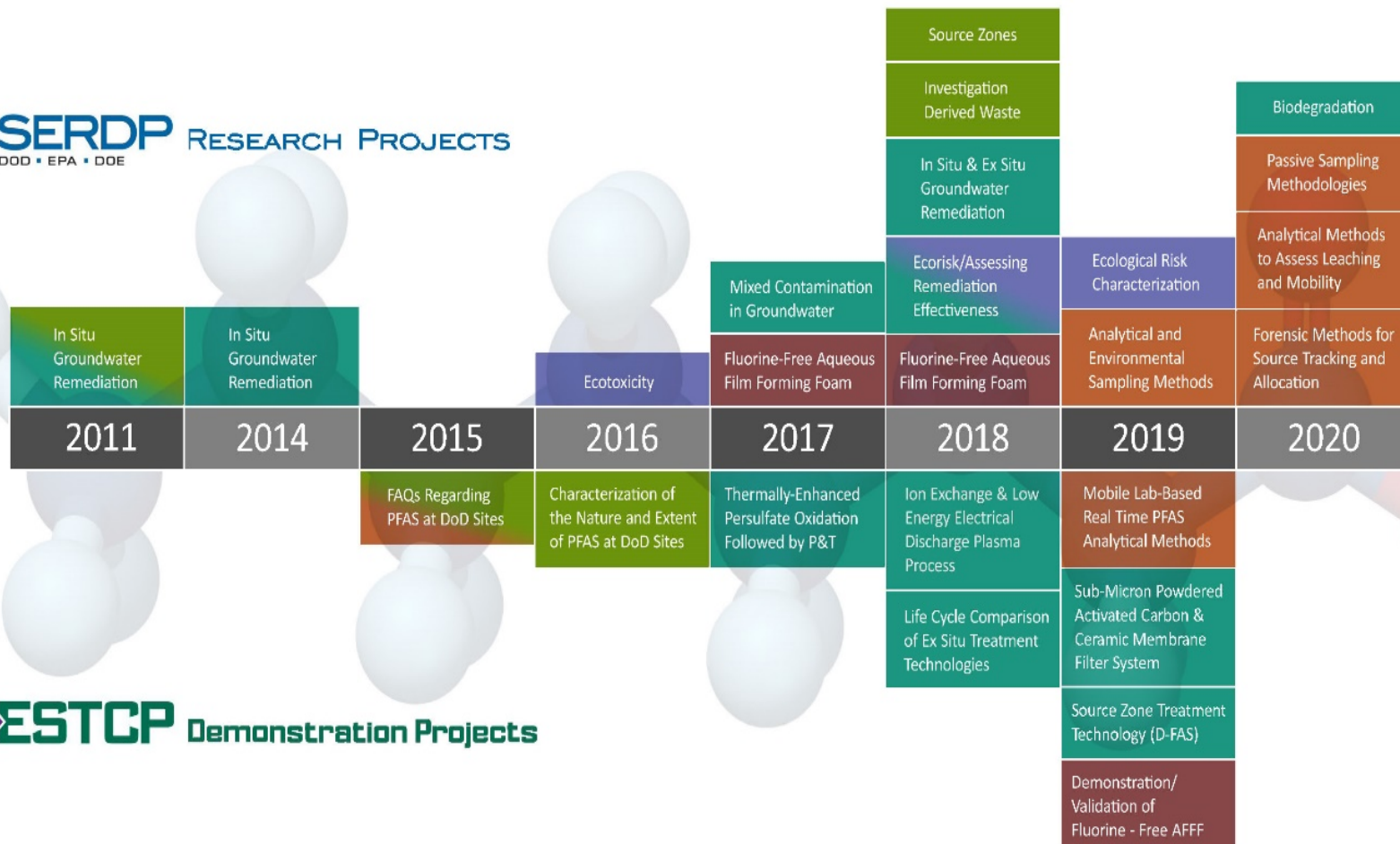
Additional information can be found on SERDP/ESTCP updated PFAS website:
http://serdp-estcp-pfas.com/pfas_efforts/pfas_efforts.pdf

SERDP and ESTCP Efforts on PFAS

Workshop Report:
Long Term Mgmt of
Contaminated
Groundwater

Workshop Report:
PFAS R&D Needs

Workshop on PFAS:
Sampling, Analysis
and Treatment



■ Remediation
 ■ Ecotoxicity
 ■ Fate, Transport and Characterization
 ■ Analytical and Sampling Methods
 ■ Fluorine-Free AFFF