

**Site Inspection
for
Per- and Polyfluoroalkyl Substances (PFAS) in Support of
Base Realignment and Closure (BRAC) Program
North Penn Memorial U.S. Army Reserve Center
1625 Berks Road, Worcester Township
Montgomery County, Pennsylvania**

**Contract Number W912DR-13-D-0017
Delivery Order Number W912DR18F0431**

Prepared for:



**US Army Corps
of Engineers®**

Prepared by:



**Final
March 2021**

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Prepared for:
**U.S. Army Corps of Engineers
Baltimore District
2 Hopkins Plaza
Room 03-G-01
Baltimore, Maryland 21201**

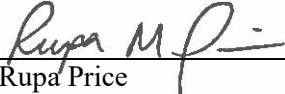
Prepared by:
**Leidos
11951 Freedom Drive
Reston, Virginia 20190**

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March 2021**

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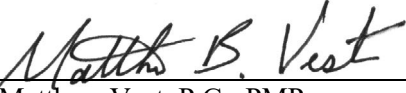
CERTIFICATION 4
CONTRACTOR STATEMENT OF INDEPENDENT TECHNICAL REVIEW

Leidos has completed this Site Inspection for Per- and Polyfluoroalkyl Substances (PFAS) in Support of Base Realignment and Closure (BRAC) Program at North Penn Memorial U.S. Army Reserve Center, 1625 Berks Road, Worcester Township, Montgomery County, Pennsylvania. Notice is hereby given that an independent technical review has been conducted that is appropriate to the level of risk and complexity inherent in the project as defined in the Leidos Quality Assurance Plan. During the independent technical review, compliance with established policy principles and procedures, using justified and valid assumptions, was verified. This included review of assumptions, methods, procedures, and materials used in analyses; the appropriateness of data used and the level of data obtained; and reasonableness of the results, including whether the product meets the customer's needs consistent with the law and existing Corps policy.




Rupa Price
Document Preparer

March 12, 2021
Date



Matthew Vest, P.G., PMP
Project Manager

March 12, 2021
Date

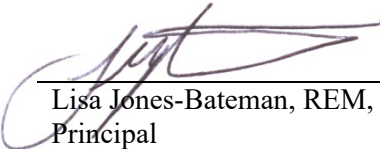


Monique Larriva, P.E., PMP, LRS
Independent Technical Review Team Leader

March 12, 2021
Date

Significant concerns and explanation of the resolutions are documented within the project file.

As noted above, all concerns resulting from independent technical review of the project have been considered.



Lisa Jones-Bateman, REM, PMP
Principal

March 12, 2021
Date

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ACRONYMS AND ABBREVIATIONS

ACSIM	Assistant Chief of Staff for Installation Management
AFFF	Aqueous Film-Forming Foam
AMSA	Area Maintenance Support Activity
AOC	Area of Concern
APHC	Army Public Health Center
BGS	Below Ground Surface
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DERP	Defense Environmental Restoration Program
DLS	Directorate of Laboratory Services
DoD	U.S. Department of Defense
EA	Environmental Assessment
ECP	Environmental Condition of Property
EDR	Environmental Data Resources, Inc.
Environmental Standards	Environmental Standards, Inc.
ft/day	Feet per Day
ft ² /day	Square Feet per Day
ft/ft	Feet per Foot
FS	Feasibility Study
FTA	Fire Training Area
HA	Health Advisory
HDPE	High-Density Polyethylene
HRS	Hazard Ranking System
in/hr	Inches per Hour
JRB	Joint Reserve Base
LRS	Licensed Remediation Specialist
mg/kg-day	Milligrams per Kilogram per Day
mL	Milliliter
MS	Matrix Spike
MSC	Medium Specific Concentration
MSD	Matrix Spike Duplicate
NAS	Naval Air Station
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEtFOSAA	N-Ethyl Perfluorooctanesulfonamidoacetic Acid
ng/L	Nanograms per Liter
NMeFOSAA	N-Methyl Perfluorooctanesulfonamidoacetic Acid
NPARC	North Penn Memorial U.S. Army Reserve Center
OMS	Organizational Maintenance Shop
OWS	Oil/Water Separator
P.E.	Professional Engineer
P.G.	Professional Geologist
PA	Preliminary Assessment
PADEP	Pennsylvania Department of Environmental Protection
PFAS	Per- and Polyfluoroalkyl Substances
PFBS	Perfluorobutane Sulfonate
PFDA	Perfluorodecanoic Acid

ACRONYMS AND ABBREVIATIONS (Continued)

PFD _o A	Perfluorododecanoic Acid
PFH _p A	Perfluoroheptanoic Acid
PFH _x A	Perfluorohexanoic Acid
PFH _x S	Perfluorohexane Sulfonate
PFNA	Perfluorononanoic Acid
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
PFTA	Perfluorotetradecanoic Acid
PFT _r DA	Perfluorotridecanoic Acid
PFUnA	Perfluoroundecanoic Acid
PMP	Project Management Professional
QA	Quality Assurance
QC	Quality Control
RD	Readiness Division
REM	Registered Environmental Manager
RfD	Reference Dose
RI	Remedial Investigation
ROE	Right-of-Entry
RSL	Regional Screening Level
SI	Site Inspection
SVOC	Semivolatile Organic Compound
TPH	Total Petroleum Hydrocarbons
U.S.C.	United States Code
USACE	U.S. Army Corps of Engineers
USAR	U.S. Army Reserve
USARC	U.S. Army Reserve Center
USEPA	U.S. Environmental Protection Agency
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

The U.S. Army Base Realignment and Closure (BRAC) Division conducted this Site Inspection (SI) at the North Penn Memorial U.S. Army Reserve Center (NPARC) site under the authority of Executive Order 12580. Executive Order 12580 authorizes the U.S. Department of Defense (DoD) to implement environmental investigations and response actions in compliance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980. The authority is further clarified in 10 United States Code (U.S.C.) 2701, which authorizes the Defense Environmental Restoration Program (DERP) for active and closed military installations. This SI was conducted in accordance with CERCLA; DERP; the National Oil and Hazardous Substances Pollution Contingency Plan (NCP); and DoD, Army, and U.S. Environmental Protection Agency (USEPA) guidance documents.

No federal regulatory standard exists for perfluorooctane sulfonate (PFOS)/perfluorooctanoic acid (PFOA) in drinking water or groundwater. However, USEPA issued a series of health advisories for PFOS and PFOA, including the most recent in May 2016. USEPA established a drinking water lifetime health advisory (HA) level for PFOS/PFOA, combined or individually, of 70 nanograms per liter (ng/L). This HA is designed to provide safe drinking water for even the most sensitive populations. The HA assumes that 80% of exposure is derived through exposure via sources other than drinking water (e.g., food and air), leaving 20% allowable for drinking water exposure. DoD has developed PFOS, PFOA, and perfluorobutane sulfonate (PFBS) screening levels for groundwater and soil (DoD 2019). The groundwater screening levels are presented in Table 1.

The SI field sampling activities were conducted prior to the Preliminary Assessment (PA), which is a deviation from the standard CERCLA PA/SI process. This SI focused on a desktop evaluation of existing per- and polyfluoroalkyl substances (known collectively as PFOS/PFOA) groundwater data for NPARC. This SI Report presents and interprets groundwater data that the Army collected between June 2016 and May 2018 from NPARC monitoring wells, surrounding area wells located on residential properties, and monitoring wells at a nearby Superfund Site, North Penn Area 12. The data were evaluated in conjunction with the findings of the PA (Leidos 2019) to determine if the PFOS/PFOA detected in the groundwater could be related to historical activities at NPARC, whether the concentrations exceed screening criteria, and assess whether additional investigation is required at NPARC. No new SI field activities were conducted under 40 Code of Federal Regulations (CFR) 300.420(c)(5).

The PA identified a total of eight potential areas of concern (AOCs) based on the possibility of storage, transfer, or use of aqueous film-forming foam (AFFF) at the location. For NPARC, each structure and one reported fire training area (FTA) burn area were considered potential AOCs. The Former FTA Burn Area was located in the northeastern area of the site. The site features associated with the potential AOCs were evaluated during the 2018 PA site visit followed by personnel interviews, evaluation of historical aerial photographs, and review of historical records. The PA determined that the structures were not AOCs and would not require further evaluation for PFOS/PFOA because there was no evidence that AFFF was used or stored at any of these buildings. Historical records, interviews, visual inspection, and chemical data do not support the existence of an FTA burn area or the storage or use of AFFF at the Former FTA Burn Area. No documentation was available to support the potential use and storage of non-AFFF materials containing PFAS at NPARC.

The groundwater data collected at and around NPARC were compared to the USEPA HA and regional screening levels (RSLs). The SI evaluation indicated that PFOS/PFOA were detected in the groundwater at NPARC and four non-drinking water wells located at surrounding residential properties at concentrations exceeding the USEPA HA and RSLs.

The results of the PA and SI conclude that PFOS/PFOA sources were not stored, used, or disposed of at NPARC. However, PFOS/PFOA detections in the site monitoring wells at concentrations above the groundwater screening levels suggests a data gap related to the source of contamination. A Remedial Investigation (RI) may be required to determine if an onsite source or evidence of groundwater conditions exists to suggest migration onto the former NPARC. In addition, the Pennsylvania Department of Environmental Protection (PADEP) may consider further investigation due to uncertainties associated with the offsite source of the detected concentrations of PFOS and PFOA (such offsite sources could include nearby airfields or industrial facilities, such as electro-plating operations).

1.0 INTRODUCTION

The U.S. Army Base Realignment and Closure (BRAC) Division conducted this Site Inspection (SI) at the North Penn Memorial U.S. Army Reserve Center (NPARC) site under the authority of Executive Order 12580. Executive Order 12580 authorizes the U.S. Department of Defense (DoD) to implement environmental investigations and response actions in compliance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980. The authority is further clarified in 10 United States Code (U.S.C.) 2701, which authorizes the Defense Environmental Restoration Program (DERP) for active and closed military installations. This SI was conducted in accordance with CERCLA; DERP; the National Oil and Hazardous Substances Pollution Contingency Plan (NCP); and DoD, Army, and U.S. Environmental Protection Agency (USEPA) guidance documents.

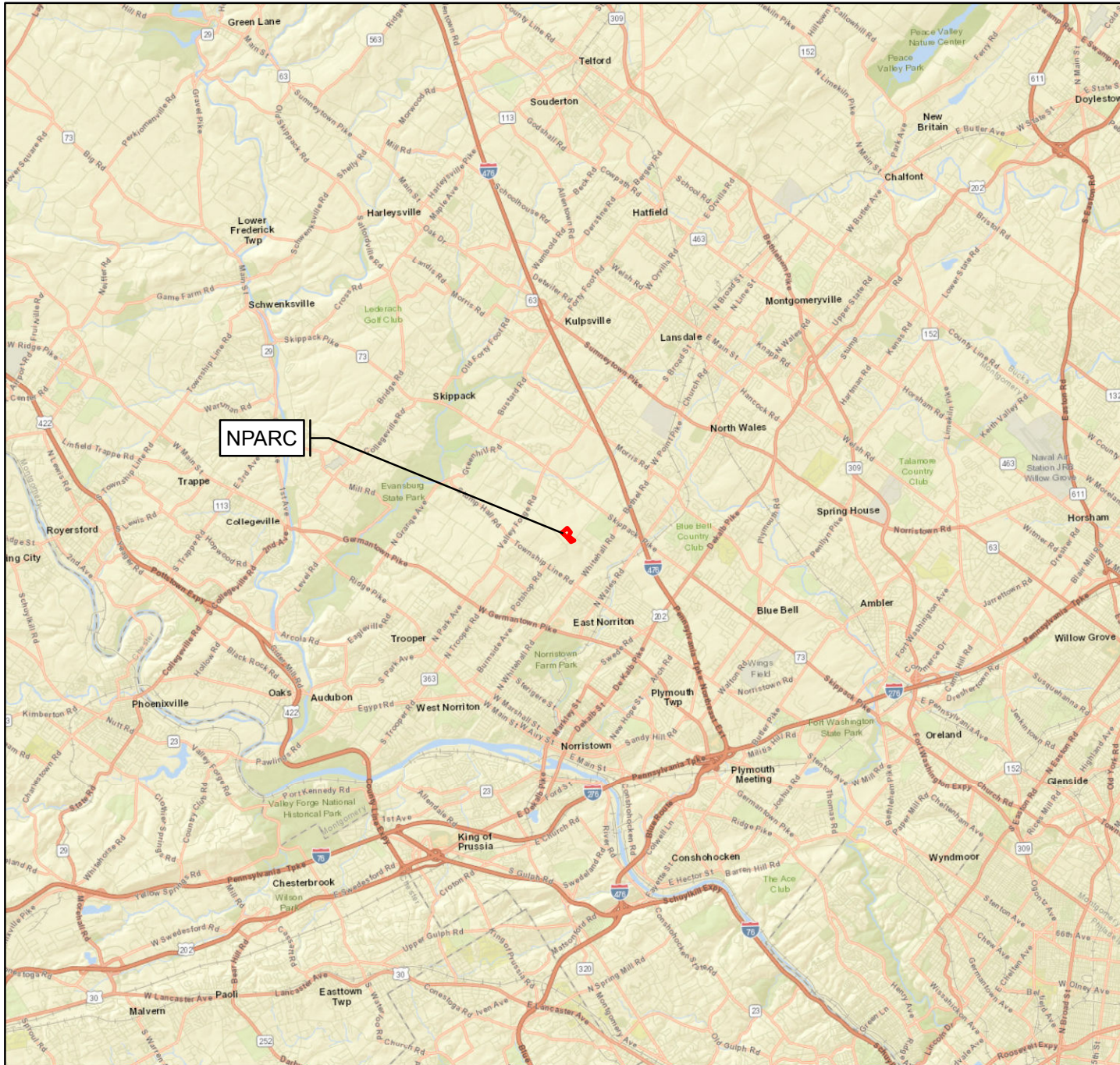
The U.S. Army Corps of Engineers (USACE), Baltimore District contracted Leidos to conduct this SI for NPARC in Worcester Township, Pennsylvania. This work is being performed in accordance with the USACE, Baltimore District Contract Number W912DR-13-D-0017, Delivery Order Number W912DR18F0431. Figure 1 presents the Installation location.


This SI focused on a desktop evaluation of existing per- and polyfluoroalkyl substances (known collectively as perfluorooctane sulfonate [PFOS]/perfluorooctanoic acid [PFOA]) groundwater data for NPARC. No new SI field activities were conducted under this scope. The SI field sampling activities were conducted prior to the Preliminary Assessment (PA), which is a deviation from the standard CERCLA PA/SI process. USEPA guidance documents relevant to this project include *Guidance for Performing Site Inspections Under CERCLA* (USEPA 1992) and *Federal Facilities Remedial Site Inspection Summary Guide* (USEPA 2005). The work also utilized DoD guidance documents, including *Emerging Contaminants* (DoD 2009) and *Testing DoD Drinking Water for PFOS and PFOA Contamination* (Office of the Assistant Secretary of Defense 2016), as well as Army PFOS/PFOA guidance documents, including *Army Guidance to Address Perfluorooctane Sulfonate and Perfluorooctanoic Acid Contamination* and *Army Guidance for Addressing Releases of Per- and Polyfluoroalkyl Substances* (Department of the Army 2018).

1.1 PROJECT OBJECTIVES AND SCOPE

The purpose of a SI is to 1) eliminate from further consideration those releases that pose no significant threat to public health or the environment; 2) determine the potential need for removal action; 3) collect or develop additional data, as appropriate, to evaluate the release pursuant to the Hazard Ranking System (HRS); and 4) collect data in addition to that required to score the release pursuant to the HRS, as appropriate, to better characterize the release for more effective and rapid initiation of the Remedial Investigation (RI)/Feasibility Study (FS) or response under other authorities (40 Code of Federal Regulations (CFR) 300.420(c)(1)). This SI Report summarizes information from the PA Report (Leidos 2019) as well as presents and interprets groundwater data that the Army collected between June 2016 and May 2018 to assess whether no action or additional investigation will be required at NPARC to meet the objectives.

Several series of groundwater samples were collected from NPARC monitoring wells, surrounding area wells located on residential properties, and monitoring wells at a nearby Superfund Site, North Penn Area 12. The data were evaluated in conjunction with the findings of the PA to determine if the PFOS/PFOA detected in the groundwater could be related to historical activities at NPARC and whether the concentrations exceed screening criteria (discussed in Section 1.2). Note: 40 CFR 300.415 requires removal and 40 CFR 300.420 requires remedial site evaluation.

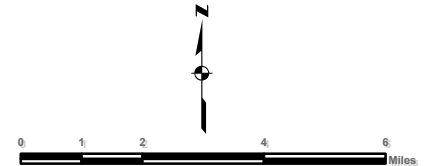




Legend
 NPARC

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KEY MAP
NOT TO SCALE



 US Army Corps of Engineers	
NPARC FACILITY LOCATION FORMER NORTH PENN ARMY RESERVE CENTER NORRISTOWN, PENNSYLVANIA	
PROJECT: IGIS_DATA\North Penn\ Figure 1 Installation Location.mxd	
FIGURE: 1	DATE: 4/8/2019

The scope of work consisted of evaluating data from the previously collected groundwater samples and applicable historical information to present conclusions and recommendations in this SI Report.

1.2 REGULATORY OVERVIEW AND SCREENING CRITERIA

Per- and polyfluoroalkyl substances (PFAS) are very stable, man-made fluorinated organic chemicals. PFAS have been extensively manufactured and used worldwide for a variety of purposes. Common industrial uses of PFAS include paints, varnishes, sealants, hydraulic fluid, a variety of surfactants, and firefighting foams. PFAS include both per- and polyfluorinated chemicals. Perfluorinated chemicals, PFOS and PFOA, are a subset of PFAS with carbon chain atoms that are totally fluorinated, while polyfluorinated chemicals have at least one carbon chain atom that is not totally fluorinated. PFAS chemicals that have eight or more carbon atoms, including PFOS and PFOA, are considered long-chain perfluorinated compounds. They are unique substances that repel oil, grease, and water. PFAS constituents, particularly PFOS and PFOA, related to DoD facilities, are often linked to the use of aqueous film-forming foam (AFFF), which contained PFOS/PFOA. AFFF is used as a firefighting agent to suppress fires involving petroleum hydrocarbons.

Following a release to the environment, PFOS/PFOA can migrate into soil and groundwater. The amount of PFOS/PFOA that migrates to groundwater depends on the type and amount of PFOS/PFOA containing chemicals used, where it was used, the type of soil, and other factors. PFOS/PFOA may migrate readily from soil to groundwater.

PFOS and PFOA compounds are highly soluble in water and have very low volatility due to their ionic nature. The specific gravity/relative density for PFOS and PFOA is 1.8 (Aquilogic 2016). Long-chain perfluorinated compounds have low vapor pressure, and they are expected to persist in aquatic environments. These compounds do not readily degrade by most natural processes. They are thermally, chemically, and biologically stable and are resistant to biodegradation, atmospheric photooxidation, direct photolysis, and hydrolysis. The structure of PFAS increases their resistance to degradation; the carbon-fluorine bonds require a lot of energy to break, and the fluorine atoms shield the carbon backbone.

Some perfluorinated compounds are considered precursor compounds (typically polyfluoroalkyl substances). These are compounds that can degrade into PFOS and PFOA via microbial degradation or metabolism in larger organisms. PFOS and PFOA are referred to as terminal compounds, meaning no further degradation products will form from them (ITRC 2018).

Detected concentrations of PFOS/PFOA in groundwater samples collected at and around NPARC were evaluated in this SI Report by comparing against water screening criteria for PFOS, PFOA, and perfluorobutane sulfonate (PFBS), as described below and listed in Table 1. As of the preparation of this SI Report, these three compounds have screening criteria.

Currently, no legally enforceable federal standards exist for PFOS/PFOA in water. However, under the Safe Drinking Water Act, USEPA issued a series of health advisories for PFOS and PFOA, including the most recent in May 2016. USEPA established a drinking water lifetime health advisory (HA) level for PFOS/PFOA, combined or individually, of 70 nanograms per liter (ng/L). This HA is designed to provide safe drinking water for even the most sensitive populations. The HA assumes that 80% of exposure is derived through exposure via sources other than drinking water (e.g., food and air) leaving 20% allowable for drinking water exposure.

Under CERCLA, site-specific regional screening levels (RSLs) for PFOS and PFOA are calculated using the USEPA online calculator using the oral reference dose (RfD) of 2E-05 milligrams per kilogram per day (mg/kg-day). The RSL for PFBS is calculated using the USEPA Provisional Peer Reviewed Toxicity Value

RfD of 2E-02 mg/kg-day. These RSLs should be used for screening to determine if further investigation in the RI phase is warranted or if the site can proceed to site closeout (DoD 2019).

Screening levels for groundwater are provided in Table 1.

Table 1. PFOS/PFOA SI Screening Criteria

Parameter	Chemical Abstract Service Number	USEPA RSL for Tap Water ^a (ng/L)	USEPA Health Advisory ^b (ng/L)
PFOS	1763-23-1	40	70.0 ^c
PFOA	335-67-1	40	
PFBS	375-73-5	40,000	N/A

^a Residential Scenario Screening Levels Calculated using USEPA RSL Calculator (April 6, 2018) and target HQ = 0.1 (DoD 2019).

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

^c When PFOA and PFOS are both present, the combined detected concentrations of the compounds are compared with the 70-ng/L health advisory value.

HQ = Hazard Quotient

N/A = Not Available

ng/L = Nanograms per Liter

PFAS = Per- and Polyfluoroalkyl Substances

PFBS = Perfluorobutane Sulfonate

PFOA = Perfluorooctanoic Acid

PFOS = Perfluorooctane Sulfonate

RSL = Regional Screening Level

SI = Site Inspection

USEPA = U.S. Environmental Protection Agency

1.3 REPORT ORGANIZATION

The contents of the remaining sections of this SI report are summarized below:

- **Section 2.0 Installation Description**—This section discusses the site location, operational history, and environmental setting at NPARC.
- **Section 3.0 Preliminary Assessment Summary**—This section provides a summary of the PA and its conclusions.
- **Section 4.0 Site Inspection Field Program**—This section provides an overview of the sampling events, analytical methods, quality assurance (QA), and sample collection procedures.
- **Section 5.0 Results**—This section presents the evaluation of groundwater sample results for NPARC.
- **Section 6.0 Summary and Recommendations**—This section presents the summary and recommendations of the SI for NPARC.
- **Section 7.0 References**—This section lists the references that were used in preparing this report.

- *Appendices*—Appendices A, B, and C include:
 - Appendix A. NPARC Well Construction Logs
 - Appendix B. Sample Collection Logs
 - Appendix C. Data Presentation Tables.

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2.0 INSTALLATION DESCRIPTION

2.1 LOCATION

The NPARC facility is located at 1625 Berks Road, Norristown, Pennsylvania. As explained in the 2011 Environmental Assessment (EA), while “Norristown” is part of the legal description and mailing address for the U.S. Army Reserve Center (USARC), the facility is located within Worcester Township, Montgomery County, Pennsylvania (USACE 2011). Worcester is a 16-square-mile township located in the central portion of Montgomery County, Pennsylvania, and approximately 17 miles northwest of Philadelphia. Worcester Township is bordered on the east by East Norriton and Whitpain townships, on the south by Lower Providence Township, on the west by Skippack Township, and on the north by Towamencin and Upper Gwynedd townships. The Transicoil/North Penn Area 12 CERCLA Superfund Site is located roughly 3,450 feet west-northwest of NPARC (USACE 2011). The NPARC facility consists of 19 acres and is located on a rural road. The surrounding properties in the area consist of farmland and single-family residences. Figure 1 depicts the USARC location.

2.2 ORGANIZATION AND HISTORY

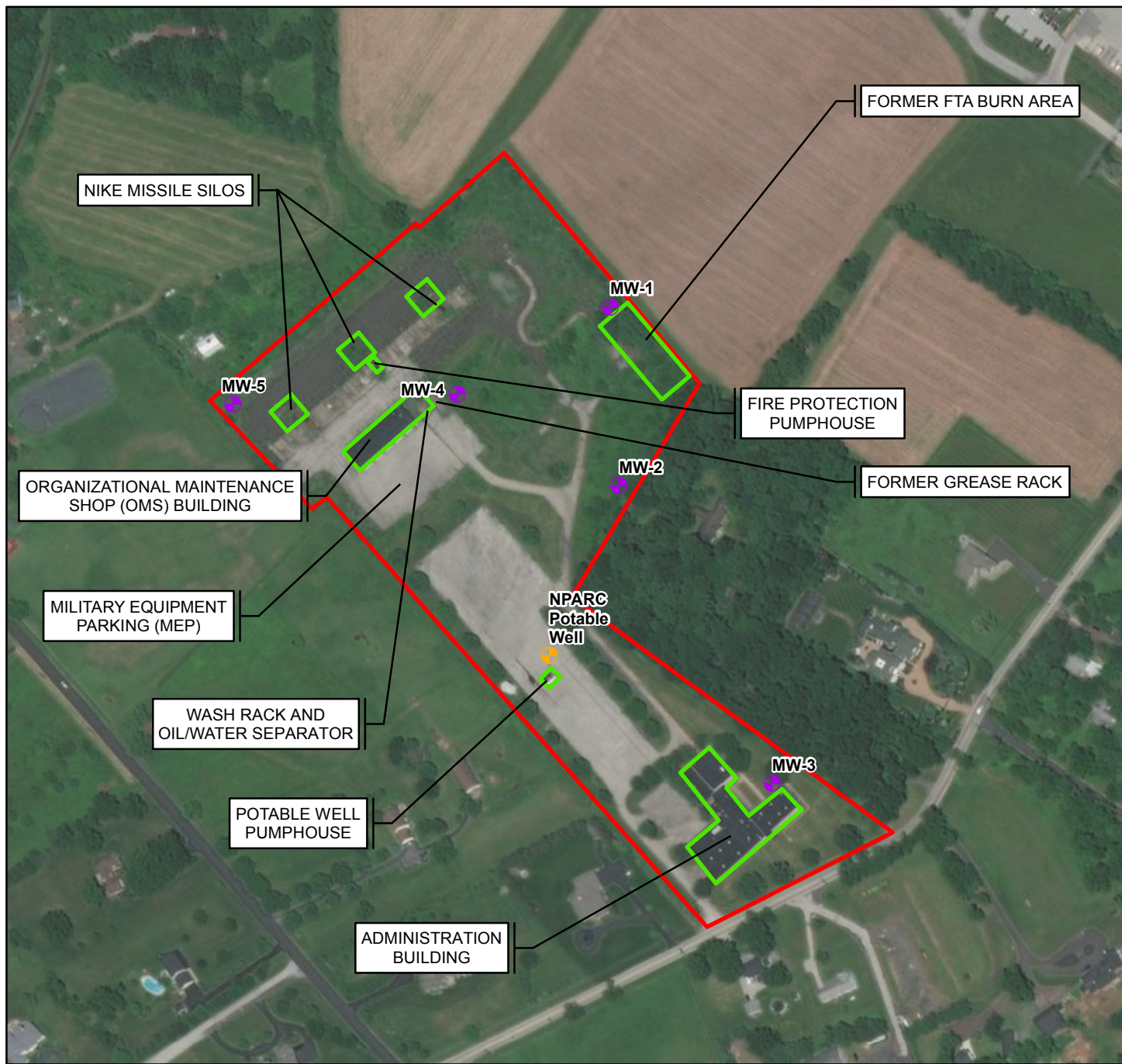
In 1954, the U.S. Government purchased and began development of the site from what was previously farmland. The Property was used as part of the Nike Ajax missile systems from 1954 to 1968, and was known as the Philadelphia Defense Area Site 91. In addition to the Nike Ajax missile silos, the original launch area contained a barracks building, a bachelor officers’ quarters, a missile assembly and test building, a generator building, a paint shed, an acid storage shed, and a chemical storage shed. These buildings were located at what is now the northeastern portion of the Property and were demolished around 1973 or 1974, leaving behind the three underground Nike Ajax missile silos and a sewage treatment plant (CH2M Hill 2007).

The U.S. Army occupied the Property from 1954 to 1968, after which it was reassigned to the U.S. Army Reserve (USAR) for use as an outdoor training site (CH2M Hill 2007). Construction of the current administration and Organizational Maintenance Shop (OMS) buildings were completed in 1974 (Taylor 2018).

As of the September 2018 PA site visit, the facility has seven permanent structures onsite (see Figure 2). The structures consist of:

- A 45,000-square-foot administration building
- A 6,800-square-foot OMS
- A 707-square-foot fire protection pump house
- A 54-square-foot pump house for the single onsite potable well
- Three former Nike Ajax missile silos.

Based on interviews with 99th Readiness Division (RD) personnel during the PA site visit, the OMS building was used to perform limited maintenance activities on military equipment. Activities inside the OMS building were limited to preventative maintenance checks, including checking vehicle fluids such as motor oil and antifreeze. Any equipment requiring heavier maintenance was sent to the Area Maintenance Support Activity (AMSA) located at the Willow Grove Naval Air Station/Joint Reserve Base (NAS/JRB) (Zangari 2018).



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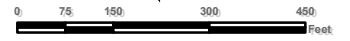
- NPARC
- Potential AOCs
- + NPARC Potable Well
- + NPARC Monitoring Wells



Note: The area for the Former FTA Burn Area was approximated from the Phase II ECP (Bhate 2011).

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KEY MAP
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 US Army Corps of Engineers	
<p>SITE FEATURES</p> <p>FORMER NORTH PENN ARMY RESERVE CENTER NORRISTOWN, PENNSYLVANIA</p>	
PROJECT: \GIS_DATA\North Penn\ Figure 2 Site Features.mxd	
FIGURE 2	DATE: 4/8/2019

Visual inspection of the site indicated no staining or releases in or around the OMS building during the September 2018 PA site visit. Vehicle washing would have historically occurred at the wash rack located outside, by the eastern wall of the OMS building. The wash rack consists of a concrete pad surrounded by a concrete curb. A grate is located in the center of the wash rack and leads to an oil/water separator (OWS). The 99th RD personnel confirmed that the wash rack and OWS are no longer used during the September 2018 PA site visit.

Although groundwater sampling had been conducted at the facility in 2016, potential releases of PFOS/PFOA from use and storage of PFOS/PFOA containing chemicals (primarily AFFF) was not evaluated prior to the Leidos 2018 PA at NPARC. Base operations that could have contributed to PFOS/PFOA contamination of groundwater include fire training areas (FTAs) and non-FTAs. Non-FTA areas of concern (AOCs) are sites where PFOS/PFOA containing chemicals were stored, released, and/or likely to have been released. Non-FTA AOCs were not identified at NPARC during the PA (Leidos 2019).

FTA AOCs are sites where AFFF may have been used for fire suppression during training activities. A Former FTA Burn Area was identified in the Phase II Environmental Condition of Property (ECP) Report as being located in the northeastern corner of the NPARC facility (Bhate 2011).

2.3 ENVIRONMENTAL SETTING

The following sections describe the environmental setting at NPARC. Climate, demography, land use, topography, geology/hydrogeology, surface water hydrology, critical habitats and endangered/threatened species, and water wells are discussed.

2.3.1 Climate

NPARC is located approximately 6 miles north of Norristown, Pennsylvania. The average temperature of Norristown is 52.39°F, which is slightly higher than the Pennsylvania average temperature of 49.80°F and is lower than the national average temperature of 54.45°F. Average annual rainfall amounts in Norristown are 45.93 inches with 76.21 days of 0.1 inches of rain or more. Average annual snowfall amounts in Norristown are 19.11 inches, with 12.79 days of 1 inch of snow or more. Average wind speed for the area is 14.02 miles per hour (USA.com 2018).

2.3.2 Demography and Land Use

NPARC is bounded by farmland and single-family residences on the northern, eastern, and western sides. Berks Road bounds the USARC to the south. The 2010 U.S. census reported a population of 9,750 for Worcester Township (U.S. Census Bureau 2018).

NPARC closed as an active USARC in September 2011. According to the Northeast Region Reserve Components Conveyance Progress Report, NPARC is intended for transfer to the Worcester Township for recreational use (e.g., a community park and performance arts center) (Department of the Army 2018).

2.3.3 Topography

The NPARC facility is at an elevation of approximately 452 feet above mean sea level and slopes toward the south-southeast (EDR 2018). The Property is generally flat, although the OMS and former Nike Ajax missile silos are located in the northern portion of the Property and are situated at a slightly higher elevation. According to the 2011 EA, the topography is flat with less than 1% slope (USACE 2011).

2.3.4 Geology/Hydrogeology

NPARC is situated in the Triassic Lowlands Section of the Piedmont Physiographic Province. The area is underlain by the Triassic Locketong and Brunswick formations, which are sedimentary deposits of the Newark Basin (Longwill and Wood 1965, Newport 1971). The Brunswick Formation is the younger of the two formations and consists of reddish-brown, thin, discontinuous layers of shale interbedded with mudstone and siltstone. The Locketong Formation consists of massive beds of medium and dark gray argillite interbedded with thin layers of gray-to-black shale and siltstone with occasional dolomite, feldspar, clay, and quartz. The Locketong Formation is more resistant to erosion and tends to form low ridges.

The formations typically dip to the north/northwest about 10 to 20 degrees and strike toward the northeast (USGS 1996). Regionally, the rocks are typically cut by a well-developed system of nearly vertical joints with three primary orientations, including north-northeast, northwest, and east-northeast. Joint sets are common in the Brunswick Formation but are less common, finer, and more widely spaced in the Locketong Formation. In areas where the Brunswick and Locketong formations are interfingering, a greater number of fractures are common (Longwill and Wood 1965). Typically, the joints are partially filled with either quartz or calcite cement.

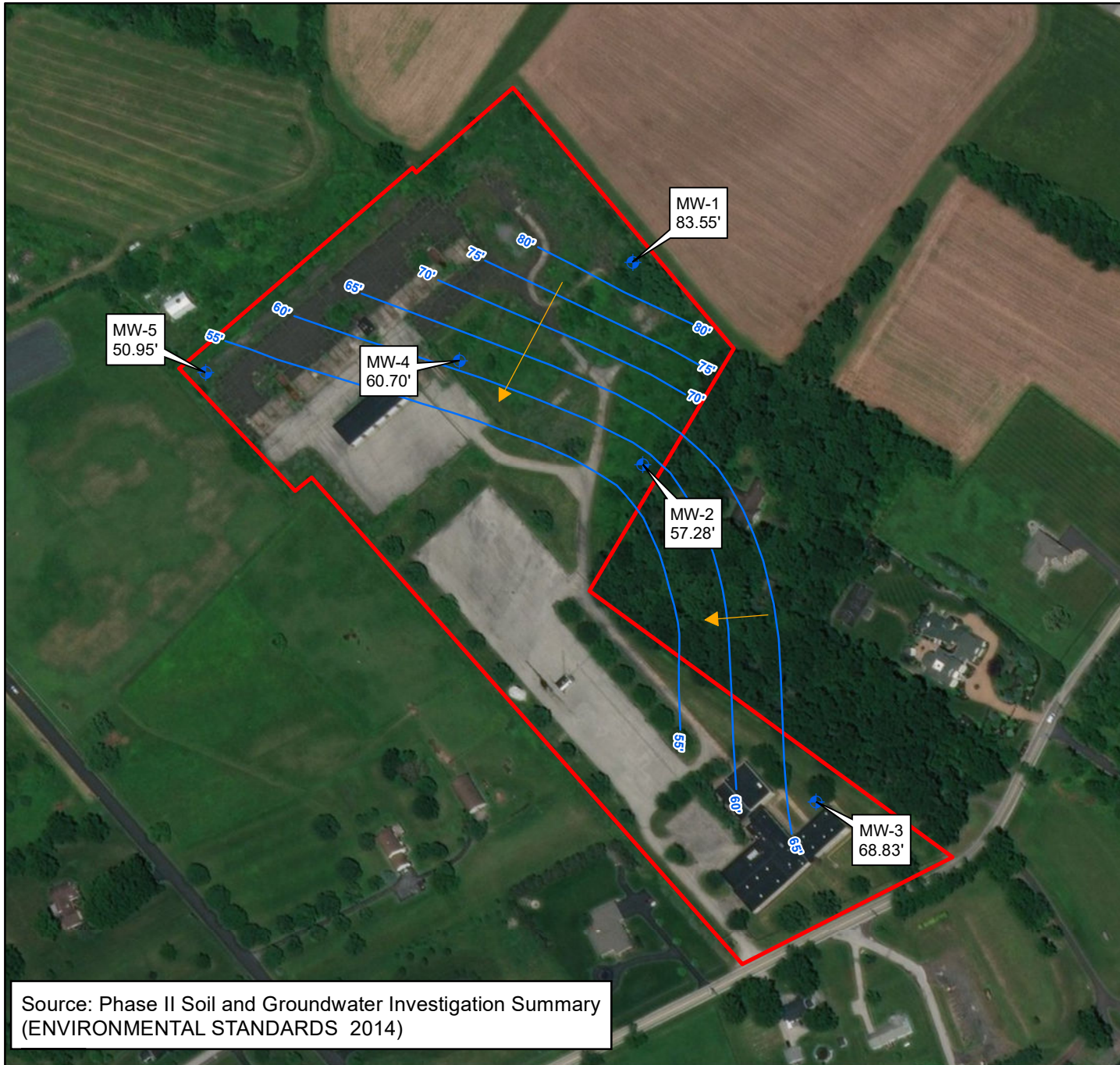
The primary porosity in both formations is very low, and permeability and storage are also very low. Therefore, groundwater movement primarily occurs through vertical and horizontal fractures (USGS 1996). Groundwater in the Locketong Formation may exist under unconfined, semi-confined, and/or perched conditions. Typically, groundwater in the upper part of the aquifer is under unconfined conditions and groundwater in the deeper part of the aquifer may be confined or partially confined, resulting in local artesian conditions (USGS 1996).

Previous site work included soil borings and installation of five monitoring wells (Environmental Standards 2014). Data obtained from the soil borings and well installations indicate an overburden thickness ranging from approximately 17 to 22 feet. Overburden materials included red-brown silty clay with fine gravel, greenish brown silty sand, red-brown clayey silt, and red-brown silty sand. Bedrock encountered at the site included red shale and gray shale.

Depth to water in the site wells ranged from approximately 31 to 48 feet below ground surface (BGS). Potentiometric mapping at the site conducted by Environmental Standards, Inc. (Environmental Standards) (2014) indicates converging groundwater flow directions, with the northern portion of the site exhibiting a southwesterly gradient and the southern portion of the site indicating a westerly gradient (Figures 3 and 4).

Based on review of the site documents, information regarding hydraulic conductivity, groundwater velocity, and infiltration rates are not available for NPARC. However, review of documents from the Transicoil/North Penn Area 12 CERCLA Superfund Site located near NPARC provided the following information:

- Infiltration rate = 0.9 inches per hour (in/hr) to 4.5 in/hr
- Average hydraulic gradient = 0.027 feet per foot (ft/ft)
- Aquifer transmissivity = 110 to 143 square feet per day (ft²/day)
- Hydraulic conductivity = 3.2 feet per day (ft/day) to 4.1 ft/day
- Average linear velocity = 2.2 ft/day to 17 ft/day.

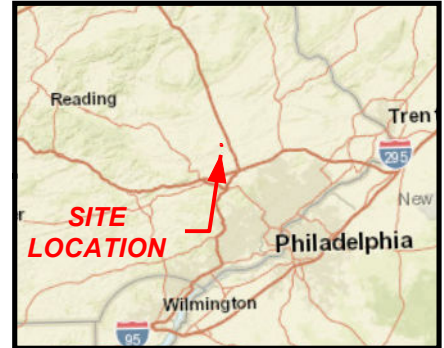


Source: Phase II Soil and Groundwater Investigation Summary (ENVIRONMENTAL STANDARDS 2014)

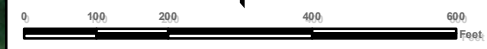
Legend

- NPARC
- + Monitoring Well Location
- Groundwater Elevation Contour (FT)
- Interpreted Groundwater Flow Direction

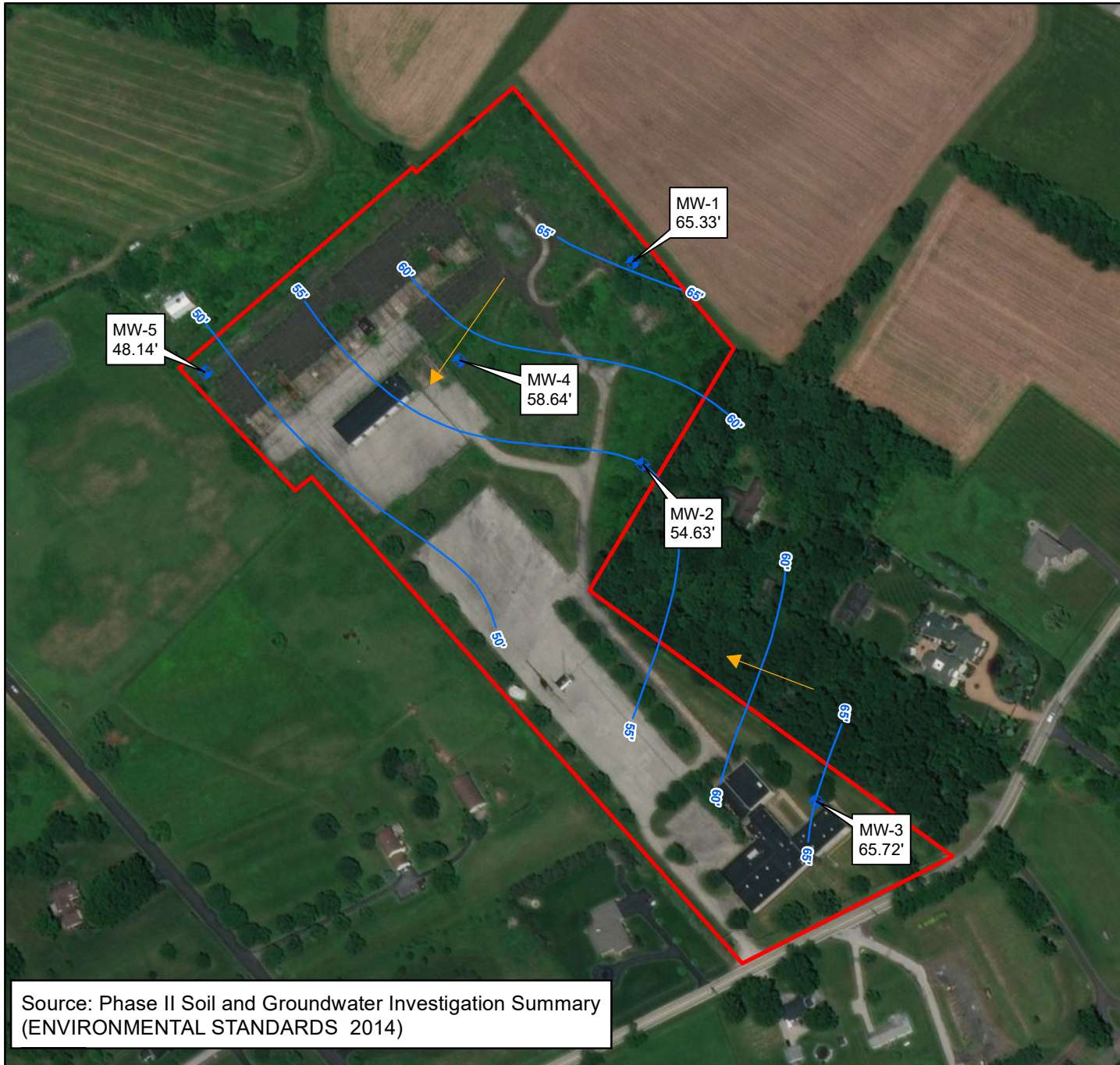
Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
 Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



KEY MAP
NOT TO SCALE



 US Army Corps of Engineers	
GROUNDWATER ELEVATION MAP JUNE 19, 2014 FORMER NORTH PENN ARMY RESERVE CENTER NORRISTOWN, PENNSYLVANIA	
PROJECT: \GIS_DATA\North Penn\ Figure 3 GW Contours June 2014.mxd	
FIGURE: 3	DATE: 11/13/2019



Source: Phase II Soil and Groundwater Investigation Summary (ENVIRONMENTAL STANDARDS 2014)

Legend


- NPARC
- + Monitoring Well Location
- Groundwater Elevation Contour (FT)
- Interpreted Groundwater Flow Direction

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



KEY MAP
NOT TO SCALE



 US Army Corps of Engineers	
GROUNDWATER ELEVATION MAP JULY 16, 2014	
FORMER NORTH PENN ARMY RESERVE CENTER NORRISTOWN, PENNSYLVANIA	
PROJECT: \GIS_DATA\North Penn\ Figure 4 GW Contours July 2014.mxd	
FIGURE: 4	DATE: 11/13/2019

2.3.5 Surface Water Hydrology

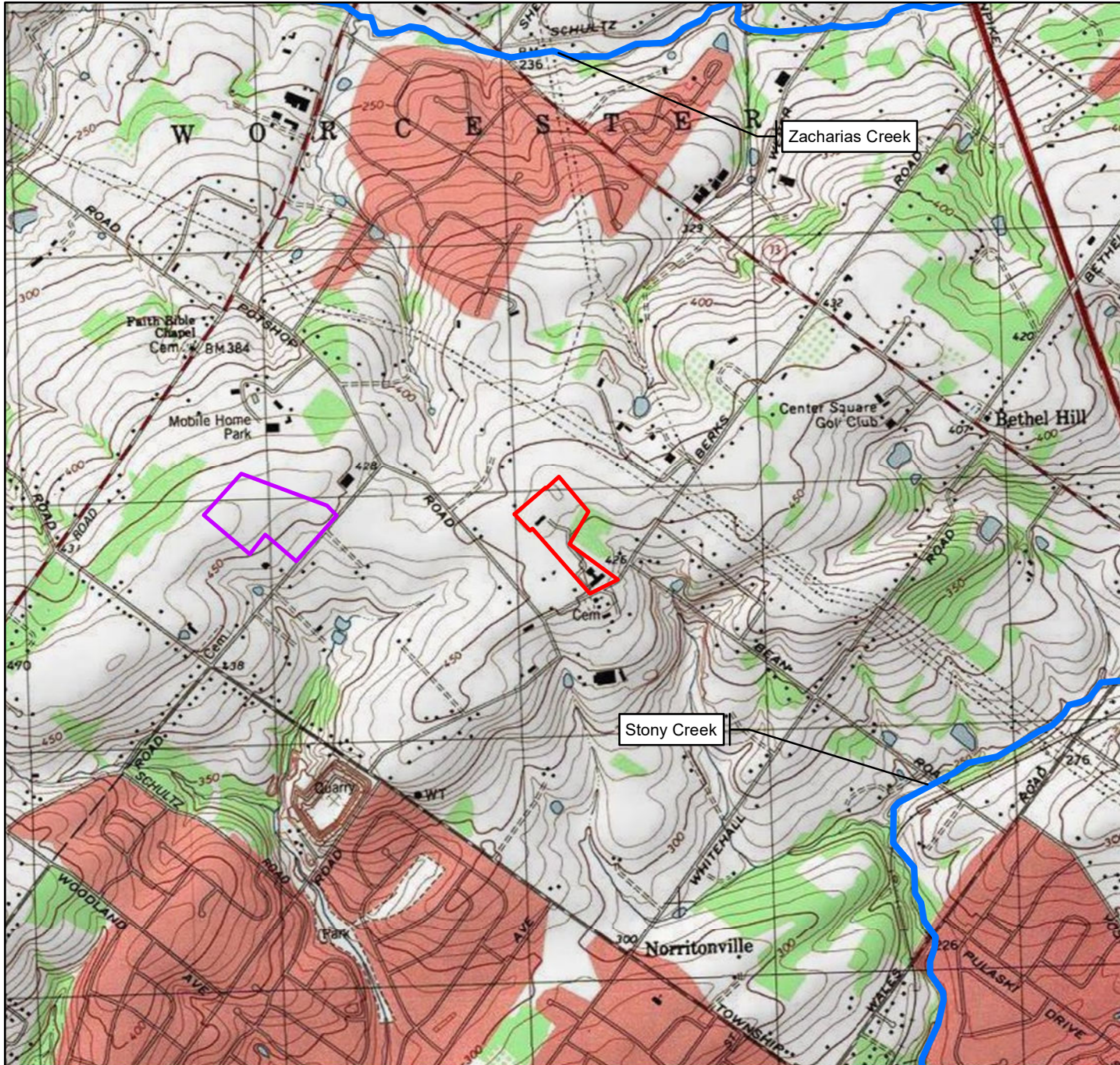
No surface water bodies are located on the NPARC Property. NPARC is located on a ridge that appears to act as a local drainage divide. In general, the Property land surface slopes toward the southeast, toward Stony Creek, which is located approximately ½ mile from the facility. Zacharias Creek is approximately ½ mile northwest of the facility. These surface water bodies are shown in Figure 5.

Storm drain pipes run along the length of the Property, along the northwestern and southwestern sides. The OMS building, former Nike Ajax missile silos, and military equipment parking lot are on a broad plateau, higher in elevation than the privately owned vehicle parking lot and administration building. A ditch runs from the northeastern side of this plateau and makes a right-angle turn in front (southeastern side) of the plateau. Stormwater would most likely flow from the northern portions of the Property to these ditches, and then enter the stormwater pipes located on either side of the Property. These stormwater pipes discharge into two ditches located at the southeastern portion of the Property and run perpendicular into another ditch that is parallel to Berks Road (CH2M Hill 2007). These ditches were dry during the 2018 PA site visit.

2.3.6 Water Wells

A potable water supply well is located on NPARC (see Figure 2). The well is located adjacent to the small pump house within the parking lot. The Environmental Data Resources, Inc. (EDR) report identified three domestic water supply sources within 0.25 miles of NPARC (EDR 2018).

Aqua Pennsylvania, the North Penn Water Authority, and Pennsylvania American Water supply water to properties connected to a public water system in Worcester Township (Worcester Township 2018). None of these utility companies own or operate any municipal water supply wells within 0.5 miles of the USARC (EDR 2018).



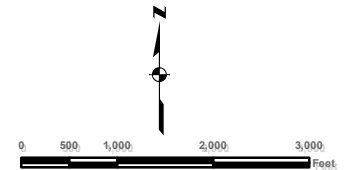
Legend



- NPARC
- North Penn Area 12

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
 Copyright: © 2013 National Geographic Society, i-cubed



KEY MAP
NOT TO SCALE



 US Army Corps of Engineers	
<p>SURFACE WATER NEAR FACILITY</p> <p>FORMER NORTH PENN ARMY RESERVE CENTER NORRITONVILLE, PENNSYLVANIA</p>	
PROJECT: IGIS_DATA\North Penn\ Figure 5 Creeks.mxd	
FIGURE: 5	DATE: 11/13/2019

3.0 PRELIMINARY ASSESSMENT SUMMARY

Leidos conducted a PA at NPARC in 2018 to identify locations where AFFF may have been used, stored, or potentially released. The PA also included an initial assessment of possible migration pathways of potential PFOS/PFOA contamination (Leidos 2019).

The PA identified a total of eight potential AOCs. These AOCs were identified based on the possibility of storage, transfer, or use of AFFF and non-AFFF PFOS/PFOA sources at the location. For NPARC, each structure and a reported FTA burn area were considered potential AOCs. The Former FTA Burn Area was located in the northeastern area of the site. The site features associated with the potential AOCs were evaluated during the 2018 PA site visit followed by personnel interviews, evaluation of historical aerial photographs, and review of historical records.

3.1 PFOS/PFOA BACKGROUND AT NPARC

Prior to being a USARC, NPARC was used as part of the Nike Ajax missile systems. USACE conducted an operational history review of AFFF/PFOA/PFOS at Nike and Atlas missile sites in 2016 (USACE 2016) in response to inquiries from state regulatory agencies. Based on USACE review of historical documents, there were no FTAs or evidence of use of AFFF for Nike or Atlas missile sites. According to the USACE operational history review, Nike Ajax was first deployed in 1954 and remained in use until 1964. Based on this period of use and the limited availability of AFFF prior to 1965, Nike Ajax sites are not considered a potential source of PFOS/PFOA.

As a result of USEPA issuing an HA for PFOS and PFOA in 2016, the Army sampled the onsite drinking water supply well located at NPARC in June 2016. The concentrations of PFOS/PFOA did not exceed the USEPA HA. Groundwater samples also were collected from the five monitoring wells located at NPARC in 2016 (see Figure 2). Individual and combined concentrations of PFOS and PFOA exceeding the USEPA HA in the 5 monitoring wells resulted in the Army collecting water samples from wells at 32 nearby residences and 2 businesses in 2017 and 2018. The 32 residences and 2 businesses were required to be connected to City water as part of a separate Superfund response action. The PA Report (Leidos 2019) focused on the evaluation of potential sources of the PFOS/PFOA at NPARC. At the time of the PA, no documentation was available showing that soil, sediment, or surface water at NPARC were previously tested for PFOS/PFOA; therefore, these compounds could be present in these media at the site.

For a portion of the time NPARC was a USARC, the 369th Engineer Detachment firefighters conducted training activities at the site. Although FTAs have received the most attention, AFFF use at military and civilian facilities is highly varied. In addition to FTAs, many other sites also are likely affected by AFFF due to past emergency response incidents, operational requirements that mandated periodic equipment calibrations on emergency vehicles, and episodic discharge of AFFF-containing fire suppression systems within large aircraft hangars and buildings. The PA site visit conducted in September 2018 visually evaluated the presence of potential AFFF use and storage areas and observed site conditions. It is likely that small quantities of products containing PFOS/PFOA were used and stored at NPARC, and there may have been incidental releases at the site; however, the PA did not find any evidence of such releases. Because the contributions of PFOS/PFOA to the environment from non-AFFF sources are likely to be minor and AFFF storage/use/releases are considered the primary source of PFOS/PFOA at DoD installations in accordance with the *Army Guidance for Addressing Releases of Per- and Polyfluoroalkyl Substances* (Department of the Army 2018), the potential use and storage of AFFF was the focus of the PA.

As of the September 2018 PA site visit, the facility consisted of seven permanent structures, as shown in Figure 2. The structures consisted of:

- A 45,000-square-foot administration building
- A 6,800-square-foot OMS
- A 707-square-foot fire protection pump house
- A 54-square-foot pump house for the single onsite potable well
- Three former Nike Ajax missile silos.

The PA determined that the structures were not AOCs and would not require further evaluation for PFOS/PFOA because there was no evidence that AFFF was used or stored at any of these buildings. Additional information pertaining to the Former FTA Burn Area is provided below.

3.1.1 Former FTA Burn Area

A Former FTA Burn Area was identified in the Phase II ECP Report and was potentially located in the northeastern corner of the facility (see Figure 2). Soil sampling in the reported Former FTA Burn Area was conducted in response to the Pennsylvania Department of Environmental Protection's (PADEP's) request as part of the Phase II ECP Report (Bhate 2011). Four soil borings were advanced and four subsurface soil samples were collected and analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and total petroleum hydrocarbons (TPH). Soil boring logs did not show any ash or burnt material indicative of a burn area. VOCs and TPH were not detected in any of the soil samples, and the detected SVOC concentrations did not exceed the PADEP Act 2 Medium Specific Concentrations (MSCs). These results do not support the presence of an FTA burn area.

Interviews with 99th RD personnel during the 2018 PA indicated that while the 369th Engineer Detachment firefighters may have conducted fire training activities at NPARC, it was unlikely to be a routine training activity. Mr. Nick Taylor (current 99th RD Directorate of Public Works Chief) was stationed at NPARC from 1998 to 2004 and did not witness fire training activities. Mr. Taylor speculated that the firefighters may have conducted some active fire training activities during weekends when he was not onsite. The firefighters may have permitted area occupants to bring refuse to NPARC for burning and fire training (Taylor 2018). Mr. Sal Zangari was with the AMSA at nearby Willow Grove and was tasked with maintaining the vehicles and equipment for the 369th Engineer Detachment. As a result, he was frequently at NPARC. Mr. Zangari was also unaware of fire training activities at NPARC, but stated that if they occurred, the 369th Engineer Detachment would have used water to extinguish the fire, not AFFF (Zangari 2018). The 369th Engineer Detachment utilized the NPARC facility grounds for limited activities, such as exercising the pumps, nozzle testing with water, confined space entry, and rescue training. Mr. Zangari noted that the firefighters trained with live fire scenarios at other facilities, such as Fort Indiantown Gap, Fort Dix, the Montgomery Fire Training Academy, and Johnstown Airport, because internal USAR policy prohibited setting fires for training purposes on USARCs (Zangari 2018). The Nike Ajax missile silos located on the northern side of the OMS building were filled with water, and the water from the center silo was used for firefighting purposes (CH2M Hill 2007). Personnel from the 369th Engineer Detachment were not available to confirm the lack of AFFF use because they were deployed during the PA data collection (Kerr 2018).

The purported burn area was heavily vegetated at the time of the PA site visit, requiring observations to be made from the closest accessible area near where the burn pit was potentially located. No burn scarring was apparent during the PA site visit. Historical records, interviews, visual inspection, and chemical data do not support the existence of an FTA burn area or the storage or use of AFFF at the Former FTA Burn Area.

3.2 PA REPORT CONCLUSION

In summary, the PA Report (Leidos 2019) indicated that all of the available information collected during the PA suggests that AFFF was not stored or used at NPARC. No documentation was available to support the potential use and storage of non-AFFF materials containing PFAS at NPARC.

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4.0 SITE INSPECTION FIELD PROGRAM

This SI focused on a desktop evaluation of existing PFOS/PFOA groundwater data for NPARC. No new SI field activities were conducted under this scope. This section summarizes the investigation field activities conducted at NPARC between June 2016 and May 2018. PFOS, PFOA, and PFBS were not detected in the groundwater from the onsite potable well. PFOS were detected at concentrations exceeding the HA level in the onsite monitoring wells, and both PFOS and PFOA were detected at concentrations exceeding the HA level in the offsite residential wells.

4.1 SAMPLING EVENTS AT NPARC

The Army sampled the onsite drinking water supply well located at NPARC in June 2016 (see Figure 2). In addition, groundwater samples from the five monitoring wells located at NPARC were collected in November 2016.

4.1.1 Sampling Events

On June 21, 2016, two groundwater samples were collected from the potable well and one groundwater sample was collected from monitoring well NP-GW-MW4 located at the NPARC facility.

On November 16, 2016, six groundwater samples (including a duplicate sample from NP-GW-MW1) were collected from the five previously installed monitoring wells at the NPARC facility.

Note that historical documents refer to the five monitoring wells as MW-1, MW-2, MW-3, MW-4, and MW-5. These designations have been subsequently revised to NP-GW-MW1, NP-GW-MW2, NP-GW-MW3, NP-GW-MW4, and NP-GW-MW5 and will be referred to by the revised identifiers for the remainder of this report. Monitoring well construction logs are available for NP-GW-MW1 through NP-GW-MW4 (Environmental Standards 2014) and are provided in Appendix A.

4.1.2 Analytical Method and Quality Assurance/Quality Control

As required by Army guidance, USEPA Method 537 (published in September 2009) was used to analyze the samples from the onsite potable well for the six PFAS compounds:

- PFOS
- PFOA
- PFBS
- Perfluorononanoic acid (PFNA)
- Perfluoroheptanoic acid (PFHpA)
- Perfluorohexane sulfonate (PFHxS).

The water samples were analyzed by the contract laboratory, Eurofins Eaton Analytical. One trip field blank was submitted with the potable well water sample.

The grab groundwater samples collected from the previously installed monitoring wells at NPARC were analyzed using USEPA Method 537 version 1.1 (published in September 2009). Monitoring well construction details for NP-GW-MW1 through NP-GW-MW4 are provided in Table 2. Groundwater quality data collected in 2014 (Environmental Standards 2014) are provided in Table 3.

Table 2. Monitoring Well Construction Details for NPARC

Monitoring Well	Top of Casing Elevation (feet)	Water Depth (ft BGS)	Screened Interval (ft BGS)	Total Well Depth (ft BGS)	Well Diameter (in.)	Casing
NP-GW-MW1	116.3	32.78	29-69	69	2	PVC
NP-GW-MW2	105.80	48.52	22-82	82	2	PVC
NP-GW-MW3	100.41	31.58	28.5-88.5	88.5	2	PVC
NP-GW-MW4	109.07	48.37	38.5-68.5	68.5	2	PVC

Notes:

The data presented in this table are summarized from monitoring well construction logs (provided in Appendix A) from the Phase II Soil and Groundwater Investigation Summary. U.S. Army Reserve Center (PA139) (Environmental Standards 2014).

Monitoring well NP-GW-MW5 was an existing well incorporated into the monitoring well network during the Phase II Soil and Groundwater Investigation Summary. Well construction details are unknown.

Monitoring well elevations (Top of Casing Elevation) were surveyed by Environmental Standards, Inc. geoscientists and referenced to a relative site datum (100-foot elevation).

Horizontal well positions were located using a Garmin GPSMAP® 76CSx.

BGS = Below Ground Surface

NPARC = North Penn Memorial U.S. Army Reserve Center

PVC = Polyvinyl Chloride

The groundwater samples were analyzed by the contract laboratory Eurofins Lancaster Laboratories Environmental using Method 537 version 1.1 modified. PFAS compounds analyzed and reported for each sample include:

- PFOA
- PFNA
- Perfluorodecanoic acid (PFDA)
- Perfluoroundecanoic acid (PFUnA)
- Perfluorododecanoic acid (PFDoA)
- Perfluorotridecanoic acid (PFTrDA)
- Perfluorotetradecanoic acid (PFTA)
- Perfluorohexanoic acid (PFHxA)
- PFHpA
- PFBS
- PFHxS
- PFOS
- N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)
- N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA).

Table 3. Field Measured Groundwater Quality Indicator Parameters – Monitoring Wells

Well Identification	Date	Top of Casing Elevation (ft)	Depth to Water (ft)	Groundwater Elevation	Groundwater Quality Indicator Parameters					
					Temperature (Celsius)	Dissolved Oxygen (mg/L)	Spec. Cond. (µS/cm)	pH	ORP (mV)	Turbidity (NTU)
MW-1	06/19/14	116.33	32.78	83.55	15.3	7.70	283.7	6.27	126.8	123
	07/16/14	116.33	51.00	65.33	15.2	6.87	293.8	6.49	94.8	172
MW-2	06/19/14	105.80	48.52	57.28	14.0	8.80	420.0	6.36	142.7	81.9
	07/16/14	105.80	52.17	53.63	16.0	7.07	405.2	6.49	90.1	165
MW-3	06/19/14	100.41	31.58	68.83	15.0	4.14	676	7.44	127.6	132
	07/16/14	100.41	34.69	65.72	16.2	1.99	659	7.52	74.7	219
MW-4	06/19/14	109.07	48.37	60.70	13.9	6.73	312.6	6.89	1,160	78.3
	07/16/14	109.07	50.43	58.64	15.3	7.62	380.4	7.09	14.7	200
MW-5	06/19/14	109.87	58.92	50.95	17.6	5.85	482.8	6.99	131.4	2.53
	07/16/14	109.87	61.73	48.14	17.8	5.37	472.3	7.04	70.6	1.40
Potable Well	06/19/14	N/A	N/A	N/A	15.2	1.37	708	7.44	115.4	3.83
	07/16/14	N/A	N/A	N/A	15.3	1.40	689	7.34	36.4	2.81

Notes:

The data presented in this table are from the Phase II Soil and Groundwater Investigation Summary (Environmental Standards 2014).

Monitoring well elevations (Top of Casing Elevation) were surveyed by Environmental Standards, Inc. geoscientists and referenced to a relative site datum (100-foot elevation).

Horizontal well positions were located using a Garmin GPSMAP® 76CSx.

mg/L = Milligrams per Liter

µS/cm = MicroSiemens per Centimeter

mV = Millivolt

N/A = Not Available

NTU = Nephelometric Turbidity Unit

ORP = Oxidation-Reduction Potential

The USACE Chemistry Technical Lead conducted a review of the laboratory report data package for the sample data from the NPARC monitoring wells. The review indicated that all method required quality control (QC) was within QC limits except for a couple minor exceedances. This resulted in a few sample results being flagged as estimated values (J flag). The method blank and field reagent blank were all non-detect. The percent recoveries for the laboratory control spike were within QC limits. The matrix spike (MS) sample had recoveries for all spiked compounds within QC limits; the matrix spike duplicate (MSD) had all spiked compounds recoveries within QC limits except for NMeFOSAA; however, there were no detections of that compound in any of the samples. The precision reported by the laboratory for the MS/MSD was very good, with each relative percent difference value well within the QC limit. Initial calibration and continuing calibration checks were within acceptable QC limits. One field duplicate sample (NP-GW-MW36) was collected at NP-GW-MW1. Both samples had very good agreement in the results reported between the two samples, indicating very good field sampling precision and laboratory analytical precision. In summary, all sample results were acceptable to use for their intended purpose as qualified.

4.2 SAMPLING EVENTS AT WELLS LOCATED ON RESIDENTIAL PROPERTIES

The Army collected water samples from wells located at 32 nearby residences and 2 businesses in 2017 and 2018. A portion of the residents use the groundwater from the wells as potable water and a portion use the well water as “garden wells.” Table 4 provides the sample date, address, and groundwater use and Figure 6 shows the approximate locations of the residence wells.

4.2.1 Sampling Events

The sampling was initiated on April 13, 2017, when a representative from USACE performed sampling of four residential wells from Potshop Road and Berks Road (see Figure 6). The sampling procedure and notes for the April 2017 sample event are provided with the sample logs from the remaining wells sampled at residential properties in Appendix B. Additional information for these residences is provided in Table 4.

In June 2017, Headquarters Department of the Army, Assistant Chief of Staff for Installation Management (ACSIM) requested that the Army Public Health Center (APHC) assist the BRAC Division in a quick response request to collect water samples for PFOS/PFOA testing from residences that are located near NPARC and use groundwater wells. A meeting was held on July 5, 2017, at PADEP in Norristown, Pennsylvania, to discuss a request by PADEP to test water at residences near the USARC. Representatives from the BRAC office, the USAR Command, and APHC met with representatives of PADEP and the Worcester Township. Based on the meeting’s discussion, the BRAC office proposed to contact residents immediately around NPARC who were determined to rely on residential well water and to ask their permission to test their water for PFOS/PFOA. In August 2017, The ACSIM BRAC office, through the Baltimore District USACE BRAC Program Manager, sent right-of-entry (ROE) letters and private well questionnaires to the identified residents. Sampling of residential wells was initiated on September 5, 2017, by APHC personnel after they had received several responses to the ROEs. Additional information for these residences is provided in Table 4.

- **September 5, 2017**—APHC sampled five residences from Potshop Road and Berks Road that use groundwater wells for supply and two residences on Potshop Road that are connected to municipal water supply but have garden wells.

Table 4. Additional Information for Wells Located at Residential Properties

Sample Date(s)	Address	Sample ID	Does Well Provide Drinking Water to Residence?
4/13/2017	2715 Potshop Road	NP-0413-W-2715	No, well is capped, not used
	2737 Potshop Road	NP-0413-W-2737	No
	1607 Berks Road	NP-0413-W-1607	Yes
	1645 Berks Road	NP-0413-W-1645	Yes
9/5/2017	1539 Potshop Road	NP-0905-P1539	Yes
	2775 Potshop Road	NP-0905-P2775/NP-0905-P2775D	No (it did prior to municipal hookup ~2000), used for laundry, garden, fill pool, and animals in barn
	2795 Potshop Road	NP-0905-P2795	No (it did prior to municipal hookup ~2000)
	1527 Potshop Road	NP-0905-T1527	Yes
	1818 Berks Road	NP-0905-B1818	Yes
	1661 Berks Road	NP-0905-B1661	Yes
	2720 Potshop Road	NP-0905-P2720	Yes
10/3/2017	2795 Potshop Road	NP-1003-P2795	No (see above)
	2775 Potshop Road	NP-1003-P2775	No (see above)
10/10/2017	1620 Berks Rd	NP-1010-B1620	Yes
	1636 Berks Rd	NP-1010-B1636	Yes
	1704 Berks Rd	NP-1010-B1704	Yes
	1720 Berks Rd	NP-1010-B1720	Yes
	1805 Berks Road (Small Tool Shop)	NP-1010-B1805STS/NP-1010-B1805STS_D	Yes (for ice machine)
	1805 Berks Road (Farmhouse Administration Building)	NP-1010-B1805FAB	Yes
	2716 Potshop Road	NP-1010-P2716	No
	2915 Potshop Road	NP-1010-P2915	No
	2959 Potshop Road	NP-1010-P2959	No

Table 4. Additional Information for Wells Located at Residential Properties (Continued)

Sample Date(s)	Address	Sample ID	Does Well Provide Drinking Water to Residence?
12/12-12/13/17	2912 Skippack Pike	NP-1212-S2912	Yes
	2862 Skippack Pike	NP-1212-S2862	Yes
	2862 Skippack Pike (After Carbon Filtration Unit)	NP-1212-S2862-PCARB	Yes
	2918 Hickory Hill Drive	NP-1212-H2918	Yes
	2925 Hickory Hill Drive	NP-1212-H2925	Yes
	1809 Landis Road	NP-1212-L1809	Yes
	2947 Hickory Hill Drive	NP-1212-H2947	Yes
	2915 Hickory Hill Drive	NP-1212-H2915	Yes
	1804 Berks Road	NP-1212-B1804	Yes
	1804 Berks Road (After Reverse Osmosis Treatment Unit)	NP-1212-B1804-RO	Yes
	1851 Berks Road	NP-1212-B1851/NP-1212-B1851D	Yes
	1575 Potshop Road	NP-1212-P1575	Yes
	1600 Potshop Road	NP-1212-P1600	Yes
	1628 Berks Road	NP-1212-B1628	Yes
2909 Hickory Hill Drive	NP-1312-H2909	Yes	
2/20/2018	1907 Berks Road	NP-0220-B1907	Yes
	1730 Valley Forge Road	NP-0220-V1730	Yes
5/9/2018	1805 Berks Road (Small Tool Shop)	NP-0509-B1805 STS	Uncertain if still used for ice maker
	1805 Berks Road (Farmhouse Administration Building)	NP-0509-B1805 FAB	Supposed to have been hooked up to main water supply line (municipal water) No field sheet exists for this sampling event

ID = Identifier

- **October 3, 2017**—APHC personnel conducted a quick turn-around collection of water samples from the two residences on Potshop Road with garden wells sampled in September to confirm high PFOS/PFOA levels detected during the initial sampling.
- **October 10, 2017**—APHC conducted water sampling at four residences on Berks Road that use supply wells and one business on Berks Road (Allan Myers) that operates two supply wells. In addition, garden wells at three residences on Potshop Road that are connected to municipal water supply were sampled at the request of the BRAC office for additional groundwater quality data.
- **December 12 and 13, 2017**—APHC conducted water sampling at 13 residences on Skippack Pike, Hickory Hill Drive, Landis Road, Berks Road, and Potshop Road, each of which uses a groundwater well for its water supply. Samples at two residences (with existing treatment units) were collected both before and after the treatment units in the homes. One of the two residences has a carbon filtration unit and the other residence has a reverse osmosis treatment unit.
- **February 20, 2018**—At the request of the BRAC office, APHC conducted water sampling at two residences (one on Berks Road and one on Valley Forge Road). Each residence uses a groundwater well for water supply.
- **May 9, 2018**—The two wells associated with the Allan Myers Farm House and Small Tool Shop on Berks Road were resampled. These wells had originally been sampled in October 2017.

4.2.2 Water Sample Collection Procedures

The Army sampled wells on a total of 32 nearby residences and 2 businesses. To minimize disturbance to the property owner and increase the opportunity to sample during the middle of the week, water samples were collected primarily from outside spigots. Collection locations for three wells sampled in October 2017 were in basements at or near the wellhead due to the lack of an outside spigot or the need to collect before a treatment system. In several instances during December 2017 and February 2018, samples were collected at kitchen faucets when outside spigots had been winterized or when a need existed to collect a sample after an in-house water treatment unit. Sample locations are identified on field sample sheets (Appendix B).

Prior to collection of water samples, the spigot or kitchen faucet was opened fully and water was run for 10 minutes to ensure a good flush of water through the pipes. In a few instances, water was flushed for less time due to site circumstances or at the request of the homeowner. Field sheets identify if water was flushed for less than 10 minutes. Prior to opening spigots, a hose was connected and laid out a distance from the house to prevent water infiltration along the foundation. After 10 minutes, the spigot was closed, the hose was disconnected, and the spigot was turned back to full flow with a 5-gallon bucket beneath it. When the bucket was approximately three-quarters full, the water flow from the spigot was turned down to a slow stream. The flushing procedure and sample collection were similar for a kitchen faucet location except that no hose was necessary as water discharged to the sink drain. Two sealed sample containers were removed from the sample kit bag and then labeled with the sample location identification, sample date, and sample time. After which, the two sample containers were filled successively with the discharging water from the spigot, immediately capped, inserted back inside the sealable plastic bag, and placed inside the shipping cooler with ice. If a duplicate sample, MS, or MSD were collected at a residence, water was collected in labeled containers immediately following the collection of the primary water sample. Duplicate samples, MSs, MSDs, and containers were collected, handled, and stored in the same manner as the primary water samples.

4.2.3 Analytical Method and Quality Assurance/Quality Control

USEPA Method 537 version 1.1 for drinking water was used to analyze each of the water samples for the following PFAS compounds:

- PFOA
- PFNA
- PFDA
- PFUnA
- PFDoA
- PFTTrDA
- PFTA
- PFHxA
- PFHpA
- PFBS
- PFHxS
- PFOS
- NEtFOSAA
- NMeFOSAA.

With the exception of the May 2018 samples, all water samples were analyzed by the contract laboratory, Eurofins Eaton Analytical. The May 2018 water samples were analyzed by TestAmerica Sacramento Division.

All sample container kits were provided by the analytical testing laboratory to the APHC Directorate of Laboratory Services (DLS), which packaged the kits for the APHC sample teams. Each sample kit consisted of three empty, 250-milliliter (mL), wide-mouth, high-density polyethylene (HDPE) sample containers with caps and one 250-mL container filled with PFOS/PFOA-free water. The sample container kits were stored within a sealable plastic bag along with several nitrile sampling gloves.

Sampling personnel wore only cotton clothing that had been laundered multiple times without softeners. No water-repellant clothing or shoes were worn. No skin care or hair products that could contain PFOS/PFOA chemicals were used by sampling personnel. Nitrile gloves were worn by sampling personnel while at each residence in accordance with testing method requirements. New, unused nitrile gloves were worn after arriving at each residence to prevent possible PFOS/PFOA contamination. New nitrile gloves also were worn between flushing operations that required the use of a garden hose and actual sample collection.

A field blank was prepared at each residence where a water sample was collected. The preparation of a field blank consisted of uncapping the laboratory-prepared PFOS/PFOA-free water container and transferring the water to an empty sample container and then securing the filled container with its cap. Water samples at each location were collected directly from the spigot or faucet discharge into each sample container and immediately capped.

MS, MSD, and duplicate water samples were collected during the September 5, 2017; October 10, 2017; and December 12-13, 2017 sampling events. MS, MSD, and duplicate samples were not collected during the sample events when only two wells were sampled.

The filled sample containers, including MS, MSD, and duplicates, were immediately placed in a shipping cooler with bagged ice. Each set was secured within a sealable plastic bag. A chain-of-custody sheet was completed and placed in the shipping cooler. The cooler was secured with tape and custody seal tape. The sealed cooler was transported by vehicle to the APHC DLS sample management branch for processing, repackaging (to include addition of ice), and overnight shipment via FedEx to the contract laboratory.

4.3 NORTH PENN SITE 12 MONITORING WELL SAMPLING

In November 2017, APHC sampled five monitoring wells located on the North Penn Area 12 Superfund Site (see Figure 6).

4.3.1 Sampling Event

North Penn Area 12 has been considered upgradient of NPARC in historical environmental reports. Monitoring and remediation of VOCs in groundwater at the North Penn Area 12 Superfund Site is being conducted with USEPA Region 3 oversight. Coordination between BRAC, USARC, APHC, and USEPA Region 3 personnel was made between late November 2017 and mid-January 2018. During these dates, information was gathered on the status of monitoring wells located at the site, selection of monitoring wells to sample, and method of water sample collection. During the first week of February 2018, it was agreed that five monitoring wells would be sampled on February 14, 2018, with USEPA Region 3 personnel onsite to observe. Note that historical documents refer to the five selected monitoring wells as MW-4, MW-6D, MW-7, MW-8, and MW-15. These designations have been subsequently revised to NP-A12-MW4, NP-A12-MW6D, NP-A12-MW7, NP-A12-MW8, and NP-A12-MW15 and will be referred to by the revised identifiers for the remainder of this report.

4.3.2 Water Sample Collection Procedures

Grab groundwater samples were collected from each of the five selected monitoring wells. Information for the monitoring wells is provided in Table 5. The approach to collect grab samples was selected as the sampling approach to eliminate purge water waste management and minimize impact to the passive groundwater treatment operations at the site.

Sampling personnel used HydraSleeve samplers to collect groundwater samples. The sleeves were made of HDPE specifically for PFOS/PFOA sampling. The sampling setup at each well consisted of single-use materials dedicated to that well: a precut length of polyethylene tether line; an adapter for either a 4- or 6-inch well; a 1-liter, HDPE, skinny HydraSleeve; a stainless steel bottom clip; and a stainless steel bottom weight.

Table 5. North Penn Area 12 Monitoring Well Details

Monitoring Well	Depth Top of HydraSleeve Lowered (ft BGS)	Well Casing Diameter (in.)	Casing Interval (ft BGS)	Screened Interval (ft BGS)	Depth to Bottom (ft BGS)
NP-A12-MW4	70	6	034	N/A	110
NP-A12-MW6D	142	4	0130	130-150	150
NP-A12-MW7	87	4	075	75-95	95
NP-A12-MW8	64	4	052	52-72	72
NP-A12-MW15	122	4	0130	110-130	130

BGS = Below Ground Surface

N/A = Not Available

The clip and weight assisted the lowering of the sleeve to the predetermined sample depth, which was the center of the screened interval or open borehole of the well to be sampled. The sleeve was secured to the bottom of the adapter by a threaded coupling, and the tether line was secured to the top of the adapter by tying it through machined slots. The adapters allowed the capture of a core grab sample without having to oscillate the sampler draw water into it. Assemblage of the sampling equipment with the attached length of required tether line was conducted the day prior to sampling in a clean environment at the APHC water laboratory building. The preassembled sampling equipment was stored in sealed plastic bags dedicated for each monitoring well. Each bag was labeled with the monitoring well identification. The single-use sampling equipment remained stored in the bags until opened at the assigned monitoring well.

When the sampling team arrived at the monitoring well to be sampled, the locked cap was removed from the well to allow access for the sampling equipment. One well, NP-A12-MW6D, required the removal of a dedicated bladder pump and tubing from the well. Available records do not indicate if Teflon[®] tubing was used. Another well, NP-A12-MW4, required the removal of wire at the top of the casing that inhibited access of the sampling equipment. Once the monitoring well was open and clear of any obstructions, the sampling equipment was removed from the bag. One of the sampling personnel held the tether line while the second sampling personnel lowered the HydraSleeve with adapter attachment and bottom weight into the well. The tether line was gradually fed to allow the sampler to slowly drop until it reached the middle of the screened interval, which was determined by the premeasured length of the tether line. The length of the premeasured tether line was based on the well construction log information. Once the sleeve was at the center of the screened or open borehole interval, it was quickly pulled upward by the tether line and then immediately drawn up and out of the well by the sampling personnel who held the line. The upward motion caused the check valve to open and the sleeve to fill with water within the screen interval.

Once the filled HydraSleeve extracted from the well, it was separated from the adapter and held by one of the sampling personnel. The other sampling personnel pierced the bottom of the sleeve with a one-time use discharge tube and collected the discharged water directly into two 250-mL, wide-mouth HDPE sample containers that had been stored in sealed plastic bags. Immediately after the groundwater sample was collected, the sample containers were secured with their caps, labeled, inserted back into sealed plastic bags, and placed on ice in storage coolers.

4.3.3 Analytical Method and Quality Assurance/Quality Control

USEPA Method 537 modified Quality Systems Manual Table B-15 was used to analyze each of the groundwater samples. The reported list included 14 PFOS/PFOA compounds for laboratory analysis. All groundwater samples were analyzed by the contract laboratory Eurofins Lancaster Laboratories Environmental.

All sample container kits were provided by the analytical testing laboratory to the APHC DLS, which packaged them for the APHC sample teams. Each sample kit consisted of two empty, 250-mL, HDPE sample containers with caps contained within a sealable plastic bag and several nitrile sampling gloves.

Sampling personnel wore only cotton clothing that had been laundered multiple times without softeners. No water-repellant clothing or shoes were worn. No skin care or hair products that could contain PFOS/PFOA were used by sampling personnel. Nitrile gloves were worn by sampling personnel while at each residence and in accordance with testing method requirements. New, unused nitrile gloves were worn after arriving at each monitoring well to prevent possible PFOS/PFOA contamination.

A field blank was prepared at one of the monitoring wells at the site. The preparation of a field blank consisted of uncapping a 250-mL laboratory-prepared, PFOS/PFOA-free water container and transferring the water to an empty, 250-mL HDPE sample container and then securing the filled container with its cap.

An MS/MSD water sample was collected at one monitoring well (NP-A12-MW7). The selected well was assumed to be the least likely impacted by either VOC or PFOS/PFOA contamination due to its location on the southwestern side of an apparent groundwater divide. The reported PFOS/PFOA analytical results indicate the assumption was valid. A duplicate water sample was collected at monitoring well NP-A12-MW6D. The well was chosen as a possible location where PFOS/PFOA might be detected.

An equipment blank also was collected at the site. The sample is identified as NP-A12-EB. The sample was prepared by running laboratory-prepared PFOS/PFOA-free water through the sleeve's sampler adapter and into an unused sampling HydraSleeve. In addition, a 3-foot length of the woven polyester tether line was placed within the HydraSleeve. The sleeve was squeezed several times to force water through the tether line. The equipment blank was then collected by decanting it directly to the sample containers using a clean, unused sampling discharge tube. The 250-mL HDPE sample containers were then secured with their caps.

The filled sample containers, including the MS, MSD, and duplicate water sample, were immediately placed in a shipping cooler with bagged ice. Each set was secured within a sealable plastic bag. A chain-of-custody sheet was completed and placed in the shipping cooler. The cooler was secured with tape and custody seal tape. The sealed cooler was transported by vehicle to the APHC DLS sample management branch for processing, repackaging (to include addition of ice), and overnight shipment via FedEx to the contract laboratory.

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5.0 RESULTS

The Army sampled the onsite drinking water supply well located at NPARC in June 2016. The results indicated that the concentrations of PFOS and PFOA did not exceed the USEPA HA. Groundwater samples also were collected from the five monitoring wells located at NPARC in 2016. Individual and combined concentrations of PFOS and PFOA exceeding the USEPA HA resulted in the Army collecting drinking water samples from 32 nearby residences and 2 businesses in 2017 and 2018. This SI report presents the results of the groundwater sampling for PFOS/PFOA at and around NPARC.

Analytical results for groundwater samples are summarized and compared to applicable screening criteria in Tables 6 through 8. These tables present data for compounds with at least one detection. The data presentation tables provided in Appendix C present the comprehensive data for all reported PFOS/PFOA compounds.

5.1 NPARC

Two groundwater sampling events were conducted at the NPARC facility. On June 21, 2016, the potable water well located onsite and NP-GW-MW4 were sampled and analyzed for the six PFAS compounds: PFOS, PFOA, PFBS, PFNA, PFHpA, and PFHxS. Groundwater samples also were collected from five previously installed monitoring wells (NP-GW-MW1, NP-GW-MW2, NP-GW-MW3, NP-GW-MW4, NP-GW-MW5) at NPARC on November 16, 2016. Monitoring wells NP-GW-MW1, NP-GW-MW2, NP-GW-MW4, and NP-GW-MW5 are located in the northern portion of the facility, and NP-GW-MW3 is located adjacent to the administration building in the southern portion of the facility. A duplicate groundwater sample was collected from NP-GW-MW1, but was referenced as NP-GW-MW36. The groundwater samples were analyzed for 14 PFAS compounds: PFOA, PFNA, PFDA, PFUnA, PFDoA, PFTTrDA, PFTA, PFHxA, PFHpA, PFBS, PFHxS, PFOS, NEtFOSAA, and NMeFOSAA. The groundwater samples were collected and analyzed as described in Section 4.1.

During the June 2016 sampling event, two samples were collected from the potable water well. Of the six PFAS compounds analyzed for in the onsite drinking water samples, only PFHxS was detected above laboratory detection limits. No screening criteria exist for PFHxS. PFOS, PFOA, and PFBS were not detected in the onsite drinking water samples.

During the June 2016 sampling event, all six PFAS compounds analyzed for in NP-GW-MW4 were detected above laboratory detection limits. No screening criteria exist for PFNA, PFHpA, and PFHxS. PFBS (23 ng/L) and PFOA (21 ng/L) did not exceed their respective screening criteria. The PFOS concentration (390 ng/L) did exceed the Tapwater RSL of 40 ng/L and the HA of 70 ng/L. The combined PFOS and PFOA concentrations (411 ng/L) exceeded the HA.

In November 2016, six groundwater samples were collected from NP-GW-MW1: NP-GW-MW36 (primary and duplicate sample), NP-GW-MW2, NP-GW-MW3, NP-GW-MW4, and NP-GW-MW5. Six of the 14 PFAS compounds (PFUnA, PFDoA, PFTTrDA, PFTA, NEtFOSAA, NMeFOSAA) were not detected. PFOA, PFNA, PFDA, PFHxA, PFHpA, PFBS, PFHxS, and PFOS were detected above laboratory detection limits. The detected concentrations of PFOA and PFBS were below applicable screening criteria. No screening criteria exist for PFNA, PFDA, PFHxA, PFHpA, and PFHxS. Groundwater analytical results (PFOS, PFOA, and PFOS+PFOA) for the NPARC monitoring wells are presented in Table 6 and shown in Figure 6.

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Table 6. Data Summary: PFOS/PFOA Groundwater Results from NPARC Potable Well and Monitoring Wells

Parameter	Location ID Sample ID Sample Type Sample Date	Units	USEPA Health Advisory [H]	USEPA Regional Screening Level	North Penn USARC Potable Well 158630001 WELL 06/21/2016	North Penn USARC Potable Well 3478260 WELL 06/21/2016	NP-GW-MW1 8702045 WELL 11/16/2016	NP-GW-MW36 8702052 WELL 11/16/2016	NP-GW-MW2 8702046 WELL 11/16/2016	NP-GW-MW3 8702049 WELL 11/16/2016	NP-GW-MW4 3478261 WELL 6/21/2016	NP-GW-MW4 8702050 WELL 11/16/2016	NP-GW-MW5 8702051 WELL 11/16/2016
PFOS/PFOA													
Perfluorooctane sulfonate		ng/l	70	40	4 U	4 U	68 [R]	66 [R]	64 [R]	10 J	390 [H,R]	250 [H,R]	180 [H,R]
Perfluorooctanoic acid		ng/l	70	40	2 U	2 U	11	11	6	11	21	26	15
PFOS + PFOA		ng/l	70	NA	6 U	6 U	79 [H]	77 [H]	70 [H]	21 J	411 [H]	276 [H]	195 [H]

Notes:

NP-GW-MW36 is a duplicate sample from NP-GW-MW1.

Bold values indicate a detection.

U = The analyte/element was not detected at or above the limit of quantitation (LOQ).

J = The reported result is an estimated value; the result is between the method detection limit (MDL) and the limit of quantitation (LOQ).

[H] = USEPA Health Advisory.

[R] = USEPA Regional Screening Level

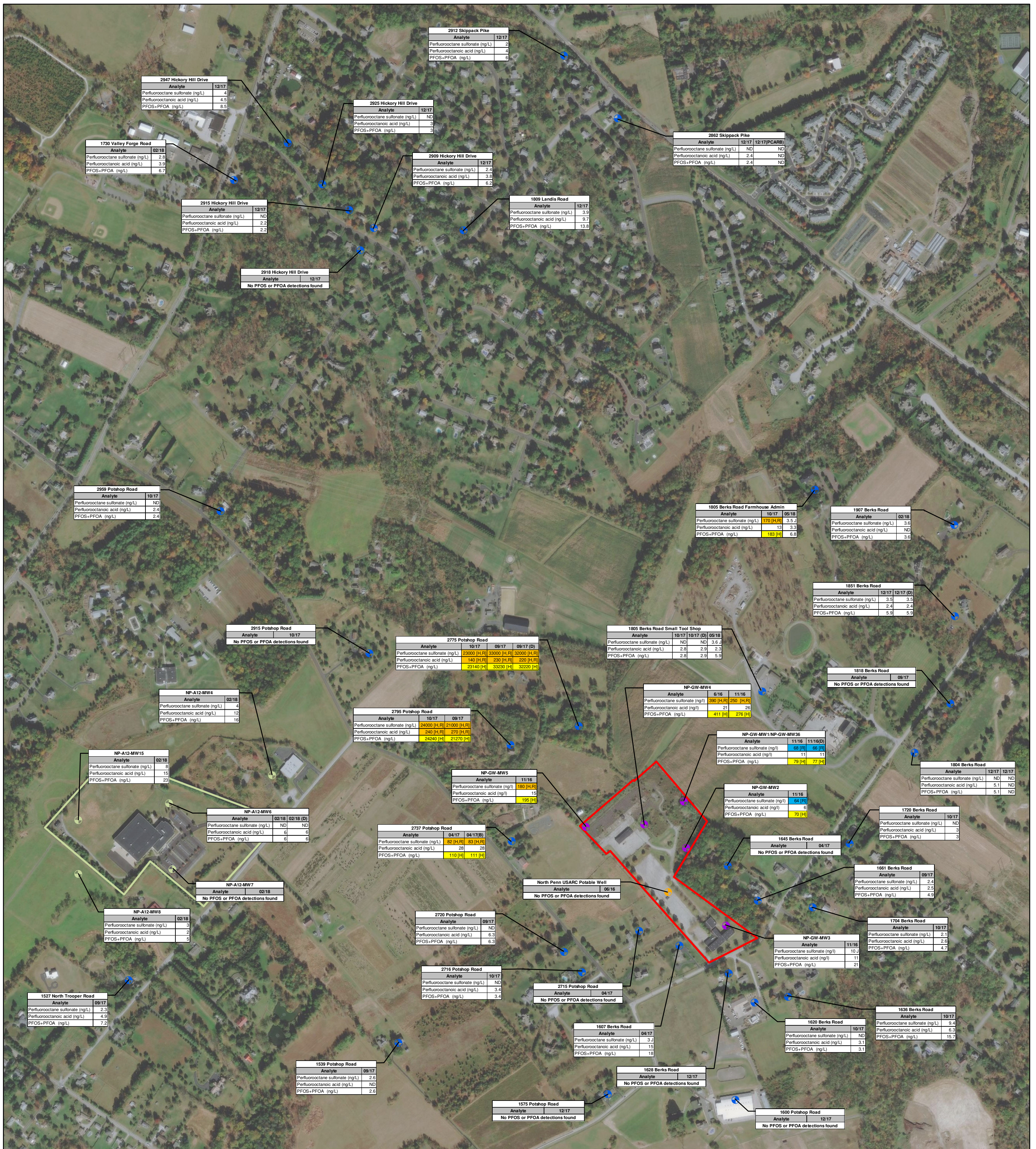
[H] Indicates an exceedance of the USEPA Health Advisory.

[H, R] Indicates an exceedance of the USEPA Health Advisory and USEPA Regional Screening Level.

NA = Not applicable.

USEPA = U.S. Environmental Protection Agency

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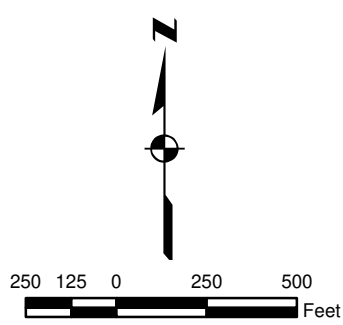
Legend

- North Penn Area 12
- NPARC
- NPARC Potable Well
- NPARC Monitoring Wells
- Wells at Residential Properties
- North Penn Area 12 Monitoring Wells

Table Notes:
 N/A - Not Applicable
 ND - Non-detect
 J - The reported result is an estimated value; the result is between the method detection limit (MDL) and the limit of quantitation (LOQ).
 [H] - Above USEPA Health Advisory
 [R] - Above USEPA Regional Screening Level
 [H,R] - Above USEPA Health Advisory and Regional Screening Level
 [H,R] - Above USEPA Health Advisory and Regional Screening Level
 [H,R] - Above USEPA Health Advisory and Regional Screening Level

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

Analyte	USEPA Health Advisory (ng/L)	USEPA Regional Screening Level (ng/L)
Perfluorooctane sulfonate (PFOS)	70	40
Perfluorooctanoic acid (PFOA)	70	40
PFOS+PFOA	70	N/A



**PFOS AND PFOA CONCENTRATIONS
 AT NPARC, WELLS
 AT RESIDENTIAL PROPERTIES,
 AND NORTH PENN AREA 12
 FORMER NORTH PENN
 ARMY RESERVE CENTER
 NORRISTOWN, PENNSYLVANIA**

PROJECT: \GIS_DATA\North Penn\SI
 Figure 6 Well Results C-size.mxd

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DATE: 6/11/2020

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PFOS and PFOA were detected in all six groundwater samples. PFOA concentrations ranged from 6 to 26 ng/L but did not exceed either the Tapwater RSL of 40 ng/L or the HA of 70 ng/L. PFOS concentrations ranged from 10 J to 250 ng/L. PFOS concentrations exceeded the Tapwater RSL at monitoring wells NP-GW-MW1/NP-GW-MW36 (68 ng/L/66ng/L), NP-GW-MW2 (64 ng/L), NP-GW-MW4 (250 ng/L), and NP-GW-MW5 (180 ng/L), and the HA at monitoring wells NP-GW-MW4 (250 ng/L) and NP-GW-MW5 (180 ng/L). The combined PFOS and PFOA concentrations were either at or exceeded the HA in five of the six samples (NP-GW-MW1/NP-GW-MW36 [79 ng/L/77 ng/L], NP-GW-MW2 [70 ng/L], NP-GW-MW4 [276 ng/L], and NP-GW-MW5 [195 ng/L]). PFOS and PFOA concentrations were below screening criteria at NP-GW-MW3.

Monitoring wells NP-GW-MW1/NP-GW-MW36 and NP-GW-MW2 are closest to the area reportedly used as an FTA burn area. The concentrations only slightly exceeded the USEPA drinking water HA at both locations. The highest concentrations of both PFOS and PFOA were detected at NP-GW-MW4, which is located centrally in the northern portion of the facility.

PFBS was detected at each sample location except NP-GW-MW3. PFBS concentrations ranged from 6 J to 27 ng/L. PFBS concentrations were below the Tapwater RSL (40,000 ng/L) at each sample location.

5.2 WELLS LOCATED AT AREA RESIDENCES

Between April 2017 and May 2018, 8 sampling events were conducted to collect groundwater from wells located at 32 nearby residences and 2 businesses near NPARC (see Table 4). The properties where the wells were sampled are located on Potshop Road (11 residences), Berks Road (13 residences), Skippack Pike (2 residences), Hickory Hill Drive (5 residences), North Trooper Road (1 residence), Landis Road (1 residence), and Valley Forge Road (1 residence).

A total of 44 groundwater samples were collected from these area wells. Duplicate samples were collected at 2775 Potshop Road, 1805 Berks Road, and 1851 Berks Road. In addition, a second round of samples was collected from 2775 Potshop Road, 2795 Potshop Road, 1804 Berks Road, 1805 Berks Road (at both the Small Tool Shop and the Farmhouse Administration Building), and 2862 Skippack Pike. With the exception of the second round of sampling at 1805 Berks Road in May 2018, all of the other samples collected from wells on residential properties were analyzed for the six PFOS/PFOA compounds: PFOS, PFOA, PFBS, PFNA, PFHpA, and PFHxS. The groundwater sample collected during the second round of sampling at 1805 Berks Road in May 2018 was analyzed for 14 PFOS/PFOA compounds: PFOA, PFNA, PFDA, PFUnA, PFDoA, PFTTrDA, PFTA, PFHxA, PFHpA, PFBS, PFHxS, PFOS, NEtFOSAA, and NMeFOSAA. The groundwater samples were collected and analyzed as described in Section 4.2.

Six of the 14 PFOS/PFOA compounds (PFUnA, PFDoA, PFTTrDA, PFTA, NEtFOSAA, NMeFOSAA) were not detected in any of the residences sampled. PFOA, PFNA, PFDA, PFHxA, PFHpA, PFBS, PFHxS, and PFOS were detected above laboratory detection limits. No screening criteria exist for PFNA, PFDA, PFHxA, PFHpA, and PFHxS.

PFOS and PFOA were detected above laboratory detection limits in groundwater from 19 wells and 25 wells located on residential properties, respectively. PFOS concentrations ranged from 2 to 32,900 ng/L and PFOA concentrations ranged from 2.2 to 270 ng/L. PFOS and PFOA concentrations exceeded the HA either individually or combined at four area wells. In addition, PFOS concentrations exceeded the Tapwater RSL at the same four area wells and PFOA concentrations exceeded the Tapwater RSL at two of the area wells. Three of the four wells exhibiting an exceedance of screening criteria are located on Potshop Road (2737 Potshop Road, 2775 Potshop Road, 2795 Potshop Road) and one is on Berks Road (1805 Berks Road).

During the first round of sampling wells on residential properties in April 2017, PFOS concentrations exceeded the HA and Tapwater RSL at 2737 Potshop Road at concentrations of 82 and 83 ng/L in primary

and duplicate samples. The combined concentrations of PFOS and PFOA are 110 and 111 ng/L. The well at this property was not sampled again; however, the exceedance of the HA at this property triggered additional sampling of wells on residential properties.

The highest concentrations of PFOS and PFOA during any of the sampling events (including at NPARC and the North Penn Area 12 monitoring wells) were detected at 2775 Potshop Road and 2795 Potshop Road. During the September 2017 sampling event, three samples were collected from these two properties (a primary and duplicate sample were collected from 2775 Potshop Road). The combined PFOS and PFOA concentrations ranged from 21,270 to 33,230 ng/L. A second round of sampling for these two residences was conducted in October 2017. The combined concentrations of PFOS and PFOA ranged from 23,140 to 24,240 ng/L, indicating lower concentrations but of the same magnitude.

During the initial sample event at the Farmhouse Administration Building at 1805 Berks Road in October 2017, PFOS exceeded the HA and Tapwater RSL at 170 ng/L. During the second round of sampling at the Farmhouse Administration Building in May 2018, PFOS was detected at 3.5 J ng/L, well below the HA and Tapwater RSL. PFOS and PFOA concentrations did not exceed the HA of 70 ng/L individually or combined at the Farmhouse Administration Building during the second sampling event. Groundwater analytical results (PFOS, PFOA, and PFOS+PFOA) for the NPARC monitoring wells are presented in Table 7 and shown in Figure 6.

PFBS were detected above laboratory detection limits in groundwater from 14 wells located on residential properties. PFBS concentrations ranged from 1.7 J to 340 ng/L in the wells located at surrounding residential properties. The highest PFBS concentrations also occurred at 2775 Potshop Road and 2795 Potshop Road. PFBS concentrations were below the Tapwater RSL at all sample locations.

5.3 NORTH PENN AREA 12

Groundwater samples were collected from previously installed monitoring wells (NP-A12-MW4, NP-A12-MW6, NP-A12-MW7, NP-A12-MW8, NP-A12-MW15) at the North Penn Area 12 on February 14, 2018. A duplicate groundwater sample was collected from NP-A12-MW6. The groundwater samples were analyzed for 14 PFOS/PFOA compounds: PFOA, PFNA, PFDA, PFUnA, PFDoA, PFTTrDA, PFTA, PFHxA, PFHpA, PFBS, PFHxS, PFOS, NEtFOSAA, and NMeFOSAA. The groundwater samples were collected and analyzed as described in Section 4.3.

Six groundwater samples were collected from NP-A12-MW4, NP-A12-MW6 (primary and duplicate samples), NP-A12-MW7, NP-A12-MW8, and NP-A12-MW15. Nine of the 14 PFOS/PFOA compounds (PFUnA, PFDoA, PFTTrDA, PFTA, PFDA, PFNA, PFHxS, NEtFOSAA, NMeFOSAA) were not detected. PFOA, PFHxA, PFHpA, PFBS, and PFOS were detected above laboratory detection limits. No screening criteria exist for PFHxA or PFHpA. Groundwater analytical results (PFOS, PFOA, and PFOS+PFOA) for the North Penn Area 12 monitoring wells are presented in Table 8 and shown in Figure 6.

PFOS was detected in three wells (NP-A12-MW4, NP-A12-MW8, NP-A12-MW15) at concentrations ranging from 3 to 8 ng/L. PFOA was detected in each groundwater sample (with the exception of PFOA at NP-A12-MW7) at concentrations ranging from 2 to 15 ng/L. PFOS and PFOA concentrations did not exceed the Tapwater RSL of 40 ng/L or the HA of 70 ng/L individually or combined at any of the North Penn Area 12 monitoring wells.

PFBS was detected in one monitoring well. The PFBS concentration of 1 ng/L was below the Tapwater RSL at NP-A12-MW15.

Table 7. Data Summary: PFOS/PFOA Groundwater Results from Wells on Residential Properties

Parameter	Location ID Sample ID Sample Type Sample Date	Units	USEPA Health Advisory [H]	USEPA Regional Screening Level [R]	1527 North Trooper Road NP-0905-T1527 WELL 09/05/2017	1539 Potshop Road NP-0905-P1539 WELL 09/05/2017	1575 Potshop Road NP-1212-P1575 WELL 12/12/2017	1600 Potshop Road NP-1212-P1600 WELL 12/12/2017	1607 Berks Road NP-0413-W-1607 WELL 04/13/2017	1620 Berks Road NP-1010-B1620 WELL 10/10/2017	1628 Berks Road NP-1212-B1628 WELL 12/12/2017	1636 Berks Road NP-1010-B1636 WELL 10/10/2017
PFOS/PFOA												
Perfluorooctane sulfonate		ng/L	70	40	2.3	2.6	2 U	2 U	3 J	2 U	2 U	9.4
Perfluorooctanoic acid		ng/l	70	40	4.9	2 U	2 U	2 U	15	3.1	2 U	6.3
PFOS + PFOA		ng/L	70	NA	7.2	2.6	4 U	4 U	18 J	3.1	4 U	15.7

Parameter	Location ID Sample ID Sample Type Sample Date	Units	USEPA Health Advisory [H]	USEPA Regional Screening Level [R]	1645 Berks Road NP-0413-W-1645 WELL 04/13/2017	1661 Berks Road NP-0905-B1661 WELL 09/05/2017	1704 Berks Road NP-1010-B1704 WELL 10/10/2017	1720 Berks Road NP-1010-B1720 WELL 10/10/2017	1730 Valley Forge Road NP-0220-V1730 WELL 02/20/2018	1804 Berks Road NP-1212-B1804 WELL 12/12/2017	1804 Berks Road NP-1212-B1804-RO WELL 12/12/2017	1805 Berks Road Farmhouse Admin NP-0509-B1805 FAB WELL 05/09/2018
PFOS/PFOA												
Perfluorooctane sulfonate		ng/L	70	40	6 U	2.4	2.1	2 U	2.8	2 U	2 U	3.5 J
Perfluorooctanoic acid		ng/l	70	40	2 U	2.5	2.6	3	3.9	5.1	2 U	3.3
PFOS + PFOA		ng/L	70	NA	8 U	4.9	4.7	3	6.7	5.1	4 U	6.8 J

Parameter	Location ID Sample ID Sample Type Sample Date	Units	USEPA Health Advisory [H]	USEPA Regional Screening Level [R]	1805 Berks Road Farmhouse Admin NP-1010-B1805FAB WELL 10/10/2017	1805 Berks Road Small Tool Shop NP-0509-B1805 STS WELL 05/09/2018	1805 Berks Road Small Tool Shop NP-1010-B1805STS WELL 10/10/2017	1805 Berks Road Small Tool Shop NP-1010-B1805STS_D WELL 10/10/2017	1809 Landis Road NP-1212-L1809 WELL 12/12/2017	1818 Berks Road NP-0905-B1818 WELL 09/05/2017	1851 Berks Road NP-1212-B1851 WELL 12/12/2017	1851 Berks Road NP-1212-B1851-D WELL 12/12/2017
PFOS/PFOA												
Perfluorooctane sulfonate		ng/L	70	40	170 [H,R]	3.6 J	2 U	2 U	3.9	2 U	3.5	3.5
Perfluorooctanoic acid		ng/l	70	40	13	2.3	2.8	2.9	9.7	2 U	2.4	2.4
PFOS + PFOA		ng/L	70	NA	183 [H]	5.9 J	2.8	2.9	13.6	4 U	5.9	5.9

Parameter	Location ID Sample ID Sample Type Sample Date	Units	USEPA Health Advisory [H]	USEPA Regional Screening Level [R]	1907 Berks Road NP-0220-B1907 WELL 02/20/2018	2715 Potshop Road NP-0413-W-2715 WELL 04/13/2017	2716 Potshop Road NP-1010-P2716 WELL 10/10/2017	2720 Potshop Road NP-0905-P2720 WELL 09/05/2017	2737 Potshop Road NP-0413-W-2737 WELL 04/13/2017	2737 Potshop Road NP-0413-W-2737B WELL 04/13/2017	2775 Potshop Road NP-0905-P2775 WELL 09/05/2017	2775 Potshop Road NP-0905-P2775D WELL 09/05/2017
PFOS/PFOA												
Perfluorooctane sulfonate		ng/L	70	40	3.6	6 U	2 U	2 U	82 [H,R]	83 [H,R]	33000 [H,R]	32000 [H,R]
Perfluorooctanoic acid		ng/l	70	40	2 U	2 U	3.4	6.3	28	28	230 [H,R]	220 [H,R]
PFOS + PFOA		ng/L	70	NA	3.6	8 U	3.4	6.3	110 [H]	111 [H]	33230 [H]	32220 [H]

Table 7. Data Summary: PFOS/PFOA Groundwater Results from Wells on Residential Properties (Continued)

Parameter	Location ID Sample ID Sample Type Sample Date	Units	USEPA Health Advisory [H]	USEPA Regional Screening Level [R]	2775 Potshop Road NP-1003-P2775 WELL 10/03/2017	2795 Potshop Road NP-0905-P2795 WELL 09/05/2017	2795 Potshop Road NP-1003-P2795 WELL 10/03/2017	2862 Skippack Pike NP-1212-S2862 WELL 12/12/2017	2862 Skippack Pike NP-1212-S2862- PCARB WELL 12/12/2017	2909 Hickory Hill Drive NP-1312-H2909 WELL 12/13/2017	2912 Skippack Pike NP-1212-S2912 WELL 12/12/2017
PFOS/PFOA											
Perfluorooctane sulfonate		ng/L	70	40	23000 [H,R]	21000 [H,R]	24000 [H,R]	2 U	2 U	2.4	2
Perfluorooctanoic acid		ng/l	70	40	140 [H,R]	270 [H,R]	240 [H,R]	2.4	2 U	3.8	4
PFOS + PFOA		ng/L	70	NA	23140 [H]	21270 [H]	24240 [H]	2.4	4 U	6.2	6

Parameter	Location ID Sample ID Sample Type Sample Date	Units	USEPA Health Advisory [H]	USEPA Regional Screening Level [R]	2915 Hickory Hill Drive NP-1212-H2915 WELL 12/12/2017	2915 Potshop Road NP-1010-P2915 WELL 10/10/2017	2918 Hickory Hill Drive NP-1212-H2918 WELL 12/12/2017	2925 Hickory Hill Drive NP-1212-H2925 WELL 12/12/2017	2947 Hickory Hill Drive NP-1212-H2947 WELL 12/12/2017	2959 Potshop Road NP-1010-P2959 WELL 10/10/2017
PFOS/PFOA										
Perfluorooctane sulfonate		ng/L	70	40	2 U	2 U	2 U	2 U	4	2 U
Perfluorooctanoic acid		ng/l	70	40	2.2	2 U	2 U	3	4.5	2.4
PFOS + PFOA		ng/L	70	NA	2.2	4 U	4 U	3	8.5	2.4

Notes:

Bold values indicate a detection.

U = The analyte/element was not detected at or above the limit of quantitation (LOQ).

J = The reported result is an estimated value; the result is between the method detection limit (MDL) and the limit of quantitation (LOQ).

[H] = USEPA Health Advisory.

[R] = USEPA Regional Screening Level

[H] Indicates an exceedance of the USEPA Health Advisory.

[H,R] Indicates an exceedance of the USEPA Health Advisory and USEPA Regional Screening Level.

ID = Identifier

NA = Not Applicable

USEPA = U.S. Environmental Protection Agency

Table 8. Data Summary: PFOS/PFOA Groundwater Results from North Penn Area 12 Monitoring Wells

Parameter	Location ID Sample ID Sample Type Sample Date	Units	USEPA Health Advisory [H]	USEPA Regional Screening Level [R]	NP-A12-MW15 206240005 WELL 02/14/2018	NP-A12-MW4 206240008 WELL 02/14/2018	NP-A12-MW6D 206240006 WELL 02/14/2018	NP-A12-MW6DX 206240007 WELL 02/14/2018	NP-A12-MW7 206240001 WELL 02/14/2018	NP-A12-MW8 206240003 WELL 02/14/2018
PFOS/PFOA										
Perfluorooctane sulfonate		ng/L	70	40	8	4	3 U,J	2 U,J	5 U	3
Perfluorooctanoic acid		ng/L	70	40	15	12	6	6	1 U,J	2
PFOS + PFOA		ng/L	70	NA	23	16	6	6	6 U,J	5

Notes:

Bold values indicate a detection.

U = The analyte/element was not detected at or above the limit of quantitation (LOQ).

J = The reported result is an estimated value; the result is between the method detection limit (MDL) and the limit of quantitation (LOQ).

[H] = USEPA Health Advisory.

[R] = USEPA Regional Screening Level

ID = Identifier

NA = Not Applicable

USEPA = U.S. Environmental Protection Agency

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6.0 SUMMARY AND RECOMMENDATIONS

The principal objective of the SI is to eliminate from further consideration those releases that pose no significant threat to public health or the environment (40 CFR 300.420(c)(1)); combined with the PA results, this SI Report concludes that high concentrations of PFOS/PFOA were detected in some offsite wells, but this contamination cannot be attributed to historical Army activities at the NPARC site.

The PA identified a total of eight potential AOCs. These AOCs were identified based on the possibility of storage, transfer, or use of AFFF at the location. For NPARC, each structure and a reported former FTA burn area were considered potential AOCs. The Former FTA Burn Area was located in the northeastern area of the site. The site features associated with the potential AOCs were evaluated during the 2018 PA site visit followed by personnel interviews and review of historical records. As noted in the PA Report (Leidos 2019), the available information collected during the PA suggests that AFFF was not stored or used at NPARC. No documentation was available to support the potential use and storage of non-AFFF materials containing PFAS at NPARC.

The groundwater samples were collected from the NPARC monitoring wells, surrounding area wells located on residential properties, and North Penn Area 12 monitoring wells during a series of sampling events from June 2016 through May 2018. PFOS/PFOA were detected in the groundwater at NPARC and four wells located at surrounding residential properties at concentrations exceeding the screening criteria.

The results of the PA and SI indicate that PFOS/PFOA were not stored, used, or disposed of at NPARC. However, the Army has identified limited data gaps that will be addressed in a RI to determine if an onsite source of PFOS/PFOA or evidence of groundwater conditions exists to suggest migration onto the former NPARC. The Army's responsibilities under a PA/SI is not to chase contamination to find a source offsite; rather, it is to gather enough facts to determine if the source is from historical activities onsite. The focus of a RI will be to gather more data to determine the existence of an onsite source and will not focus on determining the potential offsite sources. In addition, further investigation is recommended for PADEP due to uncertainties associated with the offsite source of the detected concentrations of PFOS and PFOA (such offsite sources could include nearby airfields or industrial facilities, such as electro-plating operations).

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APPENDIX A

NPARC WELL CONSTRUCTION LOGS

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MONITORING WELL #: **MW-1**

SITE LOCATION: **1625 BERKS ROAD
NORRISTOWN, PENNSYLVANIA**

PROJECT NAME: **FORMER N. PENN ARMY RESERVE
CENTER PHASE II**

DRILLING COMPANY: **ALLIED WELL DRILLING**

DATE COMPLETED: **06/03/14**

DRILL RIG: **SANDVIK DRILLTECH**

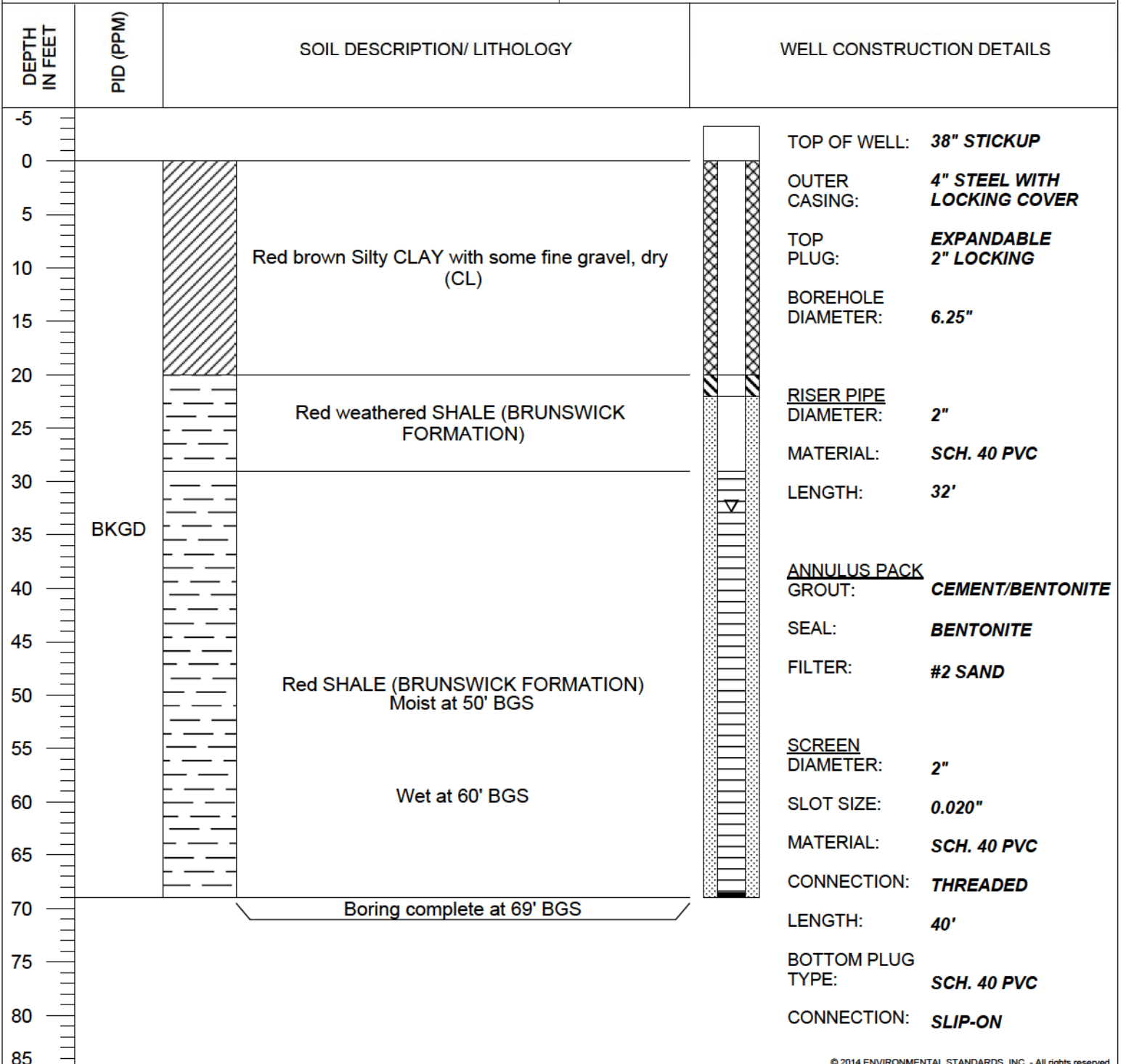
LOGGED BY: **MARK HASLETT**

DRILLING METHOD: **AIR ROTARY**

TOC ELEVATION: **116.33'**

WELL DEPTH: **69' BGS**

WATER DEPTH: **32.78'**



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MW-1 MONITORING WELL LOG	PROJECT NO.: 20146456.A		CREATION DATE: JUNE 12, 2014		BGS = BELOW GROUND SURFACE NA = NOT APPLICABLE PID = PHOTOIONIZATION DETECTOR PPM = PARTS PER MILLION BKGD = BACKGROUND PID READING *PID CALIBRATED TO 100 PPM ISOBUTYLENE CALIBRATION GAS
	DRAWN BY: SES	APPROVED BY: JPK	CHECKED BY: MCF	REVISION: 0	



MONITORING WELL #: **MW-2**

SITE LOCATION: **1625 BERKS ROAD
NORRISTOWN, PENNSYLVANIA**

PROJECT NAME: **FORMER N. PENN ARMY RESERVE
CENTER PHASE II**

DRILLING COMPANY: **ALLIED WELL DRILLING**

DATE COMPLETED: **06/03/14**

DRILL RIG: **SANDVIK DRILLTECH**

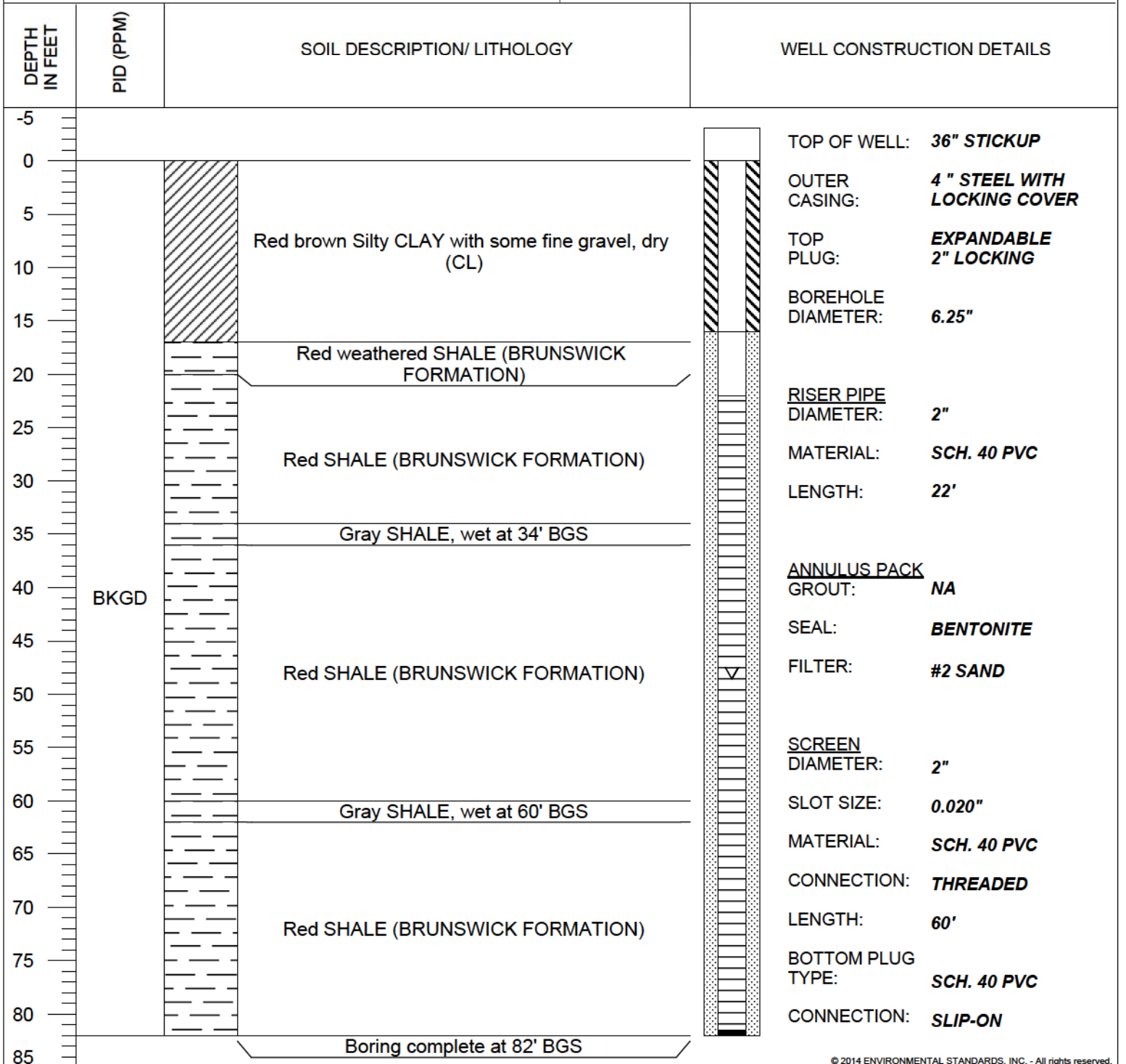
LOGGED BY: **MARK HASLETT**

DRILLING METHOD: **AIR ROTARY**

TOC ELEVATION: **105.80'**

WELL DEPTH: **82' BGS**

WATER DEPTH: **48.52'**



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MW-2 MONITORING WELL LOG	PROJECT NO.: 20146456.A		CREATION DATE: JUNE 12, 2014		BGS = BELOW GROUND SURFACE NA = NOT APPLICABLE PID = PHOTOIONIZATION DETECTOR PPM = PARTS PER MILLION BKGD = BACKGROUND PID READING *PID CALIBRATED TO 100 PPM ISOBUTYLENE CALIBRATION GAS
	DRAWN BY: SES	APPROVED BY: JPK	CHECKED BY: MCF	REVISION: 0	



MONITORING WELL #: **MW-3**

SITE LOCATION: **1625 BERKS ROAD
NORRISTOWN, PENNSYLVANIA**

PROJECT NAME: **FORMER N. PENN ARMY RESERVE
CENTER PHASE II**

DRILLING COMPANY: **ALLIED WELL DRILLING**

DATE COMPLETED: **06/09/14**

DRILL RIG: **SANDVIK DRILLTECH**

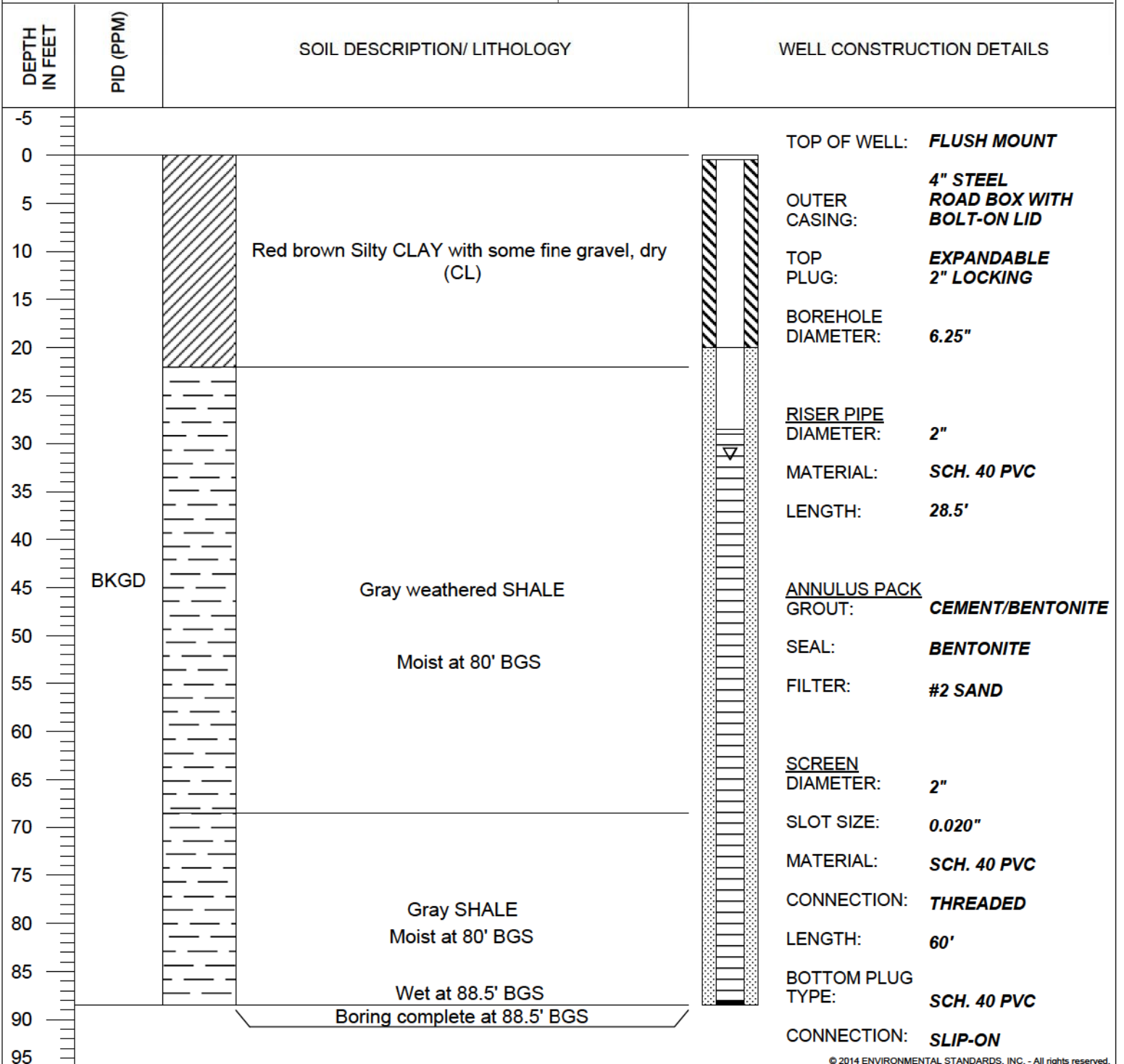
LOGGED BY: **MEGAN FILIPOVITS**

DRILLING METHOD: **AIR ROTARY**

TOC ELEVATION: **100.41'**

WELL DEPTH: **88.5' BGS**

WATER DEPTH: **31.58'**



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MW-3 MONITORING WELL LOG	PROJECT NO.: 20146456.A		CREATION DATE: JUNE 12, 2014		BGS = BELOW GROUND SURFACE NA = NOT APPLICABLE PID = PHOTOIONIZATION DETECTOR PPM = PARTS PER MILLION BKGD = BACKGROUND PID READING *PID CALIBRATED TO 100 PPM ISOBUTYLENE CALIBRATION GAS
	DRAWN BY: SES	APPROVED BY: JPK	CHECKED BY: MCF	REVISION: 0	



MONITORING WELL #: **MW-4**

SITE LOCATION: **1625 BERKS ROAD
NORRISTOWN, PENNSYLVANIA**

PROJECT NAME: **FORMER N. PENN ARMY RESERVE
CENTER PHASE II**

DRILLING COMPANY: **ALLIED WELL DRILLING**

DATE COMPLETED: **06/03/14**

DRILL RIG: **SANDVIK DRILLTECH**

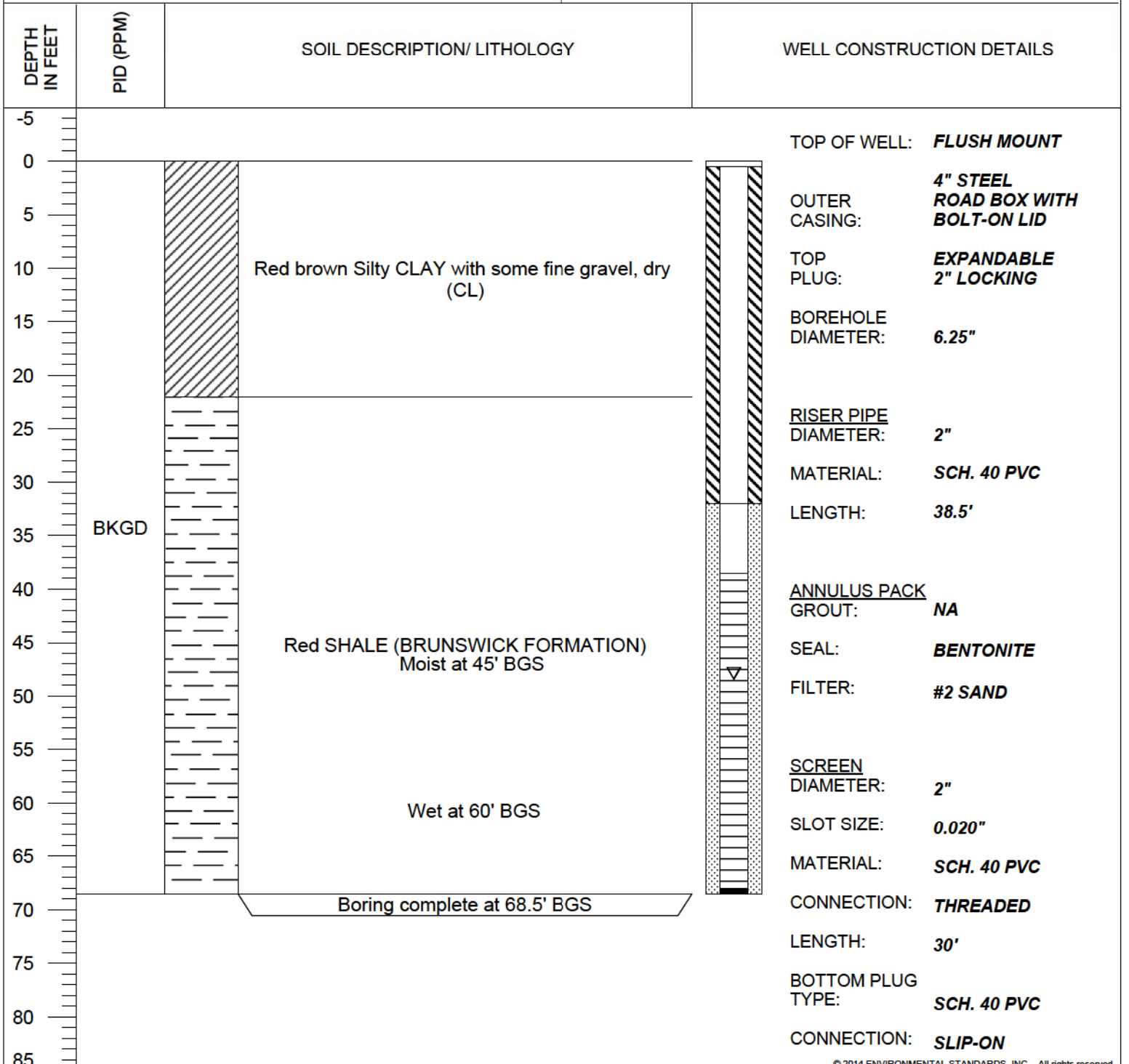
LOGGED BY: **MARK HASLETT**

DRILLING METHOD: **AIR ROTARY**

TOC ELEVATION: **109.07'**

WELL DEPTH: **68.5' BGS**

WATER DEPTH: **48.37'**



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MW-4 MONITORING WELL LOG	PROJECT NO.: 20146456.A		CREATION DATE: JUNE 12, 2014		BGS = BELOW GROUND SURFACE NA = NOT APPLICABLE PID = PHOTOIONIZATION DETECTOR PPM = PARTS PER MILLION BKGD = BACKGROUND PID READING *PID CALIBRATED TO 100 PPM ISOBUTYLENE CALIBRATION GAS
	DRAWN BY: SES	APPROVED BY: JPK	CHECKED BY: MCF	REVISION: 0	

APPENDIX B
SAMPLE COLLECTION LOGS

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North Penn Resume of Staff Visit 13 April 2017

STAFF OFFICIAL: Vernon W. Griffin, CENAB-EN-HI, (410) 962-3333

PROJECT VISITED: North Penn PFOA/PFOS Residential Well Sampling Event

DATE OF VISIT: 13 April 2017

USACE PRINCIPAL CONTACTS: Christian Gandy, USACE, 410-962-4256

PURPOSE OF VISIT: To perform PFOA/PFOS Sampling of Residential Wells Surrounding the North Penn Project Site.

PROJECT PREPARATION:

In an effort to prepare for the sampling event, the following actions were performed:

1. Ensured that clothing was old and laundered without any fabric softeners or stain treatment additives and made of natural material only prior to departing for sampling event.
2. Ensured that no Gore-Tex™ clothing and/or material was utilized or contacted prior to and during sampling event.
3. Ensured that no cologne, body lotions/gels/moisturizers, shampoos/conditioner, deodorant, insect repellent, sunscreen, or other substances were applied prior to or during the sampling event.
4. Ensured that laboratory had provided adequate bottle ware and quantity of “PFAS free water for field blanks.
5. Ensured that sample containers were sealed and not exposed to any potential sources.
6. Ensured that an adequate quantity of nitrile gloves were on hand and protected from any potential sources.
7. Ensured that no handling of plastic, aluminum or coated food wrappers or containers were handled prior to the arrival or during the sampling event.
8. Ensured that no waterproof books/pens, plastic clip boards, sharpies, or similar items were used or handled prior to and during the sampling event.
9. Ensured that a cotton blanket was used to cover seats of vehicle prior to and during the sampling event.

FINDINGS:

Upon arrival to the site the USACE representative, Mr. Vernon W. Griffin, met with several personnel representing the reserve component.

During the sampling event, the following observations and activities were noted and performed:

1. Mobilized to 1607 Berks Road at 0905 hours where the spigot that was at the back of the house (previously identified by homeowner) was located. Disconnected the hose that

was attached to the spigot and begin the purging process, which consisted of turning on the spigot fully and allowing it to run for approximately 15 minutes. Once it was determined that the line had been adequately purged and the pump had been engaged, a sample was collected. The sample was collected at 0930 hours, as follows:

- a. Turning down the flow at the spigot.
- b. Donning nitrile gloves.
- c. Ensuring that the observers representing the reserve center was down wind of the sample collection.
- d. Allowing the water from the spigot to fill the sample container.

Once the sample container was filled, it was closed securely and placed in the sample cooler on ice. At that time, the laboratory provided PFOA free water and another, empty sample container was retrieved from the cooler and a field blank was collected.

Collection of the field blank was performed as follows:

- a. The empty sample container was uncapped along with the container of PFOA free water.
- b. The PFOA free water was poured into the empty sample container until filled. A space of approximately 3-4 inches was utilized to separate the two containers.
- c. Upon filling the sample container, it was securely closed and placed in the cooler that contained ice.

2. Mobilized to 1645 Berks Road at 0945 hours where the resident of 2737 Potshop Road was called, as he had been identified as having the key to 1645 Berks Road and would provide access. There was no answer and a message was left with a return number. After approximately 15 minutes of waiting without a return call, the decision was made to proceed with locating a spigot at the rear of the house as close to the well as possible. A spigot was located directly adjacent to the well, approximately 15 feet away. The hose that was connected to the spigot was disconnected and the spigot was opened fully. Water was allowed to flow from the spigot for approximately 15 minutes prior to sample collection. Once it was determined that the line had been adequately purged and the pump had been engaged, a sample was collected. The sample and field blank was collected at 1015 hours in the same manner as listed in "1" above.
3. Called the residence at 2715 Potshop Road several times prior to leaving 1648 Berks Road to ensure that the homeowner was present; however, there was no answer and a message was left with a return number each time. Shortly after the last call, the decision was made to proceed to 2715 Potshop Road and knock on the door.

Upon arrival at 2715 Potshop Road, the resident of 2737 Potshop Road returned the call and stated that he was at work and had requested that his well be sampled at 1330 hours; however, he would attempt to get there earlier, if possible. Either way, a call would be given to confirm.

The resident of 2715 Potshop Road was located in the barn and pointed out a spigot in the front of the house that was closest to the well. There was no hose connected, so the spigot was turned on fully and allowed to run for approximately 15 minutes prior to sample collection. Once it was determined that the line had been adequately purged and

the pump had been engaged, a sample was collected. The sample and field blank was collected at 1045 hours in the same manner as listed in "1" above.

Returned the reserve center to await a call from the resident of 2737 Potshop Road. After waiting for approximately 45 minutes, the decision was made to take lunch and return to the reserve center prior to going to 2737 Potshop Road to perform the sample collection.

4. Arrived back at the reserve center at approximately 1300 hours and still hadn't received a call from the resident of 2737 Potshop Road. Therefore, at 1315 it was decided to depart of 2737 Potshop Road.

Met with the homeowner upon arrival at 2737 Potshop Road. He pointed out the location where the piping from the pump entered the residence. This location was in an earthen crawl space in the basement of the house. The spigot was located at the bottom of a water tank where the piping was connected. A hose was attached to the spigot, which was used to purge the tank and tubing. After purging approximately 30 gallons into a drum, the spigot was closed, the hose was disconnected and the spigot was turned back on and allowed to run across the earthen floor for a few seconds prior to sample collection. The primary sample, QA sample and respective field blanks were collected at 1345 hours in the same manner as listed in "1" above.

All samples were placed on ice immediately after collection. After the last samples were collected, the shipping cooler was prepped, samples properly packaged and iced, chain of custody completed (#525377) and signed, shipping cooler sealed and delivered to FedEx for priority overnight shipment to the laboratory (Eurofins Lancaster Laboratories Environmental).



Vernon W. Griffin
Industrial Hygiene Technician
EES Section, EMDC Branch
US Army Corps of Engineers

Sample Logs

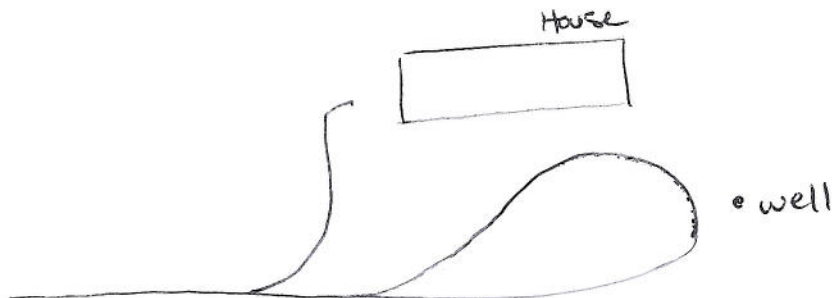


North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence	
Owner(s) Name: Richard and Barbara Weron	
Address: 2775 Potshop Road, Norristown, PA	
Sample Collection date (mm/dd): 09/05	Collection Time: 1207
Sample Collectors	
Name	Affiliation
George C. LOGAN IV	APHC
TRACY MERCHEL	APHC
Names/affiliation of other individual present during sampling	
MATTHEW WATERBURY	APHC

Sample Collection Information	
<p>Sample collection point</p> <p><input checked="" type="checkbox"/> outside spigot (if so, location: <u>Back of the house</u>)</p> <p><input type="checkbox"/> Inside faucet (if so, location: _____)</p> <p>Sample collected prior to to any existing home treatment unit? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>	<p>SAMPLE ID: NP-0905-P2775</p> <p>Notes: well is located south east of house, 425 ft deep.</p>

Sketch of well location with respect to the house
(north top of sheet)



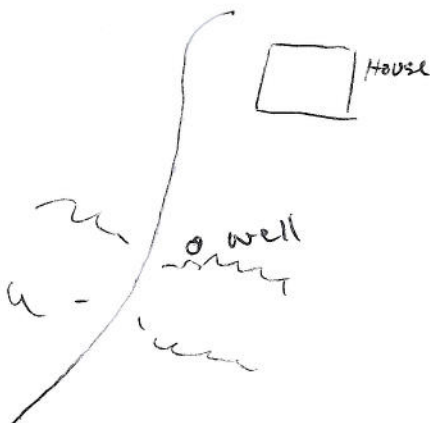


North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence	
Owner(s) Name: Robert and Kathering Kimber	
Address: 2795 Potshop Road, Norristown, PA	
Sample Collection date (mm/dd): 09/05	Collection Time: 1050
Sample Collectors	
Name	Affiliation
<i>George C. Logan IV</i>	APHC
<i>TRACY MERCHEL</i>	APHC
Names/affiliation of other individual present during sampling	
<i>MATTHEW WATERBURY</i>	APHC

Sample Collection Information	
<p>Sample collection point</p> <p><input checked="" type="checkbox"/> outside spigot (if so, location: <u>outside upper garden</u>)</p> <p><input type="checkbox"/> Inside faucet (if so, location: _____)</p> <p>Sample collected prior to to any existing home treatment unit? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p>	<p>SAMPLE ID: NP-0905-P2795</p> <p>Notes: <i>well is 5 SW of house</i></p>

Sketch of well location with respect to the house
(north top of sheet)



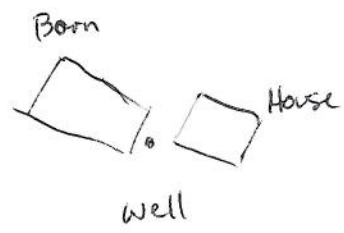


North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence	
Owner(s) Name: Gerald and Patricia McDonnell	
Address: 1527 N Trooper Road, Norristown, PA	
Sample Collection date (mm/dd): 09/05	Collection Time: 1115
Sample Collectors	
Name	Affiliation
<i>George Clinton Logan IV</i>	<i>APHC</i>
<i>TRACY MERCHEL</i>	<i>APHC</i>
Names/affiliation of other individual present during sampling	
<i>MATTEW WATERBURY</i>	<i>APHC</i>

Sample Collection Information	
<p>Sample collection point</p> <p><input checked="" type="checkbox"/> outside spigot (if so, location: <u>Front of house, left of door</u>)</p> <p><input type="checkbox"/> Inside faucet (if so, location: _____)</p> <p>Sample collected prior to to any existing home treatment unit? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>	<p>SAMPLE ID: NP-0905-T1527</p> <p>Notes: <i>Behind the house 50ft.</i></p>

Sketch of well location with respect to the house
(north top of sheet)



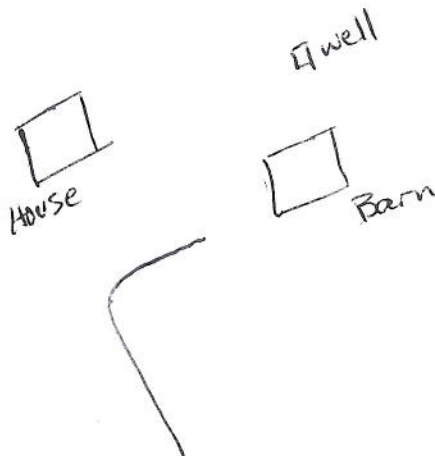


North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence	
Owner(s) Name: John Chambers	
Address: 1539 Potshop Road, Norristown, PA	
Sample Collection date (mm/dd): 09/05	Collection Time: 1142
Sample Collectors	
Name	Affiliation
George C. LOGAN IV	APHC
TRACY MERCHEL	APHC
Names/affiliation of other individual present during sampling	
MATTHEW WATERBURY	APHC

Sample Collection Information	
Sample collection point <input checked="" type="checkbox"/> outside spigot (if so, location: <u>IN BARN, left of door.</u>) <input type="checkbox"/> Inside faucet (if so, location: _____) Sample collected prior to to any existing home treatment unit? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	SAMPLE ID: NP-0905-P1539 Notes: Property to the west has a well that is not used for drinking

Sketch of well location with respect to the house
(north top of sheet)





North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence	
Owner(s) Name: Harold and Janice Hutt	
Address: 2720 Potshop Road, Norristown, PA	
Sample Collection date (mm/dd): 09/05	Collection Time: 1045
Sample Collectors	
Name	Affiliation
Dream Manners	APHC
Alex Zook	APHC
Names/affiliation of other individual present during sampling	
Ray Palma	99th RSC

Sample Collection Information

Sample collection point

outside spigot (if so, location: rear of house, left of deck)

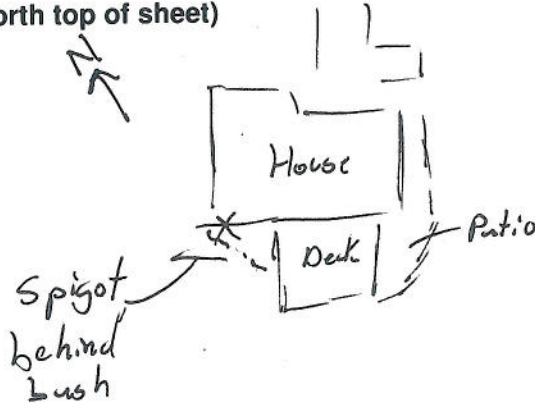
Inside faucet (if so, location: _____)

Sample collected prior to to any existing home treatment unit?
 Yes No

SAMPLE ID: NP-0905-P2720

Notes: take MS/MSD
 10:38 start flush, using attached hose rang bell, no answer, 10 min flush, flush w/o hose until 3 gal bucket full

Sketch of well location with respect to the house (north top of sheet)



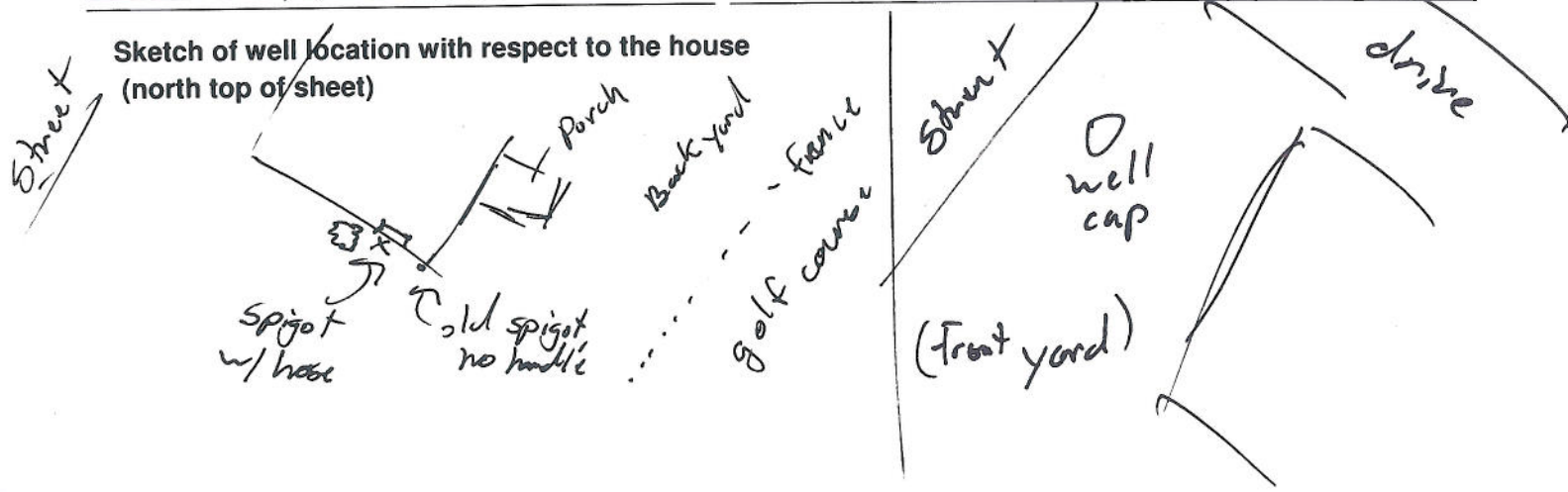
well location, unknown/not clear



North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence	
Owner(s) Name: Richard and Mary Kirkpatrick	
Address: 1818 Berks Road, Norristown, PA	
Sample Collection date (mm/dd): 09/05	Collection Time: 11:35
Sample Collectors	
Name	Affiliation
Duane Muners	APHC
Alex Cook	APHC
Names/affiliation of other individual present during sampling	
Ray Palma	99th RSC

Sample Collection Information	
<p>Sample collection point</p> <p><input checked="" type="checkbox"/> outside spigot (if so, location: <u>right side of house, below window</u>)</p> <p><input type="checkbox"/> Inside faucet (if so, location: _____)</p> <p>Sample collected prior to to any existing home treatment unit? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>	<p>SAMPLE ID: NP-0905-B1818</p> <p>Notes: flush from hose to garden, start 11:23 -</p>



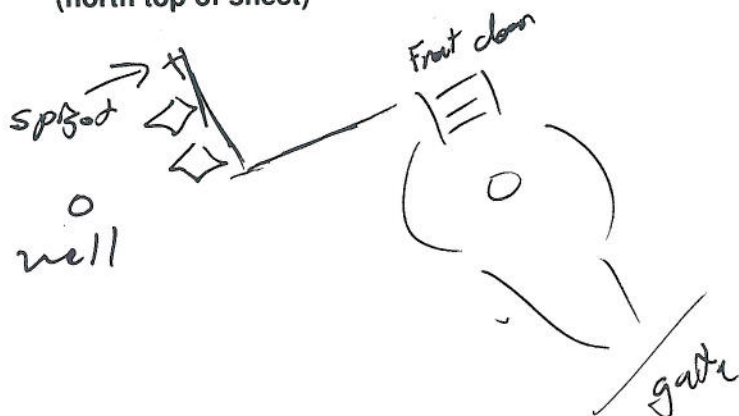


North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence	
Owner(s) Name: Francis and Catharine Genuardi	
Address: 1661 Berks Road, Norristown, PA	
Sample Collection date (mm/dd): 09/05	Collection Time: 1115
Sample Collectors	
Name	Affiliation
Diane Mavers	APHC
Alex Book	APHC
Names/affiliation of other individual present during sampling	
Ray Palma	99th RSC

Sample Collection Information	
<p>Sample collection point</p> <p><input checked="" type="checkbox"/> outside spigot (if so, location: <u>left side of house by ac condensers</u>)</p> <p><input type="checkbox"/> Inside faucet (if so, location: _____)</p> <p>Sample collected prior to to any existing home treatment unit? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>	<p>SAMPLE ID: NP-0905-B1661</p> <p>Notes: flush w/ attached hose, 11:04 - 11:11 then to bucket for several min</p>

Sketch of well location with respect to the house (north top of sheet)





North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence	
Owner(s) Name: Richard and Barbara Weron	
Address: 2775 Potshop Road, Norristown, PA	
Sample Collection date (mm/dd): 10/03 1050	Collection Time: 1107
Sample Collectors	
Name	Affiliation
MATTHEW WATERBURY	APHC
Names/affiliation of other individual present during sampling	
Barbara Weron	Homeowner

Sample Collection Information	
<p>Sample collection point</p> <p><input checked="" type="checkbox"/> outside spigot (if so, location: <u>West Side of house</u>)</p> <p><input type="checkbox"/> Inside faucet (if so, location: _____)</p> <p>Sample collected prior to to any existing home treatment unit? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>	<p>SAMPLE ID: NP-1003-P2775</p> <p>Notes: ran water from spigot for 10 minutes - flush</p>

**Sketch of well location with respect to the house
(north top of sheet)**

- Well Water Use now
- Animals in barn (horses/cats)
 - Launder clothes
 - Fill pool
 - Garden



North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence	
Owner(s) Name: Robert and Kathering Kimber	
Address: 2795 Potshop Road, Norristown, PA	
Sample Collection date (mm/dd): 10/03 0957	Collection Time: 1611
Sample Collectors	
Name	Affiliation
MATTHEW WATERBURY	APHC
Names/affiliation of other individual present during sampling	
MR. Robert Kimber	Homeowner

Sample Collection Information	
<p>Sample collection point</p> <p><input checked="" type="checkbox"/> outside spigot (if so, location: <u>North of residence</u>)</p> <p><input type="checkbox"/> Inside faucet (if so, location: _____)</p> <p>Sample collected prior to to any existing home treatment unit? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>	<p>SAMPLE ID: NP-1003-P2795</p> <p>Notes: 10 minute flush</p>

**Sketch of well location with respect to the house
(north top of sheet)**

See 5 Sep 17 field sheet

Well used for gardening and raising sheep (2005-2014)

April 2000 - house hookup to municipal water

Filter system in home

- particulate filter
- Softner
- Particulate
- Carbon filters

- Emergency water collected from well Oct/Nov 1999 - 1gal jugs

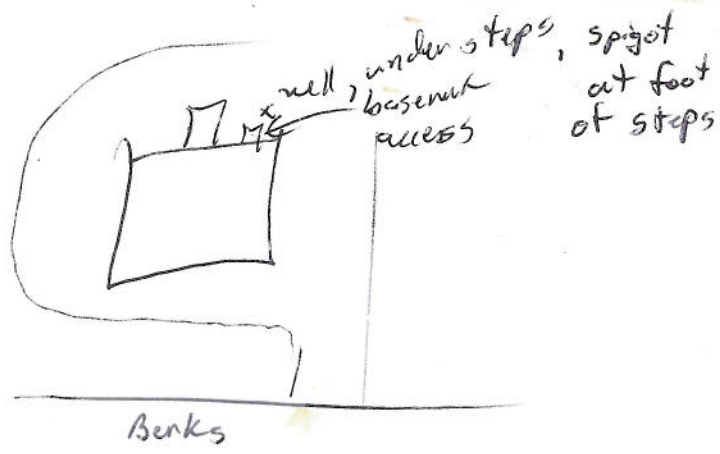


North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence	
Owner(s) Name: Sara Beyer Borr	
Address: 1620 Berks Rd, Norristown, PA	
Sample Collection date (mm/dd): 10/10	Collection Time: 11:00
Sample Collectors	
Name	Affiliation
A. Zook	APHC
L. Anderson	(collector)
Names/affiliation of other individual present during sampling	
Rick Palmer	

Sample Collection Information	
<p>Sample collection point</p> <p><input type="checkbox"/> outside spigot (if so, location: _____)</p> <p><input checked="" type="checkbox"/> Inside faucet (if so, location: <u>rear basement bottom of steps</u>)</p> <p>Sample collected prior to to any existing home treatment unit? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>	<p>SAMPLE ID: NP-1010-B1620</p> <p>Notes: resident home, spigot down basement access resident has been in area for generations, knows history of site high well pressure</p>

Sketch of well location with respect to the house (north top of sheet) (in front) according to resident



Flush hole (think)
 10:51-
 11:07
 A: 10:50
 D: 11:10



North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence	
Owner(s) Name: Andre DiPrinzio	
Address: 1636 Berks Rd, Norristown, PA	
Sample Collection date (mm/dd): 10/10	Collection Time: 1227
Sample Collectors	
Name	Affiliation
G.C. LOGAN III	APHC
TRACY MERCHEL	APHC
Names/affiliation of other individual present during sampling	
MATTHEW WATERBURY	APHC

Sample Collection Information	
<p>Sample collection point</p> <p><input type="checkbox"/> outside spigot (if so, location: _____)</p> <p><input checked="" type="checkbox"/> Inside faucet (if so, location: <u>basement, left of door</u>)</p> <p>Sample collected prior to to any existing home treatment unit? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>	<p>SAMPLE ID: NP-1010-B1636</p> <p>Notes: well is in basement 10 minute flush</p> <p>collected sample before treatment at pressure tank</p>

Sketch of well location with respect to the house
(north top of sheet)

A - 1217

D - 1231

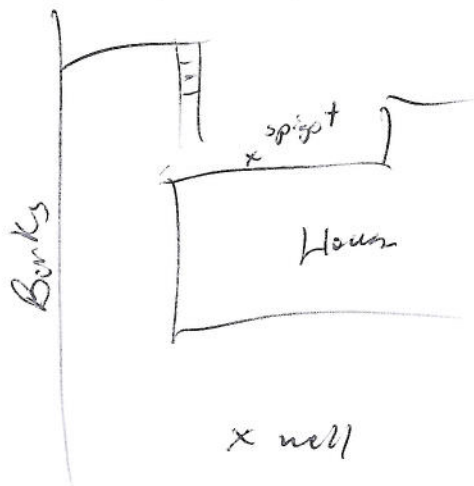


North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence	
Owner(s) Name: Kimber & Christine David	
Address: 1704 Berks Rd, Norristown, PA	
Sample Collection date (mm/dd): 10/10	Collection Time: 1155
Sample Collectors	
Name	Affiliation
A. Zook	APHC
L. Anderson	" " collector
Names/affiliation of other individual present during sampling	
R. Palmer	

Sample Collection Information	
<p>Sample collection point</p> <p><input checked="" type="checkbox"/> outside spigot (if so, location: <u>night side of house</u>)</p> <p><input type="checkbox"/> Inside faucet (if so, location: _____)</p> <p>Sample collected prior to to any existing home treatment unit? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>	<p>SAMPLE ID: NP-1010-B1704</p> <p>Notes: <i>resident drinks, no treatment on well concerned,</i></p>

Sketch of well location with respect to the house
(north top of sheet)



*Arr 11:40
 F: 11:40-43
 start (resident started flush immediately)*

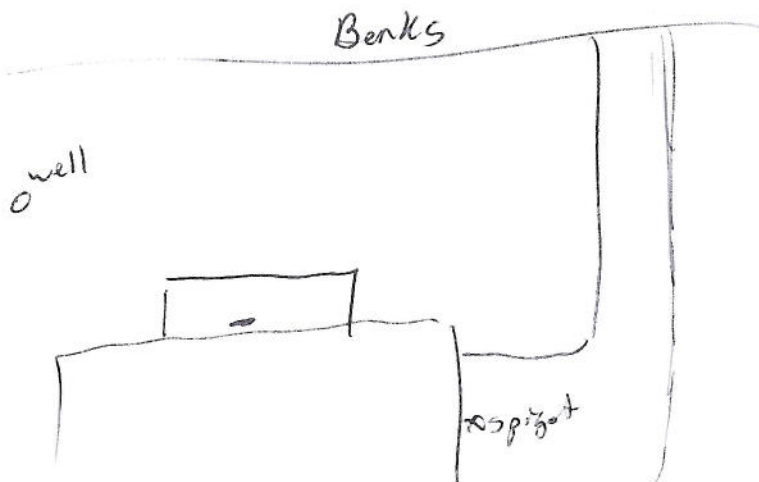


North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence	
Owner(s) Name: Victor Montemayor	
Address: 1720 Berks Rd, Norristown, PA	
Sample Collection date (mm/dd): 10/10	Collection Time: 12:35
Sample Collectors	
Name	Affiliation
A. Zook	APHC
L. Anderson	col collector
Names/affiliation of other individual present during sampling	
R. Palmer	

Sample Collection Information	
Sample collection point	SAMPLE ID: NP-1010-B1720 Notes: resident not home ms/msd taken
<input checked="" type="checkbox"/> outside spigot (if so, location: <u>Between garage doors</u>) <input type="checkbox"/> Inside faucet (if so, location: _____)	
Sample collected prior to to any existing home treatment unit? <input checked="" type="checkbox"/> Yes (believe) <input type="checkbox"/> No	

Sketch of well location with respect to the house
(north top of sheet)



A: 12:20
 F: 12:20 (started hose)
 12:30 to bucket
 P: 12:40



North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence

Owner(s) Name: Walnut Grove Farm – Ross Myers (Jim Siewart onsite POC)
 Address: 1745 Berks Rd, Norristown, PA - AIHQ Farmhouse Admin Bldg
 Sample Collection date (mm/dd): 10/10 Collection Time: 1109

Sample Collectors

Name	Affiliation
George C. LOGAN II	APHC
TRACY MERCHEZ	APHC

Names/affiliation of other individual present during sampling

JIM SIEWART	WALNUT GROVE FARM
MATTHEW WATERBURY	APHC

Sample Collection Information

Sample collection point

outside spigot (if so, location: _____)

Inside faucet (if so, location: Basement)

Sample collected prior to to any existing home treatment unit?
 Yes No

SAMPLE ID: NP-1010-B1745FAB
1805

Notes:
Well is on the South West side of BUILDING

Sketch of well location with respect to the house
(north top of sheet)

A-1059
D-1110



North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence

Owner(s) Name: Walnut Grove Farm – Ross Myers (Jim Siewart onsite POC)
 Address: ¹⁸⁰⁵ 1745 Berks Rd, Norristown, PA - Small Tools Shop P.O. BOX 98
 Sample Collection date (mm/dd): 10/10 Collection Time:

Sample Collectors

Name	Affiliation
G C LOGAN IV	APHC
TRACY MERCHEL	APHC

Names/affiliation of other individual present during sampling

JIM SIEWART	WALNUT GROVE FARM
MATTHEW WATERBURY	APHC

Sample Collection Information

Sample collection point

TM
 outside spigot (if so, location: _____)
 _____)

Inside faucet (if so, location: inside roll-up door)
Rear shop)

Sample collected prior to to any existing home treatment unit?
 Yes No

SAMPLE ID: NP-1010-B1745STS
 1805

Notes:
 Well is located west, southwest of building

Sketch of well location with respect to the house
(north top of sheet)

A - ~~1057~~TM 1115
 D - 1130

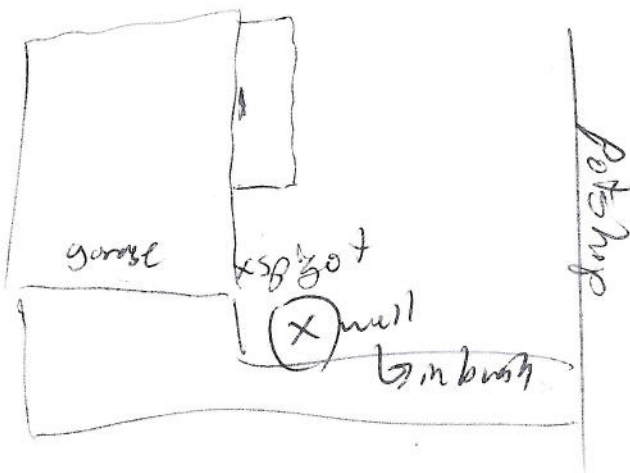


North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence	
Owner(s) Name: Curtis and Sara Yocum	
Address: 2716 Potshop Road, Norristown, PA	
Sample Collection date (mm/dd): 10/10	Collection Time: 12:10
Sample Collectors	
Name	Affiliation
A. Zook	APHC
C. Anderson	" " Collector
Names/affiliation of other individual present during sampling	
R. Palmer	

Sample Collection Information	
<p>Sample collection point</p> <p><input checked="" type="checkbox"/> outside spigot (if so, location: <u>right side of garage</u>)</p> <p><input type="checkbox"/> Inside faucet (if so, location: _____)</p> <p>Sample collected prior to to any existing home treatment unit? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <i>according to res.</i></p>	<p>SAMPLE ID: NP-1010-P2716</p> <p>Notes: <i>uses water for garden + pool res. very friendly but interested</i></p>

Sketch of well location with respect to the house
(north top of sheet)



A: 12:00
F: (sprinkler running)
to bucket: 12:05
B: 12:15/20

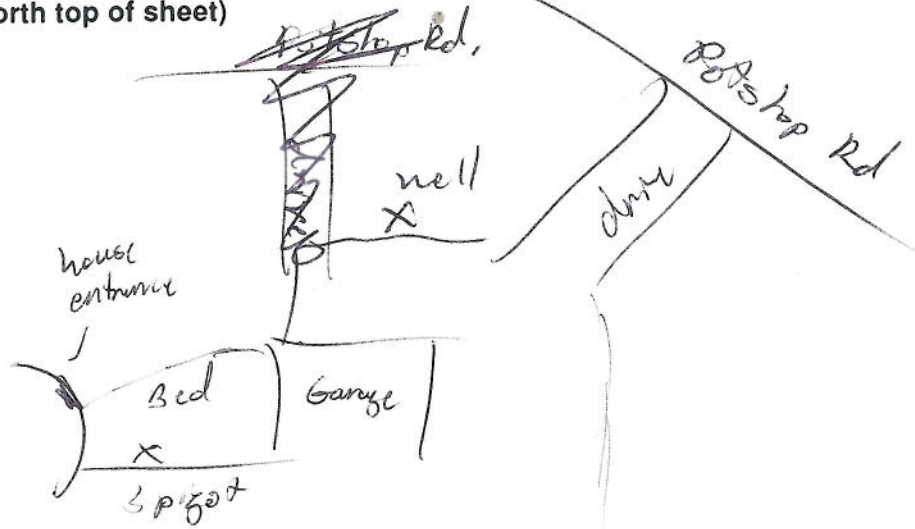


North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence	
Owner(s) Name: Dennis Carney	
Address: 2915 Potshop Road, Norristown, PA	
Sample Collection date (mm/dd): 10/10	Collection Time: 11:30
Sample Collectors	
Name	Affiliation
<i>A. Book</i>	<i>APHC</i>
<i>Z. Anderson</i>	<i>"collector"</i>
Names/affiliation of other individual present during sampling	
<i>R. Pelmer</i>	

Sample Collection Information	
<p>Sample collection point</p> <p><input checked="" type="checkbox"/> outside spigot (if so, location: <u>on other side of garage on house wall</u>)</p> <p><input type="checkbox"/> Inside faucet (if so, location: _____)</p> <p>Sample collected prior to to any existing home treatment unit? <i>as far as I know</i></p> <p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>	<p>SAMPLE ID: NP-1010-P2915</p> <p>Notes: <i>on city water (Trans: cost \$, etc)</i></p>

Sketch of well location with respect to the house (north top of sheet)



A: 11:13
flow start: 11:18
D: 11:35



North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence

Owner(s) Name: Phillip Goldblum and Amy Eckert
Address: 2959 Potshop Road, Norristown, PA
Sample Collection date (mm/dd): 10/10 Collection Time: 1155

Sample Collectors

Name	Affiliation
G. C. LOGAN III	APHC
TRACY MERCHAL	APHC

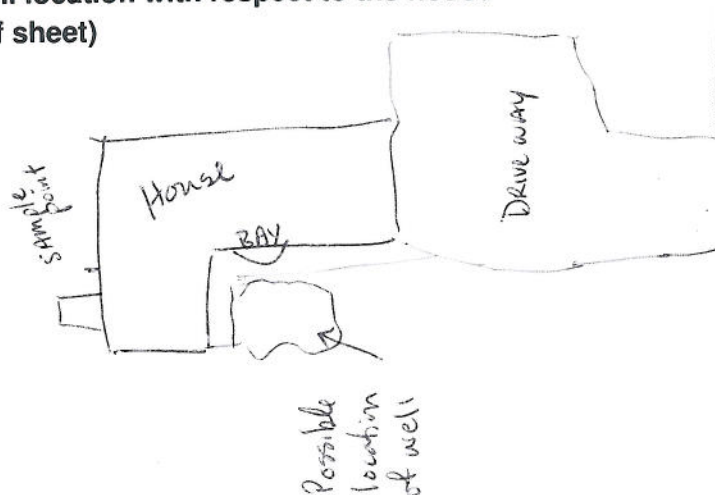
Names/affiliation of other individual present during sampling

MATTHEW WATERBURY	APHC

Sample Collection Information

<p>Sample collection point</p> <p><input checked="" type="checkbox"/> outside spigot (if so, location: <u>Back of house by basement stairs,</u> <u>NORTH EAST SIDE</u>)</p> <p><input type="checkbox"/> Inside faucet (if so, location: _____)</p> <p>Sample collected prior to any existing home treatment unit? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>	<p>SAMPLE ID: NP-1010-P2959</p> <p>Notes: 10 minute flush</p> <p>Spigot marked non-potable</p>
---	--

Sketch of well location with respect to the house
(north top of sheet)



A- 1145
D-



North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence	
Owner(s) Name: JOHN & MARY NICOLETTI	
Address: 1851 Berks Rd	
Sample Collection date (mm/dd): 12/12	Collection Time: 1100
Sample Collectors	Affiliation
Name	
A. Zook	APHC
C. Anderson	
Names/affiliation of other individual present during sampling	

Sample Collection Information

Sample collection point

outside spigot (if so, location: _____)

Inside faucet (if so, location: kitchen)
(outside spigot winterized)

Sample collected prior to to any existing home treatment unit?
(not treated)
 Yes No

SAMPLE ID: NP-1212-B1851

Notes: flush 10:52
820 Ft. well, not treated

Sketch of well location with respect to the house
(north top of sheet)



North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence

Owner(s) Name: *Andrew Huntzell*
 Address: *1628 Berks Rd*
 Sample Collection date (mm/dd): *12/12* Collection Time: *11:25*

Sample Collectors

Name	Affiliation
<i>Alex Zook</i>	<i>APHC</i>
<i>Lauren Anderson</i>	

Names/affiliation of other individual present during sampling

Sample Collection Information

Sample collection point

outside spigot (if so, location: *smaller shop building*)

Inside faucet (if so, location: _____)

Sample collected prior to to any existing home treatment unit?
unsure, but unlikely
 Yes No

SAMPLE ID: *NP-1212-B1628*
 Notes: *shop outside spigot used*

Sketch of well location with respect to the house
 (north top of sheet) *unsure,*



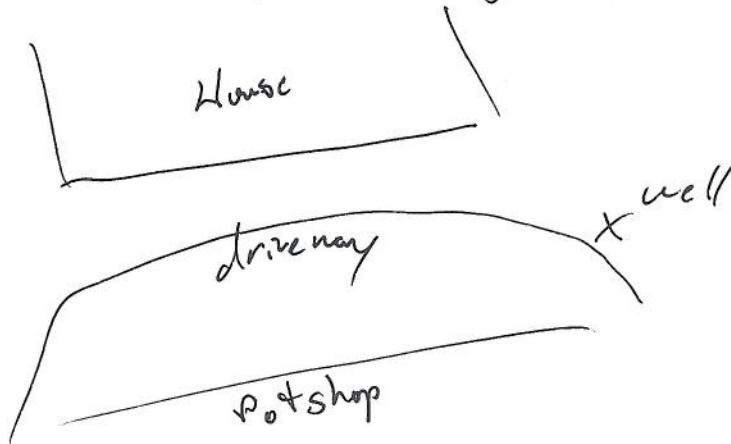
North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence	
Owner(s) Name:	
Address: 1575 Potshop Rd	
Sample Collection date (mm/dd): 12/12	Collection Time: 12:40
Sample Collectors	
Name	Affiliation
Alex Zook	APHC
Lauren Anderson	
Names/affiliation of other individual present during sampling	

Sample Collection Information	
<p>Sample collection point</p> <p><input checked="" type="checkbox"/> outside spigot (if so, location: front of house)</p> <p><input type="checkbox"/> Inside faucet (if so, location:)</p> <p>Sample collected prior to to any existing home treatment unit? not treated <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p>	<p>SAMPLE ID: NP-1212-P1575</p> <p>Notes: 12:25 arrival</p>

Sketch of well location with respect to the house
(north top of sheet)

in front, to the right of the driveway





North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence	
Owner(s) Name: <i>Greg Burkhardt</i>	
Address: <i>1804 Berks</i>	
Sample Collection date (mm/dd): <i>12/12</i> Collection Time: <i>10:40</i>	
Sample Collectors	
Name	Affiliation
<i>Alex Zeck</i>	<i>APHC</i>
<i>Lauran Anderson</i>	
Names/affiliation of other individual present during sampling	

Sample Collection Information	
<p>Sample collection point</p> <p><input type="checkbox"/> outside spigot (if so, location: _____)</p> <p><input checked="" type="checkbox"/> Inside faucet (if so, location: <u><i>kitchen</i></u>)</p> <p>Sample collected prior to to any existing home treatment unit? (<i>softener only</i>) <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>	<p>SAMPLE ID: <i>NP-1212-131804 (-RO)</i></p> <p>Notes: <i>samples from kitchen sink, flushed starting 10:28</i></p> <p><i>RO flushed for ~ 2 minutes</i></p>

+ sample after RO

Sketch of well location with respect to the house
(north top of sheet)

right in front yard



North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence	
Owner(s) Name:	
Address: <i>1600 Potshop Rd</i>	
Sample Collection date (mm/dd): <i>12/12</i>	Collection Time: <i>1200</i>
Sample Collectors	
Name	Affiliation
<i>Alex Zook</i>	<i>APHC</i>
<i>Lauren Anderson</i>	
Names/affiliation of other individual present during sampling	

Sample Collection Information	
<p>Sample collection point</p> <p><input checked="" type="checkbox"/> Outside spigot (if so, location: <i>outside off</i>)</p> <hr/> <p><input checked="" type="checkbox"/> Inside faucet (if so, location: <i>main bathroom</i>) <i>utility sink</i> <i>womens sink</i> <i>in indoor arena area</i></p> <p>Sample collected prior to to any existing home treatment unit? <i>untreated</i></p> <p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>	<p>SAMPLE ID: <i>NP-1212-P1600</i></p> <p>Notes: <i>11:45</i></p>

Sketch of well location with respect to the house
(north top of sheet)

possible water problems,
bathroom sink didn't get very cold /
smelled of sulfur.



North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence

Owner(s) Name: Robert & Mildred Kehr

Address: 2909 Hickory Hill Dr

Sample Collection date (mm/dd): 12/13/17 Collection Time: 1245

Sample Collectors	
Name	Affiliation
M. WATERBURY	.
C. Logan	

Names/affiliation of other individual present during sampling

Mildred	owner

Sample Collection Information

Sample collection point

outside spigot (if so, location: Left side of house)

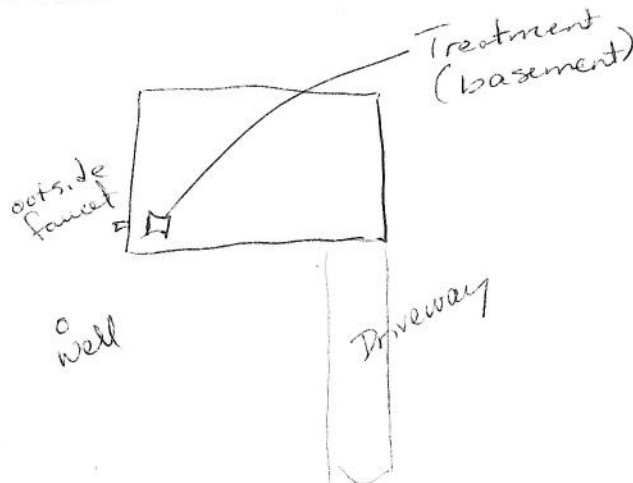
Inside faucet (if so, location: _____)

Sample collected prior to any existing home treatment unit?
 Yes No *UV only*

SAMPLE ID: NP-1213-H2909
1312

Notes:
 8-5 minute flush
 (hose bib dripping on side of house)
 * only UV treatment prior to hose bib

Sketch of well location with respect to the house
(north top of sheet)



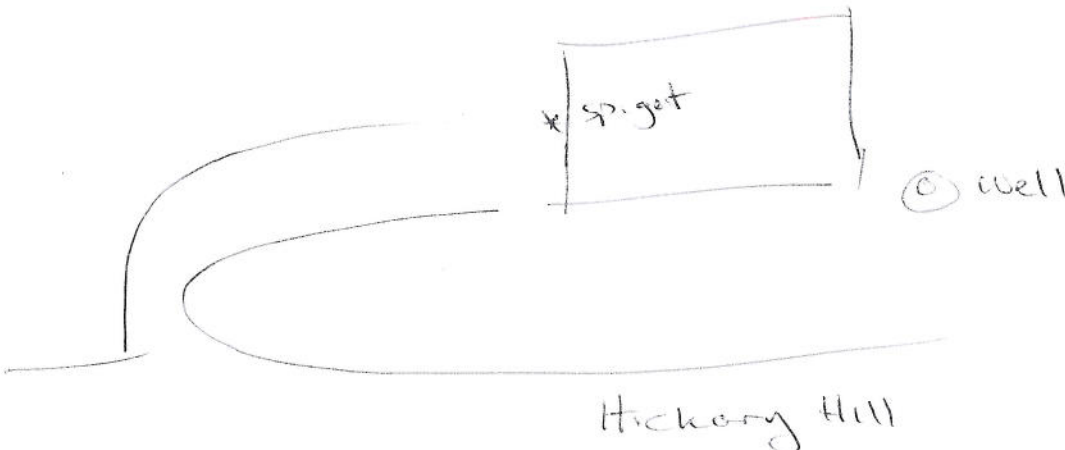


North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence	
Owner(s) Name: <u>Brian and Stephanie Haley</u>	
Address: <u>2947 Hickory Hill Dr</u>	
Sample Collection date (mm/dd): <u>12/13/17</u>	Collection Time: <u>1320</u>
Sample Collectors	
Name	Affiliation
<u>M. WATERBURY</u>	
<u>C. Logan</u>	
Names/affiliation of other individual present during sampling	
<u>left message on answering machine</u>	

Sample Collection Information	
<p>Sample collection point</p> <p><input checked="" type="checkbox"/> outside spigot (if so, location: <u>left of garage</u>)</p> <p><input type="checkbox"/> Inside faucet (if so, location: _____)</p> <p>No home water treatment</p> <p>Sample collected prior to to any existing home treatment unit?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No</p>	<p>SAMPLE ID: <u>NP-1212-H2947</u></p> <p>Notes:</p> <p><u>10 minute flush</u></p> <p><u>* Note teflon thread on spigot</u></p>

Sketch of well location with respect to the house
(north top of sheet)





North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence

Owner(s) Name: Linda Lacrosse
 Address: 1809 Landis Rd
 Sample Collection date (mm/dd): 12/12/17 Collection Time: 1225

Sample Collectors

Name	Affiliation
<u>M. WATERBURY</u>	
<u>C. LOGAN</u>	

Names/affiliation of other individual present during sampling

<u>* Spoke w/ Linda via phone</u>	

Sample Collection Information

Sample collection point

outside spigot (if so, location: rear right @ edge of deck)

Inside faucet (if so, location: _____)

No Home treatment system

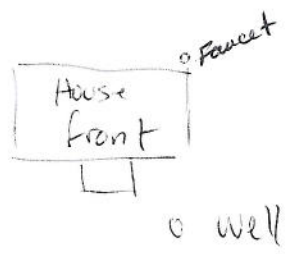
Sample collected prior to to any existing home treatment unit?
 Yes No

SAMPLE ID:

Notes: NP-1212-L1809

10 minute flush through hose

**Sketch of well location with respect to the house
(north top of sheet)**





North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence	
Owner(s) Name: <u>ETHAN POLTO</u>	
Address: <u>2925 Hickory Hill Dr</u>	
Sample Collection date (mm/dd): <u>12/12/17</u> Collection Time: <u>1200</u>	
Sample Collectors	
Name	Affiliation
<u>M. WATERBURY</u>	
<u>C. LOGAN</u>	
Names/affiliation of other individual present during sampling	
<u>ETHAN</u>	

Sample Collection Information	
<p>Sample collection point</p> <p><input type="checkbox"/> outside spigot (if so, location: _____)</p> <p><input checked="" type="checkbox"/> Inside faucet (if so, location: <u>Kitchen</u>) <u>cold</u></p> <p>Sample collected prior to to any existing home treatment unit? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <u>after softener</u></p>	<p>SAMPLE ID: <u>NP-1212-H2925</u></p> <p>Notes: <u>* Water softener to entire water supply</u> <u>ran cold for 5-10 minutes in kitchen</u></p>

Sketch of well location with respect to the house
(north top of sheet)





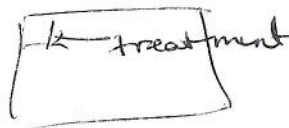
North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence	
Owner(s) Name:	
Address: 2918 Hickory Hill Dr	
Sample Collection date (mm/dd): 12/12/17 Collection Time: 1135	
Sample Collectors	
Name	Affiliation
M. WATERBURY	
C. Logan	
Names/affiliation of other individual present during sampling	
Susan	

Sample Collection Information	
<p>Sample collection point</p> <p><input type="checkbox"/> outside spigot (if so, location: _____)</p> <p><input checked="" type="checkbox"/> Inside faucet (if so, location: <u>Basement - before treatment</u>)</p> <p>Sample collected prior to to any existing home treatment unit? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>	<p>NP-1312 SAMPLE ID: AP-142918-</p> <p>Notes: * Collected before treatment only able to push into 2 gallon bucket then collected</p>

Sketch of well location with respect to the house
(north top of sheet)

Well located in rear of house based on location of inlet line to basement (left corner of basement)



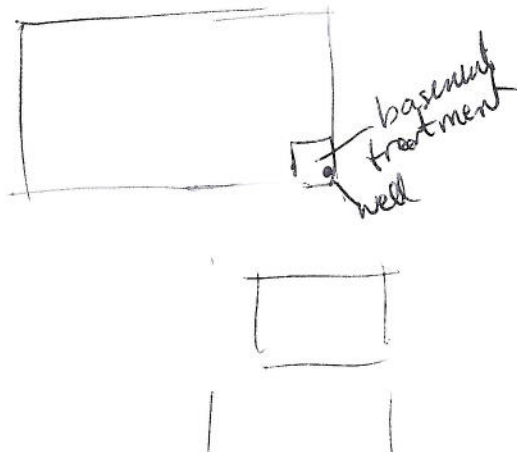


North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence	
Owner(s) Name: <u>Barry Salter</u>	
Address: <u>2862 Skippack Pike</u>	
Sample Collection date (mm/dd): <u>12 DEC 17</u> Collection Time: <u>1100 / 1110</u>	
Sample Collectors	
Name	Affiliation
<u>M. Waters</u>	
<u>C. Logan</u>	
Names/affiliation of other individual present during sampling	
<u>Larry Logan</u>	<u>IN-LAW</u>

Sample Collection Information	
Sample collection point <input type="checkbox"/> outside spigot (if so, location: _____) <input checked="" type="checkbox"/> Inside faucet (if so, location: <u>Pre-Carbon Basement</u>) <u>* also post treatment (Kitchen)</u> Sample collected prior to to any existing home treatment unit? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	SAMPLE ID: <u>NP-1212-52862 (1100)</u> Notes: <u>At wellhead</u> <u>NP-1212-52862-PCARB</u> <u>From Kitchen (1110)</u>

Sketch of well location with respect to the house
(north top of sheet)



well in basement - pre filter sample
 Post Carbon
 Kitchen cold water faucet



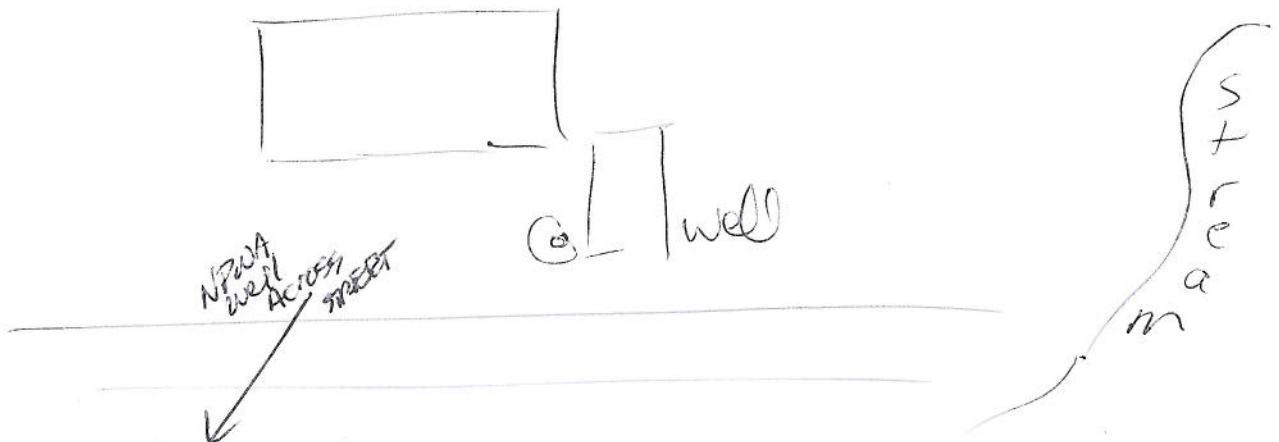
North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence	
Owner(s) Name: <i>Robert McLaughlin</i>	
Address: <i>2912 Skippack Pike</i>	
Sample Collection date (mm/dd): <i>12/12</i>	Collection Time: <i>1025</i>
Sample Collectors	
Name	Affiliation
<i>MATTHEW WATERGUY</i>	
Names/affiliation of other individual present during sampling	
<i>Robert McLaughlin</i>	

Sample Collection Information	
<p>Sample collection point</p> <p><input type="checkbox"/> outside spigot (if so, location: _____)</p> <p><input checked="" type="checkbox"/> Inside faucet (if so, location: <i>Kitchen</i>)</p> <p><i>No treatment</i></p> <p>Sample collected prior to to any existing home treatment unit?</p> <p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>	<p>SAMPLE ID: <i>NP-1212-S2912</i></p> <p>Notes:</p> <p><i>5 minute flush cold water</i></p>

Sketch of well location with respect to the house (north top of sheet)

w.l. in well 1.9' below casing



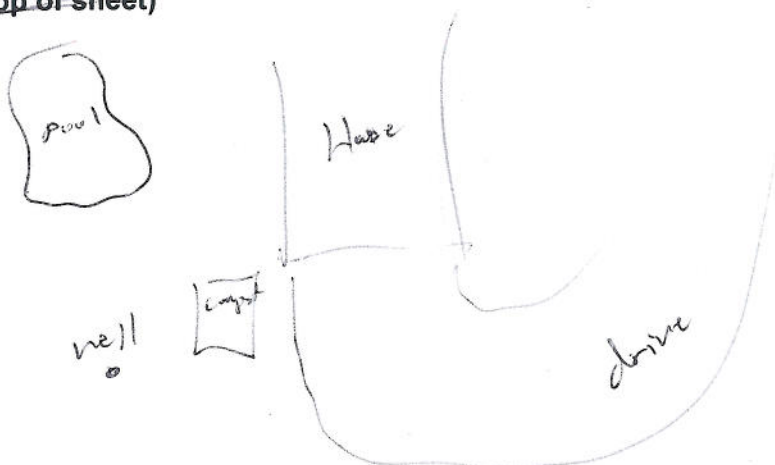


North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence	
Owner(s) Name: Hansell and Lisa Stedman	
Address: 1907 Berks Rd	
Sample Collection date (mm/dd): 02/20/2018	Collection Time: 10:45
Sample Collectors	
Name	Affiliation
Alex Zook	APHC
Clint Logan	
Names/affiliation of other individual present during sampling	

Sample Collection Information	
Sample collection point	<p>SAMPLE ID: NP-0220-B1907</p> <p>Notes: 10:35 start flush from hose</p>
<input checked="" type="checkbox"/> outside spigot (if so, location: _____)	
<input type="checkbox"/> Inside faucet (if so, location: _____)	
<p>Sample collected prior to to any existing home treatment unit?</p> <p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p><i>left spigot</i></p>	

Sketch of well location with respect to the house
(north top of sheet)



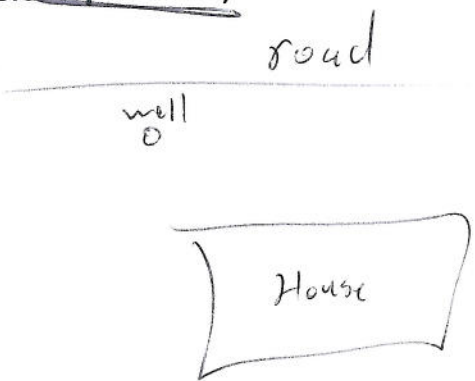


North Penn USARC BRAC Site
PFOA/PFOS Sampling – Residential
Drinking Water Wells

Contact Information for Residence	
Owner(s) Name: Ella Geyer	
Address: 1730 Valley Forge Rd	
Sample Collection date (mm/dd): 02/20/2018	Collection Time: 10:15
Sample Collectors	
Name	Affiliation
Alex Zook	APHC
Clint Logan	
Names/affiliation of other individual present during sampling	

Sample Collection Information	
<p>Sample collection point</p> <p><input type="checkbox"/> outside spigot (if so, location: _____)</p> <p><input checked="" type="checkbox"/> Inside faucet (if so, location: <u> Kitchen </u>)</p> <p>Sample collected prior to to any existing home treatment unit? <input checked="" type="checkbox"/> Yes ^{no treatment} <input type="checkbox"/> No</p>	<p>SAMPLE ID: NP-0220-V1730</p> <p>Notes: <i>flush started at 10:05</i></p>

Sketch of well location with respect to the house
~~(north top of sheet)~~



APPENDIX C

DATA PRESENTATION TABLES

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Table C-1. Data Presentation: PFAS Groundwater Results from NPARC Potable Well and Monitoring Wells

Location ID Sample ID Sample Type Depth (ft.) Parameter Sample Date	Units	North Penn USARC Potable Well 158630001 WELL 0 06/21/2016	North Penn USARC Potable Well 3478260 WELL 0 06/21/2016	NP-GW-MW1 8702045 WELL 0 11/16/2016	NP-GW-MW36 8702052 WELL 0 11/16/2016	NP-GW-MW2 8702046 WELL 0 11/16/2016	NP-GW-MW3 8702049 WELL 0 11/16/2016	NP-GW-MW4 3478261 WELL 0 6/21/2016	NP-GW-MW4 8702050 WELL 0 11/16/2016	NP-GW-MW5 8702051 WELL 0 11/16/2016
PFAs										
Perfluorobutanesulfonic acid	ng/l	9 U	9 U	14	14	6 J	10 U	23	27	14
Perfluorodecanoic acid	ng/l	N/A	N/A	2 U	2 U	2 U	4	NA	3	2 U
Perfluoroheptanoic acid	ng/L	1 U	1 U	8	8	2	4	17	20	17
Perfluorohexanesulfonic acid	ng/l	4.54	4.7	95	90	140	8 J	330	440	370
Perfluorohexanoic acid	ng/l	N/A	N/A	16	17	8	11	NA	51	44
Perfluorononanoic acid	ng/l	2 U	2 U	3	2	1 J	2	5.8	6	3
Perfluorooctane sulfonate	ng/l	4 U	4 U	68	66	64	10 J	390	250	180
Perfluorooctanoic acid	ng/l	2 U	2 U	11	11	6	11	21	26	15

Footnotes:

NP-GW-MW36 is a duplicate sample for NP-GW-MW1.

Bold values indicate a detection.

U = The analyte/element was not detected at or above the limit of quantitation (LOQ).

J = The reported result is an estimated value; the result is between the method detection limit (MDL) and the limit of quantitation (LOQ).

NA = Not available.

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Table C-2. Data Presentation: PFAS Groundwater Results from Wells on Residential Properties

Parameter	Location ID Sample ID Sample Type Sample Date	Units	1527 North Trooper Road NP-0905-T1527 WELL 09/05/2017	1539 Potshop Road NP-0905-P1539 WELL 09/05/2017	1575 Potshop Road NP-1212-P1575 WELL 12/12/2017	1600 Potshop Road NP-1212-P1600 WELL 12/12/2017	1607 Berks Road NP-0413-W-1607 WELL 04/13/2017	1620 Berks Road NP-1010-B1620 WELL 10/10/2017	1628 Berks Road NP-1212-B1628 WELL 12/12/2017
PFAS									
NEtFOSAA		ng/L	N/A	N/A	N/A	N/A	3 U	N/A	N/A
NMeFOSAA		ng/L	N/A	N/A	N/A	N/A	3 U	N/A	N/A
Perfluorobutanesulfonic acid		ng/L	3	2.3	2 U	2 U	2 J	2 U	2 U
Perfluorodecanoic acid		ng/L	N/A	N/A	N/A	N/A	2 U	N/A	N/A
Perfluorododecanoic acid		ng/L	N/A	N/A	N/A	N/A	2 U	N/A	N/A
Perfluoroheptanoic acid		ng/L	2 U	2 U	2 U	2 U	4	2 U	2 U
Perfluorohexanesulfonic acid		ng/L	2 U	2 U	2 U	2 U	1 J	2 U	2 U
Perfluorohexanoic acid		ng/L	N/A	N/A	N/A	N/A	6	N/A	N/A
Perfluorononanoic acid		ng/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Perfluorooctane sulfonate		ng/L	2.3	2.6	2 U	2 U	3 J	2 U	2 U
Perfluorooctanoic acid		ng/L	4.9	2 U	2 U	2 U	15	3.1	2 U
Perfluorotetradecanoic acid		ng/L	N/A	N/A	N/A	N/A	2 U	N/A	N/A
Perfluorotridecanoic acid		ng/L	N/A	N/A	N/A	N/A	2 U	N/A	N/A
Perfluoroundecanoic acid		ng/L	N/A	N/A	N/A	N/A	3 U	N/A	N/A

Parameter	Location ID Sample ID Sample Type Sample Date	Units	1636 Berks Road NP-1010-B1636 WELL 10/10/2017	1645 Berks Road NP-0413-W-1645 WELL 04/13/2017	1661 Berks Road NP-0905-B1661 WELL 09/05/2017	1704 Berks Road NP-1010-B1704 WELL 10/10/2017	1720 Berks Road NP-1010-B1720 WELL 10/10/2017	1730 Valley Forge Road NP-0220-V1730 WELL 02/20/2018	1804 Berks Road NP-1212-B1804 WELL 12/12/2017
PFAS									
NEtFOSAA		ng/L	N/A	3 U	N/A	N/A	N/A	N/A	N/A
NMeFOSAA		ng/L	N/A	3 U	N/A	N/A	N/A	N/A	N/A
Perfluorobutanesulfonic acid		ng/L	2 U	3 U	2 U	2 U	3.1	2 U	2 U
Perfluorodecanoic acid		ng/L	N/A	2 U	N/A	N/A	N/A	N/A	N/A
Perfluorododecanoic acid		ng/L	N/A	2 U	N/A	N/A	N/A	N/A	N/A
Perfluoroheptanoic acid		ng/L	2.3	2 U	2 U	2 U	2 U	2.2	2 U
Perfluorohexanesulfonic acid		ng/L	2 U	3 U	5.1	6.8	2 U	2 U	2 U
Perfluorohexanoic acid		ng/L	N/A	2 U	N/A	N/A	N/A	N/A	N/A
Perfluorononanoic acid		ng/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Perfluorooctane sulfonate		ng/L	9.4	6 U	2.4	2.1	2 U	2.8	2 U
Perfluorooctanoic acid		ng/L	6.3	2 U	2.5	2.6	3	3.9	5.1
Perfluorotetradecanoic acid		ng/L	N/A	2 U	N/A	N/A	N/A	N/A	N/A
Perfluorotridecanoic acid		ng/L	N/A	2 U	N/A	N/A	N/A	N/A	N/A
Perfluoroundecanoic acid		ng/L	N/A	3 U	N/A	N/A	N/A	N/A	N/A

Table C-2. Data Presentation: PFAS Groundwater Results from Wells on Residential Properties (Continued)

Parameter	Location ID Sample ID Sample Type Sample Date	Units	1804 Berks Road NP-1212-B1804-RO WELL 12/12/2017	1805 Berks Road Farmhouse Admin NP-0509-B1805 FAB WELL 05/09/2018	1805 Berks Road Farmhouse Admin NP-1010-B1805FAB WELL 10/10/2017	1805 Berks Road Small Tool Shop NP-0509-B1805 STS WELL 05/09/2018	1805 Berks Road Small Tool Shop NP-1010-B1805STS WELL 10/10/2017	1805 Berks Road Small Tool Shop NP-1010-B1805STS_D WELL 10/10/2017	1809 Landis Road NP-1212-L1809 WELL 12/12/2017
PFAS									
NEtFOSAA		ng/L	N/A	17 U	N/A	18 U	N/A	N/A	N/A
NMeFOSAA		ng/L	N/A	17 U	N/A	18 U	N/A	N/A	N/A
Perfluorobutanesulfonic acid		ng/L	2 U	1.7 J	12	1.8 J	2 U	2 U	3.1
Perfluorodecanoic acid		ng/L	N/A	1.7 U	N/A	1.8 U	N/A	N/A	N/A
Perfluorododecanoic acid		ng/L	N/A	1.7 U	N/A	1.8 U	N/A	N/A	N/A
Perfluoroheptanoic acid		ng/L	2 U	1.7	17	1.8 J	2 U	2 U	3.3
Perfluorohexanesulfonic acid		ng/L	2 U	1.7 J	130	1.8 J	2 U	2 U	2 U
Perfluorohexanoic acid		ng/L	N/A	2.1	N/A	1.8 J	N/A	N/A	N/A
Perfluorononanoic acid		ng/L	2 U	1.7 J	2 U	1.8 U	2 U	2 U	2 U
Perfluorooctane sulfonate		ng/L	2 U	3.5 J	170	3.6 J	2 U	2 U	3.9
Perfluorooctanoic acid		ng/L	2 U	3.3	13	2.3	2.8	2.9	9.7
Perfluorotetradecanoic acid		ng/L	N/A	3.5 U	N/A	3.6 U	N/A	N/A	N/A
Perfluorotridecanoic acid		ng/L	N/A	3.5 U	N/A	3.6 U	N/A	N/A	N/A
Perfluoroundecanoic acid		ng/L	N/A	1.7 U	N/A	1.8 U	N/A	N/A	N/A

Parameter	Location ID Sample ID Sample Type Sample Date	Units	1527 North Trooper Road NP-0905-T1527 WELL 09/05/2017	1539 Potshop Road NP-0905-P1539 WELL 09/05/2017	1575 Potshop Road NP-1212-P1575 WELL 12/12/2017	1600 Potshop Road NP-1212-P1600 WELL 12/12/2017	1818 Berks Road NP-0905-B1818 WELL 09/05/2017	1851 Berks Road NP-1212-B1851 WELL 12/12/2017	1851 Berks Road NP-1212-B1851-D WELL 12/12/2017
PFAS									
NEtFOSAA		ng/L	N/A	N/A	N/A	N/A	N/A	N/A	N/A
NMeFOSAA		ng/L	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Perfluorobutanesulfonic acid		ng/L	3	2.3	2 U	2 U	2 U	2 U	2 U
Perfluorodecanoic acid		ng/L	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Perfluorododecanoic acid		ng/L	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Perfluoroheptanoic acid		ng/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Perfluorohexanesulfonic acid		ng/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Perfluorohexanoic acid		ng/L	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Perfluorononanoic acid		ng/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Perfluorooctane sulfonate		ng/L	2.3	2.6	2 U	2 U	2 U	3.5	3.5
Perfluorooctanoic acid		ng/L	4.9	2 U	2 U	2 U	2 U	2.4	2.4
Perfluorotetradecanoic acid		ng/L	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Perfluorotridecanoic acid		ng/L	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Perfluoroundecanoic acid		ng/L	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table C-2. Data Presentation: PFAS Groundwater Results from Wells on Residential Properties (Continued)

Parameter	Location ID Sample ID Sample Type Sample Date	Units	1907 Berks Road NP-0220-B1907 WELL 02/20/2018	2715 Potshop Road NP-0413-W-2715 WELL 04/13/2017	2716 Potshop Road NP-1010-P2716 WELL 10/10/2017	2720 Potshop Road NP-0905-P2720 WELL 09/05/2017	2737 Potshop Road NP-0413-W-2737 WELL 04/13/2017	2737 Potshop Road NP-0413-W-2737B WELL 04/13/2017
PFAS								
NEtFOSAA		ng/L	N/A	3 U	N/A	N/A	3 U	3 U
NMeFOSAA		ng/L	N/A	3 U	N/A	N/A	3 U	3 U
Perfluorobutanesulfonic acid		ng/L	2 U	3 U	2	3.1	9	9
Perfluorodecanoic acid		ng/L	N/A	2 U	N/A	N/A	2 U	0.6 J
Perfluorododecanoic acid		ng/L	N/A	2 U	N/A	N/A	2 U	2 U
Perfluoroheptanoic acid		ng/L	2 U	2 U	2 U	2.1	39	37
Perfluorohexanesulfonic acid		ng/L	2.4	3 U	2 U	2 U	96	97
Perfluorohexanoic acid		ng/L	N/A	2 U	N/A	N/A	49	53
Perfluorononanoic acid		ng/L	2 U	2 U	2 U	2 U	6	6
Perfluorooctane sulfonate		ng/L	3.6	6 U	2 U	2 U	82	83
Perfluorooctanoic acid		ng/L	2 U	2 U	3.4	6.3	28	28
Perfluorotetradecanoic acid		ng/L	N/A	2 U	N/A	N/A	2 U	2 U
Perfluorotridecanoic acid		ng/L	N/A	2 U	N/A	N/A	2 U	2 U
Perfluoroundecanoic acid		ng/L	N/A	3 U	N/A	N/A	3 U	3 U

Parameter	Location ID Sample ID Sample Type Sample Date	Units	2775 Potshop Road NP-0905-P2775 WELL 09/05/2017	2775 Potshop Road NP-0905-P2775D WELL 09/05/2017	2775 Potshop Road NP-1003-P2775 WELL 10/03/2017	2795 Potshop Road NP-0905-P2795 WELL 09/05/2017	2795 Potshop Road NP-1003-P2795 WELL 10/03/2017	2862 Skippack Pike NP-1212-S2862 WELL 12/12/2017
PFAS								
NEtFOSAA		ng/L	N/A	N/A	N/A	N/A	N/A	N/A
NMeFOSAA		ng/L	N/A	N/A	N/A	N/A	N/A	N/A
Perfluorobutanesulfonic acid		ng/L	310	290	170	340	330	2 U
Perfluorodecanoic acid		ng/L	N/A	N/A	N/A	N/A	N/A	N/A
Perfluorododecanoic acid		ng/L	N/A	N/A	N/A	N/A	N/A	N/A
Perfluoroheptanoic acid		ng/L	100	99	65	150	150	2 U
Perfluorohexanesulfonic acid		ng/L	4500	4200	3000	4800	5000	2 U
Perfluorohexanoic acid		ng/L	N/A	N/A	N/A	N/A	N/A	N/A
Perfluorononanoic acid		ng/L	2 U	2 U	2.0 U	3.1	2.9	2 U
Perfluorooctane sulfonate		ng/L	33000	32000	23000	21000	24000	2 U
Perfluorooctanoic acid		ng/L	230	220	140	270	240	2.4
Perfluorotetradecanoic acid		ng/L	N/A	N/A	N/A	N/A	N/A	N/A
Perfluorotridecanoic acid		ng/L	N/A	N/A	N/A	N/A	N/A	N/A
Perfluoroundecanoic acid		ng/L	N/A	N/A	N/A	N/A	N/A	N/A

Table C-2. Data Presentation: PFAS Groundwater Results from Wells on Residential Properties (Continued)

Location ID Sample ID Sample Type Parameter Sample Date	Units	2862 Skippack Pike NP-1212-S2862- PCARB WELL 12/12/2017	2909 Hickory Hill Drive NP-1312-H2909 WELL 12/13/2017	2912 Skippack Pike NP-1212-S2912 WELL 12/12/2017	2915 Hickory Hill Drive NP-1212-H2915 WELL 12/12/2017	2915 Potshop Road NP-1010-P2915 WELL 10/10/2017
PFAS						
NEtFOSAA	ng/L	N/A	N/A	N/A	N/A	N/A
NMeFOSAA	ng/L	N/A	N/A	N/A	N/A	N/A
Perfluorobutanesulfonic acid	ng/L	2 U	2 U	2.4	2 U	2 U
Perfluorodecanoic acid	ng/L	N/A	N/A	N/A	N/A	N/A
Perfluorododecanoic acid	ng/L	N/A	N/A	N/A	N/A	N/A
Perfluoroheptanoic acid	ng/L	2 U	2 U	2 U	2 U	2 U
Perfluorohexanesulfonic acid	ng/L	2 U	2 U	2 U	2 U	2 U
Perfluorohexanoic acid	ng/L	N/A	N/A	N/A	N/A	N/A
Perfluorononanoic acid	ng/L	2 U	2 U	2 U	2 U	2 U
Perfluorooctane sulfonate	ng/L	2 U	2.4	2	2 U	2 U
Perfluorooctanoic acid	ng/L	2 U	3.8	4	2.2	2 U
Perfluorotetradecanoic acid	ng/L	N/A	N/A	N/A	N/A	N/A
Perfluorotridecanoic acid	ng/L	N/A	N/A	N/A	N/A	N/A
Perfluoroundecanoic acid	ng/L	N/A	N/A	N/A	N/A	N/A

Location ID Sample ID Sample Type Parameter Sample Date	Units	2918 Hickory Hill Drive NP-1212-H2918 WELL 12/12/2017	2925 Hickory Hill Drive NP-1212-H2925 WELL 12/12/2017	2947 Hickory Hill Drive NP-1212-H2947 WELL 12/12/2017	2959 Potshop Road NP-1010-P2959 WELL 10/10/2017
PFAS					
NEtFOSAA	ng/L	N/A	N/A	N/A	N/A
NMeFOSAA	ng/L	N/A	N/A	N/A	N/A
Perfluorobutanesulfonic acid	ng/L	2 U	2 U	2	2 U
Perfluorodecanoic acid	ng/L	N/A	N/A	N/A	N/A
Perfluorododecanoic acid	ng/L	N/A	N/A	N/A	N/A
Perfluoroheptanoic acid	ng/L	2 U	2 U	2 U	2 U
Perfluorohexanesulfonic acid	ng/L	2 U	2 U	2 U	2 U
Perfluorohexanoic acid	ng/L	N/A	N/A	N/A	N/A
Perfluorononanoic acid	ng/L	2 U	2 U	2 U	2 U
Perfluorooctane sulfonate	ng/L	2 U	2 U	4	2 U
Perfluorooctanoic acid	ng/L	2 U	3	4.5	2.4
Perfluorotetradecanoic acid	ng/L	N/A	N/A	N/A	N/A
Perfluorotridecanoic acid	ng/L	N/A	N/A	N/A	N/A
Perfluoroundecanoic acid	ng/L	N/A	N/A	N/A	N/A

Footnotes:

Bold values indicate a detection.

U = The analyte/element was not detected at or above the limit of quantitation (LOQ).

J = The reported result is an estimated value; the result is between the method detection limit (MDL) and the limit of quantitation (LOQ).

NA = Not available.

Table C-3. Data Presentation: PFAS Groundwater Results from North Penn Area 12 Monitoring Wells

Location ID	Sample ID	Units	NP-A12-MW15	NP-A12-MW4	NP-A12-MW6D	NP-A12-MW6DX	NP-A12-MW7	NP-A12-MW8
Sample Type	Sample Date		206240005	206240008	206240006	206240007	206240001	206240003
Parameter	Sample Date		WELL	WELL	WELL	WELL	WELL	WELL
			02/14/2018	02/14/2018	02/14/2018	02/14/2018	02/14/2018	02/14/2018
PFAS								
NEtFOSAA		ng/L	3 U	3 U	8 U	4 U	7 U	3 U
NMeFOSAA		ng/L	3 U	3 U	8 U	4 U	7 U	3 U
Perfluorobutanesulfonic acid		ng/L	1	0.4 U,J	3 U	1 U	2 U	0.9 U
Perfluorodecanoic acid		ng/L	3 U	3 U	8 U	4 U	7 U	3 U
Perfluorododecanoic acid		ng/L	0.9 U	0.9 U	3 U	1 U	2 U	0.9 U
Perfluoroheptanoic acid		ng/L	3	2	2 U,J	2	2 U	0.5 U,J
Perfluorohexanesulfonic acid		ng/L	0.8 U,J	0.6 U,J	5 U	3 U	5 U	2 U
Perfluorohexanoic acid		ng/L	5	5	3 U,J	3 U,J	7 U	3 U
Perfluorononanoic acid		ng/L	1 U,J	1 U,J	1 U,J	0.8 U,J	5 U	2 U
Perfluorooctane sulfonate		ng/L	8	4	3 U,J	2 U,J	5 U	3
Perfluorooctanoic acid		ng/L	15	12	6	6	1 U,J	2
Perfluorotetradecanoic acid		ng/L	2 U	2 U	5 U	3 U	5 U	2 U
Perfluorotridecanoic acid		ng/L	2 U	2 U	5 U	3 U	5 U	2 U
Perfluoroundecanoic acid		ng/L	2 U	2 U	5 U	3 U	5 U	2 U

Footnotes:

Bold values indicate a detection.

U = The analyte/element was not detected at or above the limit of quantitation (LOQ).

J = The reported result is an estimated value; the result is between the method detection limit (MDL) and the limit of quantitation (LOQ).

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