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FINAL PRELIMINARY ASSESSMENT/SITE INVESTIGATION REPORT GROUNDWATER SAMPLING FOR PER AND POLYFLUOROALKYL SUBSTANCES

**Cold Regions Research and Engineering Laboratory
(CRREL) Hanover, New Hampshire**

Prepared For:
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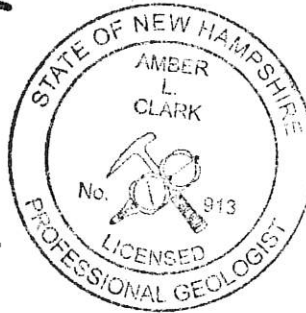
December 2021

U.S. Army Corps of Engineers - New England District
Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire
Final Preliminary Assessment/Site Investigation Report Groundwater Sampling
for Per- and Polyfluoroalkyl Substances

wood.


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**Final Preliminary
Assessment/Site
Investigation Report
Groundwater Sampling for
Per and Polyfluoroalkyl
Substances**

Cold Regions Research and Engineering
Laboratory (CRREL) Hanover, New Hampshire

Prepared for:

U.S. Army Corps of Engineers

Contract No.: W912WJ-15-D-0003

Delivery Order No.: 0002

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TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
ES – 1 Background	1
ES – 2 PA/SI Work Summary.....	1
ES – 3 Conclusions.....	1
1.0 INTRODUCTION.....	1-1
1.1 Project Background.....	1-1
1.2 PA/SI Objectives.....	1-2
2.0 INSTALLATION OVERVIEW	2-1
2.1 Site Location	2-1
2.2 Mission and Operational Brief Site History	2-1
3.0 METHODS AND PROCEDURES.....	3-1
3.1 PFAS Data Evaluation Criteria	3-1
3.2 Data Validation and Data Usability	3-1
3.3 PA/SI PFO/PFAS Sampling	3-3
4.0 SUMMARY OF FIRES AT CRREL.....	4-1
5.0 SUMMARY OF INTERVIEWS.....	5-1
6.0 SUMMARY OF CHEMICAL INVENTORY.....	6-1
7.0 SUMMARY OF GROUNDWATER SAMPLING RESULTS	7-1
8.0 REFERENCES.....	8-1

LIST OF FIGURES

Figure 1	Project Location Map
Figure 2	Site Layout
Figure 3	Overburden Monitoring Well Locations
Figure 4	PFAS Results

LIST OF TABLES

Table 1	Summary of Per- and Polyfluoroalkyl Substances in Groundwater
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LIST OF ATTACHMENTS

Attachment A	Field Data Records
Attachment B	Analytical Lab Reports
Attachment C	Data Validation Report

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

ADR	Automated Data Review
AFFF	Aqueous Film Forming Foam
AGQS	Ambient Groundwater Monitoring Quality Standards
Amec Foster Wheeler	Amec Foster Wheeler, Environment & Infrastructure, Inc.
COE-NAE	United States Army Corps of Engineers New England District
DO	Dissolved Oxygen or Delivery Order
DoD	Department of Defense
DQI	data quality indicators
ERDC	Engineer Research and Development Center
ft.	Feet/Foot
MCL	Maximum Contaminant Level
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NHDES	New Hampshire Department of Environmental Services
Pas	Preliminary Assessments
PA/SI	Preliminary Assessment Site Investigation
PFAS	Per- and Polyfluoroalkyl Substances
PFBS	Perfluorobutanesulfonic Acid
PHFpA	Perfluoroheptanoic Acid
PFHxS	Perfluorohexane sulfonic Acid
PFNA	Perfluorononanoic Acid
PFOS	Perfluorooctanesulfonic Acid
PFOA	Perfluorooctanoic Acid
SEDD	Staged Electronic Data Deliverables
SI	Site Investigation
Sis	Site Inspections
SOP	Standard Operating Procedure
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency

EXECUTIVE SUMMARY

ES – 1 Background

Groundwater sampling for Per- and Polyfluoroalkyl Substances (PFAS) was conducted in response to a New Hampshire Department of Environmental Services letter dated May 18, 2017 requesting that waste sites complete an initial screening for the presence of PFAS per the provisions of the New Hampshire Code of Administrative Rules, Chapters Env-Or 600 and Env-Or 700 as applicable. The purpose of the sampling request was to determine whether drinking water sources may be at risk and to gain a better understanding of the presence of PFAS in groundwater in New Hampshire (NHDES 2017). The Preliminary Assessment / Site Investigation (PA/SI) work was completed in accordance with the Final Groundwater Sampling for Per- and Polyfluoroalkyl Substances Work Plan (Amec Foster Wheeler, 2017). Additionally, work was conducted as per the Quality Assurance Project Plan (AMEC E&I, 2017) for the Cold Region Research and Engineering Laboratory Site (CRREL) and executed in accordance with the Accident Prevention Plan and Site Safety and Health Plan (AMEC, 2012c).

ES – 2 PA/SI Work Summary

In response to the NHDES request, the USACE conducted the following:

- 1) Conducted a records search of fires at the CRREL facility.
- 2) Conducted interviews with Site personnel and the Hanover Fire Chief
- 3) Conducted a review of previous chemical inventories completed in support of vapor intrusion activities.
- 4) Completed one round of groundwater sampling of the existing overburden groundwater network to gain a better understanding of the presence of PFAS in groundwater at the Site (NHDES 2017).

The PA/SI interviews and chemical inventories indicated that AFFF or other PFAS containing materials were not used, stored, or disposed as part of operational history (AMEC, 2012a).

ES – 3 Conclusions

This PA/SI report concludes that PFAS containing materials were not used, stored, or disposed as part of the operational history at CRREL (AMEC, 2012a). It also concludes that Aqueous Film Forming Foams (AFFF) and PFAS containing firefighting materials were not used at two known fires at CRREL.

Groundwater sampling data shows the presence of PFAS at CRREL in groundwater, but at concentrations well below health advisory guidelines. Most wells were non-detect for PFAS. PFAS related compounds were detected at very low concentrations in some wells along the

west side of CRREL bordering the Connecticut River. Based on these findings, no further action is required at the Site for characterization of PFAS related contaminants in groundwater.

1.0 INTRODUCTION

Wood Environment & Infrastructure Solutions, Inc. (Wood) (formerly Amec Foster Wheeler Environment & Infrastructure, Inc. [Amec Foster Wheeler]) was contracted by the United States Army Corp of Engineers New England District (COE-NAE) under Contract Number W912WJ-15-D-0003, Delivery Order (DO) 0002, to conduct groundwater sampling for per- and polyfluoroalkyl substances (PFAS) at the Cold Regions Research and Engineering Laboratory (CRREL or Site) in Hanover, New Hampshire (Figure 1). This Preliminary Assessment / Site Investigation (PA/SI) report has been prepared to report the results of PFAS sampling completed from October 16th to October 19th, 2017 at CRREL.

1.1 Project Background

Groundwater sampling for PFAS was conducted in response to a New Hampshire Department of Environmental Services (NHDES) letter dated May 18, 2017 requesting that waste sites complete an initial screening for the presence of PFAS per the provisions of the New Hampshire Code of Administrative Rules, Chapters Env-Or 600 and Env-Or 700 as applicable. The purpose of the sampling request was to determine whether drinking water sources may be at risk and to gain a better understanding of the presence of PFAS in groundwater in New Hampshire (NHDES 2017).

Groundwater sampling for PFAS was completed in accordance with the following documents:

- 1) Final Groundwater Sampling for Per- and Polyfluoroalkyl Substances Work Plan dated July 17, 2017 (Amec Foster Wheeler, 2017a).
- 2) Army Guidance for Addressing Releases of Per- and Polyfluoroalkyl Substances (Army, 2018).
- 3) Final Remedial Investigation Work Plan/Field Sampling Plan dated June 10, 2012 (AMEC 2012b).
- 4) Quality Assurance Project Plan (Amec Foster Wheeler, 2017b).
- 5) Site Safety and Accident Prevention Plan dated March 13, 2013 (AMEC 2013).

Sampling was conducted to investigate groundwater for the presence or absence of the six Per- and Polyfluoroalkyl Substances included on the Clean Drinking Water Act Third Unregulated Contaminant Monitoring Rule list. The list includes perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), perfluoroheptanoic acid (PFHpA), and perfluorobutanesulfonic acid (PFBS).

The lifetime health advisories released by the United States Environmental Protection Agency (USEPA) on May 19, 2016 (USEPA, 2016) is 70 nanograms per liter (ng/L or parts per trillion

[ppt]) for PFOA, PFOS, and for both PFOA and PFAS combined when they are present together. The health advisory is 20 percent of a risk-based concentration (370 ng/L) that generically accounts for other possible sources of PFAS in the environment. The NHDES adopted rules on September 30, 2019, for Maximum Contaminant Levels (MCLs) and Ambient Groundwater Monitoring Quality Standards (AGQS) for PFOA at 12 ppt, PFOS at 15 ppt, PFHxS at 18 ppt, and PFNA at 11 ppt. On December 31, 2019, the Merrimack County (N) Superior Court issued a preliminary injunction barring enforcement of these rules. On July 23, while the appeal to the preliminary injunction was pending the governor of New Hampshire signed HB 1264 into law that established in statute PFAS MCLs that were previously established by NHDES in rule. The CRREL PFAS groundwater data results were compared to both EPA and NHDES criteria.

The groundwater results are compared to the health advisory concentrations in Section 2.

1.2 PA/SI Objectives

The objectives of the PA/SI sampling were to meet the requirement set forth in NHDES letter dated May 18, 2017 requesting that CRREL complete an initial screening for the presence of PFAS per the provisions of the New Hampshire Code of Administrative Rules, Chapters Env-Or 600 and Env-Or 700 as applicable. In response to this request, the USACE conducted the following:

- 1) Conducted a records search of fires at the CRREL facility.
- 2) Conducted interviews with Site personnel and the Hanover Fire Chief
- 3) Conducted a review of previous chemical inventories completed in support of vapor intrusion activities.
- 4) Completed one round of groundwater sampling of the existing overburden groundwater network to gain a better understanding of the presence of PFAS in groundwater at the Site (NHDES 2017).

2.0 INSTALLATION OVERVIEW

2.1 Site Location

The CRREL facility is located on about 30 acres of land in Hanover, Grafton County, New Hampshire, west of, and adjacent, to State Highway 10 (Lyme Road), 1.5 miles north of the center of Hanover. (Figure 1 and Figure 2). Prior to development of the CRREL Site by the Department of Defense (DoD), the property was primarily used for agriculture, with gravel mining on the western edge of the Site. In 1960, the US Army leased 19.2 acres of land from Dartmouth College for the purpose of constructing a research facility. On June 15, 1960, the cornerstone for the facility's first building, the main lab was laid. CRREL was officially established on February 1, 1961 and has been active since its inception. In 1982, 11.02 acres of additional land were purchased to accommodate the Frost Effects Research Facility building which is located along the western border of the original CRREL tract. The purchase expanded CRREL to its current size of 30.2 acres.

The CRREL facility has been assigned the Federal Facility Identification Number NH157002484700. The daily work population consists of approximately seven military and 240 civilian personnel. There is no residential use of the CRREL facility.

The CRREL facility is roughly rectangular and measures approximately 1,360 feet (ft.) east to west, and 970 ft. north to south at its greatest extent.

Dartmouth College housing consisting of approximately 30 units is located immediately south of, and adjacent to, the CRREL facility. The Hanover Country Club, owned by Dartmouth College, borders the Site to the southwest. Former Dartmouth College student housing (demolished in 2007) was located immediately north of, and adjacent to, the CRREL facility and consisted of approximately 61 units. This property is owned by Dartmouth College Real Estate and is referred to as the "Rivercrest property". Highway 10 (Lyme Road) forms the eastern boundary of the Site. Further to the east and northeast are the Richmond Middle School and Dartmouth Printing Company, respectively.

The Connecticut River is located west of the CRREL facility, separated from the Site by former gravel pits, an unofficial small arms range, a stump dump yard, and a former domestic recycle storage area. The property between the Site and the river is owned by Dartmouth College Real Estate.

2.2 Mission and Operational Brief Site History

CRREL is an active sub-installation of the US Army ERDC of the USACE. As a USACE center of expertise, CRREL performs basic and applied research in snow, ice, and frozen ground. CRREL also provides the US Army with practical engineering research to develop equipment and procedures for application in cold regions. Today, land use within one quarter mile is primarily rural and residential, with zones of light industry, industrial/service, cropland/pasture, and deciduous and mixed forest.

CRREL combined the work of two predecessor organizations previously located in other states: The Snow, Ice, and Permafrost Research Establishment (formed on Aug. 27, 1947) and the Arctic Construction and Frost Effects Laboratory (established on Feb. 25, 1953). In late-1963, the Main Laboratory Building became fully operational, and several new buildings have been added since that time. The Facilities Engineering building opened in 1968, the Logistics and Supply building (referred to also as the Logistics Management Facility) opened in 1976, the Laboratory Addition opened in 1977, the Frost Effects Research Facility completed in 1985 and the Ice Engineering building opened in 1978. More recent construction also includes: The Child Development Center (CDC) (1990); the new Sea Ice Pond (Winter 1992); the Remote Sensing Facility (July 1993); the Technical Information Analysis Center (November 1993); and the Groundwater Treatment Plant (February 1994).

3.0 METHODS AND PROCEDURES

Work was completed as described in the Final Groundwater Sampling for Per- and Polyfluoroalkyl Substances Work Plan (Amec Foster Wheeler, 2017). Additionally, work was conducted as per the Quality Assurance Project Plan (AMEC, 2017) for this Site and executed in accordance with the Accident Prevention Plan and Site Safety and Health Plan (AMEC, 2012c).

Field investigation work consisted of the following:

- Completion of groundwater sampling at CRREL on October 16th through 20th, 2017.
- Laboratory Analysis, data validation, and reporting.

Groundwater field data records are presented in Attachment A.

Laboratory analytical data reports are presented in Attachment B.

Attachment C presents the Data Validation Report for the October 2017 Groundwater PFAS sample data set.

3.1 PFAS Data Evaluation Criteria

The lifetime health advisories released by the United States Environmental Protection Agency on May 19, 2016 (USEPA, 2016) is 70 nanograms per liter (ng/L or parts per trillion [ppt]) for PFOA, PFOS, and for both PFOA and PFAS combined where they are present together. The health advisory is 20 percent of a risk-based concentration (370 ng/L) that generically accounts for other possible sources of PFAS in the environment. The New Hampshire Department of Environmental Services (NHDES) adopted rules on September 30, 2019, for Maximum Contaminant Levels (MCLs) and Ambient Groundwater Monitoring Quality Standards (AGQS) for PFOA at 12 ppt, PFOS at 15 ppt, PFHxS at 18 ppt, and PFNA at 11 ppt. On December 31, 2019, the Merrimack County (N) Superior Court issued a preliminary injunction barring enforcement of these rules. On July 23, while the appeal to the preliminary injunction was pending the governor of New Hampshire signed HB 1264 into law that established in statute PFAS MCLs that were previously established by NHDES in rule. The CRREL PFAS data results were compared to both EPA and NHDES limits.

The groundwater results are compared to the health advisory. Note that groundwater is not used as a potable resource at CRREL.

3.2 Data Validation and Data Usability

Groundwater samples were analyzed by TestAmerica Laboratories located in West Sacramento, California. The samples were analyzed by the following USEPA methods:

Laboratory	Parameter	Analytical Method	Validation Level
TestAmerica Sacramento	Per- and Polyfluoroalkyl Substances (PFAS)	USEPA 537.1 modified	Stage 2B

Data validation was completed using the SEDD/ADR process. The data were also validated manually by the Wood project chemist using Stage 2B procedures for collected samples. Data review and qualification actions were completed based on general procedures described in USEPA National Functional Guidelines for Superfund Data Review (USEPA, 2017) and the method specifications in the referenced USEPA method used by the laboratory. Laboratory quality control limits reported by the laboratory were used for the evaluation of surrogate and laboratory control samples (LCS). Data qualifications were completed if necessary, in accordance with the USEPA guidelines and professional judgment. Data validation actions from the Stage 2B review were compared to the ADR actions prior to preparing the final data set.

Analytical data, data validation qualifiers, and QC results were evaluated to determine the confidence with which the October 2017 groundwater data could be used in the CRREL Phase I PFO/PFAS project decision-making process. Data quality indicators (DQIs) are qualitative and quantitative measures of data quality “attributes,” which are descriptors used to express various properties of analytical data. The criteria used in the data usability summary are as follows:

- Method Selectivity/Specificity, is defined as the compound type or class that can be detected by the instrument or detector,
- Method Sensitivity, which is the effectiveness of the reporting limits compared to the action levels for the site,
- Precision, which addresses analytical variability (field duplicates),
- Accuracy, which compares measured values to the true value (percent recoveries),
- Representativeness, which evaluates how well the samples represent the system under study,
- Comparability, which evaluates how well data from one study compares to data from previous studies, and
- Completeness, which looks at the percentage of usable data.

Evaluation of the DQIs is presented in the data validation report referenced in Attachment C. There were a number of data qualifications/actions applied to the laboratory results based on

data validation evaluations. Data validation actions are summarized in Attachment C, Table 3 of the Phase I PFO/PFAS Sampling validation report.

3.3 PA/SI PFO/PFAS Sampling

The majority of data validation actions for the October 2017 sampling event involved the qualification of field sample results due to method and/or field blank contamination. Field sample results for affected compounds were qualified non-detect.

No deviations were observed in the method 537.1 analyses that required rejection of results. The Phase I PFO/PFAS Method 537.1 results are interpreted to be usable.

Groundwater samples were collected from the overburden monitoring wells and production wells at CRREL from October 16th through 19th, 2017. The samples were submitted for PFOS/PFOA analysis to TestAmerica Laboratories located in Sacramento, California. Wells that were sampled are shown on Figure 3. Groundwater sampling field data records are found in Attachment A. The analytical laboratory reports are located in Attachment B. Groundwater PFAS data validation was completed using the Staged Electronic Data Deliverable (SEDD)/Automated Data Review (ADR) process.

The sampling program consisted of the following:

- Fifteen overburden monitoring well samples using low flow sampling techniques.
- Five production well samples collected from dedicated spigots.
- One duplicate and one matrix spike/matrix spike duplicate samples (MS/MSD).
- Two equipment blanks collected from each decontaminated pumping assemblage.
- One field blank collected from the laboratory supplied deionized water.

4.0 SUMMARY OF FIRES AT CRREL

PFAS are a group of synthetic fluorinated compounds used to make products more resistant to heat, grease, and water. PFAS are also used in fire suppression foams. A major source of PFAS to the environment across the nation is the use of fire suppression foams, specifically aqueous film forming foam (AFFF). AFFF often contains PFAS, notably PFOA and PFOS.

There have been two documented fire-related response events that have occurred at CRREL. In the early 1960's, the façade of the Main Laboratory caught fire and was put out by the Hanover Fire Department (Dartmouth College Library Photo File, 2017). Portions of the main entryway and the CRREL library on the second floor were damaged. It is not likely that AFFF was used by the Hanover Fire Department during this event as this predates wide usage of AFFF at military facilities (approximately 1970). The second event was an above ground tank deflagration that occurred on July 2, 1970 which the Hanover Fire Department responded to, reportedly washing trichloroethene that was released from the tank into the storm drain system (USACE News Release, 1990). It is not known if the Hanover Fire Department used AFFF in the July 1970 response.

5.0 SUMMARY OF INTERVIEWS

Interviews were conducted with the following CRREL personnel; Mr. Bartlett Harwood, CRREL Campus Manager and Mr. Larry Danyluk, retired CRREL Campus Manager. Both Mr. Harwood and Mr. Danyluk represented that they had no knowledge of the use of products containing PFAS at CRREL. Fire suppression systems and extinguishers were not known to contain AFFF or PFAS related materials. Additionally, there were no known uses of AFFF or PFAS related materials used in research experiments conducted at the Site.

An interview was also conducted with Hanover Fire Chief Martin McMillan. Chief McMillan confirmed that to his knowledge there have only been 2 responses to fires at CRREL (described in Section 3) and AFFF was not used.

6.0 SUMMARY OF CHEMICAL INVENTORY

Chemical inventories were conducted at the CRREL as part of vapor intrusion investigations at CRREL from 2011 to 2016. AFFF and PFAS containing products were not observed at the time of the inventories.

7.0 SUMMARY OF GROUNDWATER SAMPLING RESULTS

Table 1 shows the results of the PFAS sampling. Monitoring wells CECRL-07, CECRL-19, and CECRL-20 were non-detect for the presence of PFAS. Each remaining well showed the presence of several PFAS at low concentrations. The compound PFOS was present in groundwater at concentrations ranging from 0.0012J µg/L to 0.059 µg/L (1.2J to 5.9 ppt). The compound PFOA ranged from 0.00084J µg/L to 0.0082 µg/L (0.84J to 8.2 ppt). The compound PFHxS was present in groundwater at concentrations ranging from 0.00027J µg/L to 0.01 µg/L (0.27J to 10 ppt). The compound PFNA was present in groundwater at concentrations ranging from 0.00033J µg/L to 0.0018 µg/L (0.33J to 1.8 ppt).

Concentrations of PFOS and PFOA (including combined) did not exceed the USEPA health advisory limit of 0.07 µg/L (70 ppt). Concentrations of PFOS, PFOA, PFHxS, and PFNA did not exceed the NHDES MCLs/AQGS guidelines. Equipment blanks were non-detect for PFAS. Perfluorooctane sulfonamide was detected in one field blank at very low concentration (0.0006J µg/L or 0.6J ppt). Groundwater overburden monitoring well results for PFOS, PFOA, PFHxS, and PFNA are presented in Figure 4.

There are no known historic releases of these PFAS emerging contaminants as part of facility operations. Groundwater sampling data shows the presence of PFAS well below health advisory guidelines. Most wells were non-detect for PFAS. PFAS related compounds were detected at very low concentrations in some wells along the west side of CRREL bordering the Connecticut River. Based on these findings, no further action is required at the Site for characterization of PFAS related contaminants in groundwater.

8.0 REFERENCES

- AMEC, 2012a. Final Historical Review and Data Gaps Analysis Report. Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire. April 20, 2012
- AMEC, 2012b. Final Remedial Investigation Work Plan/Field Sampling Plan for Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire. July 10, 2012.
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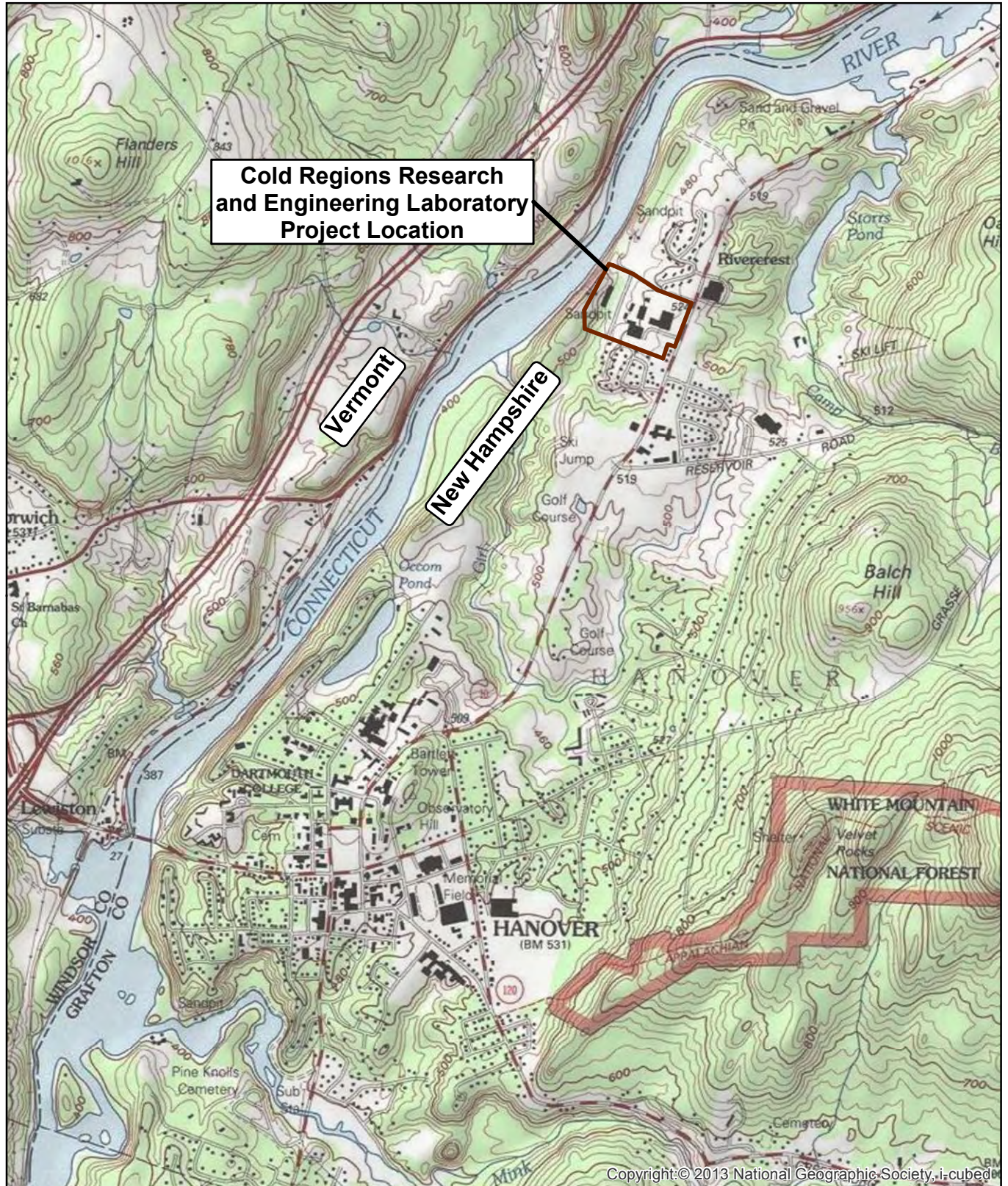
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Final Preliminary Assessment/Site Investigation Report Groundwater Sampling
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U.S. Environmental Protection Agency (USEPA), 2017. "USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Data Review"; Office of Emergency and Remedial Response; EPA-540-/R-2017-002; January 2017.

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for Per- and Polyfluoroalkyl Substances

FIGURES



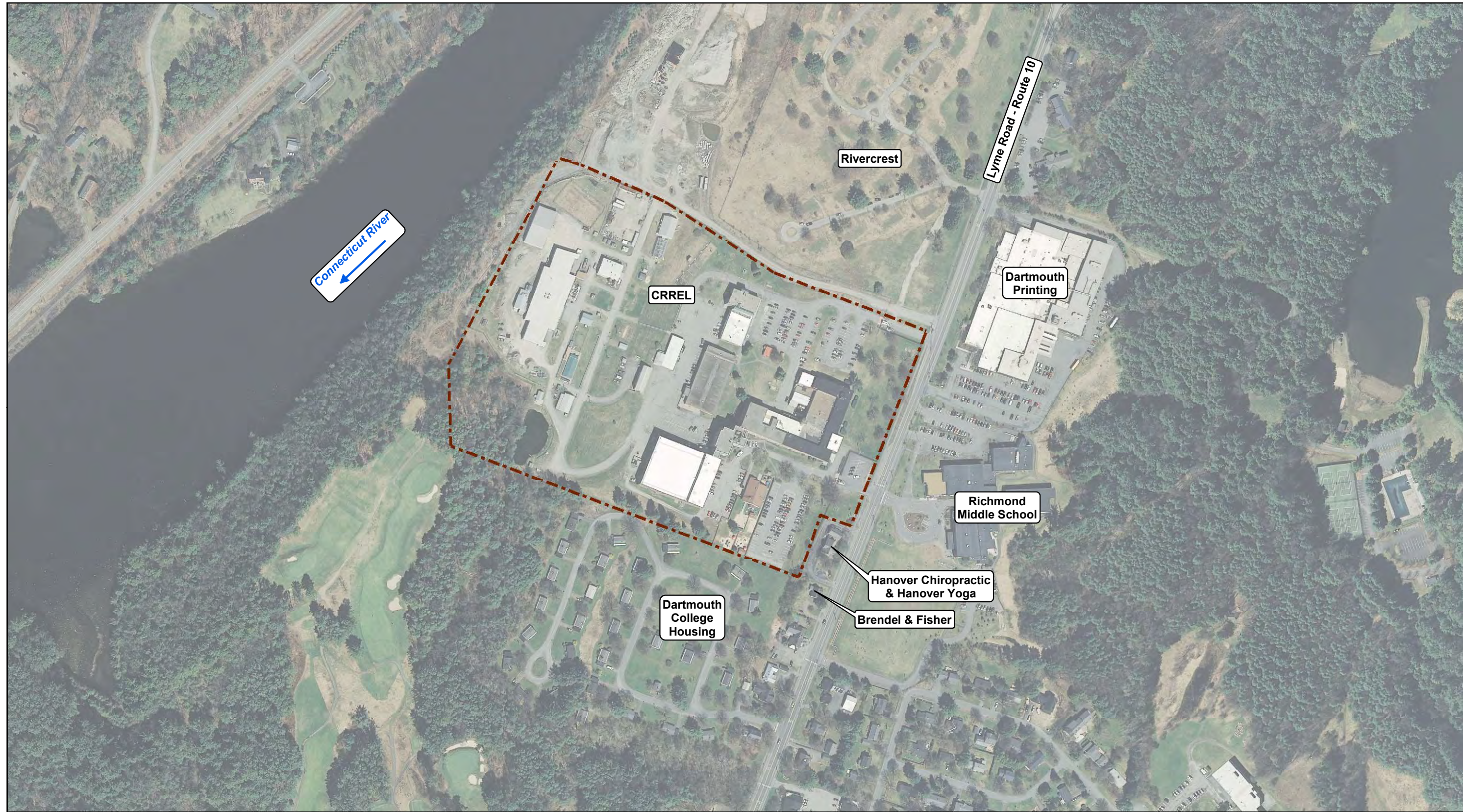
wood.

Legend

— CRREL Property Boundary

Figure 1
Project Location

Cold Regions Research and Engineering Laboratory
Hanover, New Hampshire



Legend
 --- CRREL Property Boundary

Figure 2
 Site Map



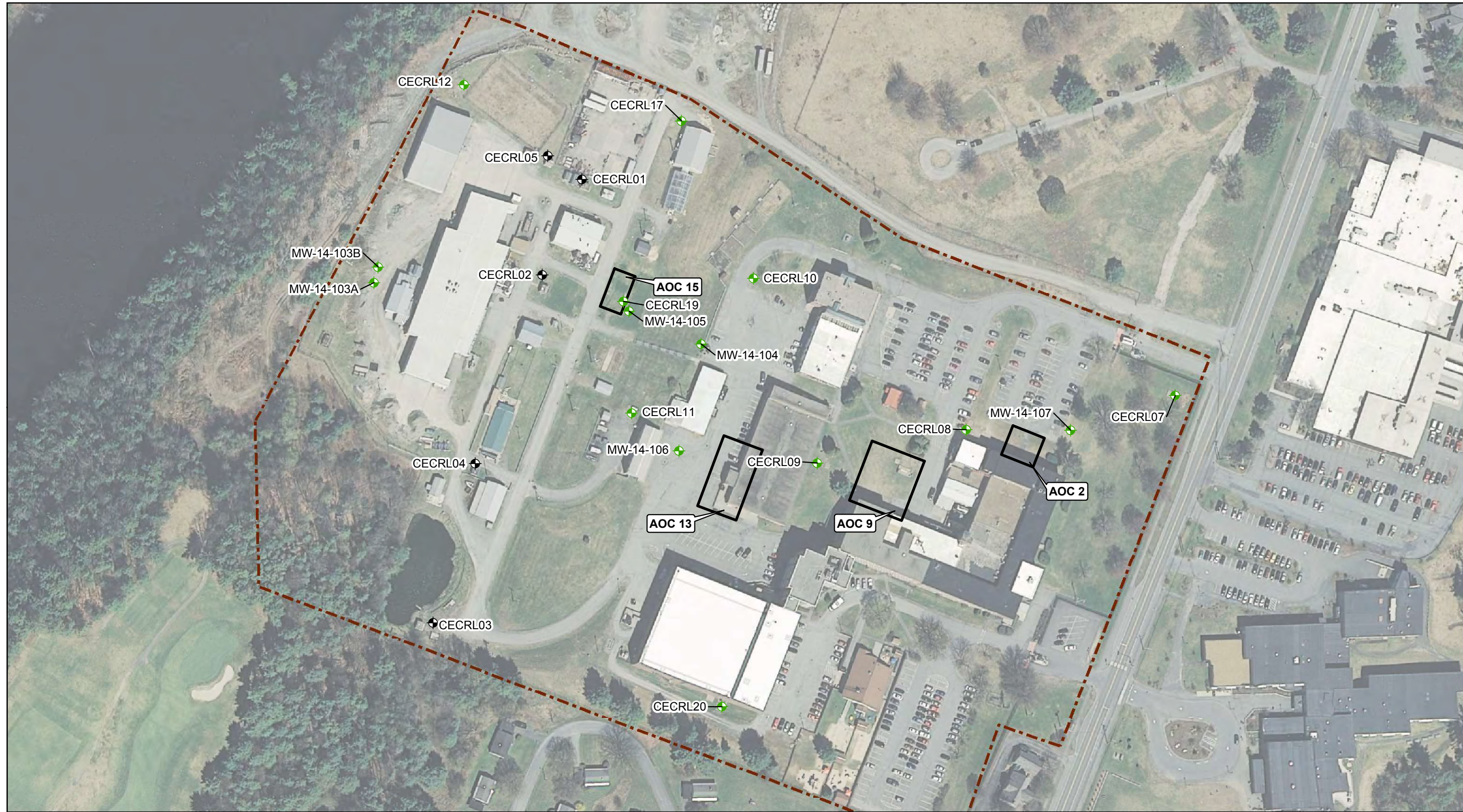


Figure 3
Overburden Monitoring Well Locations



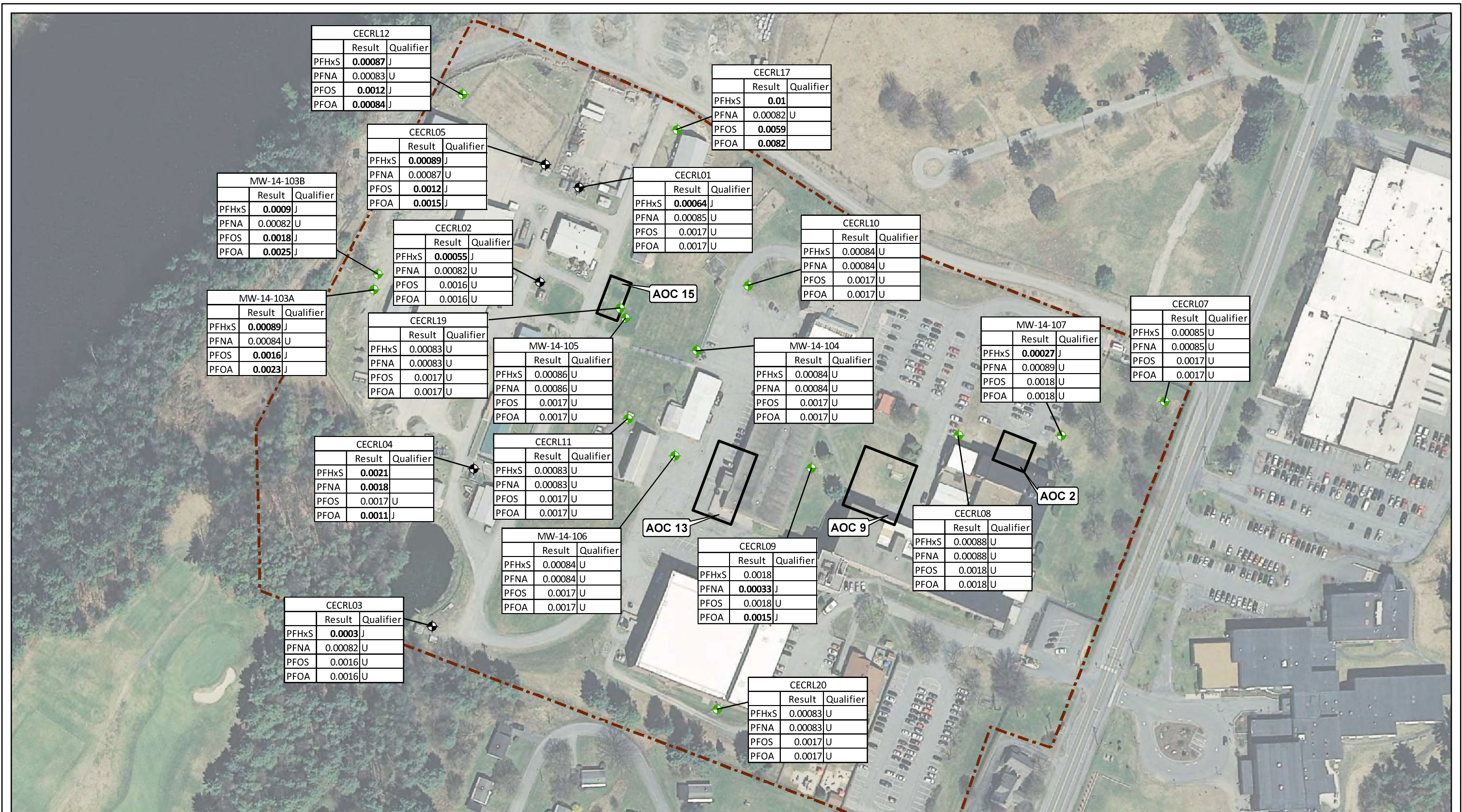
Prepared/Date: BRP 08-31-20 | Checked/Date: WDC 08-31-20



0 75 150
Feet

- Legend**
- ◆ Overburden Well
 - ◆ Production Well
 - AOC Boundary
 - CRREL Property Boundary

Cold Regions Research and Engineering Laboratory
Hanover, New Hampshire



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for Per- and Polyfluoroalkyl Substances

TABLES

Table 1
Summary of Per- and Polyfluoroalkyl Substances in Groundwater
Cold Regions Research and Engineering Laboratory
Hanover, NH

Parameter	Units	SDG		320-32527-1		320-32527-1		320-32527-1		320-32527-1	
		Location		MW-14-103A		MW-14-103B		MW-14-107		QC	
		Sample Date		10/17/2017		10/17/2017		10/18/2017		10/16/2017	
Parameter	Units	Field Sample ID		MW-14-103A		MW-14-103B		MW-14-107		EQUIP-17-001	
		QC Code		FS		FS		FS		EB	
		EPA Health Advisory	NHDES GW-1	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
6:2 Fluorotelomer sulfonate (6:2 FTS)	UG/L	NS	NS	0.0084	U	0.0082	U	0.0089	U	0.0083	U
8:2 Fluorotelomer sulfonate (8:2 FTS)	UG/L	NS	NS	0.0084	U	0.0082	U	0.0089	U	0.0083	U
N-Ethyl perfluorooctane sulfonamide	UG/L	NS	NS	50	U	50	U	50	U	50	U
N-ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	UG/L	NS	NS	0.0084	U	0.0082	U	0.0089	U	0.0083	U
N-Methyl perfluorooctane sulfonamide	UG/L	NS	NS	50	U	50	U	50	U	50	U
N-methyl perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	UG/L	NS	NS	0.0084	U	0.0082	U	0.0089	U	0.0083	U
Perfluorobutanesulfonic acid (PFBS)	UG/L	NS	NS	0.00084	J	0.00082	J	0.0021		0.00083	U
Perfluorobutanoic acid (PFBA)	UG/L	NS	NS	0.0027		0.0028		0.0044		0.00083	U
Perfluorodecanesulfonic acid (PFDS)	UG/L	NS	NS	0.00084	U	0.00082	U	0.00089	U	0.00083	U
Perfluorodecanoic acid (PFDA)	UG/L	NS	NS	0.00084	U	0.00082	U	0.00089	U	0.00083	U
Perfluorododecanoic acid (PFDoA)	UG/L	NS	NS	0.0017	U	0.0016	U	0.0018	U	0.0017	U
Perfluoroheptanesulfonic acid (PFHpS)	UG/L	NS	NS	0.00084	U	0.00082	U	0.00089	U	0.00083	U
Perfluoroheptanoic acid (PFHpA)	UG/L	NS	NS	0.00064	J	0.00069	J	0.00089	U	0.00083	U
Perfluorohexanesulfonic acid (PFHxS)	UG/L	NS	0.018	0.00089	J	0.0009	J	0.00027	J	0.00083	U
Perfluorohexanoic acid (PFHxA)	UG/L	NS	NS	0.0017	U	0.0008	J	0.023		0.0017	U
Perfluorononanoic acid (PFNA)	UG/L	NS	0.011	0.00084	U	0.00082	U	0.00089	U	0.00083	U
Perfluorooctanesulfonamide (FOSA)	UG/L	NS	NS	0.00084	U	0.00082	U	0.00089	U	0.00083	U
Perfluorooctanesulfonic acid (PFOS)	UG/L	0.07	0.015	0.0016	J	0.0018	J	0.0018	U	0.0017	U
Perfluorooctanoic acid (PFOA)	UG/L	0.07	0.012	0.0023	J	0.0025	J	0.0018	U	0.0017	U
Perfluoropentanoic acid (PFPeA)	UG/L	NS	NS	0.0011	J	0.0012	J	0.021		0.00083	U
Perfluorotetradecanoic acid (PFTeDA)	UG/L	NS	NS	0.00084	U	0.00082	U	0.00089	U	0.00083	U
Perfluorotridecanoic acid (PFTrDA)	UG/L	NS	NS	0.0025	U	0.0025	U	0.0027	U	0.0025	U
Perfluoroundecanoic acid (PFUnDA)	UG/L	NS	NS	0.0025	U	0.0025	U	0.0027	U	0.0025	U
PFOA + PFOS combined	UG/L	NS	NS	0.0039		0.0043		0.0036		0.0034	

Notes:

NS = No Standard

U = analyzed but not detected

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QC Codes

FS = Field Sample

EB = Equipment Blank

FD = Field Duplicate

Table 1
Summary of Per- and Polyfluoroalkyl Substances in Groundwater
Cold Regions Research and Engineering Laboratory
Hanover, NH

Parameter	Units	SDG		320-32527-1		320-32527-1		320-32527-1		320-32527-1	
		Location		QC		QC		WELL:CECRL01		WELL:CECRL01	
		Sample Date		10/16/2017		10/16/2017		10/16/2017		10/16/2017	
Parameter	Units	Field Sample ID		EQUIP-17-002		FIELDBLK-17-001		CECRL-01		CECRL-01DUP	
		QC Code		EB		FB		FS		FD	
Parameter	Units	EPA Health Advisory	NHDES GW-1	Result Qualifier		Result Qualifier		Result Qualifier		Result Qualifier	
				Result Qualifier		Result Qualifier		Result Qualifier		Result Qualifier	
6:2 Fluorotelomer sulfonate (6:2 FTS)	UG/L	NS	NS	0.0082	U	0.0081	U	0.0085	U	0.0084	U
8:2 Fluorotelomer sulfonate (8:2 FTS)	UG/L	NS	NS	0.0082	U	0.0081	U	0.0085	U	0.0084	U
N-Ethyl perfluorooctane sulfonamide	UG/L	NS	NS	50	U	50	U	50	U	50	U
N-ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	UG/L	NS	NS	0.0082	U	0.0081	U	0.0085	U	0.0084	U
N-Methyl perfluorooctane sulfonamide	UG/L	NS	NS	50	U	50	U	50	U	50	U
N-methyl perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	UG/L	NS	NS	0.0082	U	0.0081	U	0.0085	U	0.0084	U
Perfluorobutanesulfonic acid (PFBS)	UG/L	NS	NS	0.00082	U	0.00081	U	0.00044	J	0.00045	J
Perfluorobutanoic acid (PFBA)	UG/L	NS	NS	0.00082	U	0.00081	U	0.0018		0.0016	J
Perfluorodecanesulfonic acid (PFDS)	UG/L	NS	NS	0.00082	U	0.00081	U	0.00085	U	0.00084	U
Perfluorodecanoic acid (PFDA)	UG/L	NS	NS	0.00082	U	0.00081	U	0.00085	U	0.00084	U
Perfluorododecanoic acid (PFDoA)	UG/L	NS	NS	0.0016	U	0.0016	U	0.0017	U	0.0017	U
Perfluoroheptanesulfonic acid (PFHpS)	UG/L	NS	NS	0.00082	U	0.00081	U	0.00085	U	0.00084	U
Perfluoroheptanoic acid (PFHpA)	UG/L	NS	NS	0.00082	U	0.00081	U	0.00028	J	0.00026	J
Perfluorohexanesulfonic acid (PFHxS)	UG/L	NS	0.018	0.00082	U	0.00081	U	0.00064	J	0.00066	J
Perfluorohexanoic acid (PFHxA)	UG/L	NS	NS	0.0016	U	0.0016	U	0.0017	U	0.0017	U
Perfluorononanoic acid (PFNA)	UG/L	NS	0.011	0.00082	U	0.00081	U	0.00085	U	0.00084	U
Perfluorooctanesulfonamide (FOSA)	UG/L	NS	NS	0.00082	U	0.0003	J	0.00085	U	0.00084	U
Perfluorooctanesulfonic acid (PFOS)	UG/L	0.07	0.015	0.0016	U	0.0016	U	0.0017	U	0.0017	U
Perfluorooctanoic acid (PFOA)	UG/L	0.07	0.012	0.0016	U	0.0016	U	0.0017	U	0.0017	U
Perfluoropentanoic acid (PFPeA)	UG/L	NS	NS	0.00082	U	0.00081	U	0.0012	J	0.0011	J
Perfluorotetradecanoic acid (PFTeDA)	UG/L	NS	NS	0.00082	U	0.00081	U	0.00085	U	0.00084	U
Perfluorotridecanoic acid (PFTrDA)	UG/L	NS	NS	0.0025	U	0.0024	U	0.0026	U	0.0025	U
Perfluoroundecanoic acid (PFUnDA)	UG/L	NS	NS	0.0025	U	0.0024	U	0.0026	U	0.0025	U
PFOA + PFOS combined	UG/L	NS	NS	0.0032		0.0032		0.0034		0.0034	

Notes:

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FD = Field Duplicate

Table 1
Summary of Per- and Polyfluoroalkyl Substances in Groundwater
Cold Regions Research and Engineering Laboratory
Hanover, NH

Parameter	Units	SDG Location Sample Date Field Sample ID QC Code		320-32527-1 WELL:CECRL02 10/16/2017 CECRL-02 FS		320-32527-1 WELL:CECRL03 10/16/2017 CECRL-03 FS		320-32527-1 WELL:CECRL04 10/16/2017 CECRL-04 FS		320-32527-1 WELL:CECRL05 10/16/2017 CECRL-05 FS	
		EPA Health Advisory	NHDES GW-1	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
6:2 Fluorotelomer sulfonate (6:2 FTS)	UG/L	NS	NS	0.0082	U	0.0082	U	0.0086	U	0.0087	U
8:2 Fluorotelomer sulfonate (8:2 FTS)	UG/L	NS	NS	0.0082	U	0.0082	U	0.0086	U	0.0087	U
N-Ethyl perfluorooctane sulfonamide	UG/L	NS	NS	50	U	50	U	50	U	50	U
N-ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	UG/L	NS	NS	0.0082	U	0.0082	U	0.0086	U	0.0087	U
N-Methyl perfluorooctane sulfonamide	UG/L	NS	NS	50	U	50	U	50	U	50	U
N-methyl perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	UG/L	NS	NS	0.0082	U	0.0082	U	0.0086	U	0.0087	U
Perfluorobutanesulfonic acid (PFBS)	UG/L	NS	NS	0.00034	J	0.00082	U	0.0014	J	0.00061	J
Perfluorobutanoic acid (PFBA)	UG/L	NS	NS	0.0014	J	0.00036	J	0.0033		0.0026	
Perfluorodecanesulfonic acid (PFDS)	UG/L	NS	NS	0.00082	U	0.00082	U	0.00086	U	0.00087	U
Perfluorodecanoic acid (PFDA)	UG/L	NS	NS	0.00082	U	0.00082	U	0.00086	U	0.00087	U
Perfluorododecanoic acid (PFDoA)	UG/L	NS	NS	0.0016	U	0.0016	U	0.0017	U	0.0017	U
Perfluoroheptanesulfonic acid (PFHpS)	UG/L	NS	NS	0.00082	U	0.00082	U	0.00086	U	0.00087	U
Perfluoroheptanoic acid (PFHpA)	UG/L	NS	NS	0.00082	U	0.00029	J	0.00094	J	0.00052	J
Perfluorohexanesulfonic acid (PFHxS)	UG/L	NS	0.018	0.00055	J	0.0003	J	0.0021		0.00089	J
Perfluorohexanoic acid (PFHxA)	UG/L	NS	NS	0.0016	U	0.0016	U	0.0044		0.00098	J
Perfluorononanoic acid (PFNA)	UG/L	NS	0.011	0.00082	U	0.00082	U	0.0018		0.00087	U
Perfluorooctanesulfonamide (FOSA)	UG/L	NS	NS	0.00082	U	0.0044		0.0039		0.0023	
Perfluorooctanesulfonic acid (PFOS)	UG/L	0.07	0.015	0.0016	U	0.0016	U	0.0017	U	0.0012	J
Perfluorooctanoic acid (PFOA)	UG/L	0.07	0.012	0.0016	U	0.0016	U	0.0011	J	0.0015	J
Perfluoropentanoic acid (PFPeA)	UG/L	NS	NS	0.00099	J	0.00053	J	0.013		0.001	J
Perfluorotetradecanoic acid (PFTeDA)	UG/L	NS	NS	0.00082	U	0.00082	U	0.00086	U	0.00087	U
Perfluorotridecanoic acid (PFTrDA)	UG/L	NS	NS	0.0025	U	0.0025	U	0.0026	U	0.0026	U
Perfluoroundecanoic acid (PFUnDA)	UG/L	NS	NS	0.0025	U	0.0025	U	0.0026	U	0.0026	U
PFOA + PFOS combined	UG/L	NS	NS	0.0032		0.0032		0.0028		0.0027	

Notes:

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Table 1
Summary of Per- and Polyfluoroalkyl Substances in Groundwater
Cold Regions Research and Engineering Laboratory
Hanover, NH

Parameter	Units	SDG Location Sample Date Field Sample ID QC Code		320-32527-1 WELL:CECRL07 10/17/2017 CECRL-07 FS		320-32527-1 WELL:CECRL12 10/17/2017 CECRL-12 FS		320-32527-1 WELL:CECRL17 10/18/2017 CECRL-17 FS		320-32527-1 WELL:CECRL19 10/18/2017 CECRL-19 FS	
		EPA Health Advisory	NHDES GW-1	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
6:2 Fluorotelomer sulfonate (6:2 FTS)	UG/L	NS	NS	0.0085	U	0.0083	U	0.0082	U	0.0083	U
8:2 Fluorotelomer sulfonate (8:2 FTS)	UG/L	NS	NS	0.0085	U	0.0083	U	0.0082	U	0.0083	U
N-Ethyl perfluorooctane sulfonamide	UG/L	NS	NS	50	U	50	U	50	U	50	U
N-ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	UG/L	NS	NS	0.0085	U	0.0083	U	0.0082	U	0.0083	U
N-Methyl perfluorooctane sulfonamide	UG/L	NS	NS	50	U	50	U	50	U	50	U
N-methyl perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	UG/L	NS	NS	0.0085	U	0.0083	U	0.0082	U	0.0083	U
Perfluorobutanesulfonic acid (PFBS)	UG/L	NS	NS	0.00085	U	0.00087	J	0.00082	U	0.00083	U
Perfluorobutanoic acid (PFBA)	UG/L	NS	NS	0.00085	U	0.0029		0.00082	U	0.00083	U
Perfluorodecanesulfonic acid (PFDS)	UG/L	NS	NS	0.00085	U	0.00083	U	0.00082	U	0.00083	U
Perfluorodecanoic acid (PFDA)	UG/L	NS	NS	0.00085	U	0.00083	U	0.00082	U	0.00083	U
Perfluorododecanoic acid (PFDoA)	UG/L	NS	NS	0.0017	U	0.0017	U	0.0016	U	0.0017	U
Perfluoroheptanesulfonic acid (PFHpS)	UG/L	NS	NS	0.00085	U	0.00083	U	0.00082	U	0.00083	U
Perfluoroheptanoic acid (PFHpA)	UG/L	NS	NS	0.00085	U	0.00022	J	0.0018		0.00083	U
Perfluorohexanesulfonic acid (PFHxS)	UG/L	NS	0.018	0.00085	U	0.00087	J	0.01		0.00083	U
Perfluorohexanoic acid (PFHxA)	UG/L	NS	NS	0.0017	U	0.0017	U	0.0029	J	0.0017	U
Perfluorononanoic acid (PFNA)	UG/L	NS	0.011	0.00085	U	0.00083	U	0.00082	U	0.00083	U
Perfluorooctanesulfonamide (FOSA)	UG/L	NS	NS	0.00085	U	0.00083	U	0.00082	U	0.00083	U
Perfluorooctanesulfonic acid (PFOS)	UG/L	0.07	0.015	0.0017	U	0.0012	J	0.0059		0.0017	U
Perfluorooctanoic acid (PFOA)	UG/L	0.07	0.012	0.0017	U	0.00084	J	0.0082		0.0017	U
Perfluoropentanoic acid (PFPeA)	UG/L	NS	NS	0.00085	U	0.00051	J	0.00082	U	0.00083	U
Perfluorotetradecanoic acid (PFTeDA)	UG/L	NS	NS	0.00085	U	0.00083	U	0.00082	U	0.00083	U
Perfluorotridecanoic acid (PFTriDA)	UG/L	NS	NS	0.0026	U	0.0025	U	0.0025	U	0.0025	U
Perfluoroundecanoic acid (PFUnDA)	UG/L	NS	NS	0.0026	U	0.0025	U	0.0025	U	0.0025	U
PFOA + PFOS combined	UG/L	NS	NS	0.0034		0.00204		0.0141		0.0034	

Notes:

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Table 1
Summary of Per- and Polyfluoroalkyl Substances in Groundwater
Cold Regions Research and Engineering Laboratory
Hanover, NH

		SDG		320-32527-1		320-32575		320-32575		320-32575	
		Location		WELL:CECRL20		MW-14-104		MW-14-105		MW-14-106	
		Sample Date		10/18/2017		10/19/2017		10/19/2017		10/19/2017	
		Field Sample ID		CECRL-20		MW-14-104		MW-14-105		MW-14-106	
		QC Code		FS		FS		FS		FS	
		EPA	NHDES								
Parameter	Units	Health	GW-1	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
		Advisory									
6:2 Fluorotelomer sulfonate (6:2 FTS)	UG/L	NS	NS	0.0083	U	0.0084	U	0.0086	U	0.0084	U
8:2 Fluorotelomer sulfonate (8:2 FTS)	UG/L	NS	NS	0.0083	U	0.0084	U	0.0086	U	0.0084	U
N-Ethyl perfluorooctane sulfonamide	UG/L	NS	NS	50	U	50	U	50	U	50	U
N-ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	UG/L	NS	NS	0.0083	U	0.0084	U	0.0086	U	0.0084	U
N-Methyl perfluorooctane sulfonamide	UG/L	NS	NS	50	U	50	U	50	U	50	U
N-methyl perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	UG/L	NS	NS	0.0083	U	0.0084	U	0.0086	U	0.0084	U
Perfluorobutanesulfonic acid (PFBS)	UG/L	NS	NS	0.00083	U	0.00084	U	0.00086	U	0.00028	J
Perfluorobutanoic acid (PFBA)	UG/L	NS	NS	0.00083	U	0.00066	J	0.00045	J	0.00082	J
Perfluorodecanesulfonic acid (PFDS)	UG/L	NS	NS	0.00083	U	0.00084	U	0.00086	U	0.00084	U
Perfluorodecanoic acid (PFDA)	UG/L	NS	NS	0.00083	U	0.00084	U	0.00086	U	0.00084	U
Perfluorododecanoic acid (PFDoA)	UG/L	NS	NS	0.0017	U	0.0017	U	0.0017	U	0.0017	U
Perfluoroheptanesulfonic acid (PFHpS)	UG/L	NS	NS	0.00083	U	0.00084	U	0.00086	U	0.00084	U
Perfluoroheptanoic acid (PFHpA)	UG/L	NS	NS	0.00083	U	0.00084	U	0.00086	U	0.00084	U
Perfluorohexanesulfonic acid (PFHxS)	UG/L	NS	0.018	0.00083	U	0.00084	U	0.00086	U	0.00084	U
Perfluorohexanoic acid (PFHxA)	UG/L	NS	NS	0.0017	U	0.0017	U	0.0017	U	0.00081	J
Perfluorononanoic acid (PFNA)	UG/L	NS	0.011	0.00083	U	0.00084	U	0.00086	U	0.00084	U
Perfluorooctanesulfonamide (FOSA)	UG/L	NS	NS	0.00083	U	0.00084	U	0.00086	U	0.00084	U
Perfluorooctanesulfonic acid (PFOS)	UG/L	0.07	0.015	0.0017	U	0.0017	U	0.0017	U	0.0017	U
Perfluorooctanoic acid (PFOA)	UG/L	0.07	0.012	0.0017	U	0.0017	U	0.0017	U	0.0017	U
Perfluoropentanoic acid (PFPeA)	UG/L	NS	NS	0.00083	U	0.00084	U	0.00086	U	0.00084	U
Perfluorotetradecanoic acid (PFTeDA)	UG/L	NS	NS	0.00083	U	0.00084	U	0.00086	U	0.00084	U
Perfluorotridecanoic acid (PFTrDA)	UG/L	NS	NS	0.0025	U	0.0025	U	0.0026	U	0.0025	U
Perfluoroundecanoic acid (PFUnDA)	UG/L	NS	NS	0.0025	U	0.0025	U	0.0026	U	0.0025	U
PFOA + PFOS combined	UG/L	NS	NS	0.0034		0.0034		0.0034		0.0034	

Notes:

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Table 1
Summary of Per- and Polyfluoroalkyl Substances in Groundwater
Cold Regions Research and Engineering Laboratory
Hanover, NH

Parameter	Units	SDG		320-32575		320-32575		320-32575		320-32575	
		Location		WELL:CECRL08		WELL:CECRL09		WELL:CECRL10		WELL:CECRL11	
		Sample Date		10/19/2017		10/19/2017		10/19/2017		10/19/2017	
Field Sample ID	QC Code	CECRL-08		CECRL-09		CECRL-10		CECRL-11		CECRL-11	
		FS		FS		FS		FS		FS	
EPA Health Advisory	NHDES GW-1	Result		Result		Result		Result		Result	
		Qualifier		Qualifier		Qualifier		Qualifier		Qualifier	
6:2 Fluorotelomer sulfonate (6:2 FTS)	UG/L	NS	NS	0.0088	U	0.0088	U	0.0084	U	0.0083	U
8:2 Fluorotelomer sulfonate (8:2 FTS)	UG/L	NS	NS	0.0088	U	0.0088	U	0.0084	U	0.0083	U
N-Ethyl perfluorooctane sulfonamide	UG/L	NS	NS	50	U	50	U	50	U	50	U
N-ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	UG/L	NS	NS	0.0088	U	0.0088	U	0.0084	U	0.0083	U
N-Methyl perfluorooctane sulfonamide	UG/L	NS	NS	50	U	50	U	50	U	50	U
N-methyl perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	UG/L	NS	NS	0.0088	U	0.0088	U	0.0084	U	0.0083	U
Perfluorobutanesulfonic acid (PFBS)	UG/L	NS	NS	0.00088	U	0.00091	J	0.00084	U	0.00098	J
Perfluorobutanoic acid (PFBA)	UG/L	NS	NS	0.00032	J	0.0028		0.0011	J	0.0023	
Perfluorodecanesulfonic acid (PFDS)	UG/L	NS	NS	0.00088	U	0.00088	U	0.00084	U	0.00083	U
Perfluorodecanoic acid (PFDA)	UG/L	NS	NS	0.00088	U	0.00044	J	0.00084	U	0.00083	U
Perfluorododecanoic acid (PFDoA)	UG/L	NS	NS	0.0018	U	0.0018	U	0.0017	U	0.0017	U
Perfluoroheptanesulfonic acid (PFHpS)	UG/L	NS	NS	0.00088	U	0.00088	U	0.00084	U	0.00083	U
Perfluoroheptanoic acid (PFHpA)	UG/L	NS	NS	0.00088	U	0.0019		0.00084	U	0.00083	U
Perfluorohexanesulfonic acid (PFHxS)	UG/L	NS	0.018	0.00088	U	0.0018		0.00084	U	0.00083	U
Perfluorohexanoic acid (PFHxA)	UG/L	NS	NS	0.0018	U	0.0058		0.0017	U	0.00084	J
Perfluorononanoic acid (PFNA)	UG/L	NS	0.011	0.00088	U	0.00033	J	0.00084	U	0.00083	U
Perfluorooctanesulfonamide (FOSA)	UG/L	NS	NS	0.00088	U	0.00088	U	0.00084	U	0.00098	U
Perfluorooctanesulfonic acid (PFOS)	UG/L	0.07	0.015	0.0018	U	0.0018	U	0.0017	U	0.0017	U
Perfluorooctanoic acid (PFOA)	UG/L	0.07	0.012	0.0018	U	0.0015	J	0.0017	U	0.0017	U
Perfluoropentanoic acid (PFPeA)	UG/L	NS	NS	0.00088	U	0.0031		0.00084	U	0.0015	J
Perfluorotetradecanoic acid (PFTeDA)	UG/L	NS	NS	0.00028	J	0.00088	U	0.00031	J	0.00083	U
Perfluorotridecanoic acid (PFTriDA)	UG/L	NS	NS	0.0026	U	0.0026	U	0.0025	U	0.0025	U
Perfluoroundecanoic acid (PFUnDA)	UG/L	NS	NS	0.0026	U	0.0026	U	0.0025	U	0.0025	U
PFOA + PFOS combined	UG/L	NS	NS	0.0036		0.0033		0.0034		0.0034	

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U.S. Army Corps of Engineers - New England District
Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire
Final Preliminary Assessment/Site Investigation Report Groundwater Sampling
for Per- and Polyfluoroalkyl Substances

ATTACHMENT A
FIELD DATA RECORDS

BOTTLE TIME 1515

DISCHARGE
TIMER

(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/ml)

☒ Sulfate

* = Turbidity values should be 50 NTUs or less.

DEC
12/18/18

BOTTLE TIME 1645

Checked by _____

12/12/17

BOTTLE TIME 1620

DISCHARGE
TIMER
SETTING

 SEC

☐ OTHER☒ Sulfate

* = Turbidity values should 50 NTUs or less

APL
12/18/17

BOTTLE TIME 1540

— SEC

☒ Sulfate

* = Turbidity values should be 50 NTU or less.

Checked by

AC
12/19/17

10/17/17

DATE 10/17/2017

BOTTLE TIME 1740

PROTECTIVE
CASING / WELL
DIFFERENCE

CASING / WELL DIFFERENCE	0.19 FT
-----------------------------	---------

WELL DIAMETER 42 IN.

WELL	YES	NO	N/A
------	-----	----	-----

CASING	1/2	—	—
LOCKED	1/2	—	—
COLLAR	7	—	—

CASING	1/2	—	—
LOCKED	1/2	—	—
COLLAR	7	—	—

DISCHARGE TIMER	13	SEC
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(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/ml)

REFILL
TIMER 67 SE

DISCHARGE TIMER	13	SEC
--------------------	----	-----

[illegible]

TYPE OF BLADDER MATERIAL

 POLYETHENE☐ OTHER _____

SAMPLE
COLLECTED



2

☒ Dissolved Oxygen

1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

☒ Nitrate

☒ **Yes**

 Nitrite

 Springer☒ Ferrous Iron (Fe(II)) Total Iron☒ Relative to Sulfide☒ ☐

NOTES:

* = Turbidity values should 50 NTUs or less.

1000

12

BOTTLE TIME	1430
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DISCHARGE
TIMER 105 SEC

(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/ml)

[illegible]☐ OTHER _____

7 Sulfate

* = Turbidity values should be 50 NTUs or less.

SIGNATURE:

Checked by:

yc. TLC 10/24/1

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

amec foster wheeler



Page 1 of 2

PROJECT: CRREL - October PFAS GW sampling
 WELL ID: CECRL-09
 SAMPLE ID: CECRL 09
 SITE TYPE: RI/FS Program
 DATE: 10/19/2017
 TIME START: 1420
 END:
 JOB NUMBER: 3612162337.18.01
 BOTTLE TIME: 1730

WATER LEVEL / PUMP SETTINGS

QC SAMPLE COLLECTED ID: none
 MEASUREMENT POINT: ☒ TOP OF WELL RISER
☐ TOP OF PROTECTIVE CASING
☐ OTHER
 PROTECTIVE CASING STICKUP (FROM GROUND): 2.1 FT.
 PROTECTIVE CASING / WELL DIFFERENCE: 0.22 FT.
 INITIAL DEPTH TO WATER: 125.58 FT.
 WELL DEPTH (TOR): 137 bgs
 PID AMBIENT AIR: 0.0 PPMV
 WELL DIAMETER: 4 IN.
 FINAL DEPTH TO WATER: 125.94 FT.
 SCREEN LENGTH: 10 FT.
 PID WELL MOUTH: 0.5 PPMV
 WELL INTEGRITY: CAP ☒ YES ☐ NO ☐ N/A
 LOCKED ☒
 COLLAR ☒
 DRAWDOWN VOLUME: 0.23 GAL.
 RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED: 0.06
 PRESSURE TO PUMP: 65 PSI
 DISCHARGE TIMER SETTING: 5 SEC.
 TOTAL VOL. PURGED: 4 GAL.
 REFILL TIMER SETTING: 10 SEC.
 (purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/ml)

PURGE DATA

CLOCK TIME	DEPTH TO WATER (ft.) (0.3 ft.)	PURGE RATE (ml/min) (100-400)	TEMP. (deg. C) (3%)	SPEC. COND. (mS/cm) (3%)	pH (units) (+/- 0.1 unit)	DISS. O2 (mg/L) (10%) (>0.5)	TURBIDITY* (NTU) (10%) (>10)	ORP (mV) (+/- 10 mV)	SAMPLE DEPTH	COMMENTS
1500		Started Purging well								
1515	126.15									
1520	126.25	150	15.30	0.743	9.91	7.48	9.5	112	132	
1525	126.30		15.24	0.743	9.90	7.61		107		
1528	Pump stop Pumping. Pump out of water. Lowered Pump to 2' off BOW									
1542	126.15	200	14.89	0.742	9.76	7.75	29.2	102		hit BOW w/ Am
1545	126.25	150	14.32	0.721	9.64	8.30	25.5	102		↓ Flow Rate
1550	126.30	↓	14.17	0.726	9.78	8.00	78.9	98.4		
1555	126.35	↓	14.12	0.734	9.83	7.73	37.5	97.0		
1600	126.35	100	14.28	0.732	9.82	7.57	19.6	95.1		↓ Flow Rate
1605	126.27	100	14.78	0.729	9.79	7.34	17.1	94.1		
1610	126.24	108	15.16	0.727	9.75	7.47	14.3	95.0		
1615	126.20		15.21	0.725	9.72	7.41	14.9	93.3		
1620	126.20		15.25	0.722	9.69	7.54	-	92.2		
1625	126.16	125	15.34	0.716	9.55	7.42	13.7	92.1		
1630	126.14	130	15.35	0.708	9.28	7.51	16.6	94.0		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP: ☒ Geotech 1.66" BLADDER Pump # 1425
 TYPE OF TUBING: ☒ HDPE (Dedicated)
☐ HIGH DENSITY POLYETHYLENE
 TYPE OF PUMP MATERIAL: ☐ POLYVINYL CHLORIDE
☒ STAINLESS STEEL
 TYPE OF BLADDER MATERIAL: ☒ POLYETHYLENE
☐ OTHER

ANALYTICAL PARAMETERS

TO BE COLLECTED	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
☒ PFAS	537.1 Modified	4 DEG. C	2 x 250 HDPE	☒ PFAS
☒ Dissolved Oxygen	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Dissolved Oxygen
☒ Nitrate	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Nitrate
☒ Nitrite	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Nitrite
☒ Ferrous Iron (Fe(II))	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Ferrous Iron (Fe(II))
☒ Total Iron	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Total Iron
☒ Sulfide	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Sulfide
☒ Sulfate	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Sulfate

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: ☒ YES ☐ NO
 NUMBER OF GALLONS GENERATED: 4

Sampler (print name): Tiger Cummings

SIGNATURE:

NOTES:

* = Turbidity values should 50 NTU or less.

Checked by:

12/19/17

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

amec foster wheeler



PROJECT: CRREL - October PFAS GW sampling
 WELL ID: CECRL10
 SAMPLE ID: CECRL-10
 SITE TYPE: RI/FS Program
 DATE: 10/19/2017
 TIME START: 1030 END: 1300
 JOB NUMBER: 3612162337.18.01
 BOTTLE TIME: 1255

WATER LEVEL / PUMP SETTINGS

QC SAMPLE COLLECTED ID: none
 MEASUREMENT POINT: ☒ TOP OF WELL RISER
 INITIAL DEPTH TO WATER: 112.05 FT.
 TOP OF PROTECTIVE CASING
 FINAL DEPTH TO WATER: 112.11 FT.
 OTHER
 DRAWDOWN VOLUME: 0.039 GAL.
 (initial - final x 0.16 (2-inch) or x 0.65 (4-inch))
 RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED: 0.01
 TOTAL VOL. PURGED: 3.75 GAL.
 (purge rate (milliliters per minute) x time duration (minutes) x 0.0026 gal/ml)
 PROTECTIVE CASING STICKUP (FROM GROUND): 2.52 FT.
 PROTECTIVE CASING / WELL DIFFERENCE: 0.35 FT.
 WELL DIAMETER: 4 IN.
 PID AMBIENT AIR: 0.5 PPMV
 PID WELL MOUTH: 1.8 PPMV
 PRESSURE TO PUMP: 60 PSI
 REFILL TIMER SETTING: 13.5 SEC.
 WELL INTEGRITY: CAP ☒ YES ☐ NO ☐ N/A
 CASING ☒ LOCKED ☐
 COLLAR ☒
 DISCHARGE TIMER SETTING: 6.5 SEC.

PURGE DATA

CLOCK TIME	DEPTH TO WATER (ft.) (0.3 ft.)	PURGE RATE (ml/min) (100-400)	TEMP. (deg. C) (3%)	SPEC. COND. (mS/cm) (3%)	pH (units) (+/- 0.1 unit)	DISS. O2 (mg/L) (10%) (>0.5)	TURBIDITY* (NTU) (10%) (>10)	ORP (mV) (+/- 10 mV)	SAMPLE DEPTH	COMMENTS
1145	112.05	Started Purging well								
1155	112.11	175	12.12	0.804	7.74	2.60	29.2	137	125	
1205	112.11	200	12.08	0.801	7.73	2.51	26.2	130		↑ Flow Rate
1210	112.11		12.03	0.801	7.71	2.50	24.1	129		
1215	112.11		12.06	0.802	7.71	2.31	20.7	127		
1220	112.11		12.03	0.775	7.71	2.35	24.1	125		
1225	112.11		11.99	0.767	7.70	2.40	19.7	124	123	Raised Pump 2'
1230	112.11		12.24	0.820	7.70	2.55	21.6	123		
1235	112.11		12.43	0.826	7.70	2.05	23.7	122		
1240	112.11		12.56	0.824	7.75	2.00	22.5	120		
1245	112.11		12.48	0.824	7.74	2.05	24.4	119		
1250	112.11		12.56	0.824	7.73	2.00	18.5	118		
1255	112.11		12.48	0.825	7.71	2.00	23.2	117		Sample Collected

EQUIPMENT DOCUMENTATION

TYPE OF PUMP: ☒ Geotech 1.66" BLADDER Pump # 1425
 TYPE OF TUBING: ☐ HDPE (Dedicated) ☐ HIGH DENSITY POLYETHYLENE
 TYPE OF PUMP MATERIAL: ☐ POLYVINYL CHLORIDE ☐ STAINLESS STEEL
 TYPE OF BLADDER MATERIAL: ☐ POLYETHYLENE ☐ OTHER

ANALYTICAL PARAMETERS

TO BE COLLECTED	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
☒ PFAS	537.1 Modified	4 DEG. C	2 x 250 HDPE	☒ PFAS
☒ Dissolved Oxygen	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Dissolved Oxygen
☒ Nitrate	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Nitrate
☒ Nitrite	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Nitrite
☒ Ferrous Iron (Fe(II))	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Ferrous Iron (Fe(II))
☒ Total Iron	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Total Iron
☒ Sulfide	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Sulfide
☒ Sulfate	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Sulfate

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: YES ☒ NO ☐ NUMBER OF GALLONS GENERATED: 3.75

Sampler (print name):

SIGNATURE:

Tige Cunniff

Tige Cunniff

NOTES:

* = Turbidity values should be 50 NTUs or less.

Well should be redeveloped

Scott Calkin removes transducer

Screen 118-128 hrs

Checked by:

high Turbo

12/18/17

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

amec foster wheeler



PROJECT: CRREL - October PFAS GW sampling
 WELL ID: CECRL-12
 SAMPLE ID: CECRL-12
 SITE TYPE: RI/FS Program
 DATE: 10/ /2017
 TIME START: 1515 END: 1700
 JOB NUMBER: 3612162337.18.01
 BOTTLE TIME: 1640

WATER LEVEL / PUMP SETTINGS

QC SAMPLE COLLECTED ID: none
 INITIAL DEPTH TO WATER: 85.00 FT.
 FINAL DEPTH TO WATER: 85.60 FT.
 DRAWDOWN VOLUME: — GAL.
 (Initial - final x 0.16 (2-inch) or x 0.65 (4-inch))
 TOTAL VOL. PURGED: 4.1 GAL.
 (purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/ml)

MEASUREMENT POINT

☒ TOP OF WELL RISER
☐ TOP OF PROTECTIVE CASING
☐ OTHER

WELL DEPTH (TOR): 101.00 FT.
 SCREEN LENGTH: 10 FT.
 RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED: —

PROTECTIVE CASING STICKUP (FROM GROUND): 0.85 FT.
PID AMBIENT AIR: 0.2 PPMV
PID WELL MOUTH: 1.0 PPMV
PRESSURE TO PUMP: 42 PSI
REFILL TIMER SETTING: 10 SEC.

PROTECTIVE CASING / WELL DIFFERENCE: 1.1 FT.
WELL DIAMETER: 4 IN.
WELL INTEGRITY: CAP ☒ YES ☐ NO ☐ N/A
 CASING ☒ LOCKED ☐
 COLLAR ☒
DISCHARGE TIMER SETTING: 10 SEC.

PURGE DATA

CLOCK TIME	DEPTH TO WATER (ft.) (0.3 ft.)	PURGE RATE (ml/min) (100-400)	TEMP. (deg. C) (3%)	SPEC. COND. (mS/cm) (3%)	pH (units) (+/- 0.1 unit)	DISS. O2 (mg/L) (10%) (>0.5)	TURBIDITY* (NTU) (10%) (>10)	ORP (mV) (+/- 10 mV)	SAMPLE DEPTH	COMMENTS
1555	85.60	Started Purging well								
1600	Water @ Surface									
1605	85.60	350	10.77	0.532	7.83	3.04	3.90	87.9	87	
1610	85.60		9.65	0.532	7.86	2.05	2.42	82.3		
1615	85.60		9.31	0.531	7.86	1.66	5.48	78.7		
1620	85.60		9.16	0.530	7.88	1.31	2.28	76.4		
1625	85.60	350	9.14	0.531	7.89	1.39	1.95	74.8		
1630	85.60		9.12	0.531	7.89	0.90	2.15	72.8		
1635	85.60		9.03	0.531	7.89	0.95	1.74	71.1		
1640	85.60		8.99	0.531	7.89	0.90	1.60	70.0		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP: ☒ Geotech 1.66" BLADDER Pump # 1418
TYPE OF TUBING: ☒ HDPE (Dedicated) ☐ HIGH DENSITY POLYETHYLENE
TYPE OF PUMP MATERIAL: ☐ POLYVINYL CHLORIDE ☒ STAINLESS STEEL
TYPE OF BLADDER MATERIAL: ☒ POLYETHYLENE ☐ OTHER

ANALYTICAL PARAMETERS

TO BE COLLECTED	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
☒ PFAS	537.1 Modified	4 DEG. C	2 x 250 HDPE	☒ PFAS
☒ Dissolved Oxygen	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Dissolved Oxygen
☒ Nitrate	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Nitrate
☒ Nitrite	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Nitrite
☒ Ferrous Iron (Fe(II))	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Ferrous Iron (Fe(II))
☒ Total Iron	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Total Iron
☒ Sulfide	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Sulfide
☒ Sulfate	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Sulfate

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: YES ☒ NO ☐ NUMBER OF GALLONS GENERATED: 4

Sampler (print name): Tige Cunningham

SIGNATURE: *Tige Cunningham*

NOTES:

* = Turbidity values should be 50 NTUs or less.

Screen 81-91 hrs

Checked by:

ALC
12/18/17

BOTTLE TIME 1045

DISCHARGE TIMER SETTING

☒ Sulfat

* = Turbidity values should be 50 NTUs or less.

Checked by _____

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

amec foster wheeler



PROJECT: CRREL - October PFAS GW sampling
 WELL ID: CECRL-19
 SAMPLE ID: CECRL-19
 SITE TYPE: RI/FS Program
 DATE: 10/18/2017
 TIME START: 1215 END: 1500
 JOB NUMBER: 3612162337.18.01
 BOTTLE TIME: 1450

WATER LEVEL / PUMP SETTINGS

QC SAMPLE COLLECTED ID: none
 INITIAL DEPTH TO WATER: 82.62 FT.
 FINAL DEPTH TO WATER: 83.90 FT.
 DRAWDOWN VOLUME: 0.83 GAL.
 TOTAL VOL. PURGED: 4.2 GAL.
 (initial - final x 0.16 (2-inch) or x 0.65 (4-inch))
 (purge rate (milliliters per minute) x time duration (minutes) x 0.00262 gal/ml)

MEASUREMENT POINT

X TOP OF WELL RISER
 TOP OF PROTECTIVE CASING
 OTHER

WELL DEPTH (TOR): 2107 FT.
 SCREEN LENGTH: 20 FT.
 RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED: .198

PROTECTIVE CASING STICKUP (FROM GROUND): 2.9 FT.
PROTECTIVE CASING / WELL DIFFERENCE: 0.5 FT.
WELL DIAMETER: 4 IN.
WELL INTEGRITY: CAP YES, CASKING NO, LOCKED YES, COLLAR YES
DISCHARGE TIMER SETTING: 5 SEC.
REFILL TIMER SETTING: 10 SEC.

PURGE DATA

CLOCK TIME	DEPTH TO WATER (ft.) (0.3 ft.)	PURGE RATE (ml/min) (100-400)	TEMP. (deg. C) (3%)	SPEC. COND. (mS/cm) (3%)	pH (units) (+/- 0.1 unit)	DISS. O2 (mg/L) (10%) (>0.5)	TURBIDITY* (NTU) (10%) (>10)	ORP (mV) (+/- 10 mV)	SAMPLE DEPTH	COMMENTS
1240	82.62	Started Purging well								
1250	83.00	150	13.79	0.178	8.44	8.83	248	116	99	hit the bottom
1300	83.21		13.30	0.174	8.56	5.23	175	114		of well when setting
1305	83.25		13.13	0.173	8.57	4.78	—	113		Pump
1310	83.38		12.81	0.173	8.58	4.72	131	111		
1315	83.46		12.79	0.173	8.60	4.55	108	110		
1325	83.61		12.64	0.173	8.60	4.48	121	108		
1330	83.68		12.68	0.173	8.61	4.31	111	108		
1340	83.73		12.73	0.172	8.61	4.18	61.8	106		
1350	83.80		12.64	0.173	8.61	4.15	68.1	105		
1400	83.84	↓	12.51	0.174	8.62	4.15	76.0	105	↓	
1410	83.85	150	12.63	0.173	8.60	4.16	78.7	103	94	Raised pump 5'
1420	84.00		12.76	0.175	8.60	4.20	72.7	102		
1430	84.18	125	12.52	0.161	8.59	4.17	10.3	101		↓ Flow rate
1440	84.03	↓	13.46	0.158	8.58	4.15	4.93	100		
1445	83.96		13.48	0.159	8.58	4.17	5.39	100	↓	
1450	83.90	↓	13.56	0.158	8.57	4.12	4.58	100		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP: ☒ Geotech 1.66" BLADDER Pump # 1418
TYPE OF TUBING: ☒ HDPE (Dedicated) ☐ HIGH DENSITY POLYETHYLENE
TYPE OF PUMP MATERIAL: ☐ POLYVINYL CHLORIDE ☒ STAINLESS STEEL
TYPE OF BLADDER MATERIAL: ☒ POLYETHYLENE ☐ OTHER

ANALYTICAL PARAMETERS

TO BE COLLECTED	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
☒ PFAS	537.1 Modified	4 DEG. C	2 x 250 HDPE	☒ PFAS
☒ Dissolved Oxygen	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Dissolved Oxygen
☒ Nitrate	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Nitrate
☒ Nitrite	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Nitrite
☒ Ferrous Iron (Fe(II))	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Ferrous Iron (Fe(II))
☒ Total Iron	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Total Iron
☒ Sulfide	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Sulfide
☒ Sulfate	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Sulfate

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: YES ☒ NO ☐ NUMBER OF GALLONS GENERATED: 4.2

Sampler (print name): Troy Cunningham

SIGNATURE: *Troy Cunningham*

NOTES:

* = Turbidity values should be 50 NTUs or less.

Well needs to be redeveloped. Sediment on Row. Checked by: *[Signature]* 12/18/17

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

amec foster wheeler



PROJECT	CRREL - October PFAS GW sampling	WELL ID	CECRL-20	DATE	10/ /2017
SAMPLE ID	CECRL-20	SITE TYPE	RI/FS Program		
TIME START	0820	END	1100	JOB NUMBER	3612162337.18.01
				BOTTLE TIME	1020

WATER LEVEL / PUMP SETTINGS		MEASUREMENT POINT		PROTECTIVE CASING STICKUP (FROM GROUND)		PROTECTIVE CASING / WELL DIFFERENCE		
QC SAMPLE COLLECTED ID	—	☒ TOP OF WELL RISER			1.7	FT.	0.27	
		☐ TOP OF PROTECTIVE CASING						
		☐ OTHER						
INITIAL DEPTH TO WATER	113.09 FT.	WELL DEPTH (TOR)	NM FT.	PID AMBIENT AIR	0.0	PPMV	WELL DIAMETER	4 IN.
FINAL DEPTH TO WATER	113.09 FT.	SCREEN LENGTH	10 FT.	PID WELL MOUTH	0.2	PPMV	WELL INTEGRITY:	YES NO N/A
DRAWDOWN VOLUME	— GAL.	RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED	—	PRESSURE TO PUMP	65+	PSI	CAP	☒ —
(initial - final x 0.16 (2-inch) or x 0.65 (4-inch))				REFILL TIMER SETTING	10	SEC.	CASING	☒ —
TOTAL VOL. PURGED	3.7 GAL.						LOCKED	☒ —
(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/ml)							COLLAR	☒ —
							DISCHARGE TIMER SETTING	10 SEC.

PURGE DATA

[illegible]

EQUIPMENT DOCUMENTATION

TYPE OF PUMP		TYPE OF TUBING		TYPE OF PUMP MATERIAL		TYPE OF BLADDER MATERIAL	
☒	Geotech 1.66" BLADDER	☒	HDPE (Dedicated)	☐	POLYVINYL CHLORIDE	☒	POLYETHENE
☐		☐	HIGH DENSITY POLYETHYLENE	☒	STAINLESS STEEL	☐	OTHER

ANALYTICAL PARAMETERS

TO BE COLLECTED		METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
☒	PFAS	537.1 Modified	4 DEG. C	2 x 250 HDPE	☒ PFAS
☒	Dissolved Oxygen	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Dissolved Oxygen
☒	Nitrate	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Nitrate
☒	Nitrite	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Nitrite
☒	Ferrous Iron (Fe(II))	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Ferrous Iron (Fe(II))
☒	Total Iron	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Total Iron
☒	Sulfide	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Sulfide
☒	Sulfate	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Sulfate

PURGE OBSERVATIONS

PURGE WATER YES NO NUMBER OF GALLONS 3.7
CONTAINERIZED ☒ ☐ GENERATED

SAMPLER (print name): Terry Rawcliffe
SIGNATURE: Terry Rawcliffe

NOTES:

* = Turbidity values should be 50 NTUs or less.

Checked by: TLC 10/24/15

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

amec foster wheeler



PROJECT: CRREL - October PFAS GW sampling
 WELL ID: MW-14-103A
 SAMPLE ID: MW-14-103A
 SITE TYPE: RI/FS Program
 DATE: 10/17/2017
 TIME START: 1128 END: 1500
 JOB NUMBER: 3612162337.18.01
 BOTTLE TIME: 1405

WATER LEVEL / PUMP SETTINGS

QC SAMPLE COLLECTED ID: none
 MEASUREMENT POINT: ☒ TOP OF WELL RISER
☐ TOP OF PROTECTIVE CASING
☐ OTHER
 PROTECTIVE CASING STICKUP (FROM GROUND): 2.05 FT.
 PROTECTIVE CASING / WELL DIFFERENCE: 0.21 FT.
 INITIAL DEPTH TO WATER: 86.11 FT.
 WELL DEPTH (TOR): 140 FT.
 PID AMBIENT AIR: 0.2 PPMV
 FINAL DEPTH TO WATER: 86.11 FT.
 SCREEN LENGTH: 10 FT.
 PID WELL MOUTH: 12.5 PPMV
 DRAWDOWN VOLUME: — GAL
 RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED: —
 PRESSURE TO PUMP: 50 PSI
 TOTAL VOL. PURGED: 7.3 GAL
 REFILL TIMER SETTING: 10 SEC.
 DISCHARGE TIMER SETTING: 10 SEC.

(Initial - final x 0.16 (2-inch) or x 0.65 (4-inch))
 (purge rate (milliliters per minute) x time duration (minutes) x 0.00028 gal/ml)

WELL INTEGRITY: CAP ☒ YES ☐ NO ☐ N/A
 CASING ☒ LOCKED ☐
 COLLAR ☒

PURGE DATA

CLOCK TIME	DEPTH TO WATER (ft.) (0.3 ft.)	PURGE RATE (ml/min) (100-400)	TEMP. (deg. C) (3%)	SPEC. COND. (mS/cm) (3%)	pH (units) (+/- 0.1 unit)	DISS. O ₂ (mg/L) (10%) (>0.5)	TURBIDITY* (NTU) (10%) (>10)	ORP (mV) (+/- 10 mV)	SAMPLE DEPTH	COMMENTS
1305	86.11	Started purging well								
1315	86.11	400	9.63	0.538	8.08	14.10	71.8	-62.3	137' TOR	
1325	86.11	400	9.38	0.539	8.09	3.82	37.0	-65.5		
1330	86.11	400	9.37	0.539	8.08	2.37	26.7	-62.5		
1335	86.11		9.38	0.539	8.07	2.60	18.2	-61.3		
1340	86.11		9.28	0.539	8.07	2.00	13.4	-59.6		
1345	86.11		9.21	0.539	8.07	1.45	10.6	-55.3		
1350	86.11		9.22	0.539	8.07	1.30	10.1	-52.5		
1355	86.11		9.16	0.539	8.07	1.20	6.38	-50.6		
1400	86.11		9.11	0.539	8.06	1.01	4.70	-48.5		
1405	86.11	↓	9.22	0.538	8.06	1.00	3.67	-47.7	↓	Sample Collected
1415		Sample Collection complete					3.02			

EQUIPMENT DOCUMENTATION

TYPE OF PUMP: ☒ Geotech 1.66" BLADDER Pump # 1418
 TYPE OF TUBING: ☒ HDPE (Dedicated) ☐ HIGH DENSITY POLYETHYLENE
 TYPE OF PUMP MATERIAL: ☐ POLYVINYL CHLORIDE ☒ STAINLESS STEEL
 TYPE OF BLADDER MATERIAL: ☒ POLYETHYLENE ☐ OTHER

ANALYTICAL PARAMETERS

TO BE COLLECTED	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
☒ PFAS	537.1 Modified	4 DEG. C	2 x 250 HDPE	☒ PFAS
☒ Dissolved Oxygen	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Dissolved Oxygen
☒ Nitrate	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Nitrate
☒ Nitrite	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Nitrite
☒ Ferrous Iron (Fe(II))	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Ferrous Iron (Fe(II))
☒ Total Iron	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Total Iron
☒ Sulfide	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Sulfide
☒ Sulfate	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Sulfate

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: YES ☒ NO ☐ NUMBER OF GALLONS GENERATED: 7.3

Sampler (print name):

Tige Cunningham

SIGNATURE:

NOTES:

* = Turbidity values should be 50 NTUs or less.

mid screen is 137' TOR

Checked by:

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

amec foster wheeler



PROJECT: CRREL - October PFAS GW sampling
 WELL ID: MW-14-10313
 SAMPLE ID: MW-14-10313
 SITE TYPE: RI/FS Program
 DATE: 10/17/2017
 TIME START: 1100 END: 1420
 JOB NUMBER: 3612162337.18.01
 BOTTLE TIME: 1400

WATER LEVEL / PUMP SETTINGS

QC SAMPLE COLLECTED ID: ☐
 MEASUREMENT POINT: ☒ TOP OF WELL RISER
 PROTECTIVE CASING STICKUP (FROM GROUND): 1.8 FT.
 PROTECTIVE CASING / WELL DIFFERENCE: 0.15 FT.
 INITIAL DEPTH TO WATER: 85.89 FT.
 WELL DEPTH (TOR): 143.5 FT.
 PID AMBIENT AIR: 0.2 PPMV
 WELL DIAMETER: 2" IN.
 FINAL DEPTH TO WATER: 85.88 FT.
 SCREEN LENGTH: 15 FT.
 PID WELL MOUTH: 26 PPMV
 WELL INTEGRITY: CAP ☒ YES ☐ NO ☐ N/A
 CASKING ☒
 LOCKED ☒
 COLLAR ☒
 DRAWDOWN VOLUME: ☐ GAL.
 RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED: ☐
 PRESSURE TO PUMP: 55 PSI
 REFILL TIMER SETTING: 10 SEC.
 TOTAL VOL. PURGED: 3.5 GAL.
 (purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/ml)
 DISCHARGE TIMER SETTING: 10 SEC.

PURGE DATA

CLOCK TIME	DEPTH TO WATER (ft.) (0.3 ft.)	PURGE RATE (ml/min) (100-400)	TEMP. (deg. C) (3%)	SPEC. COND. (mS/cm) (3%)	pH (units) (+/- 0.1 unit)	DISS. O ₂ (mg/L) (10%) (>0.5)	TURBIDITY* (NTU) (10%) (>10)	ORP (mV) (+/- 10 mV)	SAMPLE DEPTH	COMMENTS
1141	85.83	Start pump							186	BGS
1206	85.91	150	11.2	0.508	7.15	10.1	2.7	195		
1215	85.90	150	11.3	0.508	7.40	4.5	49	110		
1230	85.89	130	11.2	0.514	7.50	3.8	50	35		
1240	85.89	140	11.8	0.515	7.60	2.4	35	14		
1250	85.88	110	12.3	0.515	7.60	2.4	24	3		
1300	85.88	180	11.8	0.520	7.60	1.8	21	-12		
1310	85.88	120	11.4	0.518	7.6	1.5	14	-31		
1315	85.88	120	11.4	0.518	7.7	1.3	13	-35		
1320	85.88	160	11.5	0.518	7.7	1.3	9.8	-39		
1325	85.88	150	11.7	0.518	7.7	1.2	8.8	-47		
1330	85.88	145	12.1	0.518	7.7	1.0	8.4	-51		
1335	85.88	135	12.5	0.518	7.7	1.0	8.0	-53		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP: ☒ Geotech 1.66" BLADDER Pump # 1419
 TYPE OF TUBING: ☒ HDPE (Dedicated) ☐ HIGH DENSITY POLYETHYLENE
 TYPE OF PUMP MATERIAL: ☐ POLYVINYL CHLORIDE ☒ STAINLESS STEEL
 TYPE OF BLADDER MATERIAL: ☒ POLYETHYLENE ☐ OTHER

ANALYTICAL PARAMETERS

TO BE COLLECTED	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
☒ PFAS	537.1 Modified	4 DEG. C	2 x 250 HDPE	☒ PFAS
☒ Dissolved Oxygen	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Dissolved Oxygen
☒ Nitrate	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Nitrate
☒ Nitrite	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Nitrite
☒ Ferrous Iron (Fe(II))	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Ferrous Iron (Fe(II))
☒ Total Iron	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Total Iron
☒ Sulfide	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Sulfide
☒ Sulfate	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Sulfate

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: ☒ YES ☐ NO
 NUMBER OF GALLONS GENERATED: 3.5

NOTES:

* = Turbidity values should be 50 NTUs or less.

Sampler (print name): Jerry Rowcliffe

SIGNATURE: *[Signature]*

Checked by: TLC 10/24/17

PURGE OBSERVATIONS		NOTES:
PURGE WATER CONTAINERIZED	YES ☒ NO ☐ NUMBER OF GALLONS GENERATED <u>≈ 3.6</u>	* = Turbidity values should 50 NTUs or less.
Sampler (print name) <u>Jerry Bawls</u> SIGNATURE: <u>[Signature]</u>		Checked by: <u>TLC 10/24/11</u>

FIELD DATA RECORD - LOW FLOW GROUNDWATER SAMPLING

amec foster wheeler



PROJECT: CRREL - October PFAS GW sampling
 WELL ID: MW-14-105
 SAMPLE ID: MW-14-105
 SITE TYPE: RI/FS Program
 DATE: 10/19/2017
 TIME START: 1330 END: 1610
 JOB NUMBER: 3612162337.18.01
 BOTTLE TIME: 1550

WATER LEVEL / PUMP SETTINGS

QC SAMPLE COLLECTED ID: NONE
 INITIAL DEPTH TO WATER: 84.48 FT
 FINAL DEPTH TO WATER: 84.47 FT
 DRAWDOWN VOLUME: — GAL
 (Initial - final x 0.16 (2-inch) or x 0.65 (4-inch))
 TOTAL VOL. PURGED: 3.3 GAL
 (purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/ml)

MEASUREMENT POINT

☒ TOP OF WELL RISER
☐ TOP OF PROTECTIVE CASING
☐ OTHER

WELL DEPTH (TOR): 84.47 FT
 SCREEN LENGTH: 10' FT
 RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME PURGED: —

PROTECTIVE CASING STICKUP (FROM GROUND): 3.0' FT.
PROTECTIVE CASING / WELL DIFFERENCE: 0.65' FT.
WELL DIAMETER: 2 IN.
WELL INTEGRITY: CAP ☒ YES ☐ NO ☐ N/A
 Casing Locked ☒
 Collar ☒
DISCHARGE TIMER SETTING: 9 SEC.

PID AMBIENT AIR: — NM PPMV
PID WELL MOUTH: — NM PPMV
PRESSURE TO PUMP: 40 PSI
REFILL TIMER SETTING: 11 SEC.

PURGE DATA

CLOCK TIME	DEPTH TO WATER (ft.) (0.3 ft.)	PURGE RATE (ml/min) (100-400)	TEMP. (deg. C) (3%)	SPEC. COND. (mS/cm) (3%)	pH (units) (+/- 0.1 unit)	DISS. O2 (mg/L) (10%) (>0.5)	TURBIDITY* (NTU) (10%) (>10)	ORP (mV) (+/- 10 mV)	SAMPLE DEPTH	COMMENTS
1421	84.48	Start pump								
1426	84.72	380	12.7	0.595	9.1	8.1	660	92		~140 TOR
1435	84.56	210	12.4	0.752	7.6	1.7	67	93		
1445	84.46	205	12.9	0.793	7.5	1.0	43	55		
1455	84.70	200	12.5	0.810	7.3	0.8	31	21		
1505	84.74	200	12.3	0.821	7.3	0.7	15	-1		
1510	84.51	195	12.5	0.817	7.3	0.6	13	-9		
1515	84.46	195	12.4	0.820	7.3	0.7	11	-17		
1520	84.46	195	12.4	0.822	7.3	0.7	16	-19		
1525	84.68	195	12.3	0.826	7.3	0.7	18	-21		
1530	84.71	195	12.3	0.827	7.3	0.7	17	-24		
1535	84.73	200	12.1	0.826	7.3	0.7	14	-29		
1540	84.53	200	11.8	0.824	7.3	0.7	11	-32		
1545	84.47	200	11.7	0.824	7.3	0.7	9.9	-35		

EQUIPMENT DOCUMENTATION

TYPE OF PUMP: ☒ Geotech 1.66" BLADDER Pump # 1419
TYPE OF TUBING: ☒ HDPE (Dedicated) ☐ HIGH DENSITY POLYETHYLENE
TYPE OF PUMP MATERIAL: ☐ POLYVINYL CHLORIDE ☒ STAINLESS STEEL
TYPE OF BLADDER MATERIAL: ☒ POLYETHYLENE ☐ OTHER

ANALYTICAL PARAMETERS

TO BE COLLECTED	METHOD NUMBER	PRESERVATION METHOD	VOLUME REQUIRED	SAMPLE COLLECTED
☒ PFAS	537.1 Modified	4 DEG. C	2 x 250 HDPE	☒ PFAS
☒ Dissolved Oxygen	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Dissolved Oxygen
☒ Nitrate	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Nitrate
☒ Nitrite	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Nitrite
☒ Ferrous Iron (Fe(II))	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Ferrous Iron (Fe(II))
☒ Total Iron	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Total Iron
☒ Sulfide	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Sulfide
☒ Sulfate	On-Site Analysis	4 DEG. C	1 L Plastic	☒ Sulfate

PURGE OBSERVATIONS

PURGE WATER CONTAINERIZED: YES ☒ NO ☐ NUMBER OF GALLONS GENERATED: 3.3

Sampler (print name): Jerry Randolph

SIGNATURE: Jerry Randolph

NOTES:

* = Turbidity values should 50 NTUs or less.

Checked by: T L C 10/24/17

BOTTLE TIME	1220
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0.35 FT

WELL DIAMETER 4 IN.

WELL	YES	NO
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CASING		—
LOCKED		—

LOCKED
COLLAR

DISCHARGE
TIMER 8 SEC

(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/ml)

REFILL TIMER	12	SE
-----------------	----	----

DISCHARGE
TIMER

[illegible]☒ POLYETHENE
☐ OTHER

SAMPLE
COLLECTED

 PFAS Dissolved Oxygen☐ Nitrate☒ Nitrite

☒ Ferrous Iron (Fe(II))

☐ Total iron

 Sulfide

 Sulfate

* = Turbidity values should 50 NTUs or less

Perry Rawls
Jury Clerk

Checked by: TLC 10/24/17

BOTTLE TIME	11/10
-------------	-------

Checked by:

Terry Rouch
Terry Rouch

by: TC 10/22/15

1330

2

(purge rate (milliliters per minute) x time duration (minutes) x 0.00026 gal/ml)

15

SEC

	(100-400)	(5%)	(5%)	(9%-0.1 unit)	(10%) >10	
Equipment Block collected from pump # 1419						

☐ OTHER☒ REF☐ Dissol☐ Nitrate☐ Nitrite☐ Ferrous Iron (Fe(II))☐ Total Iron☐ Sulfide☐ Sulfate

14

James R. Knecht
James R. Knecht

* = Turbidity values should 50 NTUs or less.

Pump# 1419

Checked by: TC 10/23/17

FIELD INSTRUMENTATION CALIBRATION RECORD

PROJECT NAME: PFAS GW Sampling Program at CRREL - October 2017

PROJECT NUMBER: 3612162337.18.01

PROJECT LOCATION: CRREL Hanover, New Hampshire

WEATHER CONDITIONS (AM): Cool 60° Sun

WEATHER CONDITIONS (PM): Partly cloudy 50°, breeze

DATE: 10-16-17

TIME: 1415

SAMPLER NAME (printed): Tige Cunningham

SAMPLER SIGNATURE: Tige Cunningham

PM CAL. CHECK TIME: 12/19/17

CHECKED BY: AE

DATE: 12/19/17

MULTI-PARAMETER WATER QUALITY METER

METER TYPE: YSI

MODEL NO.: 556 MPS

UNIT ID NO.: M015-13

AM CALIBRATION

Time: (1415)

Units	Standard Value	Meter Value	*Acceptance Criteria (AM)
pH (4)	SU	4.00	+/- 0.1 pH Units
pH (7)	SU	7.00	+/- 0.1 pH Units
pH (10)	SU	NA	+/- 0.1 pH Units
Redox	+/- mV	240	+/- 10 mV
Conductivity	mS/cm	1.413	+/- 3% of standard
DO (saturated)	%	98.3	
DO (saturated)	mg/L ¹	8.43	+/- 0.2 mg/L
DO (<0.1)	mg/L	NA	< 0.5 mg/L
Temperature	°C	23.16	
Baro. Press.	mmHg	749.3	

POST CALIBRATION CHECK

Time: (1715)

Standard Value	Meter Value	*Acceptance Criteria (PM)
7.0	7.01	+/- 0.3 pH Units
240	240.6	+/- 10 mV
1.413	1.420	+/- 5% of standard
9.2	9.27	+/- 0.5 mg/L of AM Meter Value
	18.33	
	750.5	

TURBIDITY METER

METER TYPE: HACH

MODEL NO.: 2100Q

UNIT ID NO.: M024-37

Units	Standard Value	Meter Value	*Acceptance Criteria (PM)
<0.1 Standard	NTU	10.2	w/in 0.3 NTU of the standard
20 Standard	NTU	20.4	+/- 5% of standard
100 Standard	NTU	99.1	+/- 5% of standard
800 Standard	NTU	786	+/- 5% of standard

Standard Value	Meter Value	*Acceptance Criteria (PM)
<0.1	10.2	w/in 0.3 NTU of the standard
20	20.4	+/- 5% of standard
100	101	+/- 5% of standard
800	794	+/- 5% of standard

PHOTOIONIZATION DETECTOR

METER TYPE: RAE

MODEL NO.: 2000

UNIT ID NO.: M001-60

Background	ppmv	<0.1	0
Span Gas	ppmv	100	104

<0.1	0	within 5 ppmv of BG
100	100	+/- 10% of standard

O₂-LEL 4 GAS METER

METER TYPE: _____

MODEL NO.: _____

UNIT ID NO.: _____

Methane	%	50	
O ₂	%	20.9	
H ₂ S	ppmv	25	
CO	ppmv	50	

50		+/- 10% of standard
20.9		+/- 10% of standard
25		+/- 10% of standard
50		+/- 10% of standard

OTHER METER

METER TYPE: _____

MODEL NO.: _____

UNIT ID NO.: _____

See Notes Below for Additional Information

☐

Equipment calibrated within the Acceptance Criteria specified for each of the parameters listed above.

☐

Equipment (not) calibrated within the Acceptance Criteria specified for each of the parameters listed above**.

MATERIALS RECORD

Deionized Water Source: AMEC FOS - Portland Maine

Date Produced: _____

Trip Blank Source: _____

Sample Preservatives Source: _____

Disposable Filter Type: 0.45µm cellulose

Calibration Fluids / Standard Source: _____

- DO Calibration Fluid (<0.1 mg/L) _____

- Other _____

	Cal. Standard Lot Number	Exp. Date
pH (4)	<u>76D788</u>	<u>4-19-19</u>
pH (7)	<u>66F140</u>	<u>6-19</u>
pH (10)	<u>NA</u>	<u>NA</u>
ORP	<u>1600</u>	<u>5-22</u>
Conductivity	<u>76F76</u>	<u>5-18</u>
10 Turb. Stan. Stabil Cal #	<u>A7240</u>	<u>11/18</u>
20 Turb. Stan. Stabil Cal #	<u>A7234</u>	<u>11/18</u>
100 Turb. Stan. Stabil Cal #	<u>A7234</u>	<u>11/18</u>
800 Turb. Stan. Stabil Cal #	<u>A7230</u>	<u>11/18</u>
Cal Gas.	<u>NA</u>	<u>NA</u>
Other	<u>NA</u>	<u>NA</u>

NOTES:

* = Unless otherwise noted, calibration procedures and acceptance criteria are in general accordance with USEPA Region 1 SOPs for Field Instrument Calibration (EQASOP-FieldCalibrat) and Low Stress Purging and Sampling (EQASOP-GW001), each dated 1/19/2010. Additional acceptance criteria obtained from instrument specific manufacturer recommendations.

** = If meter reading is not within acceptance criteria, clean/replace probe and re-calibrate, or use calibrated back-up meter if available. If project requirements necessitate use of the instrument, clearly document any deviations from acceptance criteria on all data sheets and log book entries.

1 = DO Saturated standard value is calculated based on Oxygen Solubility at Indicated Pressure Chart from the USEPA Region 1 SOP for Field Instrument Calibration (EQASOP-FieldCalibrat), dated 1/19/2010.

FIELD INSTRUMENTATION CALIBRATION RECORD

PROJECT NAME: PFAS GW Sampling Program at CRREL - October 2017
 PROJECT NUMBER: 3612162337.18.01
 PROJECT LOCATION: CRREL Hanover, New Hampshire
 WEATHER CONDITIONS (AM): cool 50's Clear
 WEATHER CONDITIONS (PM): 70's Clear Sun

DATE: 10-18-17 TIME: 0740
 SAMPLER NAME (printed): Tyler Cunningham
 SAMPLER SIGNATURE: [Signature]
 PM CAL. CHECK TIME: 1851
 CHECKED BY: APC DATE: 12/16/17

MULTI-PARAMETER WATER QUALITY METER

METER TYPE	YSI	AM CALIBRATION			
MODEL NO.	556 MPS	Time (0735)			
UNIT ID NO.	M015 - 13				
	Units	Standard Value	Meter Value	*Acceptance Criteria (AM)	
pH (4)	SU	4.0	4.03	+/- 0.1 pH Units	
pH (7)	SU	7.0	7.00	+/- 0.1 pH Units	
pH (10)	SU	10.0	NA	+/- 0.1 pH Units	
Redox	+/- mV	240	240.1	+/- 10 mV	
Conductivity	ms/cm	1.413	1.413	+/- 3% of standard	
DO (saturated)	%	100	99.2		
DO (saturated)	mg/L ¹	8.62	8.64	+/- 0.2 mg/L	
DO (<0.1)	mg/L	<0.1		< 0.5 mg/L	
Temperature	°C		22.2		
Baro. Press.	mmHg		753.9		

POST CALIBRATION CHECK

Standard Value	Meter Value	*Acceptance Criteria (PM)
	Time (1851)	
7.0	6.98	+/- 0.3 pH Units
240	240.5	+/- 10 mV
1.413	1.376	+/- 5% of standard
8.30	9.33*	+/- 0.5 mg/L of AM Meter Value
	23.7	
	754.0	

TURBIDITY METER

METER TYPE	HACH	Units	Standard Value	Meter Value	*Acceptance Criteria (PM)
MODEL NO.	2100Q				
UNIT ID NO.	M024 - 37				
		<0.1 Standard	NTU	10.1	w/in 0.3 NTU of the standard
		20 Standard	NTU	20.2	+/- 5% of standard
		100 Standard	NTU	99.8	+/- 5% of standard
		800 Standard	NTU	791	+/- 5% of standard

Standard Value	Meter Value	*Acceptance Criteria (PM)
10.1	10.2	w/in 0.3 NTU of the standard
20	20.6	+/- 5% of standard
100	99.6	+/- 5% of standard
800	791	+/- 5% of standard

PHOTOIONIZATION DETECTOR

METER TYPE		Background	ppmv	<0.1	
MODEL NO.					
UNIT ID NO.		Span Gas	ppmv	100	

Standard Value	Meter Value	*Acceptance Criteria (PM)
<0.1		within 5 ppmv of BG
100		+/- 10% of standard

O₂-LEL 4 GAS METER

METER TYPE	_____	Methane	%	50	_____
MODEL NO.	_____	O ₂	%	20.9	_____
UNIT ID NO.	_____	H ₂ S	ppmv	25	_____
		CO	ppmv	50	_____

Standard Value	Meter Value	*Acceptance Criteria (PM)
50		+/- 10% of standard
20.9		+/- 10% of standard
25		+/- 10% of standard
50		+/- 10% of standard

OTHER METER

METER TYPE					
MODEL NO.					
UNIT ID NO.					

See Notes Below for Additional Information



Equipment calibrated within the Acceptance Criteria specified for each of the parameters listed above.



Equipment (not) calibrated within the Acceptance Criteria specified for each of the parameters listed above**.

MATERIALS RECORD

Deionized Water Source: AMEC FOS - Portland Maine
 Date Produced: _____
 Trip Blank Source: _____
 Sample Preservatives Source: _____
 Disposable Filter Type: 0.45µm cellulose
 Calibration Fluids / Standard Source:
 - DO Calibration Fluid (<0.1 mg/L) _____
 - Other _____

	Cal. Standard Lot Number	Exp. Date
pH (4)	70P188	4-19
pH (7)	66F140	6-19
pH (10)	NA	NA
ORP	1600	5-22
Conductivity	76E70	4-18 5-18
10 Turb. Stan. Stabil Cal #	A 7290	11/18
20 Turb. Stan. Stabil Cal #	A 7234	
100 Turb. Stan. Stabil Cal #	A 7234	
800 Turb. Stan. Stabil Cal #	A 7230	
Cal Gas.	NA	NA
Other	NA	NA

NOTES:

* End of day DO reading high

* = Unless otherwise noted, calibration procedures and acceptance criteria are in general accordance with USEPA Region 1 SOPs for Field Instrument Calibration (EQASOP-FieldCalibrat) and Low Stress Purging and Sampling (EQASOP-GW001), each dated 1/19/2010. Additional acceptance criteria obtained from instrument specific manufacturer recommendations.

** = If meter reading is not within acceptance criteria, clean/replace probe and re-calibrate, or use calibrated back-up meter if available. If project requirements necessitate use of the instrument, clearly document any deviations from acceptance criteria on all data sheets and log book entries.

1 = DO Saturated standard value is calculated based on Oxygen Solubility at Indicated Pressure Chart from the USEPA Region 1 SOP for Field Instrument Calibration (EQASOP-FieldCalibrat), dated 1/19/2010.

FIELD INSTRUMENTATION CALIBRATION RECORD

PROJECT NAME: PFAS GW Sampling Program at CRREL - October 2017

PROJECT NUMBER: 3612162337.18.01

PROJECT LOCATION: CRREL Hanover, New Hampshire

WEATHER CONDITIONS (AM): Clear Cool 50°F

WEATHER CONDITIONS (PM): Clear 60's

DATE: 10-19-17

TIME: 0700

SAMPLER NAME (printed): Tige Lanning

SAMPLER SIGNATURE: Tige Lanning

PM CAL. CHECK TIME: 1410

CHECKED BY: SL

DATE: 12/18/17

MULTI-PARAMETER WATER QUALITY METER

METER TYPE: YSI

MODEL NO.: 556 MPS

UNIT ID NO.: M015 - 13

AM CALIBRATION

Time: (700)

	Units	Standard Value	Meter Value	*Acceptance Criteria (AM)
pH (4)	SU	4.0	<u>4.00</u>	+/- 0.1 pH Units
pH (7)	SU	7.0	<u>7.00</u>	+/- 0.1 pH Units
pH (10)	SU	10.0	<u>NA</u>	+/- 0.1 pH Units
Redox	+/- mV	240	<u>240</u>	+/- 10 mV
Conductivity	ms/cm	1.413	<u>1.413</u>	+/- 3% of standard
DO (saturated)	%	100	<u>99.1</u>	
DO (saturated)	mg/L ¹	<u>8.49</u>	<u>8.57</u>	+/- 0.2 mg/L **
DO (<0.1)	mg/L	<0.1	<u>—</u>	< 0.5 mg/L
Temperature	°C		<u>22.6</u>	
Baro. Press.	mmHg		<u>753</u>	

POST CALIBRATION CHECK

Time: (1410)

	Standard Value	Meter Value	*Acceptance Criteria (PM)
pH	7.0	<u>7.00</u>	+/- 0.3 pH Units
Redox	240	<u>240.0</u>	+/- 10 mV
Conductivity	1.413	<u>1.392</u>	+/- 5% of standard
DO (saturated)		<u>93.2</u>	
DO (saturated)		<u>28.3</u>	+/- 0.5 mg/L of AM Meter Value
Temperature		<u>23.4</u>	
Baro. Press.		<u>746.7</u>	

TURBIDITY METER

METER TYPE: HACH

MODEL NO.: 2100Q

UNIT ID NO.: M024 - 37

	Units	Standard Value	Meter Value
<0.1 Standard	NTU	<u>10.5</u>	<u>9.99</u>
20 Standard	NTU	20	<u>20.6</u>
100 Standard	NTU	100	<u>100</u>
800 Standard	NTU	800	<u>813</u>

	Standard Value	Meter Value	*Acceptance Criteria (PM)
<0.1		<u>10.4</u>	w/in 0.3 NTU of the standard
20		<u>20.4</u>	+/- 5% of standard
100		<u>101</u>	+/- 5% of standard
800		<u>798</u>	+/- 5% of standard

PHOTOIONIZATION DETECTOR

METER TYPE: Background

MODEL NO.: —

UNIT ID NO.: —

Background	ppmv	<0.1	<u>—</u>
Span Gas	ppmv	100	<u>—</u>

<0.1		within 5 ppmv of BG
100		+/- 10% of standard

O₂-LEL 4 GAS METER

METER TYPE: —

MODEL NO.: —

UNIT ID NO.: —

Methane	%	50	<u>—</u>
O ₂	%	20.9	<u>—</u>
H ₂ S	ppmv	25	<u>—</u>
CO	ppmv	50	<u>—</u>

50		+/- 10% of standard
20.9		+/- 10% of standard
25		+/- 10% of standard
50		+/- 10% of standard

OTHER METER

METER TYPE: —

MODEL NO.: —

UNIT ID NO.: —

See Notes Below for Additional Information



Equipment calibrated within the Acceptance Criteria specified for each of the parameters listed above.



Equipment (not) calibrated within the Acceptance Criteria specified for each of the parameters listed above**.

MATERIALS RECORD

Deionized Water Source: AMEC FOS - Portland Maine

Date Produced: —

Trip Blank Source: —

Sample Preservatives Source: —

Disposable Filter Type: 0.45µm cellulose

Calibration Fluids / Standard Source:

- DO Calibration Fluid (<0.1 mg/L) —

- Other —

	Cal. Standard Lot Number	Exp. Date
pH (4)	<u>700785</u>	<u>4-19</u>
pH (7)	<u>607190</u>	<u>6-19</u>
pH (10)	<u>NA</u>	<u>NA</u>
ORP	<u>1000</u>	<u>5-22</u>
Conductivity	<u>76070</u>	<u>5-18</u>
10 Turb. Stan. Stabil Cal #	<u>A 7213</u>	<u>11-18</u>
20 Turb. Stan. Stabil Cal #	<u>A 7227</u>	<u>—</u>
100 Turb. Stan. Stabil Cal #	<u>A 7228</u>	<u>—</u>
800 Turb. Stan. Stabil Cal #	<u>A 7223</u>	<u>—</u>
Cal Gas.	<u>NA</u>	<u>NA</u>
Other	<u>NA</u>	<u>NA</u>

NOTES:

** AM calibration of DO was w/in calibration

* = Unless otherwise noted, calibration procedures and acceptance criteria are in general accordance with USEPA Region 1 SOPs for Field Instrument Calibration (EQASOP-FieldCalibrat) and Low Stress Purging and Sampling (EQASOP-GW001), each dated 1/19/2010. Additional acceptance criteria obtained from instrument specific manufacturer recommendations.

** = If meter reading is not within acceptance criteria, clean/replace probe and re-calibrate, or use calibrated back-up meter if available. If project requirements necessitate use of the instrument, clearly document any deviations from acceptance criteria on all data sheets and log book entries.

1 = DO Saturated standard value is calculated based on Oxygen Solubility at Indicated Pressure Chart from the USEPA Region 1 SOP for Field Instrument Calibration (EQASOP-FieldCalibrat), dated 1/19/2010.

FIELD INSTRUMENTATION CALIBRATION RECORD

PROJECT NAME: PFAS GW Sampling Program at CRREL - October 2017
 PROJECT NUMBER: 3612162337.18.01
 PROJECT LOCATION: CRREL Hanover, New Hampshire
 WEATHER CONDITIONS (AM): Clear Cool 50's F
 WEATHER CONDITIONS (PM): clear 60's

DATE: 10-19-17 TIME: 0700
 SAMPLER NAME (printed): Jerry Rausch
 SAMPLER SIGNATURE: [Signature]
 PM CAL. CHECK TIME: 1830
 CHECKED BY: TLC DATE: 10/24/17

MULTI-PARAMETER WATER QUALITY METER

METER TYPE	YSI				
MODEL NO.	556 MPS				
UNIT ID NO.	M015 - 12				
AM CALIBRATION					
Time (700)					
	Units	Standard Value	Meter Value	*Acceptance Criteria (AM)	
pH (4)	SU	4.0	4.00	+/- 0.1 pH Units	
pH (7)	SU	7.0	7.00	+/- 0.1 pH Units	
pH (10)	SU	10.0	NA	+/- 0.1 pH Units	
Redox	+/- mV	240	240	+/- 10 mV	
Conductivity	mS/cm	1.413	1.413	+/- 3% of standard	
DO (saturated)	%	100	99.3		
DO (saturated)	mg/L ¹	8.5	8.56	+/- 0.2 mg/L ¹	
DO (<0.1)	mg/L	<0.1		<0.5 mg/L	
Temperature	°C		22.6		
Baro. Press.	mmHg		754		

POST CALIBRATION CHECK

Time (1830)		
Standard Value	Meter Value	*Acceptance Criteria (PM)
7.0	7.04	+/- 0.3 pH Units
240	240.5	+/- 10 mV
1.413	1.411	+/- 5% of standard
1813	8.04	+/- 0.5 mg/L of AM Meter Value
	23.44	
	747.2	

TURBIDITY METER

METER TYPE	HACH				
MODEL NO.	2100Q				
UNIT ID NO.	M024 - 27				
	Units	Standard Value	Meter Value		
<0.1 Standard	NTU	10	9.74		
20 Standard	NTU	20	19.8		
100 Standard	NTU	100	98.7		
800 Standard	NTU	800	793		

Standard Value	Meter Value	*Acceptance Criteria (PM)
<0.1	9.75	w/in 0.3 NTU of the standard
20	19.9	+/- 5% of standard
100	99.3	+/- 5% of standard
800	790	+/- 5% of standard

PHOTOIONIZATION DETECTOR

METER TYPE	Background	Units	Standard Value	Meter Value	
MODEL NO.					
UNIT ID NO.					
	Span Gas	ppmv	100		

<0.1		within 5 ppmv of BG
100		+/- 10% of standard

O₂-LEL 4 GAS METER

METER TYPE					
MODEL NO.					
UNIT ID NO.					
	Methane	%	50		
	O ₂	%	20.9		
	H ₂ S	ppmv	25		
	CO	ppmv	50		

50		+/- 10% of standard
20.9		+/- 10% of standard
25		+/- 10% of standard
50		+/- 10% of standard

OTHER METER

METER TYPE					
MODEL NO.					
UNIT ID NO.					

See Notes Below for Additional Information

- ☒ Equipment calibrated within the Acceptance Criteria specified for each of the parameters listed above.
☐ Equipment (not) calibrated within the Acceptance Criteria specified for each of the parameters listed above**.

MATERIALS RECORD

Deionized Water Source: AMEC FOS - Portland Maine
 Date Produced: _____
 Trip Blank Source: _____
 Sample Preservatives Source: _____
 Disposable Filter Type: 0.45µm cellulose
 Calibration Fluids / Standard Source:
 - DO Calibration Fluid (<0.1 mg/L) _____
 - Other _____

	Cal. Standard Lot Number	Exp. Date
pH (4)	760785	4/19
pH (7)	66F140	6/19
pH (10)	NA	NA
ORP	1600	5/22
Conductivity	76576	5/18
10 Turb. Stan. Stabil Cal #	A 7215	11/18
20 Turb. Stan. Stabil Cal #	A 7227	
100 Turb. Stan. Stabil Cal #	A 7228	
800 Turb. Stan. Stabil Cal #	A 7223	
Cal Gas.	NA	NA
Other	NA	NA

NOTES:

* = Unless otherwise noted, calibration procedures and acceptance criteria are in general accordance with USEPA Region 1 SOPs for Field Instrument Calibration (EQASOP-FieldCalibrat) and Low Stress Purging and Sampling (EQASOP-GW001), each dated 1/19/2010. Additional acceptance criteria obtained from instrument specific manufacturer recommendations.

** = If meter reading is not within acceptance criteria, clean/replace probe and re-calibrate, or use calibrated back-up meter if available. If project requirements necessitate use of the instrument, clearly document any deviations from acceptance criteria on all data sheets and log book entries.

¹ = DO Saturated standard value is calculated based on Oxygen Solubility at Indicated Pressure Chart from the USEPA Region 1 SOP for Field Instrument Calibration (EQASOP-FieldCalibrat), dated 1/19/2010.

FIELD INSTRUMENTATION CALIBRATION RECORD

PROJECT NAME: PFAS GW Sampling Program at CRREL - October 2017

PROJECT NUMBER: 3612162337.18.01

PROJECT LOCATION: CRREL, Hanover, New Hampshire

WEATHER CONDITIONS (AM): Sunny 80-55 calm

WEATHER CONDITIONS (PM): Sunny, 60, calm

DATE: 10/17/17

TIME: 0810

SAMPLER NAME (printed): Tony Rumball

SAMPLER SIGNATURE: Tony Rumball

PM CAL. CHECK TIME: 1845

CHECKED BY: TL

DATE: 10/24/17

MULTI-PARAMETER WATER QUALITY METER

METER TYPE: YSI

MODEL NO.: 556 MPS

UNIT ID NO.: M015-12

AM CALIBRATION

Time: (0910)

Units	Standard Value	Meter Value	*Acceptance Criteria (AM)
pH (4)	SU	4.0	+/- 0.1 pH Units
pH (7)	SU	7.0	+/- 0.1 pH Units
pH (10)	SU	10.0	+/- 0.1 pH Units
Redox	+/- mV	240	+/- 10 mV
Conductivity	mS/cm	1.413	+/- 3% of standard
DO (saturated)	%	100	
DO (saturated)	mg/L	12.8	+/- 0.2 mg/L
DO (<0.1)	mg/L	<0.1	< 0.5 mg/L
Temperature	°C	4.96	
Baro. Press.	mmHg	758.3	

POST CALIBRATION CHECK

Time: (1845)

Standard Value	Meter Value	*Acceptance Criteria (PM)
7.0	7.00	+/- 0.3 pH Units
240	217.4	+/- 10 mV
1.413	1.379	+/- 5% of standard
100	96.2	
12.8	8.50	+/- 0.5 mg/L of AM Meter Value
4.96	21.4	
758.3	753.1	

TURBIDITY METER

METER TYPE: HACH

MODEL NO.: 2100Q

UNIT ID NO.: M024-27

Units	Standard Value	Meter Value	*Acceptance Criteria (PM)
<0.1 Standard	NTU	10	w/in 0.3 NTU of the standard
20 Standard	NTU	20.4	+/- 5% of standard
100 Standard	NTU	101	+/- 5% of standard
800 Standard	NTU	817	+/- 5% of standard

Standard Value	Meter Value	*Acceptance Criteria (PM)
10	10.1	w/in 0.3 NTU of the standard
20	20.7	+/- 5% of standard
100	101	+/- 5% of standard
800	757	+/- 5% of standard

PHOTOIONIZATION DETECTOR

METER TYPE: Min/Max

MODEL NO.: 2000

UNIT ID NO.: M031-60

Background	ppmv	<0.1	0.0
Span Gas	ppmv	100	100

<0.1	0	within 5 ppmv of BG
100	98.3	+/- 10% of standard

O₂-LEL 4 GAS METER

METER TYPE: _____

MODEL NO.: _____

UNIT ID NO.: _____

Methane	%	50	
O ₂	%	20.9	
H ₂ S	ppmv	25	
CO	ppmv	50	

50		+/- 10% of standard
20.9		+/- 10% of standard
25		+/- 10% of standard
50		+/- 10% of standard

OTHER METER

METER TYPE: _____

MODEL NO.: _____

UNIT ID NO.: _____

See Notes Below for Additional Information



Equipment calibrated within the Acceptance Criteria specified for each of the parameters listed above.



Equipment (not) calibrated within the Acceptance Criteria specified for each of the parameters listed above**.

MATERIALS RECORD

Deionized Water Source: AMEC FOS - Portland Maine

Date Produced: _____

Trip Blank Source: _____

Sample Preservatives Source: _____

Disposable Filter Type: 0.45µm cellulose

Calibration Fluids / Standard Source: _____

- DO Calibration Fluid (<0.1 mg/L) _____

- Other _____

	Cal. Standard Lot Number	Exp. Date
pH (4)	760788	4/19
pH (7)	106E140	6/19
pH (10)	NA	NA
ORP	1800	3/22
Conductivity	76676	5/18
10 Turb. Stan. Stabil Cal #	A7215	11/18
20 Turb. Stan. Stabil Cal #	A7227	
100 Turb. Stan. Stabil Cal #	A7228	
800 Turb. Stan. Stabil Cal #	A7223	
Cal Gas.	NA	NA
Other	NA	NA

NOTES: ORP out of criteria at end of day.

* = Unless otherwise noted, calibration procedures and acceptance criteria are in general accordance with USEPA Region 1 SOPs for Field Instrument Calibration (EQASOP-FieldCalibrat) and Low Stress Purging and Sampling (EQASOP-GW001), each dated 1/19/2010. Additional acceptance criteria obtained from instrument specific manufacturer recommendations.

** = If meter reading is not within acceptance criteria, clean/replace probe and re-calibrate, or use calibrated back-up meter if available. If project requirements necessitate use of the instrument, clearly document any deviations from acceptance criteria on all data sheets and log book entries.

† = DO Saturated standard value is calculated based on Oxygen Solubility at Indicated Pressure Chart from the USEPA Region 1 SOP for Field Instrument Calibration (EQASOP-FieldCalibrat), dated 1/19/2010.

FIELD INSTRUMENTATION CALIBRATION RECORD

PROJECT NAME: PFAS GW Sampling Program at CRREL - October 2017

PROJECT NUMBER: 3612162337.18.01

PROJECT LOCATION: CRREL Hanover, New Hampshire

WEATHER CONDITIONS (AM): Clear (Sunny), 45-60°F, calm

WEATHER CONDITIONS (PM): Clear Sunny, 60-65°F, calm

DATE: 10/18/17 WED TIME: 0720

SAMPLER NAME (printed): Jerry Rawcliffe

SAMPLER SIGNATURE: Jerry Rawcliffe

PM CAL. CHECK TIME: 1835

CHECKED BY: TLC DATE: 10/23/17

MULTI-PARAMETER WATER QUALITY METER

METER TYPE: YSI

MODEL NO.: 556 MPS

UNIT ID NO.: M015 - 12

AM CALIBRATION

Time: (0720)

	Units	Standard Value	Meter Value	*Acceptance Criteria (AM)
pH (4)	SU	4.0	<u>4.05</u>	+/- 0.1 pH Units
pH (7)	SU	7.0	<u>7.00</u>	+/- 0.1 pH Units
pH (10)	SU	10.0	<u>NA</u>	+/- 0.1 pH Units
Redox	+/- mV	240	<u>240.1</u>	+/- 10 mV
Conductivity	ms/cm	1.413	<u>1.413</u>	+/- 3% of standard
DO (saturated)	%	100	<u>99.3</u>	
DO (saturated)	mg/L ¹	<u>8.8</u>	<u>8.76</u>	+/- 0.2 mg/L
DO (<0.1)	mg/L	<0.1	<u>-</u>	<0.5 mg/L
Temperature	°C		<u>21.55</u>	
Baro. Press.	mmHg		<u>754.6</u>	

POST CALIBRATION CHECK

Time: (1835)

	Standard Value	Meter Value	*Acceptance Criteria (PM)
pH	7.0	<u>7.04</u>	+/- 0.3 pH Units
Redox	240	<u>244.6</u>	+/- 10 mV
Conductivity	1.413	<u>1.409</u>	+/- 5% of standard
DO (saturated)	<u>38.4</u>	<u>89.7</u>	+/- 0.5 mg/L of AM Meter Value
DO (saturated)		<u>7.83</u>	
Temperature		<u>22.14</u>	
Baro. Press.		<u>754.6</u>	

TURBIDITY METER

METER TYPE: HACH

MODEL NO.: 2100Q

UNIT ID NO.: M024 - 27

	Units	Standard Value	Meter Value	*Acceptance Criteria (PM)
<0.1 Standard	NTU	<u>0.1</u>	<u>0.7</u>	w/in 0.3 NTU of the standard
20 Standard	NTU	20	<u>20.3</u>	+/- 5% of standard
100 Standard	NTU	100	<u>100</u>	+/- 5% of standard
800 Standard	NTU	800	<u>788</u>	+/- 5% of standard

	Standard Value	Meter Value	*Acceptance Criteria (PM)
<0.1	<u>0.1</u>	<u>0.7</u>	w/in 0.3 NTU of the standard
20		<u>20.3</u>	+/- 5% of standard
100		<u>100</u>	+/- 5% of standard
800		<u>788</u>	+/- 5% of standard

PHOTOIONIZATION DETECTOR

METER TYPE: Mossley

MODEL NO.: 2000

UNIT ID NO.: M001-06

Background	ppmv	<0.1	<u>0.0</u>	
Span Gas	ppmv	100	<u>103</u>	

<0.1	<u>0.0</u>	within 5 ppmv of BG
100	<u>97.5</u>	+/- 10% of standard

O₂-LEL 4 GAS METER

METER TYPE: _____

MODEL NO.: _____

UNIT ID NO.: _____

Methane	%	50		
O ₂	%	20.9		
H ₂ S	ppmv	25		
CO	ppmv	50		

50		+/- 10% of standard
20.9		+/- 10% of standard
25		+/- 10% of standard
50		+/- 10% of standard

OTHER METER

METER TYPE: _____

MODEL NO.: _____

UNIT ID NO.: _____

See Notes Below for Additional Information



Equipment calibrated within the Acceptance Criteria specified for each of the parameters listed above.



Equipment (not) calibrated within the Acceptance Criteria specified for each of the parameters listed above**.

MATERIALS RECORD

Deionized Water Source: AMEC FOS - Portland Maine

Date Produced: _____

Trip Blank Source: _____

Sample Preservatives Source: _____

Disposable Filter Type: 0.45µm cellulose

Calibration Fluids / Standard Source:

- DO Calibration Fluid (<0.1 mg/L) _____

- Other _____

	Cal. Standard Lot Number	Exp. Date
pH (4)	<u>760788</u>	<u>4/19</u>
pH (7)	<u>66F140</u>	<u>4/19</u>
pH (10)	<u>NA</u>	<u>NA</u>
ORP	<u>1600</u>	<u>5/22</u>
Conductivity	<u>76E76</u>	<u>5/18</u>
10 Turb. Stan. Stabil Cal #	<u>A 7215</u>	<u>11/18</u>
20 Turb. Stan. Stabil Cal #	<u>A 7227</u>	
100 Turb. Stan. Stabil Cal #	<u>A 7228</u>	
800 Turb. Stan. Stabil Cal #	<u>A 7223</u>	
Cal Gas.	<u>NA</u>	<u>NA</u>
Other	<u>NA</u>	<u>NA</u>

NOTES: DO meter reading a little low

* = Unless otherwise noted, calibration procedures and acceptance criteria are in general accordance with USEPA Region 1 SOPs for Field Instrument Calibration (EQASOP-FieldCalibrat) and Low Stress Purging and Sampling (EQASOP-GW001), each dated 1/19/2010. Additional acceptance criteria obtained from instrument specific manufacturer recommendations.

** = If meter reading is not within acceptance criteria, clean/replace probe and re-calibrate, or use calibrated back-up meter if available. If project requirements necessitate use of the instrument, clearly document any deviations from acceptance criteria on all data sheets and log book entries.

1 = DO Saturated standard value is calculated based on Oxygen Solubility at Indicated Pressure Chart from the USEPA Region 1 SOP for Field Instrument Calibration (EQASOP-FieldCalibrat), dated 1/19/2010.

FIELD INSTRUMENTATION CALIBRATION RECORD

PROJECT NAME: PFAS GW Sampling Program at CRREL - October 2017
 PROJECT NUMBER: 3612162337.18.01
 PROJECT LOCATION: CRREL Hanover, New Hampshire
 WEATHER CONDITIONS (AM): Sunny, cool 30-35°F caly
 WEATHER CONDITIONS (PM): Sunny, cool, caly

DATE: 10/17/17 TIME: 0840
 SAMPLER NAME (printed): Jerry R...
 SAMPLER SIGNATURE: [Signature]
 PM CAL. CHECK TIME: 1410
 CHECKED BY: TLC DATE: 10/23/17

MULTI-PARAMETER WATER QUALITY METER

METER TYPE: YSI
 MODEL NO.: 556 MPS
 UNIT ID NO.: M015-13

AM CALIBRATION

Time (0840)

	Units	Standard Value	Meter Value	*Acceptance Criteria (AM)
pH (4)	SU	4.0	<u>4.00</u>	+/- 0.1 pH Units
pH (7)	SU	7.0	<u>7.00</u>	+/- 0.1 pH Units
pH (10)	SU	10.0	<u>NA</u>	+/- 0.1 pH Units
Redox	+/- mV	240	<u>238.8</u>	+/- 10 mV
Conductivity	ms/cm	1.413	<u>1.413</u>	+/- 3% of standard
DO (saturated)	%	100	<u>99.6</u>	
DO (saturated)	mg/L ¹	<u>8.15</u>	<u>8.54</u>	+/- 0.2 mg/L
DO (<0.1)	mg/L	<0.1	<u>-</u>	< 0.5 mg/L
Temperature	°C		<u>22.41</u>	
Baro. Press.	mmHg		<u>756.4</u>	

POST CALIBRATION CHECK

Time (1410)

	Standard Value	Meter Value	*Acceptance Criteria (PM)
pH	7.0	<u>7.02</u>	+/- 0.3 pH Units
Redox	240	<u>240.8</u>	+/- 10 mV
Conductivity	1.413	<u>1.409</u>	+/- 5% of standard
DO (saturated)		<u>91.4</u>	+/- 0.5 mg/L of AM Meter Value
DO (saturated)		<u>8.56</u>	
Temperature		<u>18.67</u>	
Baro. Press.		<u>752.7</u>	

TURBIDITY METER

METER TYPE: HACH
 MODEL NO.: 2100Q
 UNIT ID NO.: M024-37

	Units	Standard Value	Meter Value
<0.1 Standard	NTU	<u>10</u>	<u>10.1</u>
20 Standard	NTU	20	<u>20.3</u>
100 Standard	NTU	100	<u>99.7</u>
800 Standard	NTU	800	<u>787</u>

	Standard Value	Meter Value	*Acceptance Criteria (PM)
<0.1 Standard	<u>10</u>	<u>10.2</u>	w/in 0.3 NTU of the standard
20 Standard	20	<u>20.5</u>	+/- 5% of standard
100 Standard	100	<u>101</u>	+/- 5% of standard
800 Standard	800	<u>800</u>	+/- 5% of standard

PHOTOIONIZATION DETECTOR

METER TYPE: Minghal
 MODEL NO.: 3000
 UNIT ID NO.: MT01-60

Background	ppmv	<0.1	
Span Gas	ppmv	100	

<0.1		within 5 ppmv of BG
100		+/- 10% of standard

O₂-LEL 4 GAS METER

METER TYPE:
 MODEL NO.:
 UNIT ID NO.:

Methane	%	50	
O ₂	%	20.9	
H ₂ S	ppmv	25	
CO	ppmv	50	

50		+/- 10% of standard
20.9		+/- 10% of standard
25		+/- 10% of standard
50		+/- 10% of standard

OTHER METER

METER TYPE:
 MODEL NO.:
 UNIT ID NO.:

See Notes Below for Additional Information



Equipment calibrated within the Acceptance Criteria specified for each of the parameters listed above.



Equipment (not) calibrated within the Acceptance Criteria specified for each of the parameters listed above**.

MATERIALS RECORD

Deionized Water Source: AMEC FOS - Portland Maine
 Date Produced:
 Trip Blank Source:
 Sample Preservatives Source:
 Disposable Filter Type: 0.45µm cellulose
 Calibration Fluids / Standard Source:
 - DO Calibration Fluid (<0.1 mg/L)
 - Other

	Cal. Standard Lot Number	Exp. Date
pH (4)	<u>76D 788</u>	<u>4/19/19</u>
pH (7)	<u>66E 140</u>	<u>6/19</u>
pH (10)	<u>NA</u>	<u>NA</u>
ORP	<u>1600</u>	<u>5/22</u>
Conductivity	<u>76E 76</u>	<u>5/18</u>
10 Turb. Stan.	Stabil Cal # <u>A7240</u>	<u>11/8</u>
20 Turb. Stan.	Stabil Cal # <u>A7234</u>	
100 Turb. Stan.	Stabil Cal # <u>A7234</u>	
800 Turb. Stan.	Stabil Cal # <u>A7230</u>	
Cal Gas.	<u>NA</u>	<u>NA</u>
Other	<u>NA</u>	<u>NA</u>

NOTES: DO slightly out of criteria at end of day

* = Unless otherwise noted, calibration procedures and acceptance criteria are in general accordance with USEPA Region 1 SOPs for Field Instrument Calibration (EQASOP-FieldCalibrat) and Low Stress Purging and Sampling (EQASOP-GW001), each dated 1/19/2010. Additional acceptance criteria obtained from instrument specific manufacturer recommendations.

** = If meter reading is not within acceptance criteria, clean/replace probe and re-calibrate, or use calibrated back-up meter if available. If project requirements necessitate use of the instrument, clearly document any deviations from acceptance criteria on all data sheets and log book entries.

1 = DO Saturated standard value is calculated based on Oxygen Solubility at Indicated Pressure Chart from the USEPA Region 1 SOP for Field Instrument Calibration (EQASOP-FieldCalibrat), dated 1/19/2010.

U.S. Army Corps of Engineers - New England District
Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire
Final Preliminary Assessment/Site Investigation Report Groundwater Sampling
for Per- and Polyfluoroalkyl Substances

ATTACHMENT B
ANALYTICAL LAB REPORTS

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica Sacramento

880 Riverside Parkway

West Sacramento, CA 95605

Tel: (916)373-5600

TestAmerica Job ID: 320-32527-1

Client Project/Site: CRREL Groundwater, New Hampshire

For:

AMEC Foster Wheeler E & I, Inc

511 Congress St. Suite 200

Portland, Maine 04101

Attn: Mr. Wolfgang Calicchio



Authorized for release by:

11/10/2017 9:50:12 AM

David Alltucker, Project Manager I

(916)374-4383

david.alltucker@testamericainc.com

LINKS

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The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Cover Page 1

Table of Contents 2

Definitions/Glossary 3

Case Narrative 4

Detection Summary 5

Client Sample Results 8

Isotope Dilution Summary 27

QC Sample Results 30

QC Association Summary 36

Lab Chronicle 38

Certification Summary 42

Method Summary 43

Sample Summary 44

Chain of Custody 45

Receipt Checklists 47



Definitions/Glossary

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Qualifiers

LCMS

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.
J	Estimated: The analyte was positively identified; the quantitation is an estimation
M	Manual integrated compound.
Q	One or more quality control criteria failed.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Case Narrative

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Job ID: 320-32527-1

Laboratory: TestAmerica Sacramento

Narrative

Job Narrative 320-32527-1

Receipt

The samples were received on 10/19/2017 10:15 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 4.6° C.

LCMS

Method(s) 537 (modified): The first level standard from the initial calibration curve is used to evaluate the tune criteria. The instrument mass windows are set at +/- 0.5amu; therefore, detection of the analyte serves as verification that the assigned mass is within +/- 0.5amu of the true value, which meets the DoD/DOE QSM tune criterion.

Method(s) 537 (modified): Isotope Dilution Analyte (IDA) recovery for d5-NEtFOSAA is above the method recommended limit for the following sample: MW-14-103A (320-32527-13). Quantitation by isotope dilution generally precludes any adverse effect on data quality due to elevated IDA recoveries. The sample was re-analyzed and the IDA recovery was still above the recommended limit.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Organic Prep

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Detection Summary

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Client Sample ID: FIELDCLK-17-001

Lab Sample ID: 320-32527-1

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorooctane Sulfonamide (FOSA)	0.00030	J	0.0016	0.00028	ug/L	1		537 (modified)	Total/NA

Client Sample ID: EQUIP-17-001

Lab Sample ID: 320-32527-2

No Detections.

Client Sample ID: EQUIP-17-002

Lab Sample ID: 320-32527-3

No Detections.

Client Sample ID: CECRL-01

Lab Sample ID: 320-32527-4

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanoic acid (PFBA)	0.0018	M	0.0017	0.00030	ug/L	1		537 (modified)	Total/NA
Perfluoropentanoic acid (PFPeA)	0.0012	J	0.0017	0.00042	ug/L	1		537 (modified)	Total/NA
Perfluoroheptanoic acid (PFHpA)	0.00028	J	0.0017	0.00021	ug/L	1		537 (modified)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	0.00044	J	0.0017	0.00026	ug/L	1		537 (modified)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	0.00064	J	0.0017	0.00026	ug/L	1		537 (modified)	Total/NA
Perfluorooctane Sulfonamide (FOSA)	0.00044	J	0.0017	0.00030	ug/L	1		537 (modified)	Total/NA

Client Sample ID: CECRL-01DUP

Lab Sample ID: 320-32527-5

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanoic acid (PFBA)	0.0016	J M	0.0017	0.00029	ug/L	1		537 (modified)	Total/NA
Perfluoropentanoic acid (PFPeA)	0.0011	J M	0.0017	0.00041	ug/L	1		537 (modified)	Total/NA
Perfluoroheptanoic acid (PFHpA)	0.00026	J	0.0017	0.00021	ug/L	1		537 (modified)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	0.00045	J M	0.0017	0.00025	ug/L	1		537 (modified)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	0.00066	J	0.0017	0.00025	ug/L	1		537 (modified)	Total/NA
Perfluorooctane Sulfonamide (FOSA)	0.00042	J	0.0017	0.00029	ug/L	1		537 (modified)	Total/NA

Client Sample ID: CECRL-05

Lab Sample ID: 320-32527-6

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanoic acid (PFBA)	0.0026	M	0.0017	0.00030	ug/L	1		537 (modified)	Total/NA
Perfluoropentanoic acid (PFPeA)	0.0010	J	0.0017	0.00043	ug/L	1		537 (modified)	Total/NA
Perfluorohexanoic acid (PFHxA)	0.00098	J	0.0035	0.00050	ug/L	1		537 (modified)	Total/NA
Perfluoroheptanoic acid (PFHpA)	0.00052	J	0.0017	0.00022	ug/L	1		537 (modified)	Total/NA
Perfluorooctanoic acid (PFOA)	0.0015	J M	0.0035	0.00074	ug/L	1		537 (modified)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	0.00061	J	0.0017	0.00026	ug/L	1		537 (modified)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	0.00089	J	0.0017	0.00026	ug/L	1		537 (modified)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	0.0012	J	0.0035	0.00047	ug/L	1		537 (modified)	Total/NA
Perfluorooctane Sulfonamide (FOSA)	0.0023		0.0017	0.00030	ug/L	1		537 (modified)	Total/NA

Client Sample ID: CECRL-02

Lab Sample ID: 320-32527-7

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanoic acid (PFBA)	0.0014	J	0.0016	0.00029	ug/L	1		537 (modified)	Total/NA
Perfluoropentanoic acid (PFPeA)	0.00099	J M	0.0016	0.00040	ug/L	1		537 (modified)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	0.00034	J M	0.0016	0.00025	ug/L	1		537 (modified)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	0.00055	J	0.0016	0.00025	ug/L	1		537 (modified)	Total/NA
Perfluorooctane Sulfonamide (FOSA)	0.00067	J	0.0016	0.00029	ug/L	1		537 (modified)	Total/NA

This Detection Summary does not include radiochemical test results.

TestAmerica Sacramento

Detection Summary

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Client Sample ID: CECRL-03

Lab Sample ID: 320-32527-8

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanoic acid (PFBA)	0.00036	J	0.0016	0.00029	ug/L	1		537 (modified)	Total/NA
Perfluoropentanoic acid (PFPeA)	0.00053	J M	0.0016	0.00040	ug/L	1		537 (modified)	Total/NA
Perfluoroheptanoic acid (PFHpA)	0.00029	J	0.0016	0.00020	ug/L	1		537 (modified)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	0.00030	J	0.0016	0.00025	ug/L	1		537 (modified)	Total/NA
Perfluorooctane Sulfonamide (FOSA)	0.0044		0.0016	0.00029	ug/L	1		537 (modified)	Total/NA

Client Sample ID: CECRL-04

Lab Sample ID: 320-32527-9

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanoic acid (PFBA)	0.0033	M	0.0017	0.00030	ug/L	1		537 (modified)	Total/NA
Perfluoropentanoic acid (PFPeA)	0.013	M	0.0017	0.00042	ug/L	1		537 (modified)	Total/NA
Perfluorohexanoic acid (PFHxA)	0.0044		0.0035	0.00050	ug/L	1		537 (modified)	Total/NA
Perfluoroheptanoic acid (PFHpA)	0.00094	J	0.0017	0.00022	ug/L	1		537 (modified)	Total/NA
Perfluorooctanoic acid (PFOA)	0.0011	J M	0.0035	0.00073	ug/L	1		537 (modified)	Total/NA
Perfluorononanoic acid (PFNA)	0.0018		0.0017	0.00023	ug/L	1		537 (modified)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	0.0014	J	0.0017	0.00026	ug/L	1		537 (modified)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	0.0021		0.0017	0.00026	ug/L	1		537 (modified)	Total/NA
Perfluorooctane Sulfonamide (FOSA)	0.0039		0.0017	0.00030	ug/L	1		537 (modified)	Total/NA

Client Sample ID: CECRL-12

Lab Sample ID: 320-32527-10

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanoic acid (PFBA)	0.0029		0.0017	0.00029	ug/L	1		537 (modified)	Total/NA
Perfluoropentanoic acid (PFPeA)	0.00051	J M	0.0017	0.00041	ug/L	1		537 (modified)	Total/NA
Perfluoroheptanoic acid (PFHpA)	0.00022	J	0.0017	0.00021	ug/L	1		537 (modified)	Total/NA
Perfluorooctanoic acid (PFOA)	0.00084	J M	0.0033	0.00071	ug/L	1		537 (modified)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	0.00087	J	0.0017	0.00025	ug/L	1		537 (modified)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	0.00087	J	0.0017	0.00025	ug/L	1		537 (modified)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	0.0012	J	0.0033	0.00045	ug/L	1		537 (modified)	Total/NA
Perfluorooctane Sulfonamide (FOSA)	0.00070	J	0.0017	0.00029	ug/L	1		537 (modified)	Total/NA

Client Sample ID: MW-14-103B

Lab Sample ID: 320-32527-11

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanoic acid (PFBA)	0.0028	M	0.0016	0.00029	ug/L	1		537 (modified)	Total/NA
Perfluoropentanoic acid (PFPeA)	0.0012	J	0.0016	0.00040	ug/L	1		537 (modified)	Total/NA
Perfluorohexanoic acid (PFHxA)	0.00080	J	0.0033	0.00047	ug/L	1		537 (modified)	Total/NA
Perfluoroheptanoic acid (PFHpA)	0.00069	J	0.0016	0.00020	ug/L	1		537 (modified)	Total/NA
Perfluorooctanoic acid (PFOA)	0.0025	J M	0.0033	0.00070	ug/L	1		537 (modified)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	0.00082	J M	0.0016	0.00025	ug/L	1		537 (modified)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	0.00090	J	0.0016	0.00025	ug/L	1		537 (modified)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	0.0018	J	0.0033	0.00044	ug/L	1		537 (modified)	Total/NA
Perfluorooctane Sulfonamide (FOSA)	0.00065	J	0.0016	0.00029	ug/L	1		537 (modified)	Total/NA

Client Sample ID: CECRL-07

Lab Sample ID: 320-32527-12

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorotetradecanoic acid (PFTeA)	0.00029	J	0.0017	0.00025	ug/L	1		537 (modified)	Total/NA
Perfluorooctane Sulfonamide (FOSA)	0.00056	J	0.0017	0.00030	ug/L	1		537 (modified)	Total/NA

This Detection Summary does not include radiochemical test results.

TestAmerica Sacramento

Detection Summary

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Client Sample ID: MW-14-103A

Lab Sample ID: 320-32527-13

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanoic acid (PFBA)	0.0027	M	0.0017	0.00029	ug/L	1		537 (modified)	Total/NA
Perfluoropentanoic acid (PFPeA)	0.0011	J	0.0017	0.00041	ug/L	1		537 (modified)	Total/NA
Perfluoroheptanoic acid (PFHpA)	0.00064	J	0.0017	0.00021	ug/L	1		537 (modified)	Total/NA
Perfluorooctanoic acid (PFOA)	0.0023	J	0.0034	0.00071	ug/L	1		537 (modified)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	0.00084	J M	0.0017	0.00025	ug/L	1		537 (modified)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	0.00089	J	0.0017	0.00025	ug/L	1		537 (modified)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	0.0016	J	0.0034	0.00045	ug/L	1		537 (modified)	Total/NA
Perfluorooctane Sulfonamide (FOSA)	0.00047	J	0.0017	0.00029	ug/L	1		537 (modified)	Total/NA

Client Sample ID: CECRL-17

Lab Sample ID: 320-32527-14

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorohexanoic acid (PFHxA)	0.0029	J M	0.0033	0.00048	ug/L	1		537 (modified)	Total/NA
Perfluoroheptanoic acid (PFHpA)	0.0018		0.0016	0.00021	ug/L	1		537 (modified)	Total/NA
Perfluorooctanoic acid (PFOA)	0.0082	M	0.0033	0.00070	ug/L	1		537 (modified)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	0.010		0.0016	0.00025	ug/L	1		537 (modified)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	0.0059		0.0033	0.00044	ug/L	1		537 (modified)	Total/NA
Perfluorooctane Sulfonamide (FOSA)	0.00030	J	0.0016	0.00029	ug/L	1		537 (modified)	Total/NA

Client Sample ID: CECRL-19

Lab Sample ID: 320-32527-15

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorooctane Sulfonamide (FOSA)	0.0013	J	0.0017	0.00029	ug/L	1		537 (modified)	Total/NA

Client Sample ID: MW-14-107

Lab Sample ID: 320-32527-16

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanoic acid (PFBA)	0.0044		0.0018	0.00031	ug/L	1		537 (modified)	Total/NA
Perfluoropentanoic acid (PFPeA)	0.021	M	0.0018	0.00043	ug/L	1		537 (modified)	Total/NA
Perfluorohexanoic acid (PFHxA)	0.023		0.0035	0.00051	ug/L	1		537 (modified)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	0.0021	M	0.0018	0.00027	ug/L	1		537 (modified)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	0.00027	J	0.0018	0.00027	ug/L	1		537 (modified)	Total/NA
Perfluorooctane Sulfonamide (FOSA)	0.00037	J	0.0018	0.00031	ug/L	1		537 (modified)	Total/NA

Client Sample ID: CECRL-20

Lab Sample ID: 320-32527-17

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorooctane Sulfonamide (FOSA)	0.00045	J	0.0017	0.00029	ug/L	1		537 (modified)	Total/NA

This Detection Summary does not include radiochemical test results.

TestAmerica Sacramento

Client Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Client Sample ID: FIELDCLK-17-001

Lab Sample ID: 320-32527-1

Date Collected: 10/16/17 13:50

Matrix: Water

Date Received: 10/19/17 10:15

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
N-EtFOSA-M	50	U	100	13	ug/L		11/06/17 14:44	11/09/17 05:02	1
Perfluorobutanoic acid (PFBA)	0.00081	U	0.0016	0.00028	ug/L		10/30/17 16:30	11/03/17 03:39	1
MeFOSA	50	U	100	22	ug/L		11/06/17 14:44	11/09/17 05:02	1
Perfluoropentanoic acid (PFPeA)	0.00081	U	0.0016	0.00040	ug/L		10/30/17 16:30	11/03/17 03:39	1
Perfluorohexanoic acid (PFHxA)	0.0016	U	0.0032	0.00047	ug/L		10/30/17 16:30	11/03/17 03:39	1
Perfluoroheptanoic acid (PFHpA)	0.00081	U	0.0016	0.00020	ug/L		10/30/17 16:30	11/03/17 03:39	1
Perfluorooctanoic acid (PFOA)	0.0016	U	0.0032	0.00069	ug/L		10/30/17 16:30	11/03/17 03:39	1
Perfluorononanoic acid (PFNA)	0.00081	U	0.0016	0.00022	ug/L		10/30/17 16:30	11/03/17 03:39	1
Perfluorodecanoic acid (PFDA)	0.00081	U	0.0016	0.00025	ug/L		10/30/17 16:30	11/03/17 03:39	1
Perfluoroundecanoic acid (PFUnA)	0.0024	U	0.0032	0.00089	ug/L		10/30/17 16:30	11/03/17 03:39	1
Perfluorododecanoic acid (PFDoA)	0.0016	U	0.0032	0.00045	ug/L		10/30/17 16:30	11/03/17 03:39	1
Perfluorotridecanoic Acid (PFTriA)	0.0024	U	0.0032	0.0011	ug/L		10/30/17 16:30	11/03/17 03:39	1
Perfluorotetradecanoic acid (PFTeA)	0.00081	U	0.0016	0.00024	ug/L		10/30/17 16:30	11/03/17 03:39	1
Perfluorobutanesulfonic acid (PFBS)	0.00081	U	0.0016	0.00024	ug/L		10/30/17 16:30	11/03/17 03:39	1
Perfluorohexanesulfonic acid (PFHxS)	0.00081	U	0.0016	0.00024	ug/L		10/30/17 16:30	11/03/17 03:39	1
Perfluoroheptanesulfonic Acid (PFHpS)	0.00081	U	0.0016	0.00024	ug/L		10/30/17 16:30	11/03/17 03:39	1
Perfluorooctanesulfonic acid (PFOS)	0.0016	U	0.0032	0.00044	ug/L		10/30/17 16:30	11/03/17 03:39	1
Perfluorodecanesulfonic acid (PFDS)	0.00081	U	0.0016	0.00026	ug/L		10/30/17 16:30	11/03/17 03:39	1
Perfluorooctane Sulfonamide (FOSA)	0.00030	J	0.0016	0.00028	ug/L		10/30/17 16:30	11/03/17 03:39	1
6:2FTS	0.0081	U	0.016	0.0024	ug/L		10/30/17 16:30	11/03/17 03:39	1
8:2FTS	0.0081	U	0.016	0.0024	ug/L		10/30/17 16:30	11/03/17 03:39	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.0081	U	0.016	0.0025	ug/L		10/30/17 16:30	11/03/17 03:39	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.0081	U	0.016	0.0024	ug/L		10/30/17 16:30	11/03/17 03:39	1

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
d-N-MeFOSA-M	62		25 - 150	11/06/17 14:44	11/09/17 05:02	1
d-N-EtFOSA-M	65		25 - 150	11/06/17 14:44	11/09/17 05:02	1
13C8 FOSA	92		25 - 150	10/30/17 16:30	11/03/17 03:39	1
13C4 PFBA	86		25 - 150	10/30/17 16:30	11/03/17 03:39	1
13C2 PFHxA	110		25 - 150	10/30/17 16:30	11/03/17 03:39	1
13C4 PFOA	94		25 - 150	10/30/17 16:30	11/03/17 03:39	1
13C5 PFNA	110		25 - 150	10/30/17 16:30	11/03/17 03:39	1
13C2 PFDA	108		25 - 150	10/30/17 16:30	11/03/17 03:39	1
13C2 PFUnA	114		25 - 150	10/30/17 16:30	11/03/17 03:39	1
13C2 PFDoA	102		25 - 150	10/30/17 16:30	11/03/17 03:39	1
13C2-PFTeDA	108		25 - 150	10/30/17 16:30	11/03/17 03:39	1
13C2-PFHxDA	85		25 - 150	10/30/17 16:30	11/03/17 03:39	1
13C3-PFBS	103		25 - 150	10/30/17 16:30	11/03/17 03:39	1
18O2 PFHxS	108		25 - 150	10/30/17 16:30	11/03/17 03:39	1
13C4 PFOS	106		25 - 150	10/30/17 16:30	11/03/17 03:39	1
13C4-PFHpA	111		25 - 150	10/30/17 16:30	11/03/17 03:39	1
13C5 PFPeA	105		25 - 150	10/30/17 16:30	11/03/17 03:39	1
M2-6:2FTS	76		25 - 150	10/30/17 16:30	11/03/17 03:39	1
d5-NEtFOSAA	112		25 - 150	10/30/17 16:30	11/03/17 03:39	1
d3-NMeFOSAA	112		25 - 150	10/30/17 16:30	11/03/17 03:39	1
M2-8:2FTS	113		25 - 150	10/30/17 16:30	11/03/17 03:39	1

TestAmerica Sacramento

Client Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Client Sample ID: EQUIP-17-001

Lab Sample ID: 320-32527-2

Date Collected: 10/16/17 13:20

Matrix: Water

Date Received: 10/19/17 10:15

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
N-EtFOSA-M	50	U	100	13	ug/L		11/06/17 14:44	11/09/17 05:10	1
Perfluorobutanoic acid (PFBA)	0.00083	U	0.0017	0.00029	ug/L		10/30/17 16:30	11/03/17 03:47	1
MeFOSA	50	U	100	22	ug/L		11/06/17 14:44	11/09/17 05:10	1
Perfluoropentanoic acid (PFPeA)	0.00083	U	0.0017	0.00041	ug/L		10/30/17 16:30	11/03/17 03:47	1
Perfluorohexanoic acid (PFHxA)	0.0017	U	0.0033	0.00048	ug/L		10/30/17 16:30	11/03/17 03:47	1
Perfluoroheptanoic acid (PFHpA)	0.00083	U	0.0017	0.00021	ug/L		10/30/17 16:30	11/03/17 03:47	1
Perfluorooctanoic acid (PFOA)	0.0017	U	0.0033	0.00071	ug/L		10/30/17 16:30	11/03/17 03:47	1
Perfluorononanoic acid (PFNA)	0.00083	U	0.0017	0.00023	ug/L		10/30/17 16:30	11/03/17 03:47	1
Perfluorodecanoic acid (PFDA)	0.00083	U	0.0017	0.00026	ug/L		10/30/17 16:30	11/03/17 03:47	1
Perfluoroundecanoic acid (PFUnA)	0.0025	U	0.0033	0.00092	ug/L		10/30/17 16:30	11/03/17 03:47	1
Perfluorododecanoic acid (PFDoA)	0.0017	U	0.0033	0.00046	ug/L		10/30/17 16:30	11/03/17 03:47	1
Perfluorotridecanoic Acid (PFTriA)	0.0025	U	0.0033	0.0011	ug/L		10/30/17 16:30	11/03/17 03:47	1
Perfluorotetradecanoic acid (PFTeA)	0.00083	U	0.0017	0.00024	ug/L		10/30/17 16:30	11/03/17 03:47	1
Perfluorobutanesulfonic acid (PFBS)	0.00083	U	0.0017	0.00025	ug/L		10/30/17 16:30	11/03/17 03:47	1
Perfluorohexanesulfonic acid (PFHxS)	0.00083	U	0.0017	0.00025	ug/L		10/30/17 16:30	11/03/17 03:47	1
Perfluoroheptanesulfonic Acid (PFHpS)	0.00083	U	0.0017	0.00025	ug/L		10/30/17 16:30	11/03/17 03:47	1
Perfluorooctanesulfonic acid (PFOS)	0.0017	U	0.0033	0.00045	ug/L		10/30/17 16:30	11/03/17 03:47	1
Perfluorodecanesulfonic acid (PFDS)	0.00083	U	0.0017	0.00027	ug/L		10/30/17 16:30	11/03/17 03:47	1
Perfluorooctane Sulfonamide (FOSA)	0.00083	U	0.0017	0.00029	ug/L		10/30/17 16:30	11/03/17 03:47	1
6:2FTS	0.0083	U	0.017	0.0025	ug/L		10/30/17 16:30	11/03/17 03:47	1
8:2FTS	0.0083	U	0.017	0.0025	ug/L		10/30/17 16:30	11/03/17 03:47	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.0083	U	0.017	0.0026	ug/L		10/30/17 16:30	11/03/17 03:47	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.0083	U	0.017	0.0025	ug/L		10/30/17 16:30	11/03/17 03:47	1

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
d-N-MeFOSA-M	63		25 - 150	11/06/17 14:44	11/09/17 05:10	1
d-N-EtFOSA-M	63		25 - 150	11/06/17 14:44	11/09/17 05:10	1
13C8 FOSA	97		25 - 150	10/30/17 16:30	11/03/17 03:47	1
13C4 PFBA	104	M	25 - 150	10/30/17 16:30	11/03/17 03:47	1
13C2 PFHxA	107		25 - 150	10/30/17 16:30	11/03/17 03:47	1
13C4 PFOA	92		25 - 150	10/30/17 16:30	11/03/17 03:47	1
13C5 PFNA	109		25 - 150	10/30/17 16:30	11/03/17 03:47	1
13C2 PFDA	108		25 - 150	10/30/17 16:30	11/03/17 03:47	1
13C2 PFUnA	109		25 - 150	10/30/17 16:30	11/03/17 03:47	1
13C2 PFDoA	105		25 - 150	10/30/17 16:30	11/03/17 03:47	1
13C2-PFTeDA	102		25 - 150	10/30/17 16:30	11/03/17 03:47	1
13C2-PFHxDA	99		25 - 150	10/30/17 16:30	11/03/17 03:47	1
13C3-PFBS	109		25 - 150	10/30/17 16:30	11/03/17 03:47	1
18O2 PFHxS	107		25 - 150	10/30/17 16:30	11/03/17 03:47	1
13C4 PFOS	106		25 - 150	10/30/17 16:30	11/03/17 03:47	1
13C4-PFHpA	111		25 - 150	10/30/17 16:30	11/03/17 03:47	1
13C5 PFPeA	105		25 - 150	10/30/17 16:30	11/03/17 03:47	1
M2-6:2FTS	69		25 - 150	10/30/17 16:30	11/03/17 03:47	1
d5-NEtFOSAA	113		25 - 150	10/30/17 16:30	11/03/17 03:47	1
d3-NMeFOSAA	116		25 - 150	10/30/17 16:30	11/03/17 03:47	1
M2-8:2FTS	115		25 - 150	10/30/17 16:30	11/03/17 03:47	1

TestAmerica Sacramento

Client Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Client Sample ID: EQUIP-17-002

Lab Sample ID: 320-32527-3

Date Collected: 10/16/17 13:30

Matrix: Water

Date Received: 10/19/17 10:15

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
N-EtFOSA-M	50	U	100	13	ug/L		11/06/17 14:44	11/09/17 05:18	1
Perfluorobutanoic acid (PFBA)	0.00082	U	0.0016	0.00029	ug/L		10/30/17 16:30	11/03/17 03:55	1
MeFOSA	50	U	100	22	ug/L		11/06/17 14:44	11/09/17 05:18	1
Perfluoropentanoic acid (PFPeA)	0.00082	U	0.0016	0.00040	ug/L		10/30/17 16:30	11/03/17 03:55	1
Perfluorohexanoic acid (PFHxA)	0.0016	U	0.0033	0.00048	ug/L		10/30/17 16:30	11/03/17 03:55	1
Perfluoroheptanoic acid (PFHpA)	0.00082	U	0.0016	0.00021	ug/L		10/30/17 16:30	11/03/17 03:55	1
Perfluorooctanoic acid (PFOA)	0.0016	U	0.0033	0.00070	ug/L		10/30/17 16:30	11/03/17 03:55	1
Perfluorononanoic acid (PFNA)	0.00082	U	0.0016	0.00022	ug/L		10/30/17 16:30	11/03/17 03:55	1
Perfluorodecanoic acid (PFDA)	0.00082	U	0.0016	0.00026	ug/L		10/30/17 16:30	11/03/17 03:55	1
Perfluoroundecanoic acid (PFUnA)	0.0025	U	0.0033	0.00091	ug/L		10/30/17 16:30	11/03/17 03:55	1
Perfluorododecanoic acid (PFDoA)	0.0016	U	0.0033	0.00045	ug/L		10/30/17 16:30	11/03/17 03:55	1
Perfluorotridecanoic Acid (PFTriA)	0.0025	U	0.0033	0.0011	ug/L		10/30/17 16:30	11/03/17 03:55	1
Perfluorotetradecanoic acid (PFTeA)	0.00082	U	0.0016	0.00024	ug/L		10/30/17 16:30	11/03/17 03:55	1
Perfluorobutanesulfonic acid (PFBS)	0.00082	U	0.0016	0.00025	ug/L		10/30/17 16:30	11/03/17 03:55	1
Perfluorohexanesulfonic acid (PFHxS)	0.00082	U	0.0016	0.00025	ug/L		10/30/17 16:30	11/03/17 03:55	1
Perfluoroheptanesulfonic Acid (PFHpS)	0.00082	U	0.0016	0.00025	ug/L		10/30/17 16:30	11/03/17 03:55	1
Perfluorooctanesulfonic acid (PFOS)	0.0016	U	0.0033	0.00045	ug/L		10/30/17 16:30	11/03/17 03:55	1
Perfluorodecanesulfonic acid (PFDS)	0.00082	U	0.0016	0.00026	ug/L		10/30/17 16:30	11/03/17 03:55	1
Perfluorooctane Sulfonamide (FOSA)	0.00082	U	0.0016	0.00029	ug/L		10/30/17 16:30	11/03/17 03:55	1
6:2FTS	0.0082	U	0.016	0.0025	ug/L		10/30/17 16:30	11/03/17 03:55	1
8:2FTS	0.0082	U	0.016	0.0025	ug/L		10/30/17 16:30	11/03/17 03:55	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.0082	U	0.016	0.0026	ug/L		10/30/17 16:30	11/03/17 03:55	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.0082	U	0.016	0.0025	ug/L		10/30/17 16:30	11/03/17 03:55	1

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
d-N-MeFOSA-M	81		25 - 150	11/06/17 14:44	11/09/17 05:18	1
d-N-EtFOSA-M	82		25 - 150	11/06/17 14:44	11/09/17 05:18	1
13C8 FOSA	98		25 - 150	10/30/17 16:30	11/03/17 03:55	1
13C4 PFBA	100		25 - 150	10/30/17 16:30	11/03/17 03:55	1
13C2 PFHxA	107		25 - 150	10/30/17 16:30	11/03/17 03:55	1
13C4 PFOA	94		25 - 150	10/30/17 16:30	11/03/17 03:55	1
13C5 PFNA	111		25 - 150	10/30/17 16:30	11/03/17 03:55	1
13C2 PFDA	108		25 - 150	10/30/17 16:30	11/03/17 03:55	1
13C2 PFUnA	113		25 - 150	10/30/17 16:30	11/03/17 03:55	1
13C2 PFDoA	100		25 - 150	10/30/17 16:30	11/03/17 03:55	1
13C2-PFTeDA	103		25 - 150	10/30/17 16:30	11/03/17 03:55	1
13C2-PFHxDA	104		25 - 150	10/30/17 16:30	11/03/17 03:55	1
13C3-PFBS	105		25 - 150	10/30/17 16:30	11/03/17 03:55	1
18O2 PFHxS	107		25 - 150	10/30/17 16:30	11/03/17 03:55	1
13C4 PFOS	106		25 - 150	10/30/17 16:30	11/03/17 03:55	1
13C4-PFHpA	111		25 - 150	10/30/17 16:30	11/03/17 03:55	1
13C5 PFPeA	107		25 - 150	10/30/17 16:30	11/03/17 03:55	1
M2-6:2FTS	67		25 - 150	10/30/17 16:30	11/03/17 03:55	1
d5-NEtFOSAA	104		25 - 150	10/30/17 16:30	11/03/17 03:55	1
d3-NMeFOSAA	111		25 - 150	10/30/17 16:30	11/03/17 03:55	1
M2-8:2FTS	116		25 - 150	10/30/17 16:30	11/03/17 03:55	1

TestAmerica Sacramento

Client Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Client Sample ID: CECRL-01

Lab Sample ID: 320-32527-4

Date Collected: 10/16/17 15:15

Matrix: Water

Date Received: 10/19/17 10:15

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
N-EtFOSA-M	50	U	100	13	ug/L		11/06/17 14:44	11/09/17 05:26	1
Perfluorobutanoic acid (PFBA)	0.0018	M	0.0017	0.00030	ug/L		10/30/17 16:30	11/03/17 04:03	1
MeFOSA	50	U	100	22	ug/L		11/06/17 14:44	11/09/17 05:26	1
Perfluoropentanoic acid (PFPeA)	0.0012	J	0.0017	0.00042	ug/L		10/30/17 16:30	11/03/17 04:03	1
Perfluorohexanoic acid (PFHxA)	0.0017	U	0.0034	0.00049	ug/L		10/30/17 16:30	11/03/17 04:03	1
Perfluoroheptanoic acid (PFHpA)	0.00028	J	0.0017	0.00021	ug/L		10/30/17 16:30	11/03/17 04:03	1
Perfluorooctanoic acid (PFOA)	0.0017	U M	0.0034	0.00073	ug/L		10/30/17 16:30	11/03/17 04:03	1
Perfluorononanoic acid (PFNA)	0.00085	U	0.0017	0.00023	ug/L		10/30/17 16:30	11/03/17 04:03	1
Perfluorodecanoic acid (PFDA)	0.00085	U	0.0017	0.00026	ug/L		10/30/17 16:30	11/03/17 04:03	1
Perfluoroundecanoic acid (PFUnA)	0.0026	U	0.0034	0.00094	ug/L		10/30/17 16:30	11/03/17 04:03	1
Perfluorododecanoic acid (PFDoA)	0.0017	U	0.0034	0.00047	ug/L		10/30/17 16:30	11/03/17 04:03	1
Perfluorotridecanoic Acid (PFTriA)	0.0026	U	0.0034	0.0011	ug/L		10/30/17 16:30	11/03/17 04:03	1
Perfluorotetradecanoic acid (PFTeA)	0.00085	U	0.0017	0.00025	ug/L		10/30/17 16:30	11/03/17 04:03	1
Perfluorobutanesulfonic acid (PFBS)	0.00044	J	0.0017	0.00026	ug/L		10/30/17 16:30	11/03/17 04:03	1
Perfluorohexanesulfonic acid (PFHxS)	0.00064	J	0.0017	0.00026	ug/L		10/30/17 16:30	11/03/17 04:03	1
Perfluoroheptanesulfonic Acid (PFHpS)	0.00085	U	0.0017	0.00026	ug/L		10/30/17 16:30	11/03/17 04:03	1
Perfluorooctanesulfonic acid (PFOS)	0.0017	U M	0.0034	0.00046	ug/L		10/30/17 16:30	11/03/17 04:03	1
Perfluorodecanesulfonic acid (PFDS)	0.00085	U	0.0017	0.00027	ug/L		10/30/17 16:30	11/03/17 04:03	1
Perfluorooctane Sulfonamide (FOSA)	0.00044	J	0.0017	0.00030	ug/L		10/30/17 16:30	11/03/17 04:03	1
6:2FTS	0.0085	U	0.017	0.0026	ug/L		10/30/17 16:30	11/03/17 04:03	1
8:2FTS	0.0085	U	0.017	0.0026	ug/L		10/30/17 16:30	11/03/17 04:03	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.0085	U	0.017	0.0026	ug/L		10/30/17 16:30	11/03/17 04:03	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.0085	U	0.017	0.0026	ug/L		10/30/17 16:30	11/03/17 04:03	1

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
d-N-MeFOSA-M	76		25 - 150	11/06/17 14:44	11/09/17 05:26	1
d-N-EtFOSA-M	75		25 - 150	11/06/17 14:44	11/09/17 05:26	1
13C8 FOSA	99		25 - 150	10/30/17 16:30	11/03/17 04:03	1
13C4 PFBA	96		25 - 150	10/30/17 16:30	11/03/17 04:03	1
13C2 PFHxA	103		25 - 150	10/30/17 16:30	11/03/17 04:03	1
13C4 PFOA	90		25 - 150	10/30/17 16:30	11/03/17 04:03	1
13C5 PFNA	102		25 - 150	10/30/17 16:30	11/03/17 04:03	1
13C2 PFDA	102		25 - 150	10/30/17 16:30	11/03/17 04:03	1
13C2 PFUnA	102		25 - 150	10/30/17 16:30	11/03/17 04:03	1
13C2 PFDoA	92		25 - 150	10/30/17 16:30	11/03/17 04:03	1
13C2-PFTeDA	97		25 - 150	10/30/17 16:30	11/03/17 04:03	1
13C2-PFHxDA	97		25 - 150	10/30/17 16:30	11/03/17 04:03	1
13C3-PFBS	103		25 - 150	10/30/17 16:30	11/03/17 04:03	1
18O2 PFHxS	105		25 - 150	10/30/17 16:30	11/03/17 04:03	1
13C4 PFOS	99		25 - 150	10/30/17 16:30	11/03/17 04:03	1
13C4-PFHpA	105		25 - 150	10/30/17 16:30	11/03/17 04:03	1
13C5 PFPeA	103		25 - 150	10/30/17 16:30	11/03/17 04:03	1
M2-6:2FTS	64		25 - 150	10/30/17 16:30	11/03/17 04:03	1
d5-NEtFOSAA	100		25 - 150	10/30/17 16:30	11/03/17 04:03	1
d3-NMeFOSAA	99		25 - 150	10/30/17 16:30	11/03/17 04:03	1
M2-8:2FTS	102		25 - 150	10/30/17 16:30	11/03/17 04:03	1

TestAmerica Sacramento

Client Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Client Sample ID: CECRL-01DUP

Date Collected: 10/16/17 15:15

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-5

Matrix: Water

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
N-EtFOSA-M	50	U	100	13	ug/L		11/06/17 14:44	11/09/17 05:34	1
Perfluorobutanoic acid (PFBA)	0.0016	J M	0.0017	0.00029	ug/L		10/30/17 16:30	11/03/17 04:10	1
MeFOSA	50	U	100	22	ug/L		11/06/17 14:44	11/09/17 05:34	1
Perfluoropentanoic acid (PFPeA)	0.0011	J M	0.0017	0.00041	ug/L		10/30/17 16:30	11/03/17 04:10	1
Perfluorohexanoic acid (PFHxA)	0.0017	U	0.0034	0.00049	ug/L		10/30/17 16:30	11/03/17 04:10	1
Perfluoroheptanoic acid (PFHpA)	0.00026	J	0.0017	0.00021	ug/L		10/30/17 16:30	11/03/17 04:10	1
Perfluorooctanoic acid (PFOA)	0.0017	U	0.0034	0.00072	ug/L		10/30/17 16:30	11/03/17 04:10	1
Perfluorononanoic acid (PFNA)	0.00084	U	0.0017	0.00023	ug/L		10/30/17 16:30	11/03/17 04:10	1
Perfluorodecanoic acid (PFDA)	0.00084	U	0.0017	0.00026	ug/L		10/30/17 16:30	11/03/17 04:10	1
Perfluoroundecanoic acid (PFUnA)	0.0025	U	0.0034	0.00093	ug/L		10/30/17 16:30	11/03/17 04:10	1
Perfluorododecanoic acid (PFDoA)	0.0017	U	0.0034	0.00046	ug/L		10/30/17 16:30	11/03/17 04:10	1
Perfluorotridecanoic Acid (PFTriA)	0.0025	U	0.0034	0.0011	ug/L		10/30/17 16:30	11/03/17 04:10	1
Perfluorotetradecanoic acid (PFTeA)	0.00084	U	0.0017	0.00024	ug/L		10/30/17 16:30	11/03/17 04:10	1
Perfluorobutanesulfonic acid (PFBS)	0.00045	J M	0.0017	0.00025	ug/L		10/30/17 16:30	11/03/17 04:10	1
Perfluorohexanesulfonic acid (PFHxS)	0.00066	J	0.0017	0.00025	ug/L		10/30/17 16:30	11/03/17 04:10	1
Perfluoroheptanesulfonic Acid (PFHpS)	0.00084	U	0.0017	0.00025	ug/L		10/30/17 16:30	11/03/17 04:10	1
Perfluorooctanesulfonic acid (PFOS)	0.0017	U	0.0034	0.00045	ug/L		10/30/17 16:30	11/03/17 04:10	1
Perfluorodecanesulfonic acid (PFDS)	0.00084	U	0.0017	0.00027	ug/L		10/30/17 16:30	11/03/17 04:10	1
Perfluorooctane Sulfonamide (FOSA)	0.00042	J	0.0017	0.00029	ug/L		10/30/17 16:30	11/03/17 04:10	1
6:2FTS	0.0084	U	0.017	0.0025	ug/L		10/30/17 16:30	11/03/17 04:10	1
8:2FTS	0.0084	U	0.017	0.0025	ug/L		10/30/17 16:30	11/03/17 04:10	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.0084	U	0.017	0.0026	ug/L		10/30/17 16:30	11/03/17 04:10	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.0084	U	0.017	0.0025	ug/L		10/30/17 16:30	11/03/17 04:10	1

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
d-N-MeFOSA-M	78		25 - 150	11/06/17 14:44	11/09/17 05:34	1
d-N-EtFOSA-M	79		25 - 150	11/06/17 14:44	11/09/17 05:34	1
13C8 FOSA	99		25 - 150	10/30/17 16:30	11/03/17 04:10	1
13C4 PFBA	96		25 - 150	10/30/17 16:30	11/03/17 04:10	1
13C2 PFHxA	102		25 - 150	10/30/17 16:30	11/03/17 04:10	1
13C4 PFOA	92		25 - 150	10/30/17 16:30	11/03/17 04:10	1
13C5 PFNA	103		25 - 150	10/30/17 16:30	11/03/17 04:10	1
13C2 PFDA	103		25 - 150	10/30/17 16:30	11/03/17 04:10	1
13C2 PFUnA	100		25 - 150	10/30/17 16:30	11/03/17 04:10	1
13C2 PFDoA	89		25 - 150	10/30/17 16:30	11/03/17 04:10	1
13C2-PFTeDA	94		25 - 150	10/30/17 16:30	11/03/17 04:10	1
13C2-PFHxDA	101		25 - 150	10/30/17 16:30	11/03/17 04:10	1
13C3-PFBS	104		25 - 150	10/30/17 16:30	11/03/17 04:10	1
18O2 PFHxS	103		25 - 150	10/30/17 16:30	11/03/17 04:10	1
13C4 PFOS	98		25 - 150	10/30/17 16:30	11/03/17 04:10	1
13C4-PFHpA	110		25 - 150	10/30/17 16:30	11/03/17 04:10	1
13C5 PFPeA	106		25 - 150	10/30/17 16:30	11/03/17 04:10	1
M2-6:2FTS	66		25 - 150	10/30/17 16:30	11/03/17 04:10	1
d5-NEtFOSAA	95		25 - 150	10/30/17 16:30	11/03/17 04:10	1
d3-NMeFOSAA	97		25 - 150	10/30/17 16:30	11/03/17 04:10	1

TestAmerica Sacramento

Client Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Client Sample ID: CECRL-01DUP

Date Collected: 10/16/17 15:15

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-5

Matrix: Water

Method: 537 (modified) - Perfluorinated Hydrocarbons (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
M2-8:2FTS	105		25 - 150	10/30/17 16:30	11/03/17 04:10	1

Client Sample ID: CECRL-05

Date Collected: 10/16/17 15:40

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-6

Matrix: Water

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
N-EtFOSA-M	50	U	100	13	ug/L		11/06/17 14:44	11/09/17 05:42	1
Perfluorobutanoic acid (PFBA)	0.0026	M	0.0017	0.00030	ug/L		10/30/17 16:30	11/03/17 04:18	1
MeFOSA	50	U	100	22	ug/L		11/06/17 14:44	11/09/17 05:42	1
Perfluoropentanoic acid (PFPeA)	0.0010	J	0.0017	0.00043	ug/L		10/30/17 16:30	11/03/17 04:18	1
Perfluorohexanoic acid (PFHxA)	0.00098	J	0.0035	0.00050	ug/L		10/30/17 16:30	11/03/17 04:18	1
Perfluoroheptanoic acid (PFHpA)	0.00052	J	0.0017	0.00022	ug/L		10/30/17 16:30	11/03/17 04:18	1
Perfluorooctanoic acid (PFOA)	0.0015	J M	0.0035	0.00074	ug/L		10/30/17 16:30	11/03/17 04:18	1
Perfluorononanoic acid (PFNA)	0.00087	U	0.0017	0.00023	ug/L		10/30/17 16:30	11/03/17 04:18	1
Perfluorodecanoic acid (PFDA)	0.00087	U	0.0017	0.00027	ug/L		10/30/17 16:30	11/03/17 04:18	1
Perfluoroundecanoic acid (PFUnA)	0.0026	U	0.0035	0.00096	ug/L		10/30/17 16:30	11/03/17 04:18	1
Perfluorododecanoic acid (PFDoA)	0.0017	U	0.0035	0.00048	ug/L		10/30/17 16:30	11/03/17 04:18	1
Perfluorotridecanoic Acid (PFTriA)	0.0026	U	0.0035	0.0011	ug/L		10/30/17 16:30	11/03/17 04:18	1
Perfluorotetradecanoic acid (PFTeA)	0.00087	U	0.0017	0.00025	ug/L		10/30/17 16:30	11/03/17 04:18	1
Perfluorobutanesulfonic acid (PFBS)	0.00061	J	0.0017	0.00026	ug/L		10/30/17 16:30	11/03/17 04:18	1
Perfluorohexanesulfonic acid (PFHxS)	0.00089	J	0.0017	0.00026	ug/L		10/30/17 16:30	11/03/17 04:18	1
Perfluoroheptanesulfonic Acid (PFHpS)	0.00087	U	0.0017	0.00026	ug/L		10/30/17 16:30	11/03/17 04:18	1
Perfluorooctanesulfonic acid (PFOS)	0.0012	J	0.0035	0.00047	ug/L		10/30/17 16:30	11/03/17 04:18	1
Perfluorodecanesulfonic acid (PFDS)	0.00087	U	0.0017	0.00028	ug/L		10/30/17 16:30	11/03/17 04:18	1
Perfluorooctane Sulfonamide (FOSA)	0.0023		0.0017	0.00030	ug/L		10/30/17 16:30	11/03/17 04:18	1
6:2FTS	0.0087	U	0.017	0.0026	ug/L		10/30/17 16:30	11/03/17 04:18	1
8:2FTS	0.0087	U	0.017	0.0026	ug/L		10/30/17 16:30	11/03/17 04:18	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.0087	U	0.017	0.0027	ug/L		10/30/17 16:30	11/03/17 04:18	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.0087	U	0.017	0.0026	ug/L		10/30/17 16:30	11/03/17 04:18	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
d-N-MeFOSA-M	79		25 - 150				11/06/17 14:44	11/09/17 05:42	1
d-N-EtFOSA-M	85		25 - 150				11/06/17 14:44	11/09/17 05:42	1
13C8 FOSA	100		25 - 150				10/30/17 16:30	11/03/17 04:18	1
13C4 PFBA	100		25 - 150				10/30/17 16:30	11/03/17 04:18	1
13C2 PFHxA	105		25 - 150				10/30/17 16:30	11/03/17 04:18	1
13C4 PFOA	94		25 - 150				10/30/17 16:30	11/03/17 04:18	1
13C5 PFNA	109		25 - 150				10/30/17 16:30	11/03/17 04:18	1
13C2 PFDA	107		25 - 150				10/30/17 16:30	11/03/17 04:18	1
13C2 PFUnA	107		25 - 150				10/30/17 16:30	11/03/17 04:18	1
13C2 PFDoA	95		25 - 150				10/30/17 16:30	11/03/17 04:18	1
13C2-PFTeDA	101		25 - 150				10/30/17 16:30	11/03/17 04:18	1
13C2-PFHxDA	102		25 - 150				10/30/17 16:30	11/03/17 04:18	1

TestAmerica Sacramento

Client Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Client Sample ID: CECRL-05

Date Collected: 10/16/17 15:40

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-6

Matrix: Water

Method: 537 (modified) - Perfluorinated Hydrocarbons (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3-PFBS	103		25 - 150	10/30/17 16:30	11/03/17 04:18	1
18O2 PFHxS	108		25 - 150	10/30/17 16:30	11/03/17 04:18	1
13C4 PFOS	101		25 - 150	10/30/17 16:30	11/03/17 04:18	1
13C4-PFHpA	109		25 - 150	10/30/17 16:30	11/03/17 04:18	1
13C5 PFPeA	107		25 - 150	10/30/17 16:30	11/03/17 04:18	1
M2-6:2FTS	69		25 - 150	10/30/17 16:30	11/03/17 04:18	1
d5-NEtFOSAA	108		25 - 150	10/30/17 16:30	11/03/17 04:18	1
d3-NMeFOSAA	103		25 - 150	10/30/17 16:30	11/03/17 04:18	1
M2-8:2FTS	112		25 - 150	10/30/17 16:30	11/03/17 04:18	1

Client Sample ID: CECRL-02

Date Collected: 10/16/17 16:00

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-7

Matrix: Water

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
N-EtFOSA-M	50	U	100	13	ug/L		11/06/17 14:44	11/09/17 05:50	1
Perfluorobutanoic acid (PFBA)	0.0014	J	0.0016	0.00029	ug/L		10/30/17 16:30	11/03/17 04:26	1
MeFOSA	50	U	100	22	ug/L		11/06/17 14:44	11/09/17 05:50	1
Perfluoropentanoic acid (PFPeA)	0.00099	J M	0.0016	0.00040	ug/L		10/30/17 16:30	11/03/17 04:26	1
Perfluorohexanoic acid (PFHxA)	0.0016	U	0.0033	0.00047	ug/L		10/30/17 16:30	11/03/17 04:26	1
Perfluoroheptanoic acid (PFHpA)	0.00082	U	0.0016	0.00020	ug/L		10/30/17 16:30	11/03/17 04:26	1
Perfluorooctanoic acid (PFOA)	0.0016	U M	0.0033	0.00069	ug/L		10/30/17 16:30	11/03/17 04:26	1
Perfluorononanoic acid (PFNA)	0.00082	U	0.0016	0.00022	ug/L		10/30/17 16:30	11/03/17 04:26	1
Perfluorodecanoic acid (PFDA)	0.00082	U	0.0016	0.00025	ug/L		10/30/17 16:30	11/03/17 04:26	1
Perfluoroundecanoic acid (PFUnA)	0.0025	U	0.0033	0.00090	ug/L		10/30/17 16:30	11/03/17 04:26	1
Perfluorododecanoic acid (PFDoA)	0.0016	U	0.0033	0.00045	ug/L		10/30/17 16:30	11/03/17 04:26	1
Perfluorotridecanoic Acid (PFTriA)	0.0025	U	0.0033	0.0011	ug/L		10/30/17 16:30	11/03/17 04:26	1
Perfluorotetradecanoic acid (PFTeA)	0.00082	U	0.0016	0.00024	ug/L		10/30/17 16:30	11/03/17 04:26	1
Perfluorobutanesulfonic acid (PFBS)	0.00034	J M	0.0016	0.00025	ug/L		10/30/17 16:30	11/03/17 04:26	1
Perfluorohexanesulfonic acid (PFHxS)	0.00055	J	0.0016	0.00025	ug/L		10/30/17 16:30	11/03/17 04:26	1
Perfluoroheptanesulfonic Acid (PFHpS)	0.00082	U	0.0016	0.00025	ug/L		10/30/17 16:30	11/03/17 04:26	1
Perfluorooctanesulfonic acid (PFOS)	0.0016	U	0.0033	0.00044	ug/L		10/30/17 16:30	11/03/17 04:26	1
Perfluorodecanesulfonic acid (PFDS)	0.00082	U	0.0016	0.00026	ug/L		10/30/17 16:30	11/03/17 04:26	1
Perfluorooctane Sulfonamide (FOSA)	0.00067	J	0.0016	0.00029	ug/L		10/30/17 16:30	11/03/17 04:26	1
6:2FTS	0.0082	U	0.016	0.0025	ug/L		10/30/17 16:30	11/03/17 04:26	1
8:2FTS	0.0082	U	0.016	0.0025	ug/L		10/30/17 16:30	11/03/17 04:26	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.0082	U	0.016	0.0025	ug/L		10/30/17 16:30	11/03/17 04:26	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.0082	U	0.016	0.0025	ug/L		10/30/17 16:30	11/03/17 04:26	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
d-N-MeFOSA-M	71		25 - 150				11/06/17 14:44	11/09/17 05:50	1
d-N-EtFOSA-M	74		25 - 150				11/06/17 14:44	11/09/17 05:50	1
13C8 FOSA	102		25 - 150				10/30/17 16:30	11/03/17 04:26	1
13C4 PFBA	100		25 - 150				10/30/17 16:30	11/03/17 04:26	1
13C2 PFHxA	108		25 - 150				10/30/17 16:30	11/03/17 04:26	1

TestAmerica Sacramento

Client Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Client Sample ID: CECRL-02

Date Collected: 10/16/17 16:00

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-7

Matrix: Water

Method: 537 (modified) - Perfluorinated Hydrocarbons (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C4 PFOA	96		25 - 150	10/30/17 16:30	11/03/17 04:26	1
13C5 PFNA	110		25 - 150	10/30/17 16:30	11/03/17 04:26	1
13C2 PFDA	109		25 - 150	10/30/17 16:30	11/03/17 04:26	1
13C2 PFUnA	102		25 - 150	10/30/17 16:30	11/03/17 04:26	1
13C2 PFDoA	97		25 - 150	10/30/17 16:30	11/03/17 04:26	1
13C2-PFTeDA	104		25 - 150	10/30/17 16:30	11/03/17 04:26	1
13C2-PFHxDA	103		25 - 150	10/30/17 16:30	11/03/17 04:26	1
13C3-PFBS	104		25 - 150	10/30/17 16:30	11/03/17 04:26	1
18O2 PFHxS	107		25 - 150	10/30/17 16:30	11/03/17 04:26	1
13C4 PFOS	102		25 - 150	10/30/17 16:30	11/03/17 04:26	1
13C4-PFHpA	107		25 - 150	10/30/17 16:30	11/03/17 04:26	1
13C5 PFPeA	109		25 - 150	10/30/17 16:30	11/03/17 04:26	1
M2-6:2FTS	67		25 - 150	10/30/17 16:30	11/03/17 04:26	1
d5-NEtFOSAA	106		25 - 150	10/30/17 16:30	11/03/17 04:26	1
d3-NMeFOSAA	103		25 - 150	10/30/17 16:30	11/03/17 04:26	1
M2-8:2FTS	110		25 - 150	10/30/17 16:30	11/03/17 04:26	1

Client Sample ID: CECRL-03

Date Collected: 10/16/17 16:45

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-8

Matrix: Water

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
N-EtFOSA-M	50	U	100	13	ug/L		11/06/17 14:44	11/09/17 05:58	1
Perfluorobutanoic acid (PFBA)	0.00036	J	0.0016	0.00029	ug/L		10/30/17 16:30	11/03/17 04:34	1
MeFOSA	50	U	100	22	ug/L		11/06/17 14:44	11/09/17 05:58	1
Perfluoropentanoic acid (PFPeA)	0.00053	J M	0.0016	0.00040	ug/L		10/30/17 16:30	11/03/17 04:34	1
Perfluorohexanoic acid (PFHxA)	0.0016	U	0.0033	0.00047	ug/L		10/30/17 16:30	11/03/17 04:34	1
Perfluoroheptanoic acid (PFHpA)	0.00029	J	0.0016	0.00020	ug/L		10/30/17 16:30	11/03/17 04:34	1
Perfluorooctanoic acid (PFOA)	0.0016	U M	0.0033	0.00070	ug/L		10/30/17 16:30	11/03/17 04:34	1
Perfluorononanoic acid (PFNA)	0.00082	U	0.0016	0.00022	ug/L		10/30/17 16:30	11/03/17 04:34	1
Perfluorodecanoic acid (PFDA)	0.00082	U	0.0016	0.00025	ug/L		10/30/17 16:30	11/03/17 04:34	1
Perfluoroundecanoic acid (PFUnA)	0.0025	U	0.0033	0.00090	ug/L		10/30/17 16:30	11/03/17 04:34	1
Perfluorododecanoic acid (PFDoA)	0.0016	U	0.0033	0.00045	ug/L		10/30/17 16:30	11/03/17 04:34	1
Perfluorotridecanoic Acid (PFTriA)	0.0025	U	0.0033	0.0011	ug/L		10/30/17 16:30	11/03/17 04:34	1
Perfluorotetradecanoic acid (PFTeA)	0.00082	U	0.0016	0.00024	ug/L		10/30/17 16:30	11/03/17 04:34	1
Perfluorobutanesulfonic acid (PFBS)	0.00082	U M	0.0016	0.00025	ug/L		10/30/17 16:30	11/03/17 04:34	1
Perfluorohexanesulfonic acid (PFHxS)	0.00030	J	0.0016	0.00025	ug/L		10/30/17 16:30	11/03/17 04:34	1
Perfluoroheptanesulfonic Acid (PFHpS)	0.00082	U	0.0016	0.00025	ug/L		10/30/17 16:30	11/03/17 04:34	1
Perfluorooctanesulfonic acid (PFOS)	0.0016	U	0.0033	0.00044	ug/L		10/30/17 16:30	11/03/17 04:34	1
Perfluorodecanesulfonic acid (PFDS)	0.00082	U	0.0016	0.00026	ug/L		10/30/17 16:30	11/03/17 04:34	1
Perfluorooctane Sulfonamide (FOSA)	0.0044		0.0016	0.00029	ug/L		10/30/17 16:30	11/03/17 04:34	1
6:2FTS	0.0082	U	0.016	0.0025	ug/L		10/30/17 16:30	11/03/17 04:34	1
8:2FTS	0.0082	U	0.016	0.0025	ug/L		10/30/17 16:30	11/03/17 04:34	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.0082	U	0.016	0.0025	ug/L		10/30/17 16:30	11/03/17 04:34	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.0082	U	0.016	0.0025	ug/L		10/30/17 16:30	11/03/17 04:34	1

TestAmerica Sacramento

Client Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Client Sample ID: CECRL-03

Date Collected: 10/16/17 16:45

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-8

Matrix: Water

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
d-N-MeFOSA-M	65		25 - 150	11/06/17 14:44	11/09/17 05:58	1
d-N-EtFOSA-M	71		25 - 150	11/06/17 14:44	11/09/17 05:58	1
13C8 FOSA	98		25 - 150	10/30/17 16:30	11/03/17 04:34	1
13C4 PFBA	97		25 - 150	10/30/17 16:30	11/03/17 04:34	1
13C2 PFHxA	99		25 - 150	10/30/17 16:30	11/03/17 04:34	1
13C4 PFOA	92		25 - 150	10/30/17 16:30	11/03/17 04:34	1
13C5 PFNA	105		25 - 150	10/30/17 16:30	11/03/17 04:34	1
13C2 PFDA	107		25 - 150	10/30/17 16:30	11/03/17 04:34	1
13C2 PFUnA	100		25 - 150	10/30/17 16:30	11/03/17 04:34	1
13C2 PFDoA	95		25 - 150	10/30/17 16:30	11/03/17 04:34	1
13C2-PFTeDA	100		25 - 150	10/30/17 16:30	11/03/17 04:34	1
13C2-PFHxDA	107		25 - 150	10/30/17 16:30	11/03/17 04:34	1
13C3-PFBS	103		25 - 150	10/30/17 16:30	11/03/17 04:34	1
18O2 PFHxS	108		25 - 150	10/30/17 16:30	11/03/17 04:34	1
13C4 PFOS	99		25 - 150	10/30/17 16:30	11/03/17 04:34	1
13C4-PFHpA	109		25 - 150	10/30/17 16:30	11/03/17 04:34	1
13C5 PFPeA	106		25 - 150	10/30/17 16:30	11/03/17 04:34	1
M2-6:2FTS	66		25 - 150	10/30/17 16:30	11/03/17 04:34	1
d5-NEtFOSAA	109		25 - 150	10/30/17 16:30	11/03/17 04:34	1
d3-NMeFOSAA	103		25 - 150	10/30/17 16:30	11/03/17 04:34	1
M2-8:2FTS	105		25 - 150	10/30/17 16:30	11/03/17 04:34	1

Client Sample ID: CECRL-04

Date Collected: 10/16/17 16:20

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-9

Matrix: Water

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
N-EtFOSA-M	50	U	100	13	ug/L		11/06/17 14:44	11/09/17 06:29	1
Perfluorobutanoic acid (PFBA)	0.0033	M	0.0017	0.00030	ug/L		10/30/17 16:30	11/03/17 05:05	1
MeFOSA	50	U	100	22	ug/L		11/06/17 14:44	11/09/17 06:29	1
Perfluoropentanoic acid (PFPeA)	0.013	M	0.0017	0.00042	ug/L		10/30/17 16:30	11/03/17 05:05	1
Perfluorohexanoic acid (PFHxA)	0.0044		0.0035	0.00050	ug/L		10/30/17 16:30	11/03/17 05:05	1
Perfluoroheptanoic acid (PFHpA)	0.00094	J	0.0017	0.00022	ug/L		10/30/17 16:30	11/03/17 05:05	1
Perfluorooctanoic acid (PFOA)	0.0011	J M	0.0035	0.00073	ug/L		10/30/17 16:30	11/03/17 05:05	1
Perfluorononanoic acid (PFNA)	0.0018		0.0017	0.00023	ug/L		10/30/17 16:30	11/03/17 05:05	1
Perfluorodecanoic acid (PFDA)	0.00086	U	0.0017	0.00027	ug/L		10/30/17 16:30	11/03/17 05:05	1
Perfluoroundecanoic acid (PFUnA)	0.0026	U	0.0035	0.00095	ug/L		10/30/17 16:30	11/03/17 05:05	1
Perfluorododecanoic acid (PFDoA)	0.0017	U	0.0035	0.00048	ug/L		10/30/17 16:30	11/03/17 05:05	1
Perfluorotridecanoic Acid (PFTriA)	0.0026	U	0.0035	0.0011	ug/L		10/30/17 16:30	11/03/17 05:05	1
Perfluorotetradecanoic acid (PFTeA)	0.00086	U	0.0017	0.00025	ug/L		10/30/17 16:30	11/03/17 05:05	1
Perfluorobutanesulfonic acid (PFBS)	0.0014	J	0.0017	0.00026	ug/L		10/30/17 16:30	11/03/17 05:05	1
Perfluorohexanesulfonic acid (PFHxS)	0.0021		0.0017	0.00026	ug/L		10/30/17 16:30	11/03/17 05:05	1
Perfluoroheptanesulfonic Acid (PFHpS)	0.00086	U	0.0017	0.00026	ug/L		10/30/17 16:30	11/03/17 05:05	1
Perfluorooctanesulfonic acid (PFOS)	0.0017	U	0.0035	0.00047	ug/L		10/30/17 16:30	11/03/17 05:05	1
Perfluorodecanesulfonic acid (PFDS)	0.00086	U	0.0017	0.00028	ug/L		10/30/17 16:30	11/03/17 05:05	1
Perfluorooctane Sulfonamide (FOSA)	0.0039		0.0017	0.00030	ug/L		10/30/17 16:30	11/03/17 05:05	1
6:2FTS	0.0086	U	0.017	0.0026	ug/L		10/30/17 16:30	11/03/17 05:05	1

TestAmerica Sacramento

Client Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Client Sample ID: CECRL-04

Date Collected: 10/16/17 16:20

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-9

Matrix: Water

Method: 537 (modified) - Perfluorinated Hydrocarbons (Continued)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
8:2FTS	0.0086	U	0.017	0.0026	ug/L		10/30/17 16:30	11/03/17 05:05	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.0086	U	0.017	0.0027	ug/L		10/30/17 16:30	11/03/17 05:05	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.0086	U	0.017	0.0026	ug/L		10/30/17 16:30	11/03/17 05:05	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
d-N-MeFOSA-M	69		25 - 150				11/06/17 14:44	11/09/17 06:29	1
d-N-EtFOSA-M	69		25 - 150				11/06/17 14:44	11/09/17 06:29	1
13C8 FOSA	99		25 - 150				10/30/17 16:30	11/03/17 05:05	1
13C4 PFBA	99		25 - 150				10/30/17 16:30	11/03/17 05:05	1
13C2 PFHxA	106		25 - 150				10/30/17 16:30	11/03/17 05:05	1
13C4 PFOA	94		25 - 150				10/30/17 16:30	11/03/17 05:05	1
13C5 PFNA	106		25 - 150				10/30/17 16:30	11/03/17 05:05	1
13C2 PFDA	108		25 - 150				10/30/17 16:30	11/03/17 05:05	1
13C2 PFUnA	102		25 - 150				10/30/17 16:30	11/03/17 05:05	1
13C2 PFDoA	95		25 - 150				10/30/17 16:30	11/03/17 05:05	1
13C2-PFTeDA	104		25 - 150				10/30/17 16:30	11/03/17 05:05	1
13C2-PFHxDA	109		25 - 150				10/30/17 16:30	11/03/17 05:05	1
13C3-PFBS	104		25 - 150				10/30/17 16:30	11/03/17 05:05	1
18O2 PFHxS	104		25 - 150				10/30/17 16:30	11/03/17 05:05	1
13C4 PFOS	99		25 - 150				10/30/17 16:30	11/03/17 05:05	1
13C4-PFHpA	110		25 - 150				10/30/17 16:30	11/03/17 05:05	1
13C5 PFPeA	106		25 - 150				10/30/17 16:30	11/03/17 05:05	1
M2-6:2FTS	70		25 - 150				10/30/17 16:30	11/03/17 05:05	1
d5-NEtFOSAA	106		25 - 150				10/30/17 16:30	11/03/17 05:05	1
d3-NMeFOSAA	107		25 - 150				10/30/17 16:30	11/03/17 05:05	1
M2-8:2FTS	109		25 - 150				10/30/17 16:30	11/03/17 05:05	1

Client Sample ID: CECRL-12

Date Collected: 10/17/17 16:40

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-10

Matrix: Water

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
N-EtFOSA-M	50	U	100	13	ug/L		11/06/17 14:44	11/09/17 06:37	1
Perfluorobutanoic acid (PFBA)	0.0029		0.0017	0.00029	ug/L		10/30/17 16:30	11/03/17 05:13	1
MeFOSA	50	U	100	22	ug/L		11/06/17 14:44	11/09/17 06:37	1
Perfluoropentanoic acid (PFPeA)	0.00051	J M	0.0017	0.00041	ug/L		10/30/17 16:30	11/03/17 05:13	1
Perfluorohexanoic acid (PFHxA)	0.0017	U	0.0033	0.00048	ug/L		10/30/17 16:30	11/03/17 05:13	1
Perfluoroheptanoic acid (PFHpA)	0.00022	J	0.0017	0.00021	ug/L		10/30/17 16:30	11/03/17 05:13	1
Perfluorooctanoic acid (PFOA)	0.00084	J M	0.0033	0.00071	ug/L		10/30/17 16:30	11/03/17 05:13	1
Perfluorononanoic acid (PFNA)	0.00083	U	0.0017	0.00022	ug/L		10/30/17 16:30	11/03/17 05:13	1
Perfluorodecanoic acid (PFDA)	0.00083	U	0.0017	0.00026	ug/L		10/30/17 16:30	11/03/17 05:13	1
Perfluoroundecanoic acid (PFUnA)	0.0025	U	0.0033	0.00092	ug/L		10/30/17 16:30	11/03/17 05:13	1
Perfluorododecanoic acid (PFDoA)	0.0017	U	0.0033	0.00046	ug/L		10/30/17 16:30	11/03/17 05:13	1
Perfluorotridecanoic Acid (PFTriA)	0.0025	U	0.0033	0.0011	ug/L		10/30/17 16:30	11/03/17 05:13	1
Perfluorotetradecanoic acid (PFTeA)	0.00083	U	0.0017	0.00024	ug/L		10/30/17 16:30	11/03/17 05:13	1
Perfluorobutanesulfonic acid (PFBS)	0.00087	J	0.0017	0.00025	ug/L		10/30/17 16:30	11/03/17 05:13	1

TestAmerica Sacramento

Client Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Client Sample ID: CECRL-12

Date Collected: 10/17/17 16:40

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-10

Matrix: Water

Method: 537 (modified) - Perfluorinated Hydrocarbons (Continued)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorohexanesulfonic acid (PFHxS)	0.00087	J	0.0017	0.00025	ug/L		10/30/17 16:30	11/03/17 05:13	1
Perfluoroheptanesulfonic Acid (PFHpS)	0.00083	U	0.0017	0.00025	ug/L		10/30/17 16:30	11/03/17 05:13	1
Perfluorooctanesulfonic acid (PFOS)	0.0012	J	0.0033	0.00045	ug/L		10/30/17 16:30	11/03/17 05:13	1
Perfluorodecanesulfonic acid (PFDS)	0.00083	U	0.0017	0.00027	ug/L		10/30/17 16:30	11/03/17 05:13	1
Perfluorooctane Sulfonamide (FOSA)	0.00070	J	0.0017	0.00029	ug/L		10/30/17 16:30	11/03/17 05:13	1
6:2FTS	0.0083	U	0.017	0.0025	ug/L		10/30/17 16:30	11/03/17 05:13	1
8:2FTS	0.0083	U	0.017	0.0025	ug/L		10/30/17 16:30	11/03/17 05:13	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.0083	U	0.017	0.0026	ug/L		10/30/17 16:30	11/03/17 05:13	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.0083	U	0.017	0.0025	ug/L		10/30/17 16:30	11/03/17 05:13	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
d-N-MeFOSA-M	62		25 - 150				11/06/17 14:44	11/09/17 06:37	1
d-N-EtFOSA-M	66		25 - 150				11/06/17 14:44	11/09/17 06:37	1
13C8 FOSA	97		25 - 150				10/30/17 16:30	11/03/17 05:13	1
13C4 PFBA	99		25 - 150				10/30/17 16:30	11/03/17 05:13	1
13C2 PFHxA	101		25 - 150				10/30/17 16:30	11/03/17 05:13	1
13C4 PFOA	91		25 - 150				10/30/17 16:30	11/03/17 05:13	1
13C5 PFNA	104		25 - 150				10/30/17 16:30	11/03/17 05:13	1
13C2 PFDA	107		25 - 150				10/30/17 16:30	11/03/17 05:13	1
13C2 PFUnA	104		25 - 150				10/30/17 16:30	11/03/17 05:13	1
13C2 PFDoA	94		25 - 150				10/30/17 16:30	11/03/17 05:13	1
13C2-PFTeDA	98		25 - 150				10/30/17 16:30	11/03/17 05:13	1
13C2-PFHxDA	100		25 - 150				10/30/17 16:30	11/03/17 05:13	1
13C3-PFBS	99		25 - 150				10/30/17 16:30	11/03/17 05:13	1
18O2 PFHxS	103		25 - 150				10/30/17 16:30	11/03/17 05:13	1
13C4 PFOS	98		25 - 150				10/30/17 16:30	11/03/17 05:13	1
13C4-PFHpA	110		25 - 150				10/30/17 16:30	11/03/17 05:13	1
13C5 PFPeA	102		25 - 150				10/30/17 16:30	11/03/17 05:13	1
M2-6:2FTS	67		25 - 150				10/30/17 16:30	11/03/17 05:13	1
d5-NEtFOSAA	106		25 - 150				10/30/17 16:30	11/03/17 05:13	1
d3-NMeFOSAA	109		25 - 150				10/30/17 16:30	11/03/17 05:13	1
M2-8:2FTS	115		25 - 150				10/30/17 16:30	11/03/17 05:13	1

Client Sample ID: MW-14-103B

Date Collected: 10/17/17 14:00

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-11

Matrix: Water

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
N-EtFOSA-M	50	U	100	13	ug/L		11/06/17 14:44	11/09/17 06:45	1
Perfluorobutanoic acid (PFBA)	0.0028	M	0.0016	0.00029	ug/L		10/30/17 16:30	11/03/17 05:21	1
MeFOSA	50	U	100	22	ug/L		11/06/17 14:44	11/09/17 06:45	1
Perfluoropentanoic acid (PFPeA)	0.0012	J	0.0016	0.00040	ug/L		10/30/17 16:30	11/03/17 05:21	1
Perfluorohexanoic acid (PFHxA)	0.00080	J	0.0033	0.00047	ug/L		10/30/17 16:30	11/03/17 05:21	1
Perfluoroheptanoic acid (PFHpA)	0.00069	J	0.0016	0.00020	ug/L		10/30/17 16:30	11/03/17 05:21	1
Perfluorooctanoic acid (PFOA)	0.0025	J M	0.0033	0.00070	ug/L		10/30/17 16:30	11/03/17 05:21	1

TestAmerica Sacramento

Client Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Client Sample ID: MW-14-103B

Lab Sample ID: 320-32527-11

Date Collected: 10/17/17 14:00

Matrix: Water

Date Received: 10/19/17 10:15

Method: 537 (modified) - Perfluorinated Hydrocarbons (Continued)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorononanoic acid (PFNA)	0.00082	U	0.0016	0.00022	ug/L		10/30/17 16:30	11/03/17 05:21	1
Perfluorodecanoic acid (PFDA)	0.00082	U	0.0016	0.00025	ug/L		10/30/17 16:30	11/03/17 05:21	1
Perfluoroundecanoic acid (PFUnA)	0.0025	U	0.0033	0.00090	ug/L		10/30/17 16:30	11/03/17 05:21	1
Perfluorododecanoic acid (PFDoA)	0.0016	U	0.0033	0.00045	ug/L		10/30/17 16:30	11/03/17 05:21	1
Perfluorotridecanoic Acid (PFTriA)	0.0025	U	0.0033	0.0011	ug/L		10/30/17 16:30	11/03/17 05:21	1
Perfluorotetradecanoic acid (PFTeA)	0.00082	U	0.0016	0.00024	ug/L		10/30/17 16:30	11/03/17 05:21	1
Perfluorobutanesulfonic acid (PFBS)	0.00082	J M	0.0016	0.00025	ug/L		10/30/17 16:30	11/03/17 05:21	1
Perfluorohexanesulfonic acid (PFHxS)	0.00090	J	0.0016	0.00025	ug/L		10/30/17 16:30	11/03/17 05:21	1
Perfluoroheptanesulfonic Acid (PFHpS)	0.00082	U	0.0016	0.00025	ug/L		10/30/17 16:30	11/03/17 05:21	1
Perfluorooctanesulfonic acid (PFOS)	0.0018	J	0.0033	0.00044	ug/L		10/30/17 16:30	11/03/17 05:21	1
Perfluorodecanesulfonic acid (PFDS)	0.00082	U	0.0016	0.00026	ug/L		10/30/17 16:30	11/03/17 05:21	1
Perfluorooctane Sulfonamide (FOSA)	0.00065	J	0.0016	0.00029	ug/L		10/30/17 16:30	11/03/17 05:21	1
6:2FTS	0.0082	U	0.016	0.0025	ug/L		10/30/17 16:30	11/03/17 05:21	1
8:2FTS	0.0082	U	0.016	0.0025	ug/L		10/30/17 16:30	11/03/17 05:21	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.0082	U	0.016	0.0025	ug/L		10/30/17 16:30	11/03/17 05:21	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.0082	U	0.016	0.0025	ug/L		10/30/17 16:30	11/03/17 05:21	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
d-N-MeFOSA-M	69		25 - 150				11/06/17 14:44	11/09/17 06:45	1
d-N-EtFOSA-M	72		25 - 150				11/06/17 14:44	11/09/17 06:45	1
13C8 FOSA	95		25 - 150				10/30/17 16:30	11/03/17 05:21	1
13C4 PFBA	97		25 - 150				10/30/17 16:30	11/03/17 05:21	1
13C2 PFHxA	101		25 - 150				10/30/17 16:30	11/03/17 05:21	1
13C4 PFOA	90		25 - 150				10/30/17 16:30	11/03/17 05:21	1
13C5 PFNA	105		25 - 150				10/30/17 16:30	11/03/17 05:21	1
13C2 PFDA	105		25 - 150				10/30/17 16:30	11/03/17 05:21	1
13C2 PFUnA	101		25 - 150				10/30/17 16:30	11/03/17 05:21	1
13C2 PFDoA	94		25 - 150				10/30/17 16:30	11/03/17 05:21	1
13C2-PFTeDA	90		25 - 150				10/30/17 16:30	11/03/17 05:21	1
13C2-PFHxDA	81		25 - 150				10/30/17 16:30	11/03/17 05:21	1
13C3-PFBS	94		25 - 150				10/30/17 16:30	11/03/17 05:21	1
18O2 PFHxS	102		25 - 150				10/30/17 16:30	11/03/17 05:21	1
13C4 PFOS	99		25 - 150				10/30/17 16:30	11/03/17 05:21	1
13C4-PFHpA	106		25 - 150				10/30/17 16:30	11/03/17 05:21	1
13C5 PFPeA	99		25 - 150				10/30/17 16:30	11/03/17 05:21	1
M2-6:2FTS	68		25 - 150				10/30/17 16:30	11/03/17 05:21	1
d5-NEtFOSAA	107		25 - 150				10/30/17 16:30	11/03/17 05:21	1
d3-NMeFOSAA	106		25 - 150				10/30/17 16:30	11/03/17 05:21	1
M2-8:2FTS	110		25 - 150				10/30/17 16:30	11/03/17 05:21	1

TestAmerica Sacramento

Client Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Client Sample ID: CECRL-07

Lab Sample ID: 320-32527-12

Date Collected: 10/17/17 17:40

Matrix: Water

Date Received: 10/19/17 10:15

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
N-EtFOSA-M	50	U	100	13	ug/L		11/06/17 14:44	11/09/17 06:53	1
Perfluorobutanoic acid (PFBA)	0.00085	U	0.0017	0.00030	ug/L		10/30/17 16:30	11/03/17 05:29	1
MeFOSA	50	U	100	22	ug/L		11/06/17 14:44	11/09/17 06:53	1
Perfluoropentanoic acid (PFPeA)	0.00085	U	0.0017	0.00042	ug/L		10/30/17 16:30	11/03/17 05:29	1
Perfluorohexanoic acid (PFHxA)	0.0017	U	0.0034	0.00050	ug/L		10/30/17 16:30	11/03/17 05:29	1
Perfluoroheptanoic acid (PFHpA)	0.00085	U	0.0017	0.00021	ug/L		10/30/17 16:30	11/03/17 05:29	1
Perfluorooctanoic acid (PFOA)	0.0017	U	0.0034	0.00073	ug/L		10/30/17 16:30	11/03/17 05:29	1
Perfluorononanoic acid (PFNA)	0.00085	U	0.0017	0.00023	ug/L		10/30/17 16:30	11/03/17 05:29	1
Perfluorodecanoic acid (PFDA)	0.00085	U	0.0017	0.00027	ug/L		10/30/17 16:30	11/03/17 05:29	1
Perfluoroundecanoic acid (PFUnA)	0.0026	U	0.0034	0.00094	ug/L		10/30/17 16:30	11/03/17 05:29	1
Perfluorododecanoic acid (PFDoA)	0.0017	U	0.0034	0.00047	ug/L		10/30/17 16:30	11/03/17 05:29	1
Perfluorotridecanoic Acid (PFTriA)	0.0026	U	0.0034	0.0011	ug/L		10/30/17 16:30	11/03/17 05:29	1
Perfluorotetradecanoic acid (PFTeA)	0.00029	J	0.0017	0.00025	ug/L		10/30/17 16:30	11/03/17 05:29	1
Perfluorobutanesulfonic acid (PFBS)	0.00085	U	0.0017	0.00026	ug/L		10/30/17 16:30	11/03/17 05:29	1
Perfluorohexanesulfonic acid (PFHxS)	0.00085	U	0.0017	0.00026	ug/L		10/30/17 16:30	11/03/17 05:29	1
Perfluoroheptanesulfonic Acid (PFHpS)	0.00085	U	0.0017	0.00026	ug/L		10/30/17 16:30	11/03/17 05:29	1
Perfluorooctanesulfonic acid (PFOS)	0.0017	U	0.0034	0.00046	ug/L		10/30/17 16:30	11/03/17 05:29	1
Perfluorodecanesulfonic acid (PFDS)	0.00085	U	0.0017	0.00027	ug/L		10/30/17 16:30	11/03/17 05:29	1
Perfluorooctane Sulfonamide (FOSA)	0.00056	J	0.0017	0.00030	ug/L		10/30/17 16:30	11/03/17 05:29	1
6:2FTS	0.0085	U	0.017	0.0026	ug/L		10/30/17 16:30	11/03/17 05:29	1
8:2FTS	0.0085	U	0.017	0.0026	ug/L		10/30/17 16:30	11/03/17 05:29	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.0085	U	0.017	0.0027	ug/L		10/30/17 16:30	11/03/17 05:29	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.0085	U	0.017	0.0026	ug/L		10/30/17 16:30	11/03/17 05:29	1

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
d-N-MeFOSA-M	70		25 - 150	11/06/17 14:44	11/09/17 06:53	1
d-N-EtFOSA-M	74		25 - 150	11/06/17 14:44	11/09/17 06:53	1
13C8 FOSA	101		25 - 150	10/30/17 16:30	11/03/17 05:29	1
13C4 PFBA	101		25 - 150	10/30/17 16:30	11/03/17 05:29	1
13C2 PFHxA	105		25 - 150	10/30/17 16:30	11/03/17 05:29	1
13C4 PFOA	94		25 - 150	10/30/17 16:30	11/03/17 05:29	1
13C5 PFNA	111		25 - 150	10/30/17 16:30	11/03/17 05:29	1
13C2 PFDA	109		25 - 150	10/30/17 16:30	11/03/17 05:29	1
13C2 PFUnA	102		25 - 150	10/30/17 16:30	11/03/17 05:29	1
13C2 PFDoA	101		25 - 150	10/30/17 16:30	11/03/17 05:29	1
13C2-PFTeDA	96		25 - 150	10/30/17 16:30	11/03/17 05:29	1
13C2-PFHxDA	96		25 - 150	10/30/17 16:30	11/03/17 05:29	1
13C3-PFBS	107		25 - 150	10/30/17 16:30	11/03/17 05:29	1
18O2 PFHxS	108		25 - 150	10/30/17 16:30	11/03/17 05:29	1
13C4 PFOS	102		25 - 150	10/30/17 16:30	11/03/17 05:29	1
13C4-PFHpA	111		25 - 150	10/30/17 16:30	11/03/17 05:29	1
13C5 PFPeA	103		25 - 150	10/30/17 16:30	11/03/17 05:29	1
M2-6:2FTS	73		25 - 150	10/30/17 16:30	11/03/17 05:29	1
d5-NEtFOSAA	112		25 - 150	10/30/17 16:30	11/03/17 05:29	1
d3-NMeFOSAA	109		25 - 150	10/30/17 16:30	11/03/17 05:29	1
M2-8:2FTS	118		25 - 150	10/30/17 16:30	11/03/17 05:29	1

TestAmerica Sacramento

Client Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Client Sample ID: MW-14-103A

Lab Sample ID: 320-32527-13

Date Collected: 10/17/17 14:05

Matrix: Water

Date Received: 10/19/17 10:15

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
N-EtFOSA-M	50	U	100	13	ug/L		11/06/17 14:44	11/09/17 07:01	1
Perfluorobutanoic acid (PFBA)	0.0027	M	0.0017	0.00029	ug/L		10/30/17 16:30	11/03/17 05:37	1
MeFOSA	50	U	100	22	ug/L		11/06/17 14:44	11/09/17 07:01	1
Perfluoropentanoic acid (PFPeA)	0.0011	J	0.0017	0.00041	ug/L		10/30/17 16:30	11/03/17 05:37	1
Perfluorohexanoic acid (PFHxA)	0.0017	U	0.0034	0.00049	ug/L		10/30/17 16:30	11/03/17 05:37	1
Perfluoroheptanoic acid (PFHpA)	0.00064	J	0.0017	0.00021	ug/L		10/30/17 16:30	11/03/17 05:37	1
Perfluorooctanoic acid (PFOA)	0.0023	J	0.0034	0.00071	ug/L		10/30/17 16:30	11/03/17 05:37	1
Perfluorononanoic acid (PFNA)	0.00084	U	0.0017	0.00023	ug/L		10/30/17 16:30	11/03/17 05:37	1
Perfluorodecanoic acid (PFDA)	0.00084	U	0.0017	0.00026	ug/L		10/30/17 16:30	11/03/17 05:37	1
Perfluoroundecanoic acid (PFUnA)	0.0025	U	0.0034	0.00092	ug/L		10/30/17 16:30	11/03/17 05:37	1
Perfluorododecanoic acid (PFDoA)	0.0017	U	0.0034	0.00046	ug/L		10/30/17 16:30	11/03/17 05:37	1
Perfluorotridecanoic Acid (PFTriA)	0.0025	U	0.0034	0.0011	ug/L		10/30/17 16:30	11/03/17 05:37	1
Perfluorotetradecanoic acid (PFTeA)	0.00084	U	0.0017	0.00024	ug/L		10/30/17 16:30	11/03/17 05:37	1
Perfluorobutanesulfonic acid (PFBS)	0.00084	J M	0.0017	0.00025	ug/L		10/30/17 16:30	11/03/17 05:37	1
Perfluorohexanesulfonic acid (PFHxS)	0.00089	J	0.0017	0.00025	ug/L		10/30/17 16:30	11/03/17 05:37	1
Perfluoroheptanesulfonic Acid (PFHpS)	0.00084	U	0.0017	0.00025	ug/L		10/30/17 16:30	11/03/17 05:37	1
Perfluorooctanesulfonic acid (PFOS)	0.0016	J	0.0034	0.00045	ug/L		10/30/17 16:30	11/03/17 05:37	1
Perfluorodecanesulfonic acid (PFDS)	0.00084	U	0.0017	0.00027	ug/L		10/30/17 16:30	11/03/17 05:37	1
Perfluorooctane Sulfonamide (FOSA)	0.00047	J	0.0017	0.00029	ug/L		10/30/17 16:30	11/03/17 05:37	1
6:2FTS	0.0084	U	0.017	0.0025	ug/L		10/30/17 16:30	11/03/17 05:37	1
8:2FTS	0.0084	U	0.017	0.0025	ug/L		10/30/17 16:30	11/03/17 05:37	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.0084	U	0.017	0.0026	ug/L		10/30/17 16:30	11/03/17 05:37	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.0084	U	0.017	0.0025	ug/L		10/30/17 16:30	11/03/17 05:37	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
d-N-MeFOSA-M	61		25 - 150				11/06/17 14:44	11/09/17 07:01	1
d-N-EtFOSA-M	62		25 - 150				11/06/17 14:44	11/09/17 07:01	1
13C8 FOSA	107		25 - 150				10/30/17 16:30	11/03/17 05:37	1
13C4 PFBA	103		25 - 150				10/30/17 16:30	11/03/17 05:37	1
13C2 PFHxA	107		25 - 150				10/30/17 16:30	11/03/17 05:37	1
13C4 PFOA	97		25 - 150				10/30/17 16:30	11/03/17 05:37	1
13C5 PFNA	114		25 - 150				10/30/17 16:30	11/03/17 05:37	1
13C2 PFDA	113		25 - 150				10/30/17 16:30	11/03/17 05:37	1
13C2 PFUnA	133		25 - 150				10/30/17 16:30	11/03/17 05:37	1
13C2 PFDoA	107		25 - 150				10/30/17 16:30	11/03/17 05:37	1
13C2-PFTeDA	110		25 - 150				10/30/17 16:30	11/03/17 05:37	1
13C2-PFHxDA	102		25 - 150				10/30/17 16:30	11/03/17 05:37	1
13C3-PFBS	113		25 - 150				10/30/17 16:30	11/03/17 05:37	1
18O2 PFHxS	109		25 - 150				10/30/17 16:30	11/03/17 05:37	1
13C4 PFOS	107		25 - 150				10/30/17 16:30	11/03/17 05:37	1
13C4-PFHpA	113		25 - 150				10/30/17 16:30	11/03/17 05:37	1
13C5 PFPeA	110		25 - 150				10/30/17 16:30	11/03/17 05:37	1
M2-6:2FTS	74		25 - 150				10/30/17 16:30	11/03/17 05:37	1
d5-NEtFOSAA	187	Q	25 - 150				10/30/17 16:30	11/03/17 05:37	1
d3-NMeFOSAA	136		25 - 150				10/30/17 16:30	11/03/17 05:37	1

TestAmerica Sacramento

Client Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Client Sample ID: MW-14-103A

Date Collected: 10/17/17 14:05

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-13

Matrix: Water

Method: 537 (modified) - Perfluorinated Hydrocarbons (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
M2-8:2FTS	145		25 - 150	10/30/17 16:30	11/03/17 05:37	1

Client Sample ID: CECRL-17

Date Collected: 10/18/17 10:45

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-14

Matrix: Water

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
N-EtFOSA-M	50	U	100	13	ug/L		11/06/17 14:44	11/09/17 07:09	1
Perfluorobutanoic acid (PFBA)	0.00082	U	0.0016	0.00029	ug/L		10/30/17 16:30	11/03/17 05:45	1
MeFOSA	50	U	100	22	ug/L		11/06/17 14:44	11/09/17 07:09	1
Perfluoropentanoic acid (PFPeA)	0.00082	U	0.0016	0.00040	ug/L		10/30/17 16:30	11/03/17 05:45	1
Perfluorohexanoic acid (PFHxA)	0.0029	J M	0.0033	0.00048	ug/L		10/30/17 16:30	11/03/17 05:45	1
Perfluoroheptanoic acid (PFHpA)	0.0018		0.0016	0.00021	ug/L		10/30/17 16:30	11/03/17 05:45	1
Perfluorooctanoic acid (PFOA)	0.0082	M	0.0033	0.00070	ug/L		10/30/17 16:30	11/03/17 05:45	1
Perfluorononanoic acid (PFNA)	0.00082	U	0.0016	0.00022	ug/L		10/30/17 16:30	11/03/17 05:45	1
Perfluorodecanoic acid (PFDA)	0.00082	U	0.0016	0.00026	ug/L		10/30/17 16:30	11/03/17 05:45	1
Perfluoroundecanoic acid (PFUnA)	0.0025	U	0.0033	0.00091	ug/L		10/30/17 16:30	11/03/17 05:45	1
Perfluorododecanoic acid (PFDoA)	0.0016	U	0.0033	0.00045	ug/L		10/30/17 16:30	11/03/17 05:45	1
Perfluorotridecanoic Acid (PFTriA)	0.0025	U	0.0033	0.0011	ug/L		10/30/17 16:30	11/03/17 05:45	1
Perfluorotetradecanoic acid (PFTeA)	0.00082	U	0.0016	0.00024	ug/L		10/30/17 16:30	11/03/17 05:45	1
Perfluorobutanesulfonic acid (PFBS)	0.00082	U	0.0016	0.00025	ug/L		10/30/17 16:30	11/03/17 05:45	1
Perfluorohexanesulfonic acid (PFHxS)	0.010		0.0016	0.00025	ug/L		10/30/17 16:30	11/03/17 05:45	1
Perfluoroheptanesulfonic Acid (PFHpS)	0.00082	U	0.0016	0.00025	ug/L		10/30/17 16:30	11/03/17 05:45	1
Perfluorooctanesulfonic acid (PFOS)	0.0059		0.0033	0.00044	ug/L		10/30/17 16:30	11/03/17 05:45	1
Perfluorodecanesulfonic acid (PFDS)	0.00082	U	0.0016	0.00026	ug/L		10/30/17 16:30	11/03/17 05:45	1
Perfluorooctane Sulfonamide (FOSA)	0.00030	J	0.0016	0.00029	ug/L		10/30/17 16:30	11/03/17 05:45	1
6:2FTS	0.0082	U	0.016	0.0025	ug/L		10/30/17 16:30	11/03/17 05:45	1
8:2FTS	0.0082	U	0.016	0.0025	ug/L		10/30/17 16:30	11/03/17 05:45	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.0082	U	0.016	0.0026	ug/L		10/30/17 16:30	11/03/17 05:45	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.0082	U	0.016	0.0025	ug/L		10/30/17 16:30	11/03/17 05:45	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
d-N-MeFOSA-M	66		25 - 150				11/06/17 14:44	11/09/17 07:09	1
d-N-EtFOSA-M	68		25 - 150				11/06/17 14:44	11/09/17 07:09	1
13C8 FOSA	93		25 - 150				10/30/17 16:30	11/03/17 05:45	1
13C4 PFBA	71		25 - 150				10/30/17 16:30	11/03/17 05:45	1
13C2 PFHxA	100		25 - 150				10/30/17 16:30	11/03/17 05:45	1
13C4 PFOA	94		25 - 150				10/30/17 16:30	11/03/17 05:45	1
13C5 PFNA	108		25 - 150				10/30/17 16:30	11/03/17 05:45	1
13C2 PFDA	102		25 - 150				10/30/17 16:30	11/03/17 05:45	1
13C2 PFUnA	98		25 - 150				10/30/17 16:30	11/03/17 05:45	1
13C2 PFDoA	96		25 - 150				10/30/17 16:30	11/03/17 05:45	1
13C2-PFTeDA	99		25 - 150				10/30/17 16:30	11/03/17 05:45	1
13C2-PFHxDA	97		25 - 150				10/30/17 16:30	11/03/17 05:45	1
13C3-PFBS	112		25 - 150				10/30/17 16:30	11/03/17 05:45	1

TestAmerica Sacramento

Client Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Client Sample ID: CECRL-17

Date Collected: 10/18/17 10:45

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-14

Matrix: Water

Method: 537 (modified) - Perfluorinated Hydrocarbons (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
18O2 PFHxS	109		25 - 150	10/30/17 16:30	11/03/17 05:45	1
13C4 PFOS	100		25 - 150	10/30/17 16:30	11/03/17 05:45	1
13C4-PFHpa	109		25 - 150	10/30/17 16:30	11/03/17 05:45	1
13C5 PFPeA	100		25 - 150	10/30/17 16:30	11/03/17 05:45	1
M2-6:2FTS	85		25 - 150	10/30/17 16:30	11/03/17 05:45	1
d5-NEtFOSAA	106		25 - 150	10/30/17 16:30	11/03/17 05:45	1
d3-NMeFOSAA	105		25 - 150	10/30/17 16:30	11/03/17 05:45	1
M2-8:2FTS	110		25 - 150	10/30/17 16:30	11/03/17 05:45	1

Client Sample ID: CECRL-19

Date Collected: 10/18/17 15:40

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-15

Matrix: Water

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
N-EtFOSA-M	50	U	100	13	ug/L		11/06/17 14:44	11/09/17 07:17	1
Perfluorobutanoic acid (PFBA)	0.00083	U	0.0017	0.00029	ug/L		10/30/17 16:30	11/03/17 05:53	1
MeFOSA	50	U	100	22	ug/L		11/06/17 14:44	11/09/17 07:17	1
Perfluoropentanoic acid (PFPeA)	0.00083	U	0.0017	0.00041	ug/L		10/30/17 16:30	11/03/17 05:53	1
Perfluorohexanoic acid (PFHxA)	0.0017	U	0.0033	0.00048	ug/L		10/30/17 16:30	11/03/17 05:53	1
Perfluoroheptanoic acid (PFHpA)	0.00083	U	0.0017	0.00021	ug/L		10/30/17 16:30	11/03/17 05:53	1
Perfluorooctanoic acid (PFOA)	0.0017	U M	0.0033	0.00071	ug/L		10/30/17 16:30	11/03/17 05:53	1
Perfluorononanoic acid (PFNA)	0.00083	U	0.0017	0.00022	ug/L		10/30/17 16:30	11/03/17 05:53	1
Perfluorodecanoic acid (PFDA)	0.00083	U	0.0017	0.00026	ug/L		10/30/17 16:30	11/03/17 05:53	1
Perfluoroundecanoic acid (PFUnA)	0.0025	U	0.0033	0.00091	ug/L		10/30/17 16:30	11/03/17 05:53	1
Perfluorododecanoic acid (PFDoA)	0.0017	U	0.0033	0.00046	ug/L		10/30/17 16:30	11/03/17 05:53	1
Perfluorotridecanoic Acid (PFTriA)	0.0025	U	0.0033	0.0011	ug/L		10/30/17 16:30	11/03/17 05:53	1
Perfluorotetradecanoic acid (PFTeA)	0.00083	U	0.0017	0.00024	ug/L		10/30/17 16:30	11/03/17 05:53	1
Perfluorobutanesulfonic acid (PFBS)	0.00083	U	0.0017	0.00025	ug/L		10/30/17 16:30	11/03/17 05:53	1
Perfluorohexanesulfonic acid (PFHxS)	0.00083	U	0.0017	0.00025	ug/L		10/30/17 16:30	11/03/17 05:53	1
Perfluoroheptanesulfonic Acid (PFHpS)	0.00083	U	0.0017	0.00025	ug/L		10/30/17 16:30	11/03/17 05:53	1
Perfluorooctanesulfonic acid (PFOS)	0.0017	U	0.0033	0.00045	ug/L		10/30/17 16:30	11/03/17 05:53	1
Perfluorodecanesulfonic acid (PFDS)	0.00083	U	0.0017	0.00027	ug/L		10/30/17 16:30	11/03/17 05:53	1
Perfluorooctane Sulfonamide (FOSA)	0.0013	J	0.0017	0.00029	ug/L		10/30/17 16:30	11/03/17 05:53	1
6:2FTS	0.0083	U	0.017	0.0025	ug/L		10/30/17 16:30	11/03/17 05:53	1
8:2FTS	0.0083	U	0.017	0.0025	ug/L		10/30/17 16:30	11/03/17 05:53	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.0083	U	0.017	0.0026	ug/L		10/30/17 16:30	11/03/17 05:53	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.0083	U	0.017	0.0025	ug/L		10/30/17 16:30	11/03/17 05:53	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
d-N-MeFOSA-M	80		25 - 150				11/06/17 14:44	11/09/17 07:17	1
d-N-EtFOSA-M	81		25 - 150				11/06/17 14:44	11/09/17 07:17	1
13C8 FOSA	100		25 - 150				10/30/17 16:30	11/03/17 05:53	1
13C4 PFBA	101	M	25 - 150				10/30/17 16:30	11/03/17 05:53	1
13C2 PFHxA	104		25 - 150				10/30/17 16:30	11/03/17 05:53	1
13C4 PFOA	91		25 - 150				10/30/17 16:30	11/03/17 05:53	1
13C5 PFNA	108		25 - 150				10/30/17 16:30	11/03/17 05:53	1

TestAmerica Sacramento

Client Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Client Sample ID: CECRL-19

Date Collected: 10/18/17 15:40

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-15

Matrix: Water

Method: 537 (modified) - Perfluorinated Hydrocarbons (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C2 PFDA	103		25 - 150	10/30/17 16:30	11/03/17 05:53	1
13C2 PFUnA	105		25 - 150	10/30/17 16:30	11/03/17 05:53	1
13C2 PFDoA	93		25 - 150	10/30/17 16:30	11/03/17 05:53	1
13C2-PFTeDA	104		25 - 150	10/30/17 16:30	11/03/17 05:53	1
13C2-PFHxDA	103		25 - 150	10/30/17 16:30	11/03/17 05:53	1
13C3-PFBS	104		25 - 150	10/30/17 16:30	11/03/17 05:53	1
18O2 PFHxS	105		25 - 150	10/30/17 16:30	11/03/17 05:53	1
13C4 PFOS	100		25 - 150	10/30/17 16:30	11/03/17 05:53	1
13C4-PFHpA	110		25 - 150	10/30/17 16:30	11/03/17 05:53	1
13C5 PFPeA	101		25 - 150	10/30/17 16:30	11/03/17 05:53	1
M2-6:2FTS	69		25 - 150	10/30/17 16:30	11/03/17 05:53	1
d5-NEtFOSAA	115		25 - 150	10/30/17 16:30	11/03/17 05:53	1
d3-NMeFOSAA	107		25 - 150	10/30/17 16:30	11/03/17 05:53	1
M2-8:2FTS	113		25 - 150	10/30/17 16:30	11/03/17 05:53	1

Client Sample ID: MW-14-107

Date Collected: 10/18/17 13:30

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-16

Matrix: Water

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
N-EtFOSA-M	50	U	100	13	ug/L		11/06/17 14:44	11/09/17 07:24	1
Perfluorobutanoic acid (PFBA)	0.0044		0.0018	0.00031	ug/L		10/30/17 16:30	11/03/17 06:01	1
MeFOSA	50	U	100	22	ug/L		11/06/17 14:44	11/09/17 07:24	1
Perfluoropentanoic acid (PFPeA)	0.021	M	0.0018	0.00043	ug/L		10/30/17 16:30	11/03/17 06:01	1
Perfluorohexanoic acid (PFHxA)	0.023		0.0035	0.00051	ug/L		10/30/17 16:30	11/03/17 06:01	1
Perfluoroheptanoic acid (PFHpA)	0.00089	U	0.0018	0.00022	ug/L		10/30/17 16:30	11/03/17 06:01	1
Perfluorooctanoic acid (PFOA)	0.0018	U	0.0035	0.00075	ug/L		10/30/17 16:30	11/03/17 06:01	1
Perfluorononanoic acid (PFNA)	0.00089	U	0.0018	0.00024	ug/L		10/30/17 16:30	11/03/17 06:01	1
Perfluorodecanoic acid (PFDA)	0.00089	U	0.0018	0.00027	ug/L		10/30/17 16:30	11/03/17 06:01	1
Perfluoroundecanoic acid (PFUnA)	0.0027	U	0.0035	0.00098	ug/L		10/30/17 16:30	11/03/17 06:01	1
Perfluorododecanoic acid (PFDoA)	0.0018	U	0.0035	0.00049	ug/L		10/30/17 16:30	11/03/17 06:01	1
Perfluorotridecanoic Acid (PFTriA)	0.0027	U	0.0035	0.0012	ug/L		10/30/17 16:30	11/03/17 06:01	1
Perfluorotetradecanoic acid (PFTeA)	0.00089	U	0.0018	0.00026	ug/L		10/30/17 16:30	11/03/17 06:01	1
Perfluorobutanesulfonic acid (PFBS)	0.0021	M	0.0018	0.00027	ug/L		10/30/17 16:30	11/03/17 06:01	1
Perfluorohexanesulfonic acid (PFHxS)	0.00027	J	0.0018	0.00027	ug/L		10/30/17 16:30	11/03/17 06:01	1
Perfluoroheptanesulfonic Acid (PFHpS)	0.00089	U	0.0018	0.00027	ug/L		10/30/17 16:30	11/03/17 06:01	1
Perfluorooctanesulfonic acid (PFOS)	0.0018	U	0.0035	0.00048	ug/L		10/30/17 16:30	11/03/17 06:01	1
Perfluorodecanesulfonic acid (PFDS)	0.00089	U	0.0018	0.00028	ug/L		10/30/17 16:30	11/03/17 06:01	1
Perfluorooctane Sulfonamide (FOSA)	0.00037	J	0.0018	0.00031	ug/L		10/30/17 16:30	11/03/17 06:01	1
6:2FTS	0.0089	U	0.018	0.0027	ug/L		10/30/17 16:30	11/03/17 06:01	1
8:2FTS	0.0089	U	0.018	0.0027	ug/L		10/30/17 16:30	11/03/17 06:01	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.0089	U	0.018	0.0027	ug/L		10/30/17 16:30	11/03/17 06:01	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.0089	U	0.018	0.0027	ug/L		10/30/17 16:30	11/03/17 06:01	1

TestAmerica Sacramento

Client Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Client Sample ID: MW-14-107

Date Collected: 10/18/17 13:30

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-16

Matrix: Water

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
d-N-MeFOSA-M	66		25 - 150	11/06/17 14:44	11/09/17 07:24	1
d-N-EtFOSA-M	67		25 - 150	11/06/17 14:44	11/09/17 07:24	1
13C8 FOSA	103		25 - 150	10/30/17 16:30	11/03/17 06:01	1
13C4 PFBA	94		25 - 150	10/30/17 16:30	11/03/17 06:01	1
13C2 PFHxA	106		25 - 150	10/30/17 16:30	11/03/17 06:01	1
13C4 PFOA	97		25 - 150	10/30/17 16:30	11/03/17 06:01	1
13C5 PFNA	108		25 - 150	10/30/17 16:30	11/03/17 06:01	1
13C2 PFDA	107		25 - 150	10/30/17 16:30	11/03/17 06:01	1
13C2 PFUnA	112		25 - 150	10/30/17 16:30	11/03/17 06:01	1
13C2 PFDaA	101		25 - 150	10/30/17 16:30	11/03/17 06:01	1
13C2-PFTeDA	110		25 - 150	10/30/17 16:30	11/03/17 06:01	1
13C2-PFHxDA	106		25 - 150	10/30/17 16:30	11/03/17 06:01	1
13C3-PFBS	111		25 - 150	10/30/17 16:30	11/03/17 06:01	1
18O2 PFHxS	107		25 - 150	10/30/17 16:30	11/03/17 06:01	1
13C4 PFOS	101		25 - 150	10/30/17 16:30	11/03/17 06:01	1
13C4-PFHpA	110		25 - 150	10/30/17 16:30	11/03/17 06:01	1
13C5 PFPeA	106		25 - 150	10/30/17 16:30	11/03/17 06:01	1
M2-6:2FTS	73		25 - 150	10/30/17 16:30	11/03/17 06:01	1
d5-NEtFOSAA	119		25 - 150	10/30/17 16:30	11/03/17 06:01	1
d3-NMeFOSAA	107		25 - 150	10/30/17 16:30	11/03/17 06:01	1
M2-8:2FTS	115		25 - 150	10/30/17 16:30	11/03/17 06:01	1

Client Sample ID: CECRL-20

Date Collected: 10/18/17 10:20

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-17

Matrix: Water

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
N-EtFOSA-M	50	U	100	13	ug/L		11/06/17 14:44	11/09/17 07:40	1
Perfluorobutanoic acid (PFBA)	0.00083	U M	0.0017	0.00029	ug/L		10/30/17 16:30	11/03/17 06:16	1
MeFOSA	50	U	100	22	ug/L		11/06/17 14:44	11/09/17 07:40	1
Perfluoropentanoic acid (PFPeA)	0.00083	U	0.0017	0.00041	ug/L		10/30/17 16:30	11/03/17 06:16	1
Perfluorohexanoic acid (PFHxA)	0.0017	U	0.0033	0.00048	ug/L		10/30/17 16:30	11/03/17 06:16	1
Perfluoroheptanoic acid (PFHpA)	0.00083	U	0.0017	0.00021	ug/L		10/30/17 16:30	11/03/17 06:16	1
Perfluorooctanoic acid (PFOA)	0.0017	U	0.0033	0.00070	ug/L		10/30/17 16:30	11/03/17 06:16	1
Perfluorononanoic acid (PFNA)	0.00083	U	0.0017	0.00022	ug/L		10/30/17 16:30	11/03/17 06:16	1
Perfluorodecanoic acid (PFDA)	0.00083	U	0.0017	0.00026	ug/L		10/30/17 16:30	11/03/17 06:16	1
Perfluoroundecanoic acid (PFUnA)	0.0025	U	0.0033	0.00091	ug/L		10/30/17 16:30	11/03/17 06:16	1
Perfluorododecanoic acid (PFDaA)	0.0017	U	0.0033	0.00046	ug/L		10/30/17 16:30	11/03/17 06:16	1
Perfluorotridecanoic Acid (PFTriA)	0.0025	U	0.0033	0.0011	ug/L		10/30/17 16:30	11/03/17 06:16	1
Perfluorotetradecanoic acid (PFTeA)	0.00083	U	0.0017	0.00024	ug/L		10/30/17 16:30	11/03/17 06:16	1
Perfluorobutanesulfonic acid (PFBS)	0.00083	U	0.0017	0.00025	ug/L		10/30/17 16:30	11/03/17 06:16	1
Perfluorohexanesulfonic acid (PFHxS)	0.00083	U	0.0017	0.00025	ug/L		10/30/17 16:30	11/03/17 06:16	1
Perfluoroheptanesulfonic Acid (PFHpS)	0.00083	U	0.0017	0.00025	ug/L		10/30/17 16:30	11/03/17 06:16	1
Perfluorooctanesulfonic acid (PFOS)	0.0017	U	0.0033	0.00045	ug/L		10/30/17 16:30	11/03/17 06:16	1
Perfluorodecanesulfonic acid (PFDS)	0.00083	U	0.0017	0.00027	ug/L		10/30/17 16:30	11/03/17 06:16	1
Perfluorooctane Sulfonamide (FOSA)	0.00045	J	0.0017	0.00029	ug/L		10/30/17 16:30	11/03/17 06:16	1
6:2FTS	0.0083	U	0.017	0.0025	ug/L		10/30/17 16:30	11/03/17 06:16	1
8:2FTS	0.0083	U	0.017	0.0025	ug/L		10/30/17 16:30	11/03/17 06:16	1

TestAmerica Sacramento

Client Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Client Sample ID: CECRL-20

Lab Sample ID: 320-32527-17

Date Collected: 10/18/17 10:20

Matrix: Water

Date Received: 10/19/17 10:15

Method: 537 (modified) - Perfluorinated Hydrocarbons (Continued)

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.0083	U	0.017	0.0026	ug/L		10/30/17 16:30	11/03/17 06:16	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.0083	U	0.017	0.0025	ug/L		10/30/17 16:30	11/03/17 06:16	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
d-N-MeFOSA-M	72		25 - 150				11/06/17 14:44	11/09/17 07:40	1
d-N-EtFOSA-M	74		25 - 150				11/06/17 14:44	11/09/17 07:40	1
13C8 FOSA	107		25 - 150				10/30/17 16:30	11/03/17 06:16	1
13C4 PFBA	103		25 - 150				10/30/17 16:30	11/03/17 06:16	1
13C2 PFHxA	106		25 - 150				10/30/17 16:30	11/03/17 06:16	1
13C4 PFOA	94		25 - 150				10/30/17 16:30	11/03/17 06:16	1
13C5 PFNA	111		25 - 150				10/30/17 16:30	11/03/17 06:16	1
13C2 PFDA	113		25 - 150				10/30/17 16:30	11/03/17 06:16	1
13C2 PFUnA	110		25 - 150				10/30/17 16:30	11/03/17 06:16	1
13C2 PFDoA	108		25 - 150				10/30/17 16:30	11/03/17 06:16	1
13C2-PFTeDA	120		25 - 150				10/30/17 16:30	11/03/17 06:16	1
13C2-PFHxDA	109		25 - 150				10/30/17 16:30	11/03/17 06:16	1
13C3-PFBS	106		25 - 150				10/30/17 16:30	11/03/17 06:16	1
18O2 PFHxS	107		25 - 150				10/30/17 16:30	11/03/17 06:16	1
13C4 PFOS	104		25 - 150				10/30/17 16:30	11/03/17 06:16	1
13C4-PFHpA	115		25 - 150				10/30/17 16:30	11/03/17 06:16	1
13C5 PFPeA	108		25 - 150				10/30/17 16:30	11/03/17 06:16	1
M2-6:2FTS	70		25 - 150				10/30/17 16:30	11/03/17 06:16	1
d5-NEtFOSAA	118		25 - 150				10/30/17 16:30	11/03/17 06:16	1
d3-NMeFOSAA	122		25 - 150				10/30/17 16:30	11/03/17 06:16	1
M2-8:2FTS	119		25 - 150				10/30/17 16:30	11/03/17 06:16	1

TestAmerica Sacramento

Isotope Dilution Summary

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Method: 537 (modified) - Perfluorinated Hydrocarbons

Matrix: Water

Prep Type: Total/NA

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	3C8 FOS/ (25-150)	3C4 PFB/ (25-150)	3C2 PFHx (25-150)	3C4 PFO/ (25-150)	3C5 PFN/ (25-150)	3C2 PFD/ (25-150)	3C2 PFUn (25-150)	3C2 PFDo (25-150)
320-32527-1	FIELDBLK-17-001	92	86	110	94	110	108	114	102
320-32527-2	EQUIP-17-001	97	104 M	107	92	109	108	109	105
320-32527-3	EQUIP-17-002	98	100	107	94	111	108	113	100
320-32527-4	CECRL-01	99	96	103	90	102	102	102	92
320-32527-5	CECRL-01DUP	99	96	102	92	103	103	100	89
320-32527-6	CECRL-05	100	100	105	94	109	107	107	95
320-32527-7	CECRL-02	102	100	108	96	110	109	102	97
320-32527-8	CECRL-03	98	97	99	92	105	107	100	95
320-32527-8 MS	CECRL-03	101	103	105	95	112	110	107	104
320-32527-8 MSD	CECRL-03	95	100	104	91	108	105	101	92
320-32527-9	CECRL-04	99	99	106	94	106	108	102	95
320-32527-10	CECRL-12	97	99	101	91	104	107	104	94
320-32527-11	MW-14-103B	95	97	101	90	105	105	101	94
320-32527-12	CECRL-07	101	101	105	94	111	109	102	101
320-32527-13	MW-14-103A	107	103	107	97	114	113	133	107
320-32527-14	CECRL-17	93	71	100	94	108	102	98	96
320-32527-15	CECRL-19	100	101 M	104	91	108	103	105	93
320-32527-16	MW-14-107	103	94	106	97	108	107	112	101
320-32527-17	CECRL-20	107	103	106	94	111	113	110	108
LCS 320-191963/2-A	Lab Control Sample	96	99	105	96	107	111	111	103
MB 320-191963/1-A	Method Blank	92	97	103	93	105	106	107	97

		Percent Isotope Dilution Recovery (Acceptance Limits)							
Lab Sample ID	Client Sample ID	C2-PFTeI (25-150)	C2-PFHxI (25-150)	3C3-PFB/ (25-150)	3C2 PFHx (25-150)	3C4 PFO/ (25-150)	3C4-PFHp (25-150)	3C5 PFPe (25-150)	M2-6:2FTS (25-150)
320-32527-1	FIELDBLK-17-001	108	85	103	108	106	111	105	76
320-32527-2	EQUIP-17-001	102	99	109	107	106	111	105	69
320-32527-3	EQUIP-17-002	103	104	105	107	106	111	107	67
320-32527-4	CECRL-01	97	97	103	105	99	105	103	64
320-32527-5	CECRL-01DUP	94	101	104	103	98	110	106	66
320-32527-6	CECRL-05	101	102	103	108	101	109	107	69
320-32527-7	CECRL-02	104	103	104	107	102	107	109	67
320-32527-8	CECRL-03	100	107	103	108	99	109	106	66
320-32527-8 MS	CECRL-03	112	110	108	108	106	113	107	72
320-32527-8 MSD	CECRL-03	98	89	103	107	99	108	101	69
320-32527-9	CECRL-04	104	109	104	104	99	110	106	70
320-32527-10	CECRL-12	98	100	99	103	98	110	102	67
320-32527-11	MW-14-103B	90	81	94	102	99	106	99	68
320-32527-12	CECRL-07	96	96	107	108	102	111	103	73
320-32527-13	MW-14-103A	110	102	113	109	107	113	110	74
320-32527-14	CECRL-17	99	97	112	109	100	109	100	85
320-32527-15	CECRL-19	104	103	104	105	100	110	101	69
320-32527-16	MW-14-107	110	106	111	107	101	110	106	73
320-32527-17	CECRL-20	120	109	106	107	104	115	108	70
LCS 320-191963/2-A	Lab Control Sample	100	96	108	107	102	110	106	66
MB 320-191963/1-A	Method Blank	100	96	101	105	100	106	104	68

TestAmerica Sacramento

Isotope Dilution Summary

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Method: 537 (modified) - Perfluorinated Hydrocarbons (Continued)

Matrix: Water

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Isotope Dilution Recovery (Acceptance Limits)		
		-NEtFOS/ (25-150)	-NMeFOS/ (25-150)	M2-8:2FTS (25-150)
320-32527-1	FIELDDBLK-17-001	112	112	113
320-32527-2	EQUIP-17-001	113	116	115
320-32527-3	EQUIP-17-002	104	111	116
320-32527-4	CECRL-01	100	99	102
320-32527-5	CECRL-01DUP	95	97	105
320-32527-6	CECRL-05	108	103	112
320-32527-7	CECRL-02	106	103	110
320-32527-8	CECRL-03	109	103	105
320-32527-8 MS	CECRL-03	111	110	115
320-32527-8 MSD	CECRL-03	105	105	107
320-32527-9	CECRL-04	106	107	109
320-32527-10	CECRL-12	106	109	115
320-32527-11	MW-14-103B	107	106	110
320-32527-12	CECRL-07	112	109	118
320-32527-13	MW-14-103A	187 Q	136	145
320-32527-14	CECRL-17	106	105	110
320-32527-15	CECRL-19	115	107	113
320-32527-16	MW-14-107	119	107	115
320-32527-17	CECRL-20	118	122	119
LCS 320-191963/2-A	Lab Control Sample	106	109	112
MB 320-191963/1-A	Method Blank	98	101	109

Surrogate Legend

13C8 FOSA = 13C8 FOSA
 13C4 PFBA = 13C4 PFBA
 13C2 PFHxA = 13C2 PFHxA
 13C4 PFOA = 13C4 PFOA
 13C5 PFNA = 13C5 PFNA
 13C2 PFDA = 13C2 PFDA
 13C2 PFUnA = 13C2 PFUnA
 13C2 PFDaA = 13C2 PFDaA
 13C2-PFTeDA = 13C2-PFTeDA
 13C2-PFHxDA = 13C2-PFHxDA
 13C3-PFBS = 13C3-PFBS
 18O2 PFHxS = 18O2 PFHxS
 13C4 PFOS = 13C4 PFOS
 13C4-PFHpA = 13C4-PFHpA
 13C5 PFPeA = 13C5 PFPeA
 M2-6:2FTS = M2-6:2FTS
 d5-NEtFOSAA = d5-NEtFOSAA
 d3-NMeFOSAA = d3-NMeFOSAA
 M2-8:2FTS = M2-8:2FTS

Isotope Dilution Summary

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Method: 537 (modified) - Perfluorinated Hydrocarbons

Matrix: Water

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Isotope Dilution Recovery (Acceptance Limits)	
		I-MeFOSA (25-150)	N-EtFOSA (25-150)
320-32527-1	FIELDCLK-17-001	62	65
320-32527-2	EQUIP-17-001	63	63
320-32527-3	EQUIP-17-002	81	82
320-32527-4	CECRL-01	76	75
320-32527-5	CECRL-01DUP	78	79
320-32527-6	CECRL-05	79	85
320-32527-7	CECRL-02	71	74
320-32527-8	CECRL-03	65	71
320-32527-8 MS	CECRL-03	65	69
320-32527-8 MSD	CECRL-03	67	68
320-32527-9	CECRL-04	69	69
320-32527-10	CECRL-12	62	66
320-32527-11	MW-14-103B	69	72
320-32527-12	CECRL-07	70	74
320-32527-13	MW-14-103A	61	62
320-32527-14	CECRL-17	66	68
320-32527-15	CECRL-19	80	81
320-32527-16	MW-14-107	66	67
320-32527-17	CECRL-20	72	74
LCS 320-193097/2-A	Lab Control Sample	72	75
MB 320-193097/1-A	Method Blank	75	78

Surrogate Legend

d-N-MeFOSA-M = d-N-MeFOSA-M

d-N-EtFOSA-M = d-N-EtFOSA-M

QC Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Method: 537 (modified) - Perfluorinated Hydrocarbons

Lab Sample ID: MB 320-191963/1-A

Matrix: Water

Analysis Batch: 192697

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 191963

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	0.0010	U	0.0020	0.00035	ug/L		10/30/17 16:30	11/03/17 03:23	1
Perfluoropentanoic acid (PFPeA)	0.0010	U	0.0020	0.00049	ug/L		10/30/17 16:30	11/03/17 03:23	1
Perfluorohexanoic acid (PFHxA)	0.0020	U	0.0040	0.00058	ug/L		10/30/17 16:30	11/03/17 03:23	1
Perfluoroheptanoic acid (PFHpA)	0.0010	U	0.0020	0.00025	ug/L		10/30/17 16:30	11/03/17 03:23	1
Perfluorooctanoic acid (PFOA)	0.0020	U	0.0040	0.00085	ug/L		10/30/17 16:30	11/03/17 03:23	1
Perfluorononanoic acid (PFNA)	0.0010	U	0.0020	0.00027	ug/L		10/30/17 16:30	11/03/17 03:23	1
Perfluorodecanoic acid (PFDA)	0.0010	U	0.0020	0.00031	ug/L		10/30/17 16:30	11/03/17 03:23	1
Perfluoroundecanoic acid (PFUnA)	0.0030	U	0.0040	0.0011	ug/L		10/30/17 16:30	11/03/17 03:23	1
Perfluorododecanoic acid (PFDoA)	0.0020	U	0.0040	0.00055	ug/L		10/30/17 16:30	11/03/17 03:23	1
Perfluorotridecanoic Acid (PFTriA)	0.0030	U	0.0040	0.0013	ug/L		10/30/17 16:30	11/03/17 03:23	1
Perfluorotetradecanoic acid (PFTeA)	0.000418	J	0.0020	0.00029	ug/L		10/30/17 16:30	11/03/17 03:23	1
Perfluorobutanesulfonic acid (PFBS)	0.0010	U	0.0020	0.00030	ug/L		10/30/17 16:30	11/03/17 03:23	1
Perfluorohexanesulfonic acid (PFHxS)	0.0010	U	0.0020	0.00030	ug/L		10/30/17 16:30	11/03/17 03:23	1
Perfluoroheptanesulfonic Acid (PFHpS)	0.0010	U	0.0020	0.00030	ug/L		10/30/17 16:30	11/03/17 03:23	1
Perfluorooctanesulfonic acid (PFOS)	0.0020	U	0.0040	0.00054	ug/L		10/30/17 16:30	11/03/17 03:23	1
Perfluorodecanesulfonic acid (PFDS)	0.0010	U	0.0020	0.00032	ug/L		10/30/17 16:30	11/03/17 03:23	1
Perfluorooctane Sulfonamide (FOSA)	0.0010	U	0.0020	0.00035	ug/L		10/30/17 16:30	11/03/17 03:23	1
6:2FTS	0.010	U	0.020	0.0030	ug/L		10/30/17 16:30	11/03/17 03:23	1
8:2FTS	0.010	U	0.020	0.0030	ug/L		10/30/17 16:30	11/03/17 03:23	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.010	U	0.020	0.0031	ug/L		10/30/17 16:30	11/03/17 03:23	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.010	U	0.020	0.0030	ug/L		10/30/17 16:30	11/03/17 03:23	1

Isotope Dilution	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C8 FOSA	92		25 - 150	10/30/17 16:30	11/03/17 03:23	1
13C4 PFBA	97		25 - 150	10/30/17 16:30	11/03/17 03:23	1
13C2 PFHxA	103		25 - 150	10/30/17 16:30	11/03/17 03:23	1
13C4 PFOA	93		25 - 150	10/30/17 16:30	11/03/17 03:23	1
13C5 PFNA	105		25 - 150	10/30/17 16:30	11/03/17 03:23	1
13C2 PFDA	106		25 - 150	10/30/17 16:30	11/03/17 03:23	1
13C2 PFUnA	107		25 - 150	10/30/17 16:30	11/03/17 03:23	1
13C2 PFDoA	97		25 - 150	10/30/17 16:30	11/03/17 03:23	1
13C2-PFTeDA	100		25 - 150	10/30/17 16:30	11/03/17 03:23	1
13C2-PFHxDA	96		25 - 150	10/30/17 16:30	11/03/17 03:23	1
13C3-PFBS	101		25 - 150	10/30/17 16:30	11/03/17 03:23	1
18O2 PFHxS	105		25 - 150	10/30/17 16:30	11/03/17 03:23	1
13C4 PFOS	100		25 - 150	10/30/17 16:30	11/03/17 03:23	1
13C4-PFHpA	106		25 - 150	10/30/17 16:30	11/03/17 03:23	1
13C5 PFPeA	104		25 - 150	10/30/17 16:30	11/03/17 03:23	1
M2-6:2FTS	68		25 - 150	10/30/17 16:30	11/03/17 03:23	1
d5-NEtFOSAA	98		25 - 150	10/30/17 16:30	11/03/17 03:23	1
d3-NMeFOSAA	101		25 - 150	10/30/17 16:30	11/03/17 03:23	1
M2-8:2FTS	109		25 - 150	10/30/17 16:30	11/03/17 03:23	1

TestAmerica Sacramento

QC Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Method: 537 (modified) - Perfluorinated Hydrocarbons (Continued)

Lab Sample ID: LCS 320-191963/2-A

Matrix: Water

Analysis Batch: 192697

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 191963

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Perfluorobutanoic acid (PFBA)	0.0400	0.0401		ug/L		100	89 - 128
Perfluoropentanoic acid (PFPeA)	0.0400	0.0400		ug/L		100	66 - 136
Perfluorohexanoic acid (PFHxA)	0.0400	0.0409		ug/L		102	86 - 126
Perfluoroheptanoic acid (PFHpA)	0.0400	0.0393		ug/L		98	89 - 127
Perfluorooctanoic acid (PFOA)	0.0400	0.0395		ug/L		99	80 - 120
Perfluorononanoic acid (PFNA)	0.0400	0.0408		ug/L		102	77 - 137
Perfluorodecanoic acid (PFDA)	0.0400	0.0413		ug/L		103	84 - 123
Perfluoroundecanoic acid (PFUnA)	0.0400	0.0379		ug/L		95	73 - 122
Perfluorododecanoic acid (PFDoA)	0.0400	0.0412		ug/L		103	82 - 122
Perfluorotridecanoic Acid (PFTriA)	0.0400	0.0397		ug/L		99	56 - 163
Perfluorotetradecanoic acid (PFTeA)	0.0400	0.0393		ug/L		98	66 - 120
Perfluorobutanesulfonic acid (PFBS)	0.0354	0.0357		ug/L		101	88 - 130
Perfluorohexanesulfonic acid (PFHxS)	0.0364	0.0350		ug/L		96	87 - 126
Perfluoroheptanesulfonic Acid (PFHpS)	0.0381	0.0405		ug/L		106	92 - 135
Perfluorooctanesulfonic acid (PFOS)	0.0371	0.0374		ug/L		101	83 - 126
Perfluorodecanesulfonic acid (PFDS)	0.0386	0.0384		ug/L		100	80 - 129
Perfluorooctane Sulfonamide (FOSA)	0.0400	0.0398		ug/L		100	91 - 133
6:2FTS	0.0379	0.0376		ug/L		99	90 - 135
8:2FTS	0.0383	0.0392		ug/L		102	88 - 132
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.0400	0.0401		ug/L		100	87 - 128
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.0400	0.0393		ug/L		98	86 - 132

Isotope Dilution	LCS LCS		Limits
	%Recovery	Qualifier	
13C8 FOSA	96		25 - 150
13C4 PFBA	99		25 - 150
13C2 PFHxA	105		25 - 150
13C4 PFOA	96		25 - 150
13C5 PFNA	107		25 - 150
13C2 PFDA	111		25 - 150
13C2 PFUnA	111		25 - 150
13C2 PFDoA	103		25 - 150
13C2-PFTeDA	100		25 - 150
13C2-PFHxDA	96		25 - 150
13C3-PFBS	108		25 - 150
18O2 PFHxS	107		25 - 150
13C4 PFOS	102		25 - 150
13C4-PFHpA	110		25 - 150

TestAmerica Sacramento

QC Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Method: 537 (modified) - Perfluorinated Hydrocarbons (Continued)

Lab Sample ID: LCS 320-191963/2-A

Matrix: Water

Analysis Batch: 192697

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 191963

Isotope Dilution	LCS %Recovery	LCS Qualifier	Limits
13C5 PFPeA	106		25 - 150
M2-6:2FTS	66		25 - 150
d5-NEtFOSAA	106		25 - 150
d3-NMeFOSAA	109		25 - 150
M2-8:2FTS	112		25 - 150

Lab Sample ID: 320-32527-8 MS

Matrix: Water

Analysis Batch: 192697

Client Sample ID: CECRL-03

Prep Type: Total/NA

Prep Batch: 191963

	Sample	Sample	Spike	MS	MS			%Rec.		
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Perfluorobutanoic acid (PFBA)	0.00036	J	0.0340	0.0332		ug/L		97	89 - 128	
Perfluoropentanoic acid (PFPeA)	0.00053	J M	0.0340	0.0349		ug/L		101	66 - 136	
Perfluorohexanoic acid (PFHxA)	0.0016	U	0.0340	0.0339		ug/L		100	86 - 126	
Perfluoroheptanoic acid (PFHpA)	0.00029	J	0.0340	0.0326		ug/L		95	89 - 127	
Perfluorooctanoic acid (PFOA)	0.0016	U M	0.0340	0.0345		ug/L		101	80 - 120	
Perfluorononanoic acid (PFNA)	0.00082	U	0.0340	0.0333		ug/L		98	77 - 137	
Perfluorodecanoic acid (PFDA)	0.00082	U	0.0340	0.0348		ug/L		102	84 - 123	
Perfluoroundecanoic acid (PFUnA)	0.0025	U	0.0340	0.0301		ug/L		89	73 - 122	
Perfluorododecanoic acid (PFDoA)	0.0016	U	0.0340	0.0352		ug/L		104	82 - 122	
Perfluorotridecanoic Acid (PFTriA)	0.0025	U	0.0340	0.0350		ug/L		103	56 - 163	
Perfluorotetradecanoic acid (PFTeA)	0.00082	U	0.0340	0.0325		ug/L		96	66 - 120	
Perfluorobutanesulfonic acid (PFBS)	0.00082	U M	0.0300	0.0305		ug/L		101	88 - 130	
Perfluorohexanesulfonic acid (PFHxS)	0.00030	J	0.0309	0.0289		ug/L		92	87 - 126	
Perfluoroheptanesulfonic Acid (PFHpS)	0.00082	U	0.0323	0.0324		ug/L		100	92 - 135	
Perfluorooctanesulfonic acid (PFOS)	0.0016	U	0.0315	0.0301		ug/L		95	83 - 126	
Perfluorodecanesulfonic acid (PFDS)	0.00082	U	0.0328	0.0307		ug/L		94	80 - 129	
Perfluorooctane Sulfonamide (FOSA)	0.0044		0.0340	0.0415		ug/L		109	91 - 133	
6:2FTS	0.0082	U	0.0322	0.0302		ug/L		94	90 - 135	
8:2FTS	0.0082	U	0.0326	0.0312		ug/L		96	88 - 132	
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.0082	U	0.0340	0.0337		ug/L		99	87 - 128	
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.0082	U	0.0340	0.0332		ug/L		98	86 - 132	
	MS	MS								
Isotope Dilution	%Recovery	Qualifier	Limits							
13C8 FOSA	101		25 - 150							
13C4 PFBA	103		25 - 150							
13C2 PFHxA	105		25 - 150							
13C4 PFOA	95		25 - 150							

TestAmerica Sacramento

QC Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Method: 537 (modified) - Perfluorinated Hydrocarbons (Continued)

Lab Sample ID: 320-32527-8 MS

Matrix: Water

Analysis Batch: 192697

Client Sample ID: CECRL-03

Prep Type: Total/NA

Prep Batch: 191963

Isotope Dilution	MS %Recovery	MS Qualifier	Limits
13C5 PFNA	112		25 - 150
13C2 PFDA	110		25 - 150
13C2 PFUnA	107		25 - 150
13C2 PFDoA	104		25 - 150
13C2-PFTeDA	112		25 - 150
13C2-PFHxDA	110		25 - 150
13C3-PFBS	108		25 - 150
18O2 PFHxS	108		25 - 150
13C4 PFOS	106		25 - 150
13C4-PFHpA	113		25 - 150
13C5 PFPeA	107		25 - 150
M2-6:2FTS	72		25 - 150
d5-NEtFOSAA	111		25 - 150
d3-NMeFOSAA	110		25 - 150
M2-8:2FTS	115		25 - 150

Lab Sample ID: 320-32527-8 MSD

Matrix: Water

Analysis Batch: 192697

Client Sample ID: CECRL-03

Prep Type: Total/NA

Prep Batch: 191963

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Perfluorobutanoic acid (PFBA)	0.00036	J	0.0339	0.0340	M	ug/L		99	89 - 128	2	30
Perfluoropentanoic acid (PFPeA)	0.00053	J M	0.0339	0.0348		ug/L		101	66 - 136	0	30
Perfluorohexanoic acid (PFHxA)	0.0016	U	0.0339	0.0341		ug/L		101	86 - 126	0	30
Perfluoroheptanoic acid (PFHpA)	0.00029	J	0.0339	0.0335		ug/L		98	89 - 127	3	30
Perfluorooctanoic acid (PFOA)	0.0016	U M	0.0339	0.0350		ug/L		103	80 - 120	2	30
Perfluorononanoic acid (PFNA)	0.00082	U	0.0339	0.0330		ug/L		97	77 - 137	1	30
Perfluorodecanoic acid (PFDA)	0.00082	U	0.0339	0.0344		ug/L		101	84 - 123	1	30
Perfluoroundecanoic acid (PFUnA)	0.0025	U	0.0339	0.0312		ug/L		92	73 - 122	4	30
Perfluorododecanoic acid (PFDoA)	0.0016	U	0.0339	0.0363		ug/L		107	82 - 122	3	30
Perfluorotridecanoic Acid (PFTriA)	0.0025	U	0.0339	0.0350		ug/L		103	56 - 163	0	30
Perfluorotetradecanoic acid (PFTeA)	0.00082	U	0.0339	0.0337		ug/L		99	66 - 120	3	30
Perfluorobutanesulfonic acid (PFBS)	0.00082	U M	0.0299	0.0307		ug/L		103	88 - 130	1	30
Perfluorohexanesulfonic acid (PFHxS)	0.00030	J	0.0308	0.0286		ug/L		92	87 - 126	1	30
Perfluoroheptanesulfonic Acid (PFHpS)	0.00082	U	0.0322	0.0338		ug/L		105	92 - 135	4	30
Perfluorooctanesulfonic acid (PFOS)	0.0016	U	0.0314	0.0307		ug/L		98	83 - 126	2	30
Perfluorodecanesulfonic acid (PFDS)	0.00082	U	0.0326	0.0304		ug/L		93	80 - 129	1	30
Perfluorooctane Sulfonamide (FOSA)	0.0044		0.0339	0.0411		ug/L		108	91 - 133	1	30
6:2FTS	0.0082	U	0.0321	0.0313		ug/L		98	90 - 135	4	30
8:2FTS	0.0082	U	0.0324	0.0324		ug/L		100	88 - 132	4	30

TestAmerica Sacramento

QC Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Method: 537 (modified) - Perfluorinated Hydrocarbons (Continued)

Lab Sample ID: 320-32527-8 MSD

Matrix: Water

Analysis Batch: 192697

Client Sample ID: CECRL-03

Prep Type: Total/NA

Prep Batch: 191963

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.0082	U	0.0339	0.0325		ug/L		96	87 - 128	4	30
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.0082	U	0.0339	0.0316		ug/L		93	86 - 132	5	30

Isotope Dilution	MSD %Recovery	MSD Qualifier	Limits
13C8 FOSA	95		25 - 150
13C4 PFBA	100		25 - 150
13C2 PFHxA	104		25 - 150
13C4 PFOA	91		25 - 150
13C5 PFNA	108		25 - 150
13C2 PFDA	105		25 - 150
13C2 PFUnA	101		25 - 150
13C2 PFDaA	92		25 - 150
13C2-PFTeDA	98		25 - 150
13C2-PFHxDA	89		25 - 150
13C3-PFBS	103		25 - 150
18O2 PFHxS	107		25 - 150
13C4 PFOS	99		25 - 150
13C4-PFHpA	108		25 - 150
13C5 PFPeA	101		25 - 150
M2-6:2FTS	69		25 - 150
d5-NEtFOSAA	105		25 - 150
d3-NMeFOSAA	105		25 - 150
M2-8:2FTS	107		25 - 150

Lab Sample ID: MB 320-193097/1-A

Matrix: Water

Analysis Batch: 193797

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 193097

Top Label: 100001									
Analyte	MB	MB	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
	Result	Qualifier							
N-EtFOSA-M	50	U	100	13	ug/L		11/06/17 14:44	11/09/17 04:47	1
MeFOSA	50	U	100	22	ug/L		11/06/17 14:44	11/09/17 04:47	1
Isotope Dilution	MB	MB	Limits				Prepared	Analyzed	Dil Fac
	%Recovery	Qualifier							
d-N-MeFOSA-M	75		25 - 150				11/06/17 14:44	11/09/17 04:47	1
d-N-EtFOSA-M	78		25 - 150				11/06/17 14:44	11/09/17 04:47	1

Lab Sample ID: LCS 320-193097/2-A

Matrix: Water

Analysis Batch: 193797

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 193097

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
N-EtFOSA-M	25.0	25.4	J	ug/L		102	60 - 140
MeFOSA	25.0	25.2	J	ug/L		101	60 - 140

TestAmerica Sacramento

QC Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

	LCS	LCS	
Isotope Dilution	%Recovery	Qualifier	Limits
d-N-MeFOSA-M	72		25 - 150
d-N-EtFOSA-M	75		25 - 150

Lab Sample ID: 320-32527-8 MS

Matrix: Water

Analysis Batch: 193797

Client Sample ID: CECRL-03

Prep Type: Total/NA

Prep Batch: 193097

	Sample	Sample	Spike	MS	MS					
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
N-EtFOSA-M	50	U	25.0	24.7	J	ug/L		99	60 - 140	
MeFOSA	50	U	25.0	25.3	J	ug/L		101	60 - 140	

	MS	MS	
Isotope Dilution	%Recovery	Qualifier	Limits
d-N-MeFOSA-M	65		25 - 150
d-N-EtFOSA-M	69		25 - 150

Lab Sample ID: 320-32527-8 MSD

Matrix: Water

Analysis Batch: 193797

Client Sample ID: CECRL-03

Prep Type: Total/NA

Prep Batch: 193097

	Sample	Sample	Spike	MSD	MSD						
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
N-EtFOSA-M	50	U	25.0	25.1	J	ug/L		101	60 - 140	2	30
MeFOSA	50	U	25.0	24.3	J	ug/L		97	60 - 140	4	30

	MSD	MSD	
Isotope Dilution	%Recovery	Qualifier	Limits
d-N-MeFOSA-M	67		25 - 150
d-N-EtFOSA-M	68		25 - 150

TestAmerica Sacramento

QC Association Summary

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

LCMS

Prep Batch: 191963

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-32527-1	FIELDCLK-17-001	Total/NA	Water	3535	
320-32527-2	EQUIP-17-001	Total/NA	Water	3535	
320-32527-3	EQUIP-17-002	Total/NA	Water	3535	
320-32527-4	CECRL-01	Total/NA	Water	3535	
320-32527-5	CECRL-01DUP	Total/NA	Water	3535	
320-32527-6	CECRL-05	Total/NA	Water	3535	
320-32527-7	CECRL-02	Total/NA	Water	3535	
320-32527-8	CECRL-03	Total/NA	Water	3535	
320-32527-9	CECRL-04	Total/NA	Water	3535	
320-32527-10	CECRL-12	Total/NA	Water	3535	
320-32527-11	MW-14-103B	Total/NA	Water	3535	
320-32527-12	CECRL-07	Total/NA	Water	3535	
320-32527-13	MW-14-103A	Total/NA	Water	3535	
320-32527-14	CECRL-17	Total/NA	Water	3535	
320-32527-15	CECRL-19	Total/NA	Water	3535	
320-32527-16	MW-14-107	Total/NA	Water	3535	
320-32527-17	CECRL-20	Total/NA	Water	3535	
MB 320-191963/1-A	Method Blank	Total/NA	Water	3535	
LCS 320-191963/2-A	Lab Control Sample	Total/NA	Water	3535	
320-32527-8 MS	CECRL-03	Total/NA	Water	3535	
320-32527-8 MSD	CECRL-03	Total/NA	Water	3535	

Analysis Batch: 192697

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-32527-1	FIELDCLK-17-001	Total/NA	Water	537 (modified)	191963
320-32527-2	EQUIP-17-001	Total/NA	Water	537 (modified)	191963
320-32527-3	EQUIP-17-002	Total/NA	Water	537 (modified)	191963
320-32527-4	CECRL-01	Total/NA	Water	537 (modified)	191963
320-32527-5	CECRL-01DUP	Total/NA	Water	537 (modified)	191963
320-32527-6	CECRL-05	Total/NA	Water	537 (modified)	191963
320-32527-7	CECRL-02	Total/NA	Water	537 (modified)	191963
320-32527-8	CECRL-03	Total/NA	Water	537 (modified)	191963
320-32527-9	CECRL-04	Total/NA	Water	537 (modified)	191963
320-32527-10	CECRL-12	Total/NA	Water	537 (modified)	191963
320-32527-11	MW-14-103B	Total/NA	Water	537 (modified)	191963
320-32527-12	CECRL-07	Total/NA	Water	537 (modified)	191963
320-32527-13	MW-14-103A	Total/NA	Water	537 (modified)	191963
320-32527-14	CECRL-17	Total/NA	Water	537 (modified)	191963
320-32527-15	CECRL-19	Total/NA	Water	537 (modified)	191963
320-32527-16	MW-14-107	Total/NA	Water	537 (modified)	191963
320-32527-17	CECRL-20	Total/NA	Water	537 (modified)	191963
MB 320-191963/1-A	Method Blank	Total/NA	Water	537 (modified)	191963
LCS 320-191963/2-A	Lab Control Sample	Total/NA	Water	537 (modified)	191963
320-32527-8 MS	CECRL-03	Total/NA	Water	537 (modified)	191963
320-32527-8 MSD	CECRL-03	Total/NA	Water	537 (modified)	191963

Prep Batch: 193097

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-32527-1	FIELDCLK-17-001	Total/NA	Water	Filtration	
320-32527-2	EQUIP-17-001	Total/NA	Water	Filtration	
320-32527-3	EQUIP-17-002	Total/NA	Water	Filtration	

TestAmerica Sacramento

QC Association Summary

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

LCMS (Continued)

Prep Batch: 193097 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-32527-4	CECRL-01	Total/NA	Water	Filtration	
320-32527-5	CECRL-01DUP	Total/NA	Water	Filtration	
320-32527-6	CECRL-05	Total/NA	Water	Filtration	
320-32527-7	CECRL-02	Total/NA	Water	Filtration	
320-32527-8	CECRL-03	Total/NA	Water	Filtration	
320-32527-9	CECRL-04	Total/NA	Water	Filtration	
320-32527-10	CECRL-12	Total/NA	Water	Filtration	
320-32527-11	MW-14-103B	Total/NA	Water	Filtration	
320-32527-12	CECRL-07	Total/NA	Water	Filtration	
320-32527-13	MW-14-103A	Total/NA	Water	Filtration	
320-32527-14	CECRL-17	Total/NA	Water	Filtration	
320-32527-15	CECRL-19	Total/NA	Water	Filtration	
320-32527-16	MW-14-107	Total/NA	Water	Filtration	
320-32527-17	CECRL-20	Total/NA	Water	Filtration	
MB 320-193097/1-A	Method Blank	Total/NA	Water	Filtration	
LCS 320-193097/2-A	Lab Control Sample	Total/NA	Water	Filtration	
320-32527-8 MS	CECRL-03	Total/NA	Water	Filtration	
320-32527-8 MSD	CECRL-03	Total/NA	Water	Filtration	

Analysis Batch: 193797

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-32527-1	FIELDCLK-17-001	Total/NA	Water	537 (modified)	193097
320-32527-2	EQUIP-17-001	Total/NA	Water	537 (modified)	193097
320-32527-3	EQUIP-17-002	Total/NA	Water	537 (modified)	193097
320-32527-4	CECRL-01	Total/NA	Water	537 (modified)	193097
320-32527-5	CECRL-01DUP	Total/NA	Water	537 (modified)	193097
320-32527-6	CECRL-05	Total/NA	Water	537 (modified)	193097
320-32527-7	CECRL-02	Total/NA	Water	537 (modified)	193097
320-32527-8	CECRL-03	Total/NA	Water	537 (modified)	193097
320-32527-9	CECRL-04	Total/NA	Water	537 (modified)	193097
320-32527-10	CECRL-12	Total/NA	Water	537 (modified)	193097
320-32527-11	MW-14-103B	Total/NA	Water	537 (modified)	193097
320-32527-12	CECRL-07	Total/NA	Water	537 (modified)	193097
320-32527-13	MW-14-103A	Total/NA	Water	537 (modified)	193097
320-32527-14	CECRL-17	Total/NA	Water	537 (modified)	193097
320-32527-15	CECRL-19	Total/NA	Water	537 (modified)	193097
320-32527-16	MW-14-107	Total/NA	Water	537 (modified)	193097
320-32527-17	CECRL-20	Total/NA	Water	537 (modified)	193097
MB 320-193097/1-A	Method Blank	Total/NA	Water	537 (modified)	193097
LCS 320-193097/2-A	Lab Control Sample	Total/NA	Water	537 (modified)	193097
320-32527-8 MS	CECRL-03	Total/NA	Water	537 (modified)	193097
320-32527-8 MSD	CECRL-03	Total/NA	Water	537 (modified)	193097

TestAmerica Sacramento

Lab Chronicle

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Client Sample ID: FIELDBLK-17-001

Date Collected: 10/16/17 13:50

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-1

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			308.5 mL	10.00 mL	191963	10/30/17 16:30	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192697	11/03/17 03:39	ABH	TAL SAC
Total/NA	Prep	Filtration			2.00 mL	10.00 mL	193097	11/06/17 14:44	JER	TAL SAC
Total/NA	Analysis	537 (modified)		1			193797	11/09/17 05:02	CBW	TAL SAC

Client Sample ID: EQUIP-17-001

Date Collected: 10/16/17 13:20

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-2

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			299.7 mL	10.00 mL	191963	10/30/17 16:30	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192697	11/03/17 03:47	ABH	TAL SAC
Total/NA	Prep	Filtration			2.00 mL	10.00 mL	193097	11/06/17 14:44	JER	TAL SAC
Total/NA	Analysis	537 (modified)		1			193797	11/09/17 05:10	CBW	TAL SAC

Client Sample ID: EQUIP-17-002

Date Collected: 10/16/17 13:30

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-3

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			303.2 mL	10.00 mL	191963	10/30/17 16:30	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192697	11/03/17 03:55	ABH	TAL SAC
Total/NA	Prep	Filtration			2.00 mL	10.00 mL	193097	11/06/17 14:44	JER	TAL SAC
Total/NA	Analysis	537 (modified)		1			193797	11/09/17 05:18	CBW	TAL SAC

Client Sample ID: CECRL-01

Date Collected: 10/16/17 15:15

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-4

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			293 mL	10.00 mL	191963	10/30/17 16:30	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192697	11/03/17 04:03	ABH	TAL SAC
Total/NA	Prep	Filtration			2.00 mL	10.00 mL	193097	11/06/17 14:44	JER	TAL SAC
Total/NA	Analysis	537 (modified)		1			193797	11/09/17 05:26	CBW	TAL SAC

Client Sample ID: CECRL-01DUP

Date Collected: 10/16/17 15:15

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-5

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			297.1 mL	10.00 mL	191963	10/30/17 16:30	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192697	11/03/17 04:10	ABH	TAL SAC
Total/NA	Prep	Filtration			2.00 mL	10.00 mL	193097	11/06/17 14:44	JER	TAL SAC

TestAmerica Sacramento

Lab Chronicle

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Client Sample ID: CECRL-01DUP

Date Collected: 10/16/17 15:15

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-5

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	537 (modified)		1			193797	11/09/17 05:34	CBW	TAL SAC

Client Sample ID: CECRL-05

Date Collected: 10/16/17 15:40

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-6

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			287.6 mL	10.00 mL	191963	10/30/17 16:30	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192697	11/03/17 04:18	ABH	TAL SAC
Total/NA	Prep	Filtration			2.00 mL	10.00 mL	193097	11/06/17 14:44	JER	TAL SAC
Total/NA	Analysis	537 (modified)		1			193797	11/09/17 05:42	CBW	TAL SAC

Client Sample ID: CECRL-02

Date Collected: 10/16/17 16:00

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-7

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			305.9 mL	10.00 mL	191963	10/30/17 16:30	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192697	11/03/17 04:26	ABH	TAL SAC
Total/NA	Prep	Filtration			2.00 mL	10.00 mL	193097	11/06/17 14:44	JER	TAL SAC
Total/NA	Analysis	537 (modified)		1			193797	11/09/17 05:50	CBW	TAL SAC

Client Sample ID: CECRL-03

Date Collected: 10/16/17 16:45

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-8

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			305.5 mL	10.00 mL	191963	10/30/17 16:30	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192697	11/03/17 04:34	ABH	TAL SAC
Total/NA	Prep	Filtration			2.00 mL	10.00 mL	193097	11/06/17 14:44	JER	TAL SAC
Total/NA	Analysis	537 (modified)		1			193797	11/09/17 05:58	CBW	TAL SAC

Client Sample ID: CECRL-04

Date Collected: 10/16/17 16:20

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-9

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			289.2 mL	10.00 mL	191963	10/30/17 16:30	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192697	11/03/17 05:05	ABH	TAL SAC
Total/NA	Prep	Filtration			2.00 mL	10.00 mL	193097	11/06/17 14:44	JER	TAL SAC
Total/NA	Analysis	537 (modified)		1			193797	11/09/17 06:29	CBW	TAL SAC

TestAmerica Sacramento

Lab Chronicle

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Client Sample ID: CECRL-12

Date Collected: 10/17/17 16:40

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-10

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			300.2 mL	10.00 mL	191963	10/30/17 16:30	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192697	11/03/17 05:13	ABH	TAL SAC
Total/NA	Prep	Filtration			2.00 mL	10.00 mL	193097	11/06/17 14:44	JER	TAL SAC
Total/NA	Analysis	537 (modified)		1			193797	11/09/17 06:37	CBW	TAL SAC

Client Sample ID: MW-14-103B

Date Collected: 10/17/17 14:00

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-11

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			305.4 mL	10.00 mL	191963	10/30/17 16:30	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192697	11/03/17 05:21	ABH	TAL SAC
Total/NA	Prep	Filtration			2.00 mL	10.00 mL	193097	11/06/17 14:44	JER	TAL SAC
Total/NA	Analysis	537 (modified)		1			193797	11/09/17 06:45	CBW	TAL SAC

Client Sample ID: CECRL-07

Date Collected: 10/17/17 17:40

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-12

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			292.4 mL	10.00 mL	191963	10/30/17 16:30	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192697	11/03/17 05:29	ABH	TAL SAC
Total/NA	Prep	Filtration			2.00 mL	10.00 mL	193097	11/06/17 14:44	JER	TAL SAC
Total/NA	Analysis	537 (modified)		1			193797	11/09/17 06:53	CBW	TAL SAC

Client Sample ID: MW-14-103A

Date Collected: 10/17/17 14:05

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-13

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			297.4 mL	10.00 mL	191963	10/30/17 16:30	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192697	11/03/17 05:37	ABH	TAL SAC
Total/NA	Prep	Filtration			2.00 mL	10.00 mL	193097	11/06/17 14:44	JER	TAL SAC
Total/NA	Analysis	537 (modified)		1			193797	11/09/17 07:01	CBW	TAL SAC

Client Sample ID: CECRL-17

Date Collected: 10/18/17 10:45

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-14

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			303.8 mL	10.00 mL	191963	10/30/17 16:30	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192697	11/03/17 05:45	ABH	TAL SAC
Total/NA	Prep	Filtration			2.00 mL	10.00 mL	193097	11/06/17 14:44	JER	TAL SAC

TestAmerica Sacramento

Lab Chronicle

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Client Sample ID: CECRL-17

Date Collected: 10/18/17 10:45

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-14

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	537 (modified)		1			193797	11/09/17 07:09	CBW	TAL SAC

Client Sample ID: CECRL-19

Date Collected: 10/18/17 15:40

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-15

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			300.9 mL	10.00 mL	191963	10/30/17 16:30	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192697	11/03/17 05:53	ABH	TAL SAC
Total/NA	Prep	Filtration			2.00 mL	10.00 mL	193097	11/06/17 14:44	JER	TAL SAC
Total/NA	Analysis	537 (modified)		1			193797	11/09/17 07:17	CBW	TAL SAC

Client Sample ID: MW-14-107

Date Collected: 10/18/17 13:30

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-16

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			282 mL	10.00 mL	191963	10/30/17 16:30	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192697	11/03/17 06:01	ABH	TAL SAC
Total/NA	Prep	Filtration			2.00 mL	10.00 mL	193097	11/06/17 14:44	JER	TAL SAC
Total/NA	Analysis	537 (modified)		1			193797	11/09/17 07:24	CBW	TAL SAC

Client Sample ID: CECRL-20

Date Collected: 10/18/17 10:20

Date Received: 10/19/17 10:15

Lab Sample ID: 320-32527-17

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			301.7 mL	10.00 mL	191963	10/30/17 16:30	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192697	11/03/17 06:16	ABH	TAL SAC
Total/NA	Prep	Filtration			2.00 mL	10.00 mL	193097	11/06/17 14:44	JER	TAL SAC
Total/NA	Analysis	537 (modified)		1			193797	11/09/17 07:40	CBW	TAL SAC

Laboratory References:

TAL SAC = TestAmerica Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

TestAmerica Sacramento

Accreditation/Certification Summary

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Laboratory: TestAmerica Sacramento

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	EPA Region	Identification Number	Expiration Date
L-A-B	DoD ELAP		L2468	01-20-18

Analysis Method	Prep Method	Matrix	Analyte
New Hampshire	NELAP	1	2997
The following analytes are included in this report, but accreditation/certification is not offered by the governing authority:			
Analysis Method	Prep Method	Matrix	Analyte
537 (modified)	3535	Water	6:2FTS
537 (modified)	3535	Water	8:2FTS
537 (modified)	3535	Water	N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)
537 (modified)	3535	Water	N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)
537 (modified)	3535	Water	Perfluorobutanesulfonic acid (PFBS)
537 (modified)	3535	Water	Perfluorobutanoic acid (PFBA)
537 (modified)	3535	Water	Perfluorodecanesulfonic acid (PFDS)
537 (modified)	3535	Water	Perfluorodecanoic acid (PFDA)
537 (modified)	3535	Water	Perfluorododecanoic acid (PFDoA)
537 (modified)	3535	Water	Perfluoroheptanesulfonic Acid (PFHpS)
537 (modified)	3535	Water	Perfluoroheptanoic acid (PFHpA)
537 (modified)	3535	Water	Perfluorohexanesulfonic acid (PFHxS)
537 (modified)	3535	Water	Perfluorohexanoic acid (PFHxA)
537 (modified)	3535	Water	Perfluorononanoic acid (PFNA)
537 (modified)	3535	Water	Perfluorooctane Sulfonamide (FOSA)
537 (modified)	3535	Water	Perfluorooctanesulfonic acid (PFOS)
537 (modified)	3535	Water	Perfluorooctanoic acid (PFOA)
537 (modified)	3535	Water	Perfluoropentanoic acid (PFPeA)
537 (modified)	3535	Water	Perfluorotetradecanoic acid (PFTeA)
537 (modified)	3535	Water	Perfluorotridecanoic Acid (PFTriA)
537 (modified)	3535	Water	Perfluoroundecanoic acid (PFUnA)
537 (modified)	Filtration	Water	MeFOSA
537 (modified)	Filtration	Water	N-EtFOSA-M

Method Summary

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Method	Method Description	Protocol	Laboratory
537 (modified)	Perfluorinated Hydrocarbons	EPA	TAL SAC

Protocol References:

EPA = US Environmental Protection Agency

Laboratory References:

TAL SAC = TestAmerica Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Sample Summary

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32527-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
320-32527-1	FIELDCLK-17-001	Water	10/16/17 13:50	10/19/17 10:15
320-32527-2	EQUIP-17-001	Water	10/16/17 13:20	10/19/17 10:15
320-32527-3	EQUIP-17-002	Water	10/16/17 13:30	10/19/17 10:15
320-32527-4	CECRL-01	Water	10/16/17 15:15	10/19/17 10:15
320-32527-5	CECRL-01DUP	Water	10/16/17 15:15	10/19/17 10:15
320-32527-6	CECRL-05	Water	10/16/17 15:40	10/19/17 10:15
320-32527-7	CECRL-02	Water	10/16/17 16:00	10/19/17 10:15
320-32527-8	CECRL-03	Water	10/16/17 16:45	10/19/17 10:15
320-32527-9	CECRL-04	Water	10/16/17 16:20	10/19/17 10:15
320-32527-10	CECRL-12	Water	10/17/17 16:40	10/19/17 10:15
320-32527-11	MW-14-103B	Water	10/17/17 14:00	10/19/17 10:15
320-32527-12	CECRL-07	Water	10/17/17 17:40	10/19/17 10:15
320-32527-13	MW-14-103A	Water	10/17/17 14:05	10/19/17 10:15
320-32527-14	CECRL-17	Water	10/18/17 10:45	10/19/17 10:15
320-32527-15	CECRL-19	Water	10/18/17 15:40	10/19/17 10:15
320-32527-16	MW-14-107	Water	10/18/17 13:30	10/19/17 10:15
320-32527-17	CECRL-20	Water	10/18/17 10:20	10/19/17 10:15

Nest Sacramento, CA 95605
Phone: 916.373.5600 Fax:

THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.
TAL-8210 (0713)

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact		Project Manager:		Site Contact:		Date: 10-18-17		COC No:	
Company Name: <u>Amec Foster Wheeler</u>		Tel/Fax:		Lab Contact:		Carrier: <u>FedEx</u>		of COCs	
Address: <u>511 Congress St</u>		Analysis Turnaround Time		Performed MS/MSD (Y/N)		Sampler:			
City/State/Zip: <u>Perth Amboy NJ 08410</u>		☐ CALENDAR DAYS ☐ WORKING DAYS		Filtered Sample (Y/N)		For Lab Use Only:			
Phone: <u>207 828 3415</u>		TAT if different from Below		Perform MS/MSD (Y/N)		Walk-in Client:			
Fax:		☒ <u>Per Contact</u>				Lab Sampling:			
Project Name: <u>CRREL PFAS</u>		☐ 1 week				Job / SDG No.:			
Site: <u>CRREL</u>		☐ 2 days							
PO # <u>FO13900954</u>		☐ 1 day							
Sample Identification		2017 Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Sample Specific Notes:		
MW-14-103B	10/17	1400	G	W	2				
CECRL-07	10/17	1740	G	W	2				
MW-14-103A	10/17	1405	G	W	2				
CECRL-17	10/18	1045	G	W	2				
CECRL-19	10/18	1450	G	W	2				
MW-14-107	10/18	1330	G	W	2				
CECRL-20	10/18	1020	G	W	2				
Preservation Used: 1=Ice, 2=HCl, 3=H2SO4, 4=HNO3, 5=NaOH, 6=Other									
Possible Hazard Identification: Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.									
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown									
Special Instructions/QC Requirements & Comments:									
Custody Seals Intact: ☐ Yes ☐ No		Custody Seal No.:		Cooler Temp. (°C): Obs'd: <u>4.6°C</u> Cor'd: <u>AP2</u>		Therm ID No.:			
Relinquished by: <u>Tige Cunningham</u>		Company: <u>Amec Fw</u>		Received by: <u>FedEx</u>		Company: <u>FedEx</u>		Date/Time: <u>10/18/17 1630</u>	
Relinquished by:		Company:		Received by: <u>W3</u>		Company: <u>W3</u>		Date/Time: <u>10/19/17 1015</u>	
Relinquished by:		Company:		Received in Laboratory by:		Company:		Date/Time:	

Login Sample Receipt Checklist

Client: AMEC Foster Wheeler E & I, Inc

Job Number: 320-32527-1

Login Number: 32527

List Number: 1

Creator: Hytrek, Cheryl

List Source: TestAmerica Sacramento

Question	Answer	Comment
Radioactivity wasn't checked or is $\leq$ background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	False	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is $<6\text{mm}$ (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica Sacramento

880 Riverside Parkway

West Sacramento, CA 95605

Tel: (916)373-5600

TestAmerica Job ID: 320-32575-1

Client Project/Site: CRREL Groundwater, New Hampshire

For:

AMEC Foster Wheeler E & I, Inc

511 Congress St. Suite 200

Portland, Maine 04101

Attn: Mr. Wolfgang Calicchio



Authorized for release by:

11/10/2017 3:50:19 PM

David Alltucker, Project Manager I

(916)374-4383

david.alltucker@testamericainc.com

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results through

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www.testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Cover Page	1
Table of Contents	2
Definitions/Glossary	3
Case Narrative	4
Detection Summary	5
Client Sample Results	7
Isotope Dilution Summary	14
QC Sample Results	16
QC Association Summary	20
Lab Chronicle	21
Certification Summary	23
Method Summary	24
Sample Summary	25
Chain of Custody	26
Receipt Checklists	27



Definitions/Glossary

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32575-1

Qualifiers

LCMS

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.
J	Estimated: The analyte was positively identified; the quantitation is an estimation
M	Manual integrated compound.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Case Narrative

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32575-1

Job ID: 320-32575-1

Laboratory: TestAmerica Sacramento

Narrative

Job Narrative 320-32575-1

Receipt

The samples were received on 10/21/2017 9:05 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 2.7° C.

LCMS

Method(s) 537 (modified): The first level standard from the initial calibration curve is used to evaluate the tune criteria. The instrument mass windows are set at +/- 0.5amu; therefore, detection of the analyte serves as verification that the assigned mass is within +/- 0.5amu of the true value, which meets the DoD/DOE QSM tune criterion.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Organic Prep

Method(s) 3535: Insufficient sample volume was available to perform a matrix spike/matrix spike duplicate (MS/MSD) associated with preparation batch 320-191964.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Detection Summary

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32575-1

Client Sample ID: CECRL-09

Lab Sample ID: 320-32575-1

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanoic acid (PFBA)	0.0028		0.0018	0.00031	ug/L	1		537 (modified)	Total/NA
Perfluoropentanoic acid (PFPeA)	0.0031	M	0.0018	0.00043	ug/L	1		537 (modified)	Total/NA
Perfluorohexanoic acid (PFHxA)	0.0058		0.0035	0.00051	ug/L	1		537 (modified)	Total/NA
Perfluoroheptanoic acid (PFHpA)	0.0019		0.0018	0.00022	ug/L	1		537 (modified)	Total/NA
Perfluorooctanoic acid (PFOA)	0.0015	J M	0.0035	0.00075	ug/L	1		537 (modified)	Total/NA
Perfluorononanoic acid (PFNA)	0.00033	J	0.0018	0.00024	ug/L	1		537 (modified)	Total/NA
Perfluorodecanoic acid (PFDA)	0.00044	J	0.0018	0.00027	ug/L	1		537 (modified)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	0.00091	J M	0.0018	0.00026	ug/L	1		537 (modified)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	0.0018		0.0018	0.00026	ug/L	1		537 (modified)	Total/NA
Perfluorooctane Sulfonamide (FOSA)	0.00050	J	0.0018	0.00031	ug/L	1		537 (modified)	Total/NA

Client Sample ID: CECRL-11

Lab Sample ID: 320-32575-2

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanoic acid (PFBA)	0.0023	M	0.0017	0.00029	ug/L	1		537 (modified)	Total/NA
Perfluoropentanoic acid (PFPeA)	0.0015	J	0.0017	0.00041	ug/L	1		537 (modified)	Total/NA
Perfluorohexanoic acid (PFHxA)	0.00084	J	0.0033	0.00048	ug/L	1		537 (modified)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	0.00098	J M	0.0017	0.00025	ug/L	1		537 (modified)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	0.00025	J	0.0017	0.00025	ug/L	1		537 (modified)	Total/NA
Perfluorooctane Sulfonamide (FOSA)	0.00098	J	0.0017	0.00029	ug/L	1		537 (modified)	Total/NA

Client Sample ID: MW-14-104

Lab Sample ID: 320-32575-3

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanoic acid (PFBA)	0.00066	J M	0.0017	0.00029	ug/L	1		537 (modified)	Total/NA

Client Sample ID: MW-14-105

Lab Sample ID: 320-32575-4

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanoic acid (PFBA)	0.00045	J	0.0017	0.00030	ug/L	1		537 (modified)	Total/NA

Client Sample ID: CECRL-08

Lab Sample ID: 320-32575-5

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanoic acid (PFBA)	0.00032	J	0.0018	0.00031	ug/L	1		537 (modified)	Total/NA
Perfluorotetradecanoic acid (PFTeA)	0.00028	J	0.0018	0.00026	ug/L	1		537 (modified)	Total/NA
Perfluorooctane Sulfonamide (FOSA)	0.00051	J	0.0018	0.00031	ug/L	1		537 (modified)	Total/NA

Client Sample ID: MW-14-106

Lab Sample ID: 320-32575-6

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanoic acid (PFBA)	0.00082	J	0.0017	0.00030	ug/L	1		537 (modified)	Total/NA
Perfluorohexanoic acid (PFHxA)	0.00081	J	0.0034	0.00049	ug/L	1		537 (modified)	Total/NA
Perfluorobutanesulfonic acid (PFBS)	0.00028	J M	0.0017	0.00025	ug/L	1		537 (modified)	Total/NA
Perfluorooctane Sulfonamide (FOSA)	0.00040	J	0.0017	0.00030	ug/L	1		537 (modified)	Total/NA

Client Sample ID: CECRL-10

Lab Sample ID: 320-32575-7

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanoic acid (PFBA)	0.0011	J	0.0017	0.00029	ug/L	1		537 (modified)	Total/NA

This Detection Summary does not include radiochemical test results.

TestAmerica Sacramento

Detection Summary

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32575-1

Client Sample ID: CECRL-10 (Continued)

Lab Sample ID: 320-32575-7

Analyte	Result	Qualifier	LOQ	DL	Unit	Dil Fac	D	Method	Prep Type
Perfluorotetradecanoic acid (PFTeA)	0.00031	J M	0.0017	0.00024	ug/L	1		537 (modified)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	0.00028	J	0.0017	0.00025	ug/L	1		537 (modified)	Total/NA
Perfluorooctane Sulfonamide (FOSA)	0.0011	J	0.0017	0.00029	ug/L	1		537 (modified)	Total/NA

This Detection Summary does not include radiochemical test results.

TestAmerica Sacramento

Client Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32575-1

Client Sample ID: CECRL-09

Date Collected: 10/19/17 17:50

Date Received: 10/21/17 09:05

Lab Sample ID: 320-32575-1

Matrix: Water

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
N-EtFOSA-M	50	U	100	13	ug/L		11/06/17 14:52	11/08/17 08:33	1
Perfluorobutanoic acid (PFBA)	0.0028		0.0018	0.00031	ug/L		10/30/17 16:38	11/03/17 07:04	1
MeFOSA	50	U	100	22	ug/L		11/06/17 14:52	11/08/17 08:33	1
Perfluoropentanoic acid (PFPeA)	0.0031	M	0.0018	0.00043	ug/L		10/30/17 16:38	11/03/17 07:04	1
Perfluorohexanoic acid (PFHxA)	0.0058		0.0035	0.00051	ug/L		10/30/17 16:38	11/03/17 07:04	1
Perfluoroheptanoic acid (PFHpA)	0.0019		0.0018	0.00022	ug/L		10/30/17 16:38	11/03/17 07:04	1
Perfluorooctanoic acid (PFOA)	0.0015	J M	0.0035	0.00075	ug/L		10/30/17 16:38	11/03/17 07:04	1
Perfluorononanoic acid (PFNA)	0.00033	J	0.0018	0.00024	ug/L		10/30/17 16:38	11/03/17 07:04	1
Perfluorodecanoic acid (PFDA)	0.00044	J	0.0018	0.00027	ug/L		10/30/17 16:38	11/03/17 07:04	1
Perfluoroundecanoic acid (PFUnA)	0.0026	U	0.0035	0.00096	ug/L		10/30/17 16:38	11/03/17 07:04	1
Perfluorododecanoic acid (PFDoA)	0.0018	U	0.0035	0.00048	ug/L		10/30/17 16:38	11/03/17 07:04	1
Perfluorotridecanoic Acid (PFTrIA)	0.0026	U	0.0035	0.0011	ug/L		10/30/17 16:38	11/03/17 07:04	1
Perfluorotetradecanoic acid (PFTeA)	0.00088	U	0.0018	0.00025	ug/L		10/30/17 16:38	11/03/17 07:04	1
Perfluorobutanesulfonic acid (PFBS)	0.00091	J M	0.0018	0.00026	ug/L		10/30/17 16:38	11/03/17 07:04	1
Perfluorohexanesulfonic acid (PFHxS)	0.0018		0.0018	0.00026	ug/L		10/30/17 16:38	11/03/17 07:04	1
Perfluoroheptanesulfonic Acid (PFHpS)	0.00088	U	0.0018	0.00026	ug/L		10/30/17 16:38	11/03/17 07:04	1
Perfluorooctanesulfonic acid (PFOS)	0.0018	U	0.0035	0.00047	ug/L		10/30/17 16:38	11/03/17 07:04	1
Perfluorodecanesulfonic acid (PFDS)	0.00088	U	0.0018	0.00028	ug/L		10/30/17 16:38	11/03/17 07:04	1
Perfluorooctane Sulfonamide (FOSA)	0.00050	J	0.0018	0.00031	ug/L		10/30/17 16:38	11/03/17 07:04	1
6:2FTS	0.0088	U	0.018	0.0026	ug/L		10/30/17 16:38	11/03/17 07:04	1
8:2FTS	0.0088	U	0.018	0.0026	ug/L		10/30/17 16:38	11/03/17 07:04	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.0088	U	0.018	0.0027	ug/L		10/30/17 16:38	11/03/17 07:04	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.0088	U	0.018	0.0026	ug/L		10/30/17 16:38	11/03/17 07:04	1

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
d-N-MeFOSA-M	73		25 - 150	11/06/17 14:52	11/08/17 08:33	1
d-N-EtFOSA-M	79		25 - 150	11/06/17 14:52	11/08/17 08:33	1
13C8 FOSA	102		25 - 150	10/30/17 16:38	11/03/17 07:04	1
13C4 PFBA	109		25 - 150	10/30/17 16:38	11/03/17 07:04	1
13C2 PFHxA	106		25 - 150	10/30/17 16:38	11/03/17 07:04	1
13C4 PFOA	97		25 - 150	10/30/17 16:38	11/03/17 07:04	1
13C5 PFNA	113		25 - 150	10/30/17 16:38	11/03/17 07:04	1
13C2 PFDA	111		25 - 150	10/30/17 16:38	11/03/17 07:04	1
13C2 PFUnA	112		25 - 150	10/30/17 16:38	11/03/17 07:04	1
13C2 PFDoA	99		25 - 150	10/30/17 16:38	11/03/17 07:04	1
13C2-PFTeDA	106		25 - 150	10/30/17 16:38	11/03/17 07:04	1
13C3-PFBS	107		25 - 150	10/30/17 16:38	11/03/17 07:04	1
18O2 PFHxS	109		25 - 150	10/30/17 16:38	11/03/17 07:04	1
13C4 PFOS	105		25 - 150	10/30/17 16:38	11/03/17 07:04	1
13C4-PFHpA	118		25 - 150	10/30/17 16:38	11/03/17 07:04	1
13C5 PFPeA	108		25 - 150	10/30/17 16:38	11/03/17 07:04	1
M2-6:2FTS	71		25 - 150	10/30/17 16:38	11/03/17 07:04	1
d5-NEtFOSAA	117		25 - 150	10/30/17 16:38	11/03/17 07:04	1
d3-NMeFOSAA	109		25 - 150	10/30/17 16:38	11/03/17 07:04	1
M2-8:2FTS	112		25 - 150	10/30/17 16:38	11/03/17 07:04	1

TestAmerica Sacramento

Client Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32575-1

Client Sample ID: CECRL-11

Lab Sample ID: 320-32575-2

Date Collected: 10/19/17 09:10

Matrix: Water

Date Received: 10/21/17 09:05

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
N-EtFOSA-M	50	U	100	13	ug/L		11/06/17 14:52	11/08/17 08:41	1
Perfluorobutanoic acid (PFBA)	0.0023	M	0.0017	0.00029	ug/L		10/30/17 16:38	11/03/17 07:12	1
MeFOSA	50	U	100	22	ug/L		11/06/17 14:52	11/08/17 08:41	1
Perfluoropentanoic acid (PFPeA)	0.0015	J	0.0017	0.00041	ug/L		10/30/17 16:38	11/03/17 07:12	1
Perfluorohexanoic acid (PFHxA)	0.00084	J	0.0033	0.00048	ug/L		10/30/17 16:38	11/03/17 07:12	1
Perfluoroheptanoic acid (PFHpA)	0.00083	U	0.0017	0.00021	ug/L		10/30/17 16:38	11/03/17 07:12	1
Perfluorooctanoic acid (PFOA)	0.0017	U M	0.0033	0.00071	ug/L		10/30/17 16:38	11/03/17 07:12	1
Perfluorononanoic acid (PFNA)	0.00083	U	0.0017	0.00022	ug/L		10/30/17 16:38	11/03/17 07:12	1
Perfluorodecanoic acid (PFDA)	0.00083	U	0.0017	0.00026	ug/L		10/30/17 16:38	11/03/17 07:12	1
Perfluoroundecanoic acid (PFUnA)	0.0025	U	0.0033	0.00091	ug/L		10/30/17 16:38	11/03/17 07:12	1
Perfluorododecanoic acid (PFDoA)	0.0017	U	0.0033	0.00046	ug/L		10/30/17 16:38	11/03/17 07:12	1
Perfluorotridecanoic Acid (PFTriA)	0.0025	U	0.0033	0.0011	ug/L		10/30/17 16:38	11/03/17 07:12	1
Perfluorotetradecanoic acid (PFTeA)	0.00083	U	0.0017	0.00024	ug/L		10/30/17 16:38	11/03/17 07:12	1
Perfluorobutanesulfonic acid (PFBS)	0.00098	J M	0.0017	0.00025	ug/L		10/30/17 16:38	11/03/17 07:12	1
Perfluorohexanesulfonic acid (PFHxS)	0.00025	J	0.0017	0.00025	ug/L		10/30/17 16:38	11/03/17 07:12	1
Perfluoroheptanesulfonic Acid (PFHpS)	0.00083	U	0.0017	0.00025	ug/L		10/30/17 16:38	11/03/17 07:12	1
Perfluorooctanesulfonic acid (PFOS)	0.0017	U	0.0033	0.00045	ug/L		10/30/17 16:38	11/03/17 07:12	1
Perfluorodecanesulfonic acid (PFDS)	0.00083	U	0.0017	0.00027	ug/L		10/30/17 16:38	11/03/17 07:12	1
Perfluorooctane Sulfonamide (FOSA)	0.00098	J	0.0017	0.00029	ug/L		10/30/17 16:38	11/03/17 07:12	1
6:2FTS	0.0083	U	0.017	0.0025	ug/L		10/30/17 16:38	11/03/17 07:12	1
8:2FTS	0.0083	U	0.017	0.0025	ug/L		10/30/17 16:38	11/03/17 07:12	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.0083	U	0.017	0.0026	ug/L		10/30/17 16:38	11/03/17 07:12	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.0083	U	0.017	0.0025	ug/L		10/30/17 16:38	11/03/17 07:12	1

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
d-N-MeFOSA-M	68		25 - 150	11/06/17 14:52	11/08/17 08:41	1
d-N-EtFOSA-M	70		25 - 150	11/06/17 14:52	11/08/17 08:41	1
13C8 FOSA	102		25 - 150	10/30/17 16:38	11/03/17 07:12	1
13C4 PFBA	95		25 - 150	10/30/17 16:38	11/03/17 07:12	1
13C2 PFHxA	107		25 - 150	10/30/17 16:38	11/03/17 07:12	1
13C4 PFOA	97		25 - 150	10/30/17 16:38	11/03/17 07:12	1
13C5 PFNA	116		25 - 150	10/30/17 16:38	11/03/17 07:12	1
13C2 PFDA	107		25 - 150	10/30/17 16:38	11/03/17 07:12	1
13C2 PFUnA	116		25 - 150	10/30/17 16:38	11/03/17 07:12	1
13C2 PFDoA	99		25 - 150	10/30/17 16:38	11/03/17 07:12	1
13C2-PFTeDA	105		25 - 150	10/30/17 16:38	11/03/17 07:12	1
13C3-PFBS	103		25 - 150	10/30/17 16:38	11/03/17 07:12	1
18O2 PFHxS	110		25 - 150	10/30/17 16:38	11/03/17 07:12	1
13C4 PFOS	108		25 - 150	10/30/17 16:38	11/03/17 07:12	1
13C4-PFHpA	116		25 - 150	10/30/17 16:38	11/03/17 07:12	1
13C5 PFPeA	108		25 - 150	10/30/17 16:38	11/03/17 07:12	1
M2-6:2FTS	71		25 - 150	10/30/17 16:38	11/03/17 07:12	1
d5-NEtFOSAA	136		25 - 150	10/30/17 16:38	11/03/17 07:12	1
d3-NMeFOSAA	111		25 - 150	10/30/17 16:38	11/03/17 07:12	1
M2-8:2FTS	113		25 - 150	10/30/17 16:38	11/03/17 07:12	1

TestAmerica Sacramento

Client Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32575-1

Client Sample ID: MW-14-104

Lab Sample ID: 320-32575-3

Date Collected: 10/19/17 09:30

Matrix: Water

Date Received: 10/21/17 09:05

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
N-EtFOSA-M	50	U	100	13	ug/L		11/06/17 14:52	11/08/17 08:49	1
Perfluorobutanoic acid (PFBA)	0.00066	J M	0.0017	0.00029	ug/L		10/30/17 16:38	11/03/17 07:20	1
MeFOSA	50	U	100	22	ug/L		11/06/17 14:52	11/08/17 08:49	1
Perfluoropentanoic acid (PFPeA)	0.00084	U	0.0017	0.00041	ug/L		10/30/17 16:38	11/03/17 07:20	1
Perfluorohexanoic acid (PFHxA)	0.0017	U	0.0034	0.00049	ug/L		10/30/17 16:38	11/03/17 07:20	1
Perfluoroheptanoic acid (PFHpA)	0.00084	U	0.0017	0.00021	ug/L		10/30/17 16:38	11/03/17 07:20	1
Perfluorooctanoic acid (PFOA)	0.0017	U	0.0034	0.00072	ug/L		10/30/17 16:38	11/03/17 07:20	1
Perfluorononanoic acid (PFNA)	0.00084	U	0.0017	0.00023	ug/L		10/30/17 16:38	11/03/17 07:20	1
Perfluorodecanoic acid (PFDA)	0.00084	U	0.0017	0.00026	ug/L		10/30/17 16:38	11/03/17 07:20	1
Perfluoroundecanoic acid (PFUnA)	0.0025	U	0.0034	0.00093	ug/L		10/30/17 16:38	11/03/17 07:20	1
Perfluorododecanoic acid (PFDoA)	0.0017	U	0.0034	0.00046	ug/L		10/30/17 16:38	11/03/17 07:20	1
Perfluorotridecanoic Acid (PFTriA)	0.0025	U	0.0034	0.0011	ug/L		10/30/17 16:38	11/03/17 07:20	1
Perfluorotetradecanoic acid (PFTeA)	0.00084	U	0.0017	0.00024	ug/L		10/30/17 16:38	11/03/17 07:20	1
Perfluorobutanesulfonic acid (PFBS)	0.00084	U	0.0017	0.00025	ug/L		10/30/17 16:38	11/03/17 07:20	1
Perfluorohexanesulfonic acid (PFHxS)	0.00084	U	0.0017	0.00025	ug/L		10/30/17 16:38	11/03/17 07:20	1
Perfluoroheptanesulfonic Acid (PFHpS)	0.00084	U	0.0017	0.00025	ug/L		10/30/17 16:38	11/03/17 07:20	1
Perfluorooctanesulfonic acid (PFOS)	0.0017	U	0.0034	0.00045	ug/L		10/30/17 16:38	11/03/17 07:20	1
Perfluorodecanesulfonic acid (PFDS)	0.00084	U	0.0017	0.00027	ug/L		10/30/17 16:38	11/03/17 07:20	1
Perfluorooctane Sulfonamide (FOSA)	0.00084	U	0.0017	0.00029	ug/L		10/30/17 16:38	11/03/17 07:20	1
6:2FTS	0.0084	U	0.017	0.0025	ug/L		10/30/17 16:38	11/03/17 07:20	1
8:2FTS	0.0084	U	0.017	0.0025	ug/L		10/30/17 16:38	11/03/17 07:20	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.0084	U	0.017	0.0026	ug/L		10/30/17 16:38	11/03/17 07:20	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.0084	U	0.017	0.0025	ug/L		10/30/17 16:38	11/03/17 07:20	1

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
d-N-MeFOSA-M	81		25 - 150	11/06/17 14:52	11/08/17 08:49	1
d-N-EtFOSA-M	86		25 - 150	11/06/17 14:52	11/08/17 08:49	1
13C8 FOSA	100		25 - 150	10/30/17 16:38	11/03/17 07:20	1
13C4 PFBA	99		25 - 150	10/30/17 16:38	11/03/17 07:20	1
13C2 PFHxA	101		25 - 150	10/30/17 16:38	11/03/17 07:20	1
13C4 PFOA	92		25 - 150	10/30/17 16:38	11/03/17 07:20	1
13C5 PFNA	111		25 - 150	10/30/17 16:38	11/03/17 07:20	1
13C2 PFDA	105		25 - 150	10/30/17 16:38	11/03/17 07:20	1
13C2 PFUnA	108		25 - 150	10/30/17 16:38	11/03/17 07:20	1
13C2 PFDoA	96		25 - 150	10/30/17 16:38	11/03/17 07:20	1
13C2-PFTeDA	97		25 - 150	10/30/17 16:38	11/03/17 07:20	1
13C3-PFBS	105		25 - 150	10/30/17 16:38	11/03/17 07:20	1
18O2 PFHxS	105		25 - 150	10/30/17 16:38	11/03/17 07:20	1
13C4 PFOS	104		25 - 150	10/30/17 16:38	11/03/17 07:20	1
13C4-PFHpA	109		25 - 150	10/30/17 16:38	11/03/17 07:20	1
13C5 PFPeA	104		25 - 150	10/30/17 16:38	11/03/17 07:20	1
M2-6:2FTS	67		25 - 150	10/30/17 16:38	11/03/17 07:20	1
d5-NEtFOSAA	113		25 - 150	10/30/17 16:38	11/03/17 07:20	1
d3-NMeFOSAA	106		25 - 150	10/30/17 16:38	11/03/17 07:20	1
M2-8:2FTS	108		25 - 150	10/30/17 16:38	11/03/17 07:20	1

TestAmerica Sacramento

Client Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32575-1

Client Sample ID: MW-14-105

Lab Sample ID: 320-32575-4

Date Collected: 10/19/17 15:50

Matrix: Water

Date Received: 10/21/17 09:05

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
N-EtFOSA-M	50	U	100	13	ug/L		11/06/17 14:52	11/08/17 08:56	1
Perfluorobutanoic acid (PFBA)	0.00045	J	0.0017	0.00030	ug/L		10/30/17 16:38	11/03/17 07:27	1
MeFOSA	50	U	100	22	ug/L		11/06/17 14:52	11/08/17 08:56	1
Perfluoropentanoic acid (PFPeA)	0.00086	U M	0.0017	0.00042	ug/L		10/30/17 16:38	11/03/17 07:27	1
Perfluorohexanoic acid (PFHxA)	0.0017	U	0.0035	0.00050	ug/L		10/30/17 16:38	11/03/17 07:27	1
Perfluoroheptanoic acid (PFHpA)	0.00086	U	0.0017	0.00022	ug/L		10/30/17 16:38	11/03/17 07:27	1
Perfluorooctanoic acid (PFOA)	0.0017	U	0.0035	0.00073	ug/L		10/30/17 16:38	11/03/17 07:27	1
Perfluorononanoic acid (PFNA)	0.00086	U	0.0017	0.00023	ug/L		10/30/17 16:38	11/03/17 07:27	1
Perfluorodecanoic acid (PFDA)	0.00086	U	0.0017	0.00027	ug/L		10/30/17 16:38	11/03/17 07:27	1
Perfluoroundecanoic acid (PFUnA)	0.0026	U	0.0035	0.00095	ug/L		10/30/17 16:38	11/03/17 07:27	1
Perfluorododecanoic acid (PFDoA)	0.0017	U	0.0035	0.00048	ug/L		10/30/17 16:38	11/03/17 07:27	1
Perfluorotridecanoic Acid (PFTriA)	0.0026	U	0.0035	0.0011	ug/L		10/30/17 16:38	11/03/17 07:27	1
Perfluorotetradecanoic acid (PFTeA)	0.00086	U	0.0017	0.00025	ug/L		10/30/17 16:38	11/03/17 07:27	1
Perfluorobutanesulfonic acid (PFBS)	0.00086	U	0.0017	0.00026	ug/L		10/30/17 16:38	11/03/17 07:27	1
Perfluorohexanesulfonic acid (PFHxS)	0.00086	U	0.0017	0.00026	ug/L		10/30/17 16:38	11/03/17 07:27	1
Perfluoroheptanesulfonic Acid (PFHpS)	0.00086	U	0.0017	0.00026	ug/L		10/30/17 16:38	11/03/17 07:27	1
Perfluorooctanesulfonic acid (PFOS)	0.0017	U	0.0035	0.00047	ug/L		10/30/17 16:38	11/03/17 07:27	1
Perfluorodecanesulfonic acid (PFDS)	0.00086	U	0.0017	0.00028	ug/L		10/30/17 16:38	11/03/17 07:27	1
Perfluorooctane Sulfonamide (FOSA)	0.00086	U	0.0017	0.00030	ug/L		10/30/17 16:38	11/03/17 07:27	1
6:2FTS	0.0086	U	0.017	0.0026	ug/L		10/30/17 16:38	11/03/17 07:27	1
8:2FTS	0.0086	U	0.017	0.0026	ug/L		10/30/17 16:38	11/03/17 07:27	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.0086	U	0.017	0.0027	ug/L		10/30/17 16:38	11/03/17 07:27	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.0086	U	0.017	0.0026	ug/L		10/30/17 16:38	11/03/17 07:27	1

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
d-N-MeFOSA-M	66		25 - 150	11/06/17 14:52	11/08/17 08:56	1
d-N-EtFOSA-M	69		25 - 150	11/06/17 14:52	11/08/17 08:56	1
13C8 FOSA	104		25 - 150	10/30/17 16:38	11/03/17 07:27	1
13C4 PFBA	108		25 - 150	10/30/17 16:38	11/03/17 07:27	1
13C2 PFHxA	110		25 - 150	10/30/17 16:38	11/03/17 07:27	1
13C4 PFOA	98		25 - 150	10/30/17 16:38	11/03/17 07:27	1
13C5 PFNA	110		25 - 150	10/30/17 16:38	11/03/17 07:27	1
13C2 PFDA	113		25 - 150	10/30/17 16:38	11/03/17 07:27	1
13C2 PFUnA	120		25 - 150	10/30/17 16:38	11/03/17 07:27	1
13C2 PFDoA	107		25 - 150	10/30/17 16:38	11/03/17 07:27	1
13C2-PFTeDA	114		25 - 150	10/30/17 16:38	11/03/17 07:27	1
13C3-PFBS	112		25 - 150	10/30/17 16:38	11/03/17 07:27	1
18O2 PFHxS	109		25 - 150	10/30/17 16:38	11/03/17 07:27	1
13C4 PFOS	105		25 - 150	10/30/17 16:38	11/03/17 07:27	1
13C4-PFHpA	115		25 - 150	10/30/17 16:38	11/03/17 07:27	1
13C5 PFPeA	112		25 - 150	10/30/17 16:38	11/03/17 07:27	1
M2-6:2FTS	70		25 - 150	10/30/17 16:38	11/03/17 07:27	1
d5-NEtFOSAA	144		25 - 150	10/30/17 16:38	11/03/17 07:27	1
d3-NMeFOSAA	110		25 - 150	10/30/17 16:38	11/03/17 07:27	1
M2-8:2FTS	115		25 - 150	10/30/17 16:38	11/03/17 07:27	1

TestAmerica Sacramento

Client Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32575-1

Client Sample ID: CECRL-08

Lab Sample ID: 320-32575-5

Date Collected: 10/19/17 16:35

Matrix: Water

Date Received: 10/21/17 09:05

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
N-EtFOSA-M	50	U	100	13	ug/L		11/06/17 14:52	11/08/17 09:04	1
Perfluorobutanoic acid (PFBA)	0.00032	J	0.0018	0.00031	ug/L		10/30/17 16:38	11/03/17 07:35	1
MeFOSA	50	U	100	22	ug/L		11/06/17 14:52	11/08/17 09:04	1
Perfluoropentanoic acid (PFPeA)	0.00088	U	0.0018	0.00043	ug/L		10/30/17 16:38	11/03/17 07:35	1
Perfluorohexanoic acid (PFHxA)	0.0018	U	0.0035	0.00051	ug/L		10/30/17 16:38	11/03/17 07:35	1
Perfluoroheptanoic acid (PFHpA)	0.00088	U	0.0018	0.00022	ug/L		10/30/17 16:38	11/03/17 07:35	1
Perfluorooctanoic acid (PFOA)	0.0018	U	0.0035	0.00075	ug/L		10/30/17 16:38	11/03/17 07:35	1
Perfluorononanoic acid (PFNA)	0.00088	U	0.0018	0.00024	ug/L		10/30/17 16:38	11/03/17 07:35	1
Perfluorodecanoic acid (PFDA)	0.00088	U	0.0018	0.00027	ug/L		10/30/17 16:38	11/03/17 07:35	1
Perfluoroundecanoic acid (PFUnA)	0.0026	U	0.0035	0.00097	ug/L		10/30/17 16:38	11/03/17 07:35	1
Perfluorododecanoic acid (PFDoA)	0.0018	U	0.0035	0.00048	ug/L		10/30/17 16:38	11/03/17 07:35	1
Perfluorotridecanoic Acid (PFTriA)	0.0026	U	0.0035	0.0011	ug/L		10/30/17 16:38	11/03/17 07:35	1
Perfluorotetradecanoic acid (PFTeA)	0.00028	J	0.0018	0.00026	ug/L		10/30/17 16:38	11/03/17 07:35	1
Perfluorobutanesulfonic acid (PFBS)	0.00088	U	0.0018	0.00026	ug/L		10/30/17 16:38	11/03/17 07:35	1
Perfluorohexanesulfonic acid (PFHxS)	0.00088	U	0.0018	0.00026	ug/L		10/30/17 16:38	11/03/17 07:35	1
Perfluoroheptanesulfonic Acid (PFHpS)	0.00088	U	0.0018	0.00026	ug/L		10/30/17 16:38	11/03/17 07:35	1
Perfluorooctanesulfonic acid (PFOS)	0.0018	U	0.0035	0.00048	ug/L		10/30/17 16:38	11/03/17 07:35	1
Perfluorodecanesulfonic acid (PFDS)	0.00088	U	0.0018	0.00028	ug/L		10/30/17 16:38	11/03/17 07:35	1
Perfluorooctane Sulfonamide (FOSA)	0.00051	J	0.0018	0.00031	ug/L		10/30/17 16:38	11/03/17 07:35	1
6:2FTS	0.0088	U	0.018	0.0026	ug/L		10/30/17 16:38	11/03/17 07:35	1
8:2FTS	0.0088	U	0.018	0.0026	ug/L		10/30/17 16:38	11/03/17 07:35	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.0088	U	0.018	0.0027	ug/L		10/30/17 16:38	11/03/17 07:35	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.0088	U	0.018	0.0026	ug/L		10/30/17 16:38	11/03/17 07:35	1

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
d-N-MeFOSA-M	61		25 - 150	11/06/17 14:52	11/08/17 09:04	1
d-N-EtFOSA-M	66		25 - 150	11/06/17 14:52	11/08/17 09:04	1
13C8 FOSA	102		25 - 150	10/30/17 16:38	11/03/17 07:35	1
13C4 PFBA	115		25 - 150	10/30/17 16:38	11/03/17 07:35	1
13C2 PFHxA	108		25 - 150	10/30/17 16:38	11/03/17 07:35	1
13C4 PFOA	93		25 - 150	10/30/17 16:38	11/03/17 07:35	1
13C5 PFNA	111		25 - 150	10/30/17 16:38	11/03/17 07:35	1
13C2 PFDA	113		25 - 150	10/30/17 16:38	11/03/17 07:35	1
13C2 PFUnA	108		25 - 150	10/30/17 16:38	11/03/17 07:35	1
13C2 PFDoA	102		25 - 150	10/30/17 16:38	11/03/17 07:35	1
13C2-PFTeDA	119		25 - 150	10/30/17 16:38	11/03/17 07:35	1
13C3-PFBS	111		25 - 150	10/30/17 16:38	11/03/17 07:35	1
18O2 PFHxS	110		25 - 150	10/30/17 16:38	11/03/17 07:35	1
13C4 PFOS	103		25 - 150	10/30/17 16:38	11/03/17 07:35	1
13C4-PFHpA	114		25 - 150	10/30/17 16:38	11/03/17 07:35	1
13C5 PFPeA	107		25 - 150	10/30/17 16:38	11/03/17 07:35	1
M2-6:2FTS	70		25 - 150	10/30/17 16:38	11/03/17 07:35	1
d5-NEtFOSAA	116		25 - 150	10/30/17 16:38	11/03/17 07:35	1
d3-NMeFOSAA	109		25 - 150	10/30/17 16:38	11/03/17 07:35	1
M2-8:2FTS	108		25 - 150	10/30/17 16:38	11/03/17 07:35	1

TestAmerica Sacramento

Client Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32575-1

Client Sample ID: MW-14-106

Lab Sample ID: 320-32575-6

Date Collected: 10/19/17 12:20

Matrix: Water

Date Received: 10/21/17 09:05

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
N-EtFOSA-M	50	U	100	13	ug/L		11/06/17 14:52	11/08/17 09:12	1
Perfluorobutanoic acid (PFBA)	0.00082	J	0.0017	0.00030	ug/L		10/30/17 16:38	11/03/17 07:43	1
MeFOSA	50	U	100	22	ug/L		11/06/17 14:52	11/08/17 09:12	1
Perfluoropentanoic acid (PFPeA)	0.00084	U M	0.0017	0.00041	ug/L		10/30/17 16:38	11/03/17 07:43	1
Perfluorohexanoic acid (PFHxA)	0.00081	J	0.0034	0.00049	ug/L		10/30/17 16:38	11/03/17 07:43	1
Perfluoroheptanoic acid (PFHpA)	0.00084	U	0.0017	0.00021	ug/L		10/30/17 16:38	11/03/17 07:43	1
Perfluorooctanoic acid (PFOA)	0.0017	U	0.0034	0.00072	ug/L		10/30/17 16:38	11/03/17 07:43	1
Perfluorononanoic acid (PFNA)	0.00084	U	0.0017	0.00023	ug/L		10/30/17 16:38	11/03/17 07:43	1
Perfluorodecanoic acid (PFDA)	0.00084	U	0.0017	0.00026	ug/L		10/30/17 16:38	11/03/17 07:43	1
Perfluoroundecanoic acid (PFUnA)	0.0025	U	0.0034	0.00093	ug/L		10/30/17 16:38	11/03/17 07:43	1
Perfluorododecanoic acid (PFDoA)	0.0017	U	0.0034	0.00046	ug/L		10/30/17 16:38	11/03/17 07:43	1
Perfluorotridecanoic Acid (PFTriA)	0.0025	U	0.0034	0.0011	ug/L		10/30/17 16:38	11/03/17 07:43	1
Perfluorotetradecanoic acid (PFTeA)	0.00084	U	0.0017	0.00024	ug/L		10/30/17 16:38	11/03/17 07:43	1
Perfluorobutanesulfonic acid (PFBS)	0.00028	J M	0.0017	0.00025	ug/L		10/30/17 16:38	11/03/17 07:43	1
Perfluorohexanesulfonic acid (PFHxS)	0.00084	U	0.0017	0.00025	ug/L		10/30/17 16:38	11/03/17 07:43	1
Perfluoroheptanesulfonic Acid (PFHpS)	0.00084	U	0.0017	0.00025	ug/L		10/30/17 16:38	11/03/17 07:43	1
Perfluorooctanesulfonic acid (PFOS)	0.0017	U	0.0034	0.00046	ug/L		10/30/17 16:38	11/03/17 07:43	1
Perfluorodecanesulfonic acid (PFDS)	0.00084	U	0.0017	0.00027	ug/L		10/30/17 16:38	11/03/17 07:43	1
Perfluorooctane Sulfonamide (FOSA)	0.00040	J	0.0017	0.00030	ug/L		10/30/17 16:38	11/03/17 07:43	1
6:2FTS	0.0084	U	0.017	0.0025	ug/L		10/30/17 16:38	11/03/17 07:43	1
8:2FTS	0.0084	U	0.017	0.0025	ug/L		10/30/17 16:38	11/03/17 07:43	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.0084	U	0.017	0.0026	ug/L		10/30/17 16:38	11/03/17 07:43	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.0084	U	0.017	0.0025	ug/L		10/30/17 16:38	11/03/17 07:43	1

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
d-N-MeFOSA-M	61		25 - 150	11/06/17 14:52	11/08/17 09:12	1
d-N-EtFOSA-M	65		25 - 150	11/06/17 14:52	11/08/17 09:12	1
13C8 FOSA	102		25 - 150	10/30/17 16:38	11/03/17 07:43	1
13C4 PFBA	112		25 - 150	10/30/17 16:38	11/03/17 07:43	1
13C2 PFHxA	112		25 - 150	10/30/17 16:38	11/03/17 07:43	1
13C4 PFOA	96		25 - 150	10/30/17 16:38	11/03/17 07:43	1
13C5 PFNA	116		25 - 150	10/30/17 16:38	11/03/17 07:43	1
13C2 PFDA	112		25 - 150	10/30/17 16:38	11/03/17 07:43	1
13C2 PFUnA	117		25 - 150	10/30/17 16:38	11/03/17 07:43	1
13C2 PFDoA	104		25 - 150	10/30/17 16:38	11/03/17 07:43	1
13C2-PFTeDA	103		25 - 150	10/30/17 16:38	11/03/17 07:43	1
13C3-PFBS	111		25 - 150	10/30/17 16:38	11/03/17 07:43	1
18O2 PFHxS	113		25 - 150	10/30/17 16:38	11/03/17 07:43	1
13C4 PFOS	106		25 - 150	10/30/17 16:38	11/03/17 07:43	1
13C4-PFHpA	112		25 - 150	10/30/17 16:38	11/03/17 07:43	1
13C5 PFPeA	107		25 - 150	10/30/17 16:38	11/03/17 07:43	1
M2-6:2FTS	76		25 - 150	10/30/17 16:38	11/03/17 07:43	1
d5-NEtFOSAA	131		25 - 150	10/30/17 16:38	11/03/17 07:43	1
d3-NMeFOSAA	113		25 - 150	10/30/17 16:38	11/03/17 07:43	1
M2-8:2FTS	116		25 - 150	10/30/17 16:38	11/03/17 07:43	1

TestAmerica Sacramento

Client Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32575-1

Client Sample ID: CECRL-10

Lab Sample ID: 320-32575-7

Date Collected: 10/19/17 12:55

Matrix: Water

Date Received: 10/21/17 09:05

Method: 537 (modified) - Perfluorinated Hydrocarbons

Analyte	Result	Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
N-EtFOSA-M	50	U	100	13	ug/L		11/06/17 14:52	11/08/17 09:20	1
Perfluorobutanoic acid (PFBA)	0.0011	J	0.0017	0.00029	ug/L		10/30/17 16:38	11/03/17 07:51	1
MeFOSA	50	U	100	22	ug/L		11/06/17 14:52	11/08/17 09:20	1
Perfluoropentanoic acid (PFPeA)	0.00084	U M	0.0017	0.00041	ug/L		10/30/17 16:38	11/03/17 07:51	1
Perfluorohexanoic acid (PFHxA)	0.0017	U	0.0034	0.00049	ug/L		10/30/17 16:38	11/03/17 07:51	1
Perfluoroheptanoic acid (PFHpA)	0.00084	U	0.0017	0.00021	ug/L		10/30/17 16:38	11/03/17 07:51	1
Perfluorooctanoic acid (PFOA)	0.0017	U	0.0034	0.00071	ug/L		10/30/17 16:38	11/03/17 07:51	1
Perfluorononanoic acid (PFNA)	0.00084	U	0.0017	0.00023	ug/L		10/30/17 16:38	11/03/17 07:51	1
Perfluorodecanoic acid (PFDA)	0.00084	U	0.0017	0.00026	ug/L		10/30/17 16:38	11/03/17 07:51	1
Perfluoroundecanoic acid (PFUnA)	0.0025	U	0.0034	0.00092	ug/L		10/30/17 16:38	11/03/17 07:51	1
Perfluorododecanoic acid (PFDoA)	0.0017	U	0.0034	0.00046	ug/L		10/30/17 16:38	11/03/17 07:51	1
Perfluorotridecanoic Acid (PFTriA)	0.0025	U	0.0034	0.0011	ug/L		10/30/17 16:38	11/03/17 07:51	1
Perfluorotetradecanoic acid (PFTeA)	0.00031	J M	0.0017	0.00024	ug/L		10/30/17 16:38	11/03/17 07:51	1
Perfluorobutanesulfonic acid (PFBS)	0.00084	U M	0.0017	0.00025	ug/L		10/30/17 16:38	11/03/17 07:51	1
Perfluorohexanesulfonic acid (PFHxS)	0.00028	J	0.0017	0.00025	ug/L		10/30/17 16:38	11/03/17 07:51	1
Perfluoroheptanesulfonic Acid (PFHpS)	0.00084	U	0.0017	0.00025	ug/L		10/30/17 16:38	11/03/17 07:51	1
Perfluorooctanesulfonic acid (PFOS)	0.0017	U M	0.0034	0.00045	ug/L		10/30/17 16:38	11/03/17 07:51	1
Perfluorodecanesulfonic acid (PFDS)	0.00084	U	0.0017	0.00027	ug/L		10/30/17 16:38	11/03/17 07:51	1
Perfluorooctane Sulfonamide (FOSA)	0.0011	J	0.0017	0.00029	ug/L		10/30/17 16:38	11/03/17 07:51	1
6:2FTS	0.0084	U	0.017	0.0025	ug/L		10/30/17 16:38	11/03/17 07:51	1
8:2FTS	0.0084	U	0.017	0.0025	ug/L		10/30/17 16:38	11/03/17 07:51	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.0084	U	0.017	0.0026	ug/L		10/30/17 16:38	11/03/17 07:51	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.0084	U	0.017	0.0025	ug/L		10/30/17 16:38	11/03/17 07:51	1

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
d-N-MeFOSA-M	68		25 - 150	11/06/17 14:52	11/08/17 09:20	1
d-N-EtFOSA-M	72		25 - 150	11/06/17 14:52	11/08/17 09:20	1
13C8 FOSA	98		25 - 150	10/30/17 16:38	11/03/17 07:51	1
13C4 PFBA	97		25 - 150	10/30/17 16:38	11/03/17 07:51	1
13C2 PFHxA	109		25 - 150	10/30/17 16:38	11/03/17 07:51	1
13C4 PFOA	93		25 - 150	10/30/17 16:38	11/03/17 07:51	1
13C5 PFNA	105		25 - 150	10/30/17 16:38	11/03/17 07:51	1
13C2 PFDA	103		25 - 150	10/30/17 16:38	11/03/17 07:51	1
13C2 PFUnA	102		25 - 150	10/30/17 16:38	11/03/17 07:51	1
13C2 PFDoA	98		25 - 150	10/30/17 16:38	11/03/17 07:51	1
13C2-PFTeDA	102		25 - 150	10/30/17 16:38	11/03/17 07:51	1
13C3-PFBS	106		25 - 150	10/30/17 16:38	11/03/17 07:51	1
18O2 PFHxS	109		25 - 150	10/30/17 16:38	11/03/17 07:51	1
13C4 PFOS	98		25 - 150	10/30/17 16:38	11/03/17 07:51	1
13C4-PFHpA	112		25 - 150	10/30/17 16:38	11/03/17 07:51	1
13C5 PFPeA	103		25 - 150	10/30/17 16:38	11/03/17 07:51	1
M2-6:2FTS	66		25 - 150	10/30/17 16:38	11/03/17 07:51	1
d5-NEtFOSAA	115		25 - 150	10/30/17 16:38	11/03/17 07:51	1
d3-NMeFOSAA	106		25 - 150	10/30/17 16:38	11/03/17 07:51	1
M2-8:2FTS	106		25 - 150	10/30/17 16:38	11/03/17 07:51	1

TestAmerica Sacramento

Isotope Dilution Summary

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32575-1

Method: 537 (modified) - Perfluorinated Hydrocarbons

Matrix: Water

Prep Type: Total/NA

Percent Isotope Dilution Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	3C8 FOS/ (25-150)	3C4 PFB/ (25-150)	3C2 PFHx/ (25-150)	3C4 PFO/ (25-150)	3C5 PFN/ (25-150)	3C2 PFD/ (25-150)	3C2 PFUn/ (25-150)	3C2 PFDa/ (25-150)
320-32575-1	CECRL-09	102	109	106	97	113	111	112	99
320-32575-2	CECRL-11	102	95	107	97	116	107	116	99
320-32575-3	MW-14-104	100	99	101	92	111	105	108	96
320-32575-4	MW-14-105	104	108	110	98	110	113	120	107
320-32575-5	CECRL-08	102	115	108	93	111	113	108	102
320-32575-6	MW-14-106	102	112	112	96	116	112	117	104
320-32575-7	CECRL-10	98	97	109	93	105	103	102	98
LCS 320-191964/2-A	Lab Control Sample	92	99 M	105	90	109	106	106	99
LCSD 320-191964/3-A	Lab Control Sample Dup	90	104 M	101	91	104	105	102	96
MB 320-191964/1-A	Method Blank	89	104	103	91	104	106	103	100

Percent Isotope Dilution Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	C2-PFTeF/ (25-150)	3C3-PFB/ (25-150)	3O2 PFHx/ (25-150)	3C4 PFO/ (25-150)	3C4-PFHp/ (25-150)	3C5 PFPe/ (25-150)	M2-6:2FTE/ (25-150)	1-NMeFOS/ (25-150)
320-32575-1	CECRL-09	106	107	109	105	118	108	71	117
320-32575-2	CECRL-11	105	103	110	108	116	108	71	136
320-32575-3	MW-14-104	97	105	105	104	109	104	67	113
320-32575-4	MW-14-105	114	112	109	105	115	112	70	144
320-32575-5	CECRL-08	119	111	110	103	114	107	70	116
320-32575-6	MW-14-106	103	111	113	106	112	107	76	131
320-32575-7	CECRL-10	102	106	109	98	112	103	66	115
LCS 320-191964/2-A	Lab Control Sample	104	103	105	102	106	102	62	104
LCSD 320-191964/3-A	Lab Control Sample Dup	104	101	103	99	103	99	65	99
MB 320-191964/1-A	Method Blank	105	106	103	98	106	102	65	107

Percent Isotope Dilution Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	1-NMeFOS/ (25-150)	M2-8:2FTE/ (25-150)
320-32575-1	CECRL-09	109	112
320-32575-2	CECRL-11	111	113
320-32575-3	MW-14-104	106	108
320-32575-4	MW-14-105	110	115
320-32575-5	CECRL-08	109	108
320-32575-6	MW-14-106	113	116
320-32575-7	CECRL-10	106	106
LCS 320-191964/2-A	Lab Control Sample	108	107
LCSD 320-191964/3-A	Lab Control Sample Dup	101	106
MB 320-191964/1-A	Method Blank	102	104

Surrogate Legend

13C8 FOSA = 13C8 FOSA
13C4 PFBA = 13C4 PFBA
13C2 PFHxA = 13C2 PFHxA
13C4 PFOA = 13C4 PFOA
13C5 PFNA = 13C5 PFNA
13C2 PFDA = 13C2 PFDA
13C2 PFUnA = 13C2 PFUnA
13C2 PFDa = 13C2 PFDa
13C2-PFTeDA = 13C2-PFTeDA
13C3-PFBS = 13C3-PFBS
18O2 PFHxS = 18O2 PFHxS

TestAmerica Sacramento

Isotope Dilution Summary

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32575-1

$^{13}\text{C}_4 \text{ PFOS} = ^{13}\text{C}_4 \text{ PFOS}$
 $^{13}\text{C}_4 \text{ PFHpA} = ^{13}\text{C}_4 \text{ PFHpA}$
 $^{13}\text{C}_5 \text{ PFPeA} = ^{13}\text{C}_5 \text{ PFPeA}$
 $\text{M2-6:2FTS} = \text{M2-6:2FTS}$
 $\text{d5-NEtFOSAA} = \text{d5-NEtFOSAA}$
 $\text{d3-NMeFOSAA} = \text{d3-NMeFOSAA}$
 $\text{M2-8:2FTS} = \text{M2-8:2FTS}$

Method: 537 (modified) - Perfluorinated Hydrocarbons

Matrix: Water

Prep Type: Total/NA

Percent Isotope Dilution Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	I-MeFOSA	N-EtFOSA
		(25-150)	(25-150)
320-32575-1	CECRL-09	73	79
320-32575-2	CECRL-11	68	70
320-32575-3	MW-14-104	81	86
320-32575-4	MW-14-105	66	69
320-32575-5	CECRL-08	61	66
320-32575-6	MW-14-106	61	65
320-32575-7	CECRL-10	68	72
LCS 320-193099/2-A	Lab Control Sample	68	70
MB 320-193099/1-A	Method Blank	65	68

Surrogate Legend

d-N-MeFOSA-M = d-N-MeFOSA-M
d-N-EtFOSA-M = d-N-EtFOSA-M

QC Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32575-1

Method: 537 (modified) - Perfluorinated Hydrocarbons

Lab Sample ID: MB 320-191964/1-A

Matrix: Water

Analysis Batch: 192700

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 191964

Analyte	MB Result	MB Qualifier	LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	0.0010	U	0.0020	0.00035	ug/L		10/30/17 16:38	11/03/17 06:40	1
Perfluoropentanoic acid (PFPeA)	0.0010	U	0.0020	0.00049	ug/L		10/30/17 16:38	11/03/17 06:40	1
Perfluorohexanoic acid (PFHxA)	0.0020	U	0.0040	0.00058	ug/L		10/30/17 16:38	11/03/17 06:40	1
Perfluoroheptanoic acid (PFHpA)	0.0010	U	0.0020	0.00025	ug/L		10/30/17 16:38	11/03/17 06:40	1
Perfluorooctanoic acid (PFOA)	0.0020	U	0.0040	0.00085	ug/L		10/30/17 16:38	11/03/17 06:40	1
Perfluorononanoic acid (PFNA)	0.0010	U	0.0020	0.00027	ug/L		10/30/17 16:38	11/03/17 06:40	1
Perfluorodecanoic acid (PFDA)	0.0010	U	0.0020	0.00031	ug/L		10/30/17 16:38	11/03/17 06:40	1
Perfluoroundecanoic acid (PFUnA)	0.0030	U	0.0040	0.0011	ug/L		10/30/17 16:38	11/03/17 06:40	1
Perfluorododecanoic acid (PFDoA)	0.0020	U	0.0040	0.00055	ug/L		10/30/17 16:38	11/03/17 06:40	1
Perfluorotridecanoic Acid (PFTriA)	0.0030	U	0.0040	0.0013	ug/L		10/30/17 16:38	11/03/17 06:40	1
Perfluorotetradecanoic acid (PFTeA)	0.0010	U	0.0020	0.00029	ug/L		10/30/17 16:38	11/03/17 06:40	1
Perfluorobutanesulfonic acid (PFBS)	0.0010	U	0.0020	0.00030	ug/L		10/30/17 16:38	11/03/17 06:40	1
Perfluorohexanesulfonic acid (PFHxS)	0.000310	J	0.0020	0.00030	ug/L		10/30/17 16:38	11/03/17 06:40	1
Perfluoroheptanesulfonic Acid (PFHpS)	0.0010	U	0.0020	0.00030	ug/L		10/30/17 16:38	11/03/17 06:40	1
Perfluorooctanesulfonic acid (PFOS)	0.0020	U	0.0040	0.00054	ug/L		10/30/17 16:38	11/03/17 06:40	1
Perfluorodecanesulfonic acid (PFDS)	0.0010	U	0.0020	0.00032	ug/L		10/30/17 16:38	11/03/17 06:40	1
Perfluorooctane Sulfonamide (FOSA)	0.000357	J	0.0020	0.00035	ug/L		10/30/17 16:38	11/03/17 06:40	1
6:2FTS	0.010	U	0.020	0.0030	ug/L		10/30/17 16:38	11/03/17 06:40	1
8:2FTS	0.010	U	0.020	0.0030	ug/L		10/30/17 16:38	11/03/17 06:40	1
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.010	U	0.020	0.0031	ug/L		10/30/17 16:38	11/03/17 06:40	1
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.010	U	0.020	0.0030	ug/L		10/30/17 16:38	11/03/17 06:40	1

Isotope Dilution	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C8 FOSA	89		25 - 150	10/30/17 16:38	11/03/17 06:40	1
13C4 PFBA	104		25 - 150	10/30/17 16:38	11/03/17 06:40	1
13C2 PFHxA	103		25 - 150	10/30/17 16:38	11/03/17 06:40	1
13C4 PFOA	91		25 - 150	10/30/17 16:38	11/03/17 06:40	1
13C5 PFNA	104		25 - 150	10/30/17 16:38	11/03/17 06:40	1
13C2 PFDA	106		25 - 150	10/30/17 16:38	11/03/17 06:40	1
13C2 PFUnA	103		25 - 150	10/30/17 16:38	11/03/17 06:40	1
13C2 PFDoA	100		25 - 150	10/30/17 16:38	11/03/17 06:40	1
13C2-PFTeDA	105		25 - 150	10/30/17 16:38	11/03/17 06:40	1
13C3-PFBS	106		25 - 150	10/30/17 16:38	11/03/17 06:40	1
18O2 PFHxS	103		25 - 150	10/30/17 16:38	11/03/17 06:40	1
13C4 PFOS	98		25 - 150	10/30/17 16:38	11/03/17 06:40	1
13C4-PFHpA	106		25 - 150	10/30/17 16:38	11/03/17 06:40	1
13C5 PFPeA	102		25 - 150	10/30/17 16:38	11/03/17 06:40	1
M2-6:2FTS	65		25 - 150	10/30/17 16:38	11/03/17 06:40	1
d5-NEtFOSAA	107		25 - 150	10/30/17 16:38	11/03/17 06:40	1
d3-NMeFOSAA	102		25 - 150	10/30/17 16:38	11/03/17 06:40	1
M2-8:2FTS	104		25 - 150	10/30/17 16:38	11/03/17 06:40	1

TestAmerica Sacramento

QC Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32575-1

Method: 537 (modified) - Perfluorinated Hydrocarbons (Continued)

Lab Sample ID: LCS 320-191964/2-A

Matrix: Water

Analysis Batch: 192700

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 191964

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
Perfluorobutanoic acid (PFBA)	0.0400	0.0393	M	ug/L		98	89 - 128
Perfluoropentanoic acid (PFPeA)	0.0400	0.0379		ug/L		95	66 - 136
Perfluorohexanoic acid (PFHxA)	0.0400	0.0367		ug/L		92	86 - 126
Perfluoroheptanoic acid (PFHpA)	0.0400	0.0377		ug/L		94	89 - 127
Perfluorooctanoic acid (PFOA)	0.0400	0.0388		ug/L		97	80 - 120
Perfluorononanoic acid (PFNA)	0.0400	0.0363		ug/L		91	77 - 137
Perfluorodecanoic acid (PFDA)	0.0400	0.0391		ug/L		98	84 - 123
Perfluoroundecanoic acid (PFUnA)	0.0400	0.0355		ug/L		89	73 - 122
Perfluorododecanoic acid (PFDoA)	0.0400	0.0403		ug/L		101	82 - 122
Perfluorotridecanoic Acid (PFTriA)	0.0400	0.0418		ug/L		104	56 - 163
Perfluorotetradecanoic acid (PFTeA)	0.0400	0.0387		ug/L		97	66 - 120
Perfluorobutanesulfonic acid (PFBS)	0.0354	0.0351		ug/L		99	88 - 130
Perfluorohexanesulfonic acid (PFHxS)	0.0364	0.0331		ug/L		91	87 - 126
Perfluoroheptanesulfonic Acid (PFHpS)	0.0381	0.0381		ug/L		100	92 - 135
Perfluorooctanesulfonic acid (PFOS)	0.0371	0.0355		ug/L		96	83 - 126
Perfluorodecanesulfonic acid (PFDS)	0.0386	0.0381		ug/L		99	80 - 129
Perfluorooctane Sulfonamide (FOSA)	0.0400	0.0395		ug/L		99	91 - 133
6:2FTS	0.0379	0.0349		ug/L		92	90 - 135
8:2FTS	0.0383	0.0376		ug/L		98	88 - 132
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.0400	0.0380		ug/L		95	87 - 128
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.0400	0.0364		ug/L		91	86 - 132

Isotope Dilution	LCS LCS		Limits
	%Recovery	Qualifier	
13C8 FOSA	92		25 - 150
13C4 PFBA	99	M	25 - 150
13C2 PFHxA	105		25 - 150
13C4 PFOA	90		25 - 150
13C5 PFNA	109		25 - 150
13C2 PFDA	106		25 - 150
13C2 PFUnA	106		25 - 150
13C2 PFDoA	99		25 - 150
13C2-PFTeDA	104		25 - 150
13C3-PFBS	103		25 - 150
18O2 PFHxS	105		25 - 150
13C4 PFOS	102		25 - 150
13C4-PFHpA	106		25 - 150
13C5 PFPeA	102		25 - 150

TestAmerica Sacramento

QC Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32575-1

Method: 537 (modified) - Perfluorinated Hydrocarbons (Continued)

Lab Sample ID: LCS 320-191964/2-A

Matrix: Water

Analysis Batch: 192700

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 191964

<i>Isotope Dilution</i>	<i>%Recovery</i>	<i>LCS Qualifier</i>	<i>Limits</i>
M2-6:2FTS	62		25 - 150
d5-NEtFOSAA	104		25 - 150
d3-NMeFOSAA	108		25 - 150
M2-8:2FTS	107		25 - 150

Lab Sample ID: LCSD 320-191964/3-A

Matrix: Water

Analysis Batch: 192700

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Prep Batch: 191964

<i>Analyte</i>	<i>Spike Added</i>	<i>LCSD Result</i>	<i>LCSD Qualifier</i>	<i>Unit</i>	<i>D</i>	<i>%Rec</i>	<i>%Rec. Limits</i>	<i>RPD</i>	<i>RPD Limit</i>
Perfluorobutanoic acid (PFBA)	0.0400	0.0396	M	ug/L		99	89 - 128	1	30
Perfluoropentanoic acid (PFPeA)	0.0400	0.0396		ug/L		99	66 - 136	4	30
Perfluorohexanoic acid (PFHxA)	0.0400	0.0396		ug/L		99	86 - 126	8	30
Perfluoroheptanoic acid (PFHpA)	0.0400	0.0384		ug/L		96	89 - 127	2	30
Perfluorooctanoic acid (PFOA)	0.0400	0.0403		ug/L		101	80 - 120	4	30
Perfluorononanoic acid (PFNA)	0.0400	0.0382		ug/L		96	77 - 137	5	30
Perfluorodecanoic acid (PFDA)	0.0400	0.0394		ug/L		98	84 - 123	1	30
Perfluoroundecanoic acid (PFUnA)	0.0400	0.0383		ug/L		96	73 - 122	8	30
Perfluorododecanoic acid (PFDoA)	0.0400	0.0415		ug/L		104	82 - 122	3	30
Perfluorotridecanoic Acid (PFTriA)	0.0400	0.0407		ug/L		102	56 - 163	3	30
Perfluorotetradecanoic acid (PFTeA)	0.0400	0.0375		ug/L		94	66 - 120	3	30
Perfluorobutanesulfonic acid (PFBS)	0.0354	0.0361		ug/L		102	88 - 130	3	30
Perfluorohexanesulfonic acid (PFHxS)	0.0364	0.0333		ug/L		91	87 - 126	1	30
Perfluoroheptanesulfonic Acid (PFHpS)	0.0381	0.0386		ug/L		101	92 - 135	1	30
Perfluorooctanesulfonic acid (PFOS)	0.0371	0.0359		ug/L		97	83 - 126	1	30
Perfluorodecanesulfonic acid (PFDS)	0.0386	0.0361		ug/L		94	80 - 129	6	30
Perfluorooctane Sulfonamide (FOSA)	0.0400	0.0404		ug/L		101	91 - 133	2	30
6:2FTS	0.0379	0.0343		ug/L		90	90 - 135	2	30
8:2FTS	0.0383	0.0356		ug/L		93	88 - 132	5	30
N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)	0.0400	0.0395		ug/L		99	87 - 128	4	30
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	0.0400	0.0399		ug/L		100	86 - 132	9	30

<i>Isotope Dilution</i>	<i>%Recovery</i>	<i>LCSD Qualifier</i>	<i>Limits</i>
13C8 FOSA	90		25 - 150
13C4 PFBA	104	M	25 - 150
13C2 PFHxA	101		25 - 150
13C4 PFOA	91		25 - 150
13C5 PFNA	104		25 - 150

TestAmerica Sacramento

QC Sample Results

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32575-1

Method: 537 (modified) - Perfluorinated Hydrocarbons (Continued)

Lab Sample ID: LCSD 320-191964/3-A

Matrix: Water

Analysis Batch: 192700

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Prep Batch: 191964

Isotope Dilution	LCSD		Limits
	%Recovery	Qualifier	
13C2 PFDA	105		25 - 150
13C2 PFUnA	102		25 - 150
13C2 PFDoA	96		25 - 150
13C2-PFTeDA	104		25 - 150
13C3-PFBS	101		25 - 150
18O2 PFHxS	103		25 - 150
13C4 PFOS	99		25 - 150
13C4-PFHpA	103		25 - 150
13C5 PFPeA	99		25 - 150
M2-6:2FTS	65		25 - 150
d5-NEtFOSAA	99		25 - 150
d3-NMeFOSAA	101		25 - 150
M2-8:2FTS	106		25 - 150

Lab Sample ID: MB 320-193099/1-A

Matrix: Water

Analysis Batch: 193599

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 193099

Analyte	MB		LOQ	DL	Unit	D	Prepared	Analyzed	Dil Fac
	Result	Qualifier							
N-EtFOSA-M	50	U	100	13	ug/L		11/06/17 14:52	11/08/17 08:17	1
MeFOSA	50	U	100	22	ug/L		11/06/17 14:52	11/08/17 08:17	1
Isotope Dilution	MB		Limits				Prepared	Analyzed	Dil Fac
	%Recovery	Qualifier							
d-N-MeFOSA-M	65		25 - 150				11/06/17 14:52	11/08/17 08:17	1
d-N-EtFOSA-M	68		25 - 150				11/06/17 14:52	11/08/17 08:17	1

Lab Sample ID: LCS 320-193099/2-A

Matrix: Water

Analysis Batch: 193599

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 193099

Analyte	Spike Added	LCS		Unit	D	%Rec	%Rec. Limits
		Result	Qualifier				
N-EtFOSA-M	25.0	24.0	J	ug/L		96	60 - 140
MeFOSA	25.0	24.6	J	ug/L		99	60 - 140
Isotope Dilution	LCS		Limits				
	%Recovery	Qualifier					
d-N-MeFOSA-M	68		25 - 150				
d-N-EtFOSA-M	70		25 - 150				

TestAmerica Sacramento

QC Association Summary

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32575-1

LCMS

Prep Batch: 191964

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-32575-1	CECRL-09	Total/NA	Water	3535	
320-32575-2	CECRL-11	Total/NA	Water	3535	
320-32575-3	MW-14-104	Total/NA	Water	3535	
320-32575-4	MW-14-105	Total/NA	Water	3535	
320-32575-5	CECRL-08	Total/NA	Water	3535	
320-32575-6	MW-14-106	Total/NA	Water	3535	
320-32575-7	CECRL-10	Total/NA	Water	3535	
MB 320-191964/1-A	Method Blank	Total/NA	Water	3535	
LCS 320-191964/2-A	Lab Control Sample	Total/NA	Water	3535	
LCSD 320-191964/3-A	Lab Control Sample Dup	Total/NA	Water	3535	

Analysis Batch: 192700

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-32575-1	CECRL-09	Total/NA	Water	537 (modified)	191964
320-32575-2	CECRL-11	Total/NA	Water	537 (modified)	191964
320-32575-3	MW-14-104	Total/NA	Water	537 (modified)	191964
320-32575-4	MW-14-105	Total/NA	Water	537 (modified)	191964
320-32575-5	CECRL-08	Total/NA	Water	537 (modified)	191964
320-32575-6	MW-14-106	Total/NA	Water	537 (modified)	191964
320-32575-7	CECRL-10	Total/NA	Water	537 (modified)	191964
MB 320-191964/1-A	Method Blank	Total/NA	Water	537 (modified)	191964
LCS 320-191964/2-A	Lab Control Sample	Total/NA	Water	537 (modified)	191964
LCSD 320-191964/3-A	Lab Control Sample Dup	Total/NA	Water	537 (modified)	191964

Prep Batch: 193099

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-32575-1	CECRL-09	Total/NA	Water	Filtration	
320-32575-2	CECRL-11	Total/NA	Water	Filtration	
320-32575-3	MW-14-104	Total/NA	Water	Filtration	
320-32575-4	MW-14-105	Total/NA	Water	Filtration	
320-32575-5	CECRL-08	Total/NA	Water	Filtration	
320-32575-6	MW-14-106	Total/NA	Water	Filtration	
320-32575-7	CECRL-10	Total/NA	Water	Filtration	
MB 320-193099/1-A	Method Blank	Total/NA	Water	Filtration	
LCS 320-193099/2-A	Lab Control Sample	Total/NA	Water	Filtration	

Analysis Batch: 193599

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-32575-1	CECRL-09	Total/NA	Water	537 (modified)	193099
320-32575-2	CECRL-11	Total/NA	Water	537 (modified)	193099
320-32575-3	MW-14-104	Total/NA	Water	537 (modified)	193099
320-32575-4	MW-14-105	Total/NA	Water	537 (modified)	193099
320-32575-5	CECRL-08	Total/NA	Water	537 (modified)	193099
320-32575-6	MW-14-106	Total/NA	Water	537 (modified)	193099
320-32575-7	CECRL-10	Total/NA	Water	537 (modified)	193099
MB 320-193099/1-A	Method Blank	Total/NA	Water	537 (modified)	193099
LCS 320-193099/2-A	Lab Control Sample	Total/NA	Water	537 (modified)	193099

TestAmerica Sacramento

Lab Chronicle

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32575-1

Client Sample ID: CECRL-09

Date Collected: 10/19/17 17:50

Date Received: 10/21/17 09:05

Lab Sample ID: 320-32575-1

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			285 mL	10.00 mL	191964	10/30/17 16:38	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192700	11/03/17 07:04	CBW	TAL SAC
Total/NA	Prep	Filtration			2.00 mL	10.00 mL	193099	11/06/17 14:52	JER	TAL SAC
Total/NA	Analysis	537 (modified)		1			193599	11/08/17 08:33	JRB	TAL SAC

Client Sample ID: CECRL-11

Date Collected: 10/19/17 09:10

Date Received: 10/21/17 09:05

Lab Sample ID: 320-32575-2

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			301.4 mL	10.00 mL	191964	10/30/17 16:38	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192700	11/03/17 07:12	CBW	TAL SAC
Total/NA	Prep	Filtration			2.00 mL	10.00 mL	193099	11/06/17 14:52	JER	TAL SAC
Total/NA	Analysis	537 (modified)		1			193599	11/08/17 08:41	JRB	TAL SAC

Client Sample ID: MW-14-104

Date Collected: 10/19/17 09:30

Date Received: 10/21/17 09:05

Lab Sample ID: 320-32575-3

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			297.2 mL	10.00 mL	191964	10/30/17 16:38	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192700	11/03/17 07:20	CBW	TAL SAC
Total/NA	Prep	Filtration			2.00 mL	10.00 mL	193099	11/06/17 14:52	JER	TAL SAC
Total/NA	Analysis	537 (modified)		1			193599	11/08/17 08:49	JRB	TAL SAC

Client Sample ID: MW-14-105

Date Collected: 10/19/17 15:50

Date Received: 10/21/17 09:05

Lab Sample ID: 320-32575-4

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			289.2 mL	10.00 mL	191964	10/30/17 16:38	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192700	11/03/17 07:27	CBW	TAL SAC
Total/NA	Prep	Filtration			2.00 mL	10.00 mL	193099	11/06/17 14:52	JER	TAL SAC
Total/NA	Analysis	537 (modified)		1			193599	11/08/17 08:56	JRB	TAL SAC

Client Sample ID: CECRL-08

Date Collected: 10/19/17 16:35

Date Received: 10/21/17 09:05

Lab Sample ID: 320-32575-5

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			283.7 mL	10.00 mL	191964	10/30/17 16:38	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192700	11/03/17 07:35	CBW	TAL SAC
Total/NA	Prep	Filtration			2.00 mL	10.00 mL	193099	11/06/17 14:52	JER	TAL SAC

TestAmerica Sacramento

Lab Chronicle

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32575-1

Client Sample ID: CECRL-08

Date Collected: 10/19/17 16:35

Date Received: 10/21/17 09:05

Lab Sample ID: 320-32575-5

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	537 (modified)		1			193599	11/08/17 09:04	JRB	TAL SAC

Client Sample ID: MW-14-106

Date Collected: 10/19/17 12:20

Date Received: 10/21/17 09:05

Lab Sample ID: 320-32575-6

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			296.1 mL	10.00 mL	191964	10/30/17 16:38	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192700	11/03/17 07:43	CBW	TAL SAC
Total/NA	Prep	Filtration			2.00 mL	10.00 mL	193099	11/06/17 14:52	JER	TAL SAC
Total/NA	Analysis	537 (modified)		1			193599	11/08/17 09:12	JRB	TAL SAC

Client Sample ID: CECRL-10

Date Collected: 10/19/17 12:55

Date Received: 10/21/17 09:05

Lab Sample ID: 320-32575-7

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			297.8 mL	10.00 mL	191964	10/30/17 16:38	TWL	TAL SAC
Total/NA	Analysis	537 (modified)		1			192700	11/03/17 07:51	CBW	TAL SAC
Total/NA	Prep	Filtration			2.00 mL	10.00 mL	193099	11/06/17 14:52	JER	TAL SAC
Total/NA	Analysis	537 (modified)		1			193599	11/08/17 09:20	JRB	TAL SAC

Laboratory References:

TAL SAC = TestAmerica Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Accreditation/Certification Summary

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32575-1

Laboratory: TestAmerica Sacramento

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	EPA Region	Identification Number	Expiration Date
L-A-B	DoD ELAP		L2468	01-20-18

Analysis Method	Prep Method	Matrix	Analyte
New Hampshire	NELAP	1	2997
04-18-18			
The following analytes are included in this report, but accreditation/certification is not offered by the governing authority:			
Analysis Method	Prep Method	Matrix	Analyte
537 (modified)	3535	Water	6:2FTS
537 (modified)	3535	Water	8:2FTS
537 (modified)	3535	Water	N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)
537 (modified)	3535	Water	N-methyl perfluorooctane sulfonamidoacetic acid (NMeFOSAA)
537 (modified)	3535	Water	Perfluorobutanesulfonic acid (PFBS)
537 (modified)	3535	Water	Perfluorobutanoic acid (PFBA)
537 (modified)	3535	Water	Perfluorodecanesulfonic acid (PFDS)
537 (modified)	3535	Water	Perfluorodecanoic acid (PFDA)
537 (modified)	3535	Water	Perfluorododecanoic acid (PFDoA)
537 (modified)	3535	Water	Perfluoroheptanesulfonic Acid (PFHpS)
537 (modified)	3535	Water	Perfluoroheptanoic acid (PFHpA)
537 (modified)	3535	Water	Perfluorohexanesulfonic acid (PFHxS)
537 (modified)	3535	Water	Perfluorohexanoic acid (PFHxA)
537 (modified)	3535	Water	Perfluorononanoic acid (PFNA)
537 (modified)	3535	Water	Perfluorooctane Sulfonamide (FOSA)
537 (modified)	3535	Water	Perfluorooctanesulfonic acid (PFOS)
537 (modified)	3535	Water	Perfluorooctanoic acid (PFOA)
537 (modified)	3535	Water	Perfluoropentanoic acid (PFPeA)
537 (modified)	3535	Water	Perfluorotetradecanoic acid (PFTeA)
537 (modified)	3535	Water	Perfluorotridecanoic Acid (PFTriA)
537 (modified)	3535	Water	Perfluoroundecanoic acid (PFUnA)
537 (modified)	Filtration	Water	MeFOSA
537 (modified)	Filtration	Water	N-EtFOSA-M

Method Summary

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32575-1

Method	Method Description	Protocol	Laboratory
537 (modified)	Perfluorinated Hydrocarbons	EPA	TAL SAC

Protocol References:

EPA = US Environmental Protection Agency

Laboratory References:

TAL SAC = TestAmerica Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Sample Summary

Client: AMEC Foster Wheeler E & I, Inc
Project/Site: CRREL Groundwater, New Hampshire

TestAmerica Job ID: 320-32575-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
320-32575-1	CECRL-09	Water	10/19/17 17:50	10/21/17 09:05
320-32575-2	CECRL-11	Water	10/19/17 09:10	10/21/17 09:05
320-32575-3	MW-14-104	Water	10/19/17 09:30	10/21/17 09:05
320-32575-4	MW-14-105	Water	10/19/17 15:50	10/21/17 09:05
320-32575-5	CECRL-08	Water	10/19/17 16:35	10/21/17 09:05
320-32575-6	MW-14-106	Water	10/19/17 12:20	10/21/17 09:05
320-32575-7	CECRL-10	Water	10/19/17 12:55	10/21/17 09:05

West Sacramento, CA 95605
Phone: 916.373.5600 Fax:

THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.
TAL-8210 (0713)

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Company Name: Amec Foster Wheeler		Client Contact		Project Manager:		Site Contact:		Date:		COC No: _____ of _____ COCs	
Address: 511 Congress St		Tel/Fax:		Analysis Turnaround Time		Lab Contact:		Carrier:		Sampler:	
City/State/Zip: Portland Maine 04101		☐ CALENDAR DAYS ☐ WORKING DAYS		TAT if different from Below		Perform MS / MSD (Y / N)				For Lab Use Only:	
Phone: 207 828 3415		☒ Per Contract		☐ 1 week		Filtered Sample (Y / N)				Walk-in Client:	
Fax: Call 207 329 0164		☐ 2 days		☐ 1 day						Lab Sampling:	
Project Name: CRREL PFAS		Sample Date		Sample Time		Sample Type (C=Comp, G=Grab)		Matrix		Job / SDG No.:	
Site: CRREL		2017									
PO # F013900954		10/19		1750		G		W			
Sample Identification		10/19		0910		G		W			
CECRL-09		10/19		0930		G		W			
CECRL-11		10/19		1550		G		W			
MW-14-104		10/19		1035		G		W			
MW-14-105		10/19		1220		G		W			
CECRL-08		10/19		1255		G		W			
MW-14-106											
CECRL-10											
Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____ Possible Hazard Identification: _____ Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section, if the lab is to dispose of the sample. ☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown											
Special Instructions/QC Requirements & Comments: Custody Seals Intact: ☐ Yes ☐ No Relinquished by: Tige Cunningham Foster Relinquished by: Amec Fw Relinquished by: _____											
Cooler Temp. (°C): Obs'd 22 Corr'd: 22 Therm ID No.: AK-3 Received by: Fed Ex Date/Time: 10-20-17 10am Received by: Ames Date/Time: 10-21-17 9am Received by: _____ Date/Time: _____											

Login Sample Receipt Checklist

Client: AMEC Foster Wheeler E & I, Inc

Job Number: 320-32575-1

Login Number: 32575

List Source: TestAmerica Sacramento

List Number: 1

Creator: Aguayo, Alonso

Question	Answer	Comment
Radioactivity wasn't checked or is $\leq$ background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	False	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is $<6\text{mm}$ (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

U.S. Army Corps of Engineers - New England District
Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire
Final Preliminary Assessment/Site Investigation Report Groundwater Sampling
for Per- and Polyfluoroalkyl Substances

ATTACHMENT C
DATA VALIDATION REPORT

**DRAFT
DATA VALIDATION REPORT
OCTOBER 2017 GROUNDWATER SAMPLING FOR PER-
AND POLYFLUOROALKYL SUBSTANCES**

For

REMEDIAL INVESTIGATION AND FEASIBILITY STUDY
COLD REGIONS RESEARCH ENGINEERING LABORATORY (CRREL)
HANOVER, NEW HAMPSHIRE

Contract No.: W912WJ-15-D-0003
TASK ORDER 0002

Prepared for:



**New England District
U.S. Army Corps of Engineers
696 Virginia Road
Concord MA 01742-2751**

July 23, 2020

**DRAFT
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July 23, 2020

Jeffrey S. Pickett
Project Manager

Amberlee Clark
Project Geologist, NH PG

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 PER- AND POLYFLUOROYLALKYL SUBSTANCES 2

 2.1 Blanks..... 2

3.0 REFERENCES 3

TABLES

Table 1	Sample Summary
Table 2	Validated Sample Results
Table 3	Data Validation Action Summary

ACRONYMS AND ABBREVIATION

ADR	Automated Data Review
AMEC	AMEC Environment and Infrastructure, Inc
CRREL	Cold Regions Research and Engineering Laboratory
DOD	Department of Defense
J	estimated value
LOD	Limit of Detection
LOQ	Limit of Quantitation
LCS	Laboratory Control Sample
MDL	Method Detection Limit
µg/l	micrograms per liter
NHDES	New Hampshire Department of Environmental Services
NFG	National Functional Guidelines
PFAS	Per – and Polyfluoroalkyl Substances
QAPP	Quality Assurance Project Plan
QC	Quality Control
QSM	Quality Systems Manual
RI	Remedial Investigation
RL	Reporting Limit
SDG	Sample Delivery Group
SEDD	Staged Electronic Data Deliverable
U	not detected
USEPA	United States Environmental Protection Agency

1.0 INTRODUCTION

Groundwater samples were collected from existing monitoring wells at the Cold Regions Research and Engineering Laboratory (CRREL or Site) in Hanover, New Hampshire in response to a New Hampshire Department of Environmental Services letter dated May 18, 2017 requesting that waste sites complete an initial screening for the presence of PFAS per the provisions of the New Hampshire Code of Administrative Rules, Chapters Env-Or 600 and Env-Or 700 as applicable. The purpose of the sampling request was to determine whether drinking water sources may be at risk and to gain a better understanding of the presence of PFAS in groundwater in New Hampshire (NHDES 2017). Samples were collected in October 2017. The samples were analyzed by TestAmerica Laboratories located in West Sacramento, California. The samples were analyzed by the following U.S. Environmental Protection Agency (USEPA) methods:

Laboratory	Parameter	Analytical Method	Validation Level
TestAmerica Sacramento	Per- and Polyfluoroalkyl Substances (PFO/PFAS)	USEPA 537.1 modified	Stage 2B

A summary of samples included in this data validation report is presented in Table 1. The analytical data package was reviewed in accordance with the general specifications for remedial investigation (RI) data in the draft CRREL Quality assurance Project Plan (QAPP) [AMEC, 2013].

Data validation was completed using the Staged Electronic Data Deliverable (SEDD)/Automated Data review (ADR) process. The data were also validated manually by the Wood project chemist using Stage 2B procedures for all samples. Data review and qualification actions were completed based on general procedures described in USEPA National Functional Guidelines (NFG) for Superfund Data Review (USEPA, 2017) and the method specifications in the referenced USEPA method used by the laboratory. Laboratory quality control (QC) limits reported by the laboratory were used for the evaluation of surrogate and laboratory control samples (LCS). Data qualifications were completed if necessary in accordance with the USEPA guidelines and professional judgment. Data validation actions from the Stage 2B review were compared to the ADR actions prior to preparing the final data set.

A summary of validated sample results is presented in Table 2. Groundwater samples are reported in micrograms per liter ($\mu\text{g/l}$). A summary of data validation actions is presented in Table 3. Table 3 includes results for samples that have been qualified (data validation has resulted in revisions to the laboratory result) and any results with validation codes that have been applied by ADR or the project chemist. Table 3 includes final results and validation qualifiers and validation reason codes that define the actions.

In accordance with general data reporting procedures in the Department of Defense (DOD) Quality Systems Manual (QSM) [DOD, 2010], the laboratory reported results using a combination of three detection limits including the limit of quantitation (LOQ), limit of detection (LOD), and the method detection limit (MDL). Results for compounds that are not detected in samples are reported as U qualified results at the LOD. The laboratory reports positive detections above the MDL. Values between the MDL and the LOQ are qualified as estimated (J) by the laboratory. The ADR validation module applies a validation reason code of RL to all results that are reported as J qualified positive detections below the LOQ.

2.0 PER- AND POLYFLUOROYLALKYL SUBSTANCES

Samples were analyzed for PFAS by USEPA Method 537.1 modified. A description of validation actions for each laboratory data group is presented in the following subsection. Data were evaluated based on the following parameters:

- * Data Completeness
 - * Holding Times and Preservation
Blanks
 - * Instrument Tunes
 - * Laboratory Control Sample (LCS)
 - * Field Duplicate
 - * Surrogate Recovery
 - * Internal Standards
 - * Detection Limits
 - * Sample Result Verification/Electronic Evaluation Verification (EDD)
- * = indicates that criteria were met for this parameter

Except for the validation actions noted below, sample results are interpreted to be usable as reported by the laboratory. A summary of final results is presented on Table 2. A summary of data validation actions is presented on Table 3.

2.1 Blanks

A summary of holding time actions is presented in Table 3 with results being assigned validation qualifier reason codes of BL-1 and BL-2.

SDG 320-32527-1

Perfluorotetradecanoic acid (0.000418 µg/l) was detected in the method blank associated with all samples in SDG 320-32527-1. An action level was established at five times the reported method blank concentration and compared to sample results. The result for perfluorotetradecanoic acid in sample CECRL-07 was less than the action level and was qualified non-detect (U).

SDG 320-32575-1

Perfluorohexanesulfonic acid (0.000310 µg/l) and perfluorooctane sulfonamide (0.000357 µg/l) were detected in the method blank associated with all samples in SDG 320-32575-1. Action levels were established at five times the reported method blank concentrations and compared to sample results. The results for perfluorohexanesulfonic acid in samples CECRL-10 and CECRL-11 were less than the action level and were qualified non-detect (U). The results for perfluorooctane sulfonamide in samples CECRL-08, CECRL-09, CECRL-10, CECRL-11, and MW-14-106 were less than the action level and were qualified non-detect (U).

SDG 320-32527-1 and 320-32575-1

Perfluorooctane sulfonamide (0.0003 µg/l) was detected in the field blank associated with all samples. An action level was established at five times the reported method blank concentration and compared to sample results. The results for perfluorooctane sulfonamide in samples CECRL-01 and DUP, CECRL-02, CECRL-07 through -12, CECRL-17, CECRL-19, CECRL-20, MW-14-103A and B, MW-14-106 and MW-14-107 were less than the action level and were qualified non-detect (U).

3.0 REFERENCES

AMEC, 2013. "Draft CRREL Remedial Investigation/Feasibility Study/Pilot Study/Decision Document Quality Assurance Project Plan"; Revision 1; Cold Regions Research and Engineering Laboratory Site; 72 Lyme Road; Hanover, NH; May 2013.

Department of Defense (DOD), 2010. "Quality Systems Manual for Environmental Laboratories"; Department of Navy; Version 4.2; October 25, 2010.

USEPA, 1996. "Region 1 EPA-NE Data Validation Guidelines for Evaluating Environmental Analyses"; Quality Assurance Unit Staff; Office of Environmental Measurement and Evaluation; December 1996.

U.S. Environmental Protection Agency (USEPA), 2017. "USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Data Review"; Office of Emergency and Remedial Response; EPA-540-/R-2017-002; January 2017.

Data validation was completed by project chemist:

- Wolfgang Calicchio

Reviewed by QA Officer:

- Chris Ricardi, NRCC-EAC

TABLES

Table 1 - Sample Summary
Data Validation Report
October 2017 Per- and Polyfluoroalkyl Substances Groundwater Sampling
Cold Regions Research and Engineering Laboratory
Hanover, New Hampshire

Method Class Analysis Method Fraction							PFAS 537.1 modified T
SDG	Location	Lab Sample ID	Field Sample ID	Sample Date	QC Code	Media	
320-32527-1	CECRL-01	320-32527-4	CECRL-01	10/16/17	GW	FS	23
320-32527-1	CECRL-01	320-32527-5	CECRL-01DUP	10/16/17	GW	FD	23
320-32527-1	CECRL-02	320-32527-7	CECRL-02	10/16/17	GW	FS	23
320-32527-1	CECRL-03	320-32527-8	CECRL-03	10/16/17	GW	FS	23
320-32527-1	CECRL-04	320-32527-9	CECRL-04	10/16/17	GW	FS	23
320-32527-1	CECRL-05	320-32527-6	CECRL-05	10/16/17	GW	FS	23
320-32527-1	CECRL-07	320-32527-12	CECRL-07	10/17/17	GW	FS	23
320-32527-1	CECRL-12	320-32527-10	CECRL-12	10/17/17	GW	FS	23
320-32527-1	CECRL-17	320-32527-14	CECRL-17	10/18/17	GW	FS	23
320-32527-1	CECRL-19	320-32527-15	CECRL-19	10/18/17	GW	FS	23
320-32527-1	CECRL-20	320-32527-17	CECRL-20	10/18/17	GW	FS	23
320-32527-1	MW-14-103A	320-32527-13	MW-14-103A	10/17/17	GW	FS	23
320-32527-1	MW-14-103B	320-32527-11	MW-14-103B	10/17/17	GW	FS	23
320-32527-1	QC	320-32527-1	FIELD BLK-17-001	10/16/17	BW	FB	23
320-32527-1	QC	320-32527-2	EQUIP-17-001	10/16/17	BW	EB	23
320-32527-1	QC	320-32527-3	EQUIP-17-002	10/16/17	BW	EB	23
320-32575-1	CECRL-08	320-32575-5	CECRL-08	10/19/17	GW	FS	23
320-32575-1	CECRL-09	320-32575-1	CECRL-09	10/19/17	GW	FS	23
320-32575-1	CECRL-10	320-32575-7	CECRL-10	10/19/17	GW	FS	23
320-32575-1	CECRL-11	320-32575-2	CECRL-11	10/19/17	GW	FS	23
320-32575-1	MW-14-104	320-32575-3	MW-14-104	10/19/17	GW	FS	23
320-32575-1	MW-14-105	320-32575-4	MW-14-105	10/19/17	GW	FS	23
320-32575-1	MW-14-106	320-32575-6	MW-14-106	10/19/17	GW	FS	23
320-32527-1	MW-14-107	320-32527-16	MW-14-107	10/18/17	GW	FS	23

Notes:

Number listed under method indicates the number of target analytes reported.

BW = blank water

EB = equipment blank

FB = field blank

FD = field duplicate

FS = field sample

GW = groundwater

QC = quality control

T = total

Table 2 - Validated Sample Results
Data Validation Report
October 2017 Per- and Polyfluoroalkyl Substances Groundwater Sampling
Cold Regions Research and Engineering Laboratory
Hanover, New Hampshire

		Location ID	MW-14-103A	MW-14-103B
		Sample Name	MW-14-103A	MW-14-103B
		Sample Date	10/17/2017	10/17/2017
		Sample Type	FS	FS
		Sample Delivery Group	320-32527-1	320-32527-1
Method	Parameter	Units	Result Qualifier	Result Qualifier
537 Modified	6:2 Fluorotelomer sulfonate (6:2 FTS)	UG/L	0.0084 U	0.0082 U
537 Modified	8:2 Fluorotelomer sulfonate (8:2 FTS)	UG/L	0.0084 U	0.0082 U
537 Modified	N-Ethyl perfluorooctane sulfonamide	UG/L	50 U	50 U
537 Modified	N-ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	UG/L	0.0084 U	0.0082 U
537 Modified	N-Methyl perfluorooctane sulfonamide	UG/L	50 U	50 U
537 Modified	N-methyl perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	UG/L	0.0084 U	0.0082 U
537 Modified	Perfluorobutanesulfonic acid (PFBS)	UG/L	0.00084 J	0.00082 J
537 Modified	Perfluorobutanoic acid (PFBA)	UG/L	0.0027	0.0028
537 Modified	Perfluorodecanesulfonic acid (PFDS)	UG/L	0.00084 U	0.00082 U
537 Modified	Perfluorodecanoic acid (PFDA)	UG/L	0.00084 U	0.00082 U
537 Modified	Perfluorododecanoic acid (PFDoA)	UG/L	0.0017 U	0.0016 U
537 Modified	Perfluoroheptanesulfonic acid (PFHpS)	UG/L	0.00084 U	0.00082 U
537 Modified	Perfluoroheptanoic acid (PFHpA)	UG/L	0.00064 J	0.00069 J
537 Modified	Perfluorohexanesulfonic acid (PFHxS)	UG/L	0.00089 J	0.0009 J
537 Modified	Perfluorohexanoic acid (PFHxA)	UG/L	0.0017 U	0.0008 J
537 Modified	Perfluorononanoic acid (PFNA)	UG/L	0.00084 U	0.00082 U
537 Modified	Perfluorooctanesulfonamide (FOSA)	UG/L	0.00084 U	0.00082 U
537 Modified	Perfluorooctanesulfonic acid (PFOS)	UG/L	0.0016 J	0.0018 J
537 Modified	Perfluorooctanoic acid (PFOA)	UG/L	0.0023 J	0.0025 J
537 Modified	Perfluoropentanoic acid (PFPeA)	UG/L	0.0011 J	0.0012 J
537 Modified	Perfluorotetradecanoic acid (PFTeDA)	UG/L	0.00084 U	0.00082 U
537 Modified	Perfluorotridecanoic acid (PFTTrDA)	UG/L	0.0025 U	0.0025 U
537 Modified	Perfluoroundecanoic acid (PFUnDA)	UG/L	0.0025 U	0.0025 U

Notes:

EB = equipment blank

FB = field blank

FS = field sample

FD = field duplicate

J = value is estimated

U = not detected above the reported concentration

UG/L = micrograms per liter

Table 2 - Validated Sample Results
Data Validation Report
October 2017 Per- and Polyfluoroalkyl Substances Groundwater Sampling
Cold Regions Research and Engineering Laboratory
Hanover, New Hampshire

		Location ID	MW-14-107	QC
		Sample Name	MW-14-107	EQUIP-17-001
		Sample Date	10/18/2017	10/16/2017
		Sample Type	FS	EB
		Sample Delivery Group	320-32527-1	320-32527-1
Method	Parameter	Units	Result Qualifier	Result Qualifier
537 Modified	6:2 Fluorotelomer sulfonate (6:2 FTS)	UG/L	0.0089 U	0.0083 U
537 Modified	8:2 Fluorotelomer sulfonate (8:2 FTS)	UG/L	0.0089 U	0.0083 U
537 Modified	N-Ethyl perfluorooctane sulfonamide	UG/L	50 U	50 U
537 Modified	N-ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	UG/L	0.0089 U	0.0083 U
537 Modified	N-Methyl perfluorooctane sulfonamide	UG/L	50 U	50 U
537 Modified	N-methyl perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	UG/L	0.0089 U	0.0083 U
537 Modified	Perfluorobutanesulfonic acid (PFBS)	UG/L	0.0021	0.00083 U
537 Modified	Perfluorobutanoic acid (PFBA)	UG/L	0.0044	0.00083 U
537 Modified	Perfluorodecanesulfonic acid (PFDS)	UG/L	0.00089 U	0.00083 U
537 Modified	Perfluorodecanoic acid (PFDA)	UG/L	0.00089 U	0.00083 U
537 Modified	Perfluorododecanoic acid (PFDoA)	UG/L	0.0018 U	0.0017 U
537 Modified	Perfluoroheptanesulfonic acid (PFHpS)	UG/L	0.00089 U	0.00083 U
537 Modified	Perfluoroheptanoic acid (PFHpA)	UG/L	0.00089 U	0.00083 U
537 Modified	Perfluorohexanesulfonic acid (PFHxS)	UG/L	0.00027 J	0.00083 U
537 Modified	Perfluorohexanoic acid (PFHxA)	UG/L	0.023	0.0017 U
537 Modified	Perfluorononanoic acid (PFNA)	UG/L	0.00089 U	0.00083 U
537 Modified	Perfluorooctanesulfonamide (FOSA)	UG/L	0.00089 U	0.00083 U
537 Modified	Perfluorooctanesulfonic acid (PFOS)	UG/L	0.0018 U	0.0017 U
537 Modified	Perfluorooctanoic acid (PFOA)	UG/L	0.0018 U	0.0017 U
537 Modified	Perfluoropentanoic acid (PFPeA)	UG/L	0.021	0.00083 U
537 Modified	Perfluorotetradecanoic acid (PFTeDA)	UG/L	0.00089 U	0.00083 U
537 Modified	Perfluorotridecanoic acid (PFTTrDA)	UG/L	0.0027 U	0.0025 U
537 Modified	Perfluoroundecanoic acid (PFUnDA)	UG/L	0.0027 U	0.0025 U

Notes:

EB = equipment blank

FB = field blank

FS = field sample

FD = field duplicate

J = value is estimated

U = not detected above the reported concentration

UG/L = micrograms per liter

Table 2 - Validated Sample Results
Data Validation Report
October 2017 Per- and Polyfluoroalkyl Substances Groundwater Sampling
Cold Regions Research and Engineering Laboratory
Hanover, New Hampshire

			Location ID	QC		QC	
			Sample Name	EQUIP-17-002		FIELDBLK-17-001	
			Sample Date	10/16/2017		10/16/2017	
			Sample Type	EB		FB	
			Sample Delivery Group	320-32527-1		320-32527-1	
Method	Parameter	Units	Result	Qualifier	Result	Qualifier	
537 Modified	6:2 Fluorotelomer sulfonate (6:2 FTS)	UG/L	0.0082 U		0.0081 U		
537 Modified	8:2 Fluorotelomer sulfonate (8:2 FTS)	UG/L	0.0082 U		0.0081 U		
537 Modified	N-Ethyl perfluorooctane sulfonamide	UG/L	50 U		50 U		
537 Modified	N-ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	UG/L	0.0082 U		0.0081 U		
537 Modified	N-Methyl perfluorooctane sulfonamide	UG/L	50 U		50 U		
537 Modified	N-methyl perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	UG/L	0.0082 U		0.0081 U		
537 Modified	Perfluorobutanesulfonic acid (PFBS)	UG/L	0.00082 U		0.00081 U		
537 Modified	Perfluorobutanoic acid (PFBA)	UG/L	0.00082 U		0.00081 U		
537 Modified	Perfluorodecanesulfonic acid (PFDS)	UG/L	0.00082 U		0.00081 U		
537 Modified	Perfluorodecanoic acid (PFDA)	UG/L	0.00082 U		0.00081 U		
537 Modified	Perfluorododecanoic acid (PFDoA)	UG/L	0.0016 U		0.0016 U		
537 Modified	Perfluoroheptanesulfonic acid (PFHpS)	UG/L	0.00082 U		0.00081 U		
537 Modified	Perfluoroheptanoic acid (PFHpA)	UG/L	0.00082 U		0.00081 U		
537 Modified	Perfluorohexanesulfonic acid (PFHxS)	UG/L	0.00082 U		0.00081 U		
537 Modified	Perfluorohexanoic acid (PFHxA)	UG/L	0.0016 U		0.0016 U		
537 Modified	Perfluorononanoic acid (PFNA)	UG/L	0.00082 U		0.00081 U		
537 Modified	Perfluorooctanesulfonamide (FOSA)	UG/L	0.00082 U		0.0003 J		
537 Modified	Perfluorooctanesulfonic acid (PFOS)	UG/L	0.0016 U		0.0016 U		
537 Modified	Perfluorooctanoic acid (PFOA)	UG/L	0.0016 U		0.0016 U		
537 Modified	Perfluoropentanoic acid (PFPeA)	UG/L	0.00082 U		0.00081 U		
537 Modified	Perfluorotetradecanoic acid (PFTeDA)	UG/L	0.00082 U		0.00081 U		
537 Modified	Perfluorotridecanoic acid (PFTrDA)	UG/L	0.0025 U		0.0024 U		
537 Modified	Perfluoroundecanoic acid (PFUnDA)	UG/L	0.0025 U		0.0024 U		

Notes:

EB = equipment blank

FB = field blank

FS = field sample

FD = field duplicate

J = value is estimated

U = not detected above the reported concentration

UG/L = micrograms per liter

Table 2 - Validated Sample Results
Data Validation Report
October 2017 Per- and Polyfluoroalkyl Substances Groundwater Sampling
Cold Regions Research and Engineering Laboratory
Hanover, New Hampshire

		Location ID	WELL:CECRL01	WELL:CECRL01
		Sample Name	CECRL-01	CECRL-01DUP
		Sample Date	10/16/2017	10/16/2017
		Sample Type	FS	FD
		Sample Delivery Group	320-32527-1	320-32527-1
Method	Parameter	Units	Result Qualifier	Result Qualifier
537 Modified	6:2 Fluorotelomer sulfonate (6:2 FTS)	UG/L	0.0085 U	0.0084 U
537 Modified	8:2 Fluorotelomer sulfonate (8:2 FTS)	UG/L	0.0085 U	0.0084 U
537 Modified	N-Ethyl perfluorooctane sulfonamide	UG/L	50 U	50 U
537 Modified	N-ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	UG/L	0.0085 U	0.0084 U
537 Modified	N-Methyl perfluorooctane sulfonamide	UG/L	50 U	50 U
537 Modified	N-methyl perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	UG/L	0.0085 U	0.0084 U
537 Modified	Perfluorobutanesulfonic acid (PFBS)	UG/L	0.00044 J	0.00045 J
537 Modified	Perfluorobutanoic acid (PFBA)	UG/L	0.0018	0.0016 J
537 Modified	Perfluorodecanesulfonic acid (PFDS)	UG/L	0.00085 U	0.00084 U
537 Modified	Perfluorodecanoic acid (PFDA)	UG/L	0.00085 U	0.00084 U
537 Modified	Perfluorododecanoic acid (PFDoA)	UG/L	0.0017 U	0.0017 U
537 Modified	Perfluoroheptanesulfonic acid (PFHpS)	UG/L	0.00085 U	0.00084 U
537 Modified	Perfluoroheptanoic acid (PFHpA)	UG/L	0.00028 J	0.00026 J
537 Modified	Perfluorohexanesulfonic acid (PFHxS)	UG/L	0.00064 J	0.00066 J
537 Modified	Perfluorohexanoic acid (PFHxA)	UG/L	0.0017 U	0.0017 U
537 Modified	Perfluorononanoic acid (PFNA)	UG/L	0.00085 U	0.00084 U
537 Modified	Perfluorooctanesulfonamide (FOSA)	UG/L	0.00085 U	0.00084 U
537 Modified	Perfluorooctanesulfonic acid (PFOS)	UG/L	0.0017 U	0.0017 U
537 Modified	Perfluorooctanoic acid (PFOA)	UG/L	0.0017 U	0.0017 U
537 Modified	Perfluoropentanoic acid (PFPeA)	UG/L	0.0012 J	0.0011 J
537 Modified	Perfluorotetradecanoic acid (PFTeDA)	UG/L	0.00085 U	0.00084 U
537 Modified	Perfluorotridecanoic acid (PFTTrDA)	UG/L	0.0026 U	0.0025 U
537 Modified	Perfluoroundecanoic acid (PFUnDA)	UG/L	0.0026 U	0.0025 U

Notes:

EB = equipment blank

FB = field blank

FS = field sample

FD = field duplicate

J = value is estimated

U = not detected above the reported concentration

UG/L = micrograms per liter

Table 2 - Validated Sample Results
Data Validation Report
October 2017 Per- and Polyfluoroalkyl Substances Groundwater Sampling
Cold Regions Research and Engineering Laboratory
Hanover, New Hampshire

		Location ID	WELL:CECRL02	WELL:CECRL03
		Sample Name	CECRL-02	CECRL-03
		Sample Date	10/16/2017	10/16/2017
		Sample Type	FS	FS
		Sample Delivery Group	320-32527-1	320-32527-1
Method	Parameter	Units	Result Qualifier	Result Qualifier
537 Modified	6:2 Fluorotelomer sulfonate (6:2 FTS)	UG/L	0.0082 U	0.0082 U
537 Modified	8:2 Fluorotelomer sulfonate (8:2 FTS)	UG/L	0.0082 U	0.0082 U
537 Modified	N-Ethyl perfluorooctane sulfonamide	UG/L	50 U	50 U
537 Modified	N-ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	UG/L	0.0082 U	0.0082 U
537 Modified	N-Methyl perfluorooctane sulfonamide	UG/L	50 U	50 U
537 Modified	N-methyl perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	UG/L	0.0082 U	0.0082 U
537 Modified	Perfluorobutanesulfonic acid (PFBS)	UG/L	0.00034 J	0.00082 U
537 Modified	Perfluorobutanoic acid (PFBA)	UG/L	0.0014 J	0.00036 J
537 Modified	Perfluorodecanesulfonic acid (PFDS)	UG/L	0.00082 U	0.00082 U
537 Modified	Perfluorodecanoic acid (PFDA)	UG/L	0.00082 U	0.00082 U
537 Modified	Perfluorododecanoic acid (PFDoA)	UG/L	0.0016 U	0.0016 U
537 Modified	Perfluoroheptanesulfonic acid (PFHpS)	UG/L	0.00082 U	0.00082 U
537 Modified	Perfluoroheptanoic acid (PFHpA)	UG/L	0.00082 U	0.00029 J
537 Modified	Perfluorohexanesulfonic acid (PFHxS)	UG/L	0.00055 J	0.0003 J
537 Modified	Perfluorohexanoic acid (PFHxA)	UG/L	0.0016 U	0.0016 U
537 Modified	Perfluorononanoic acid (PFNA)	UG/L	0.00082 U	0.00082 U
537 Modified	Perfluorooctanesulfonamide (FOSA)	UG/L	0.00082 U	0.0044
537 Modified	Perfluorooctanesulfonic acid (PFOS)	UG/L	0.0016 U	0.0016 U
537 Modified	Perfluorooctanoic acid (PFOA)	UG/L	0.0016 U	0.0016 U
537 Modified	Perfluoropentanoic acid (PFPeA)	UG/L	0.00099 J	0.00053 J
537 Modified	Perfluorotetradecanoic acid (PFTeDA)	UG/L	0.00082 U	0.00082 U
537 Modified	Perfluorotridecanoic acid (PFTTrDA)	UG/L	0.0025 U	0.0025 U
537 Modified	Perfluoroundecanoic acid (PFUnDA)	UG/L	0.0025 U	0.0025 U

Notes:

EB = equipment blank

FB = field blank

FS = field sample

FD = field duplicate

J = value is estimated

U = not detected above the reported concentration

UG/L = micrograms per liter

Table 2 - Validated Sample Results
Data Validation Report
October 2017 Per- and Polyfluoroalkyl Substances Groundwater Sampling
Cold Regions Research and Engineering Laboratory
Hanover, New Hampshire

		Location ID	WELL:CECRL04	WELL:CECRL05
		Sample Name	CECRL-04	CECRL-05
		Sample Date	10/16/2017	10/16/2017
		Sample Type	FS	FS
		Sample Delivery Group	320-32527-1	320-32527-1
Method	Parameter	Units	Result Qualifier	Result Qualifier
537 Modified	6:2 Fluorotelomer sulfonate (6:2 FTS)	UG/L	0.0086 U	0.0087 U
537 Modified	8:2 Fluorotelomer sulfonate (8:2 FTS)	UG/L	0.0086 U	0.0087 U
537 Modified	N-Ethyl perfluorooctane sulfonamide	UG/L	50 U	50 U
537 Modified	N-ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	UG/L	0.0086 U	0.0087 U
537 Modified	N-Methyl perfluorooctane sulfonamide	UG/L	50 U	50 U
537 Modified	N-methyl perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	UG/L	0.0086 U	0.0087 U
537 Modified	Perfluorobutanesulfonic acid (PFBS)	UG/L	0.0014 J	0.00061 J
537 Modified	Perfluorobutanoic acid (PFBA)	UG/L	0.0033	0.0026
537 Modified	Perfluorodecanesulfonic acid (PFDS)	UG/L	0.00086 U	0.00087 U
537 Modified	Perfluorodecanoic acid (PFDA)	UG/L	0.00086 U	0.00087 U
537 Modified	Perfluorododecanoic acid (PFDoA)	UG/L	0.0017 U	0.0017 U
537 Modified	Perfluoroheptanesulfonic acid (PFHpS)	UG/L	0.00086 U	0.00087 U
537 Modified	Perfluoroheptanoic acid (PFHpA)	UG/L	0.00094 J	0.00052 J
537 Modified	Perfluorohexanesulfonic acid (PFHxS)	UG/L	0.0021	0.00089 J
537 Modified	Perfluorohexanoic acid (PFHxA)	UG/L	0.0044	0.00098 J
537 Modified	Perfluorononanoic acid (PFNA)	UG/L	0.0018	0.00087 U
537 Modified	Perfluorooctanesulfonamide (FOSA)	UG/L	0.0039	0.0023
537 Modified	Perfluorooctanesulfonic acid (PFOS)	UG/L	0.0017 U	0.0012 J
537 Modified	Perfluorooctanoic acid (PFOA)	UG/L	0.0011 J	0.0015 J
537 Modified	Perfluoropentanoic acid (PFPeA)	UG/L	0.013	0.001 J
537 Modified	Perfluorotetradecanoic acid (PFTeDA)	UG/L	0.00086 U	0.00087 U
537 Modified	Perfluorotridecanoic acid (PFTrDA)	UG/L	0.0026 U	0.0026 U
537 Modified	Perfluoroundecanoic acid (PFUnDA)	UG/L	0.0026 U	0.0026 U

Notes:

EB = equipment blank

FB = field blank

FS = field sample

FD = field duplicate

J = value is estimated

U = not detected above the reported concentration

UG/L = micrograms per liter

Table 2 - Validated Sample Results
Data Validation Report
October 2017 Per- and Polyfluoroalkyl Substances Groundwater Sampling
Cold Regions Research and Engineering Laboratory
Hanover, New Hampshire

		Location ID	WELL:CECRL07	WELL:CECRL12
		Sample Name	CECRL-07	CECRL-12
		Sample Date	10/17/2017	10/17/2017
		Sample Type	FS	FS
		Sample Delivery Group	320-32527-1	320-32527-1
Method	Parameter	Units	Result Qualifier	Result Qualifier
537 Modified	6:2 Fluorotelomer sulfonate (6:2 FTS)	UG/L	0.0085 U	0.0083 U
537 Modified	8:2 Fluorotelomer sulfonate (8:2 FTS)	UG/L	0.0085 U	0.0083 U
537 Modified	N-Ethyl perfluorooctane sulfonamide	UG/L	50 U	50 U
537 Modified	N-ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	UG/L	0.0085 U	0.0083 U
537 Modified	N-Methyl perfluorooctane sulfonamide	UG/L	50 U	50 U
537 Modified	N-methyl perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	UG/L	0.0085 U	0.0083 U
537 Modified	Perfluorobutanesulfonic acid (PFBS)	UG/L	0.00085 U	0.00087 J
537 Modified	Perfluorobutanoic acid (PFBA)	UG/L	0.00085 U	0.0029
537 Modified	Perfluorodecanesulfonic acid (PFDS)	UG/L	0.00085 U	0.00083 U
537 Modified	Perfluorodecanoic acid (PFDA)	UG/L	0.00085 U	0.00083 U
537 Modified	Perfluorododecanoic acid (PFDoA)	UG/L	0.0017 U	0.0017 U
537 Modified	Perfluoroheptanesulfonic acid (PFHpS)	UG/L	0.00085 U	0.00083 U
537 Modified	Perfluoroheptanoic acid (PFHpA)	UG/L	0.00085 U	0.00022 J
537 Modified	Perfluorohexanesulfonic acid (PFHxS)	UG/L	0.00085 U	0.00087 J
537 Modified	Perfluorohexanoic acid (PFHxA)	UG/L	0.0017 U	0.0017 U
537 Modified	Perfluorononanoic acid (PFNA)	UG/L	0.00085 U	0.00083 U
537 Modified	Perfluorooctanesulfonamide (FOSA)	UG/L	0.00085 U	0.00083 U
537 Modified	Perfluorooctanesulfonic acid (PFOS)	UG/L	0.0017 U	0.0012 J
537 Modified	Perfluorooctanoic acid (PFOA)	UG/L	0.0017 U	0.00084 J
537 Modified	Perfluoropentanoic acid (PFPeA)	UG/L	0.00085 U	0.00051 J
537 Modified	Perfluorotetradecanoic acid (PFTeDA)	UG/L	0.00085 U	0.00083 U
537 Modified	Perfluorotridecanoic acid (PFTrDA)	UG/L	0.0026 U	0.0025 U
537 Modified	Perfluoroundecanoic acid (PFUnDA)	UG/L	0.0026 U	0.0025 U

Notes:

EB = equipment blank

FB = field blank

FS = field sample

FD = field duplicate

J = value is estimated

U = not detected above the reported concentration

UG/L = micrograms per liter

Table 2 - Validated Sample Results
Data Validation Report
October 2017 Per- and Polyfluoroalkyl Substances Groundwater Sampling
Cold Regions Research and Engineering Laboratory
Hanover, New Hampshire

		Location ID	WELL:CECRL17	WELL:CECRL19
		Sample Name	CECRL-17	CECRL-19
		Sample Date	10/18/2017	10/18/2017
		Sample Type	FS	FS
		Sample Delivery Group	320-32527-1	320-32527-1
Method	Parameter	Units	Result Qualifier	Result Qualifier
537 Modified	6:2 Fluorotelomer sulfonate (6:2 FTS)	UG/L	0.0082 U	0.0083 U
537 Modified	8:2 Fluorotelomer sulfonate (8:2 FTS)	UG/L	0.0082 U	0.0083 U
537 Modified	N-Ethyl perfluorooctane sulfonamide	UG/L	50 U	50 U
537 Modified	N-ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	UG/L	0.0082 U	0.0083 U
537 Modified	N-Methyl perfluorooctane sulfonamide	UG/L	50 U	50 U
537 Modified	N-methyl perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	UG/L	0.0082 U	0.0083 U
537 Modified	Perfluorobutanesulfonic acid (PFBS)	UG/L	0.00082 U	0.00083 U
537 Modified	Perfluorobutanoic acid (PFBA)	UG/L	0.00082 U	0.00083 U
537 Modified	Perfluorodecanesulfonic acid (PFDS)	UG/L	0.00082 U	0.00083 U
537 Modified	Perfluorodecanoic acid (PFDA)	UG/L	0.00082 U	0.00083 U
537 Modified	Perfluorododecanoic acid (PFDoA)	UG/L	0.0016 U	0.0017 U
537 Modified	Perfluoroheptanesulfonic acid (PFHpS)	UG/L	0.00082 U	0.00083 U
537 Modified	Perfluoroheptanoic acid (PFHpA)	UG/L	0.0018	0.00083 U
537 Modified	Perfluorohexanesulfonic acid (PFHxS)	UG/L	0.01	0.00083 U
537 Modified	Perfluorohexanoic acid (PFHxA)	UG/L	0.0029 J	0.0017 U
537 Modified	Perfluorononanoic acid (PFNA)	UG/L	0.00082 U	0.00083 U
537 Modified	Perfluorooctanesulfonamide (FOSA)	UG/L	0.00082 U	0.00083 U
537 Modified	Perfluorooctanesulfonic acid (PFOS)	UG/L	0.0059	0.0017 U
537 Modified	Perfluorooctanoic acid (PFOA)	UG/L	0.0082	0.0017 U
537 Modified	Perfluoropentanoic acid (PFPeA)	UG/L	0.00082 U	0.00083 U
537 Modified	Perfluorotetradecanoic acid (PFTeDA)	UG/L	0.00082 U	0.00083 U
537 Modified	Perfluorotridecanoic acid (PFTrDA)	UG/L	0.0025 U	0.0025 U
537 Modified	Perfluoroundecanoic acid (PFUnDA)	UG/L	0.0025 U	0.0025 U

Notes:

EB = equipment blank

FB = field blank

FS = field sample

FD = field duplicate

J = value is estimated

U = not detected above the reported concentration

UG/L = micrograms per liter

Table 2 - Validated Sample Results
Data Validation Report
October 2017 Per- and Polyfluoroalkyl Substances Groundwater Sampling
Cold Regions Research and Engineering Laboratory
Hanover, New Hampshire

		Location ID	WELL:CECRL20	MW-14-104
		Sample Name	CECRL-20	MW-14-104
		Sample Date	10/18/2017	10/19/2017
		Sample Type	FS	FS
		Sample Delivery Group	320-32527-1	320-32575-1
Method	Parameter	Units	Result Qualifier	Result Qualifier
537 Modified	6:2 Fluorotelomer sulfonate (6:2 FTS)	UG/L	0.0083 U	0.0084 U
537 Modified	8:2 Fluorotelomer sulfonate (8:2 FTS)	UG/L	0.0083 U	0.0084 U
537 Modified	N-Ethyl perfluorooctane sulfonamide	UG/L	50 U	50 U
537 Modified	N-ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	UG/L	0.0083 U	0.0084 U
537 Modified	N-Methyl perfluorooctane sulfonamide	UG/L	50 U	50 U
537 Modified	N-methyl perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	UG/L	0.0083 U	0.0084 U
537 Modified	Perfluorobutanesulfonic acid (PFBS)	UG/L	0.00083 U	0.00084 U
537 Modified	Perfluorobutanoic acid (PFBA)	UG/L	0.00083 U	0.00066 J
537 Modified	Perfluorodecanesulfonic acid (PFDS)	UG/L	0.00083 U	0.00084 U
537 Modified	Perfluorodecanoic acid (PFDA)	UG/L	0.00083 U	0.00084 U
537 Modified	Perfluorododecanoic acid (PFDoA)	UG/L	0.0017 U	0.0017 U
537 Modified	Perfluoroheptanesulfonic acid (PFHpS)	UG/L	0.00083 U	0.00084 U
537 Modified	Perfluoroheptanoic acid (PFHpA)	UG/L	0.00083 U	0.00084 U
537 Modified	Perfluorohexanesulfonic acid (PFHxS)	UG/L	0.00083 U	0.00084 U
537 Modified	Perfluorohexanoic acid (PFHxA)	UG/L	0.0017 U	0.0017 U
537 Modified	Perfluorononanoic acid (PFNA)	UG/L	0.00083 U	0.00084 U
537 Modified	Perfluorooctanesulfonamide (FOSA)	UG/L	0.00083 U	0.00084 U
537 Modified	Perfluorooctanesulfonic acid (PFOS)	UG/L	0.0017 U	0.0017 U
537 Modified	Perfluorooctanoic acid (PFOA)	UG/L	0.0017 U	0.0017 U
537 Modified	Perfluoropentanoic acid (PFPeA)	UG/L	0.00083 U	0.00084 U
537 Modified	Perfluorotetradecanoic acid (PFTeDA)	UG/L	0.00083 U	0.00084 U
537 Modified	Perfluorotridecanoic acid (PFTTrDA)	UG/L	0.0025 U	0.0025 U
537 Modified	Perfluoroundecanoic acid (PFUnDA)	UG/L	0.0025 U	0.0025 U

Notes:

EB = equipment blank

FB = field blank

FS = field sample

FD = field duplicate

J = value is estimated

U = not detected above the reported concentration

UG/L = micrograms per liter

Table 2 - Validated Sample Results
Data Validation Report
October 2017 Per- and Polyfluoroalkyl Substances Groundwater Sampling
Cold Regions Research and Engineering Laboratory
Hanover, New Hampshire

		Location ID	MW-14-105	MW-14-106
		Sample Name	MW-14-105	MW-14-106
		Sample Date	10/19/2017	10/19/2017
		Sample Type	FS	FS
		Sample Delivery Group	320-32575-1	320-32575-1
Method	Parameter	Units	Result Qualifier	Result Qualifier
537 Modified	6:2 Fluorotelomer sulfonate (6:2 FTS)	UG/L	0.0086 U	0.0084 U
537 Modified	8:2 Fluorotelomer sulfonate (8:2 FTS)	UG/L	0.0086 U	0.0084 U
537 Modified	N-Ethyl perfluorooctane sulfonamide	UG/L	50 U	50 U
537 Modified	N-ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	UG/L	0.0086 U	0.0084 U
537 Modified	N-Methyl perfluorooctane sulfonamide	UG/L	50 U	50 U
537 Modified	N-methyl perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	UG/L	0.0086 U	0.0084 U
537 Modified	Perfluorobutanesulfonic acid (PFBS)	UG/L	0.00086 U	0.00028 J
537 Modified	Perfluorobutanoic acid (PFBA)	UG/L	0.00045 J	0.00082 J
537 Modified	Perfluorodecanesulfonic acid (PFDS)	UG/L	0.00086 U	0.00084 U
537 Modified	Perfluorodecanoic acid (PFDA)	UG/L	0.00086 U	0.00084 U
537 Modified	Perfluorododecanoic acid (PFDoA)	UG/L	0.0017 U	0.0017 U
537 Modified	Perfluoroheptanesulfonic acid (PFHpS)	UG/L	0.00086 U	0.00084 U
537 Modified	Perfluoroheptanoic acid (PFHpA)	UG/L	0.00086 U	0.00084 U
537 Modified	Perfluorohexanesulfonic acid (PFHxS)	UG/L	0.00086 U	0.00084 U
537 Modified	Perfluorohexanoic acid (PFHxA)	UG/L	0.0017 U	0.00081 J
537 Modified	Perfluorononanoic acid (PFNA)	UG/L	0.00086 U	0.00084 U
537 Modified	Perfluorooctanesulfonamide (FOSA)	UG/L	0.00086 U	0.00084 U
537 Modified	Perfluorooctanesulfonic acid (PFOS)	UG/L	0.0017 U	0.0017 U
537 Modified	Perfluorooctanoic acid (PFOA)	UG/L	0.0017 U	0.0017 U
537 Modified	Perfluoropentanoic acid (PFPeA)	UG/L	0.00086 U	0.00084 U
537 Modified	Perfluorotetradecanoic acid (PFTeDA)	UG/L	0.00086 U	0.00084 U
537 Modified	Perfluorotridecanoic acid (PFTTrDA)	UG/L	0.0026 U	0.0025 U
537 Modified	Perfluoroundecanoic acid (PFUnDA)	UG/L	0.0026 U	0.0025 U

Notes:

EB = equipment blank

FB = field blank

FS = field sample

FD = field duplicate

J = value is estimated

U = not detected above the reported concentration

UG/L = micrograms per liter

Table 2 - Validated Sample Results
Data Validation Report
October 2017 Per- and Polyfluoroalkyl Substances Groundwater Sampling
Cold Regions Research and Engineering Laboratory
Hanover, New Hampshire

		Location ID	WELL:CECRL08	WELL:CECRL09
		Sample Name	CECRL-08	CECRL-09
		Sample Date	10/19/2017	10/19/2017
		Sample Type	FS	FS
		Sample Delivery Group	320-32575-1	320-32575-1
Method	Parameter	Units	Result Qualifier	Result Qualifier
537 Modified	6:2 Fluorotelomer sulfonate (6:2 FTS)	UG/L	0.0088 U	0.0088 U
537 Modified	8:2 Fluorotelomer sulfonate (8:2 FTS)	UG/L	0.0088 U	0.0088 U
537 Modified	N-Ethyl perfluorooctane sulfonamide	UG/L	50 U	50 U
537 Modified	N-ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	UG/L	0.0088 U	0.0088 U
537 Modified	N-Methyl perfluorooctane sulfonamide	UG/L	50 U	50 U
537 Modified	N-methyl perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	UG/L	0.0088 U	0.0088 U
537 Modified	Perfluorobutanesulfonic acid (PFBS)	UG/L	0.00088 U	0.00091 J
537 Modified	Perfluorobutanoic acid (PFBA)	UG/L	0.00032 J	0.0028
537 Modified	Perfluorodecanesulfonic acid (PFDS)	UG/L	0.00088 U	0.00088 U
537 Modified	Perfluorodecanoic acid (PFDA)	UG/L	0.00088 U	0.00044 J
537 Modified	Perfluorododecanoic acid (PFDoA)	UG/L	0.0018 U	0.0018 U
537 Modified	Perfluoroheptanesulfonic acid (PFHpS)	UG/L	0.00088 U	0.00088 U
537 Modified	Perfluoroheptanoic acid (PFHpA)	UG/L	0.00088 U	0.0019
537 Modified	Perfluorohexanesulfonic acid (PFHxS)	UG/L	0.00088 U	0.0018
537 Modified	Perfluorohexanoic acid (PFHxA)	UG/L	0.0018 U	0.0058
537 Modified	Perfluorononanoic acid (PFNA)	UG/L	0.00088 U	0.00033 J
537 Modified	Perfluorooctanesulfonamide (FOSA)	UG/L	0.00088 U	0.00088 U
537 Modified	Perfluorooctanesulfonic acid (PFOS)	UG/L	0.0018 U	0.0018 U
537 Modified	Perfluorooctanoic acid (PFOA)	UG/L	0.0018 U	0.0015 J
537 Modified	Perfluoropentanoic acid (PFPeA)	UG/L	0.00088 U	0.0031
537 Modified	Perfluorotetradecanoic acid (PFTeDA)	UG/L	0.00028 J	0.00088 U
537 Modified	Perfluorotridecanoic acid (PFTrDA)	UG/L	0.0026 U	0.0026 U
537 Modified	Perfluoroundecanoic acid (PFUnDA)	UG/L	0.0026 U	0.0026 U

Notes:

EB = equipment blank

FB = field blank

FS = field sample

FD = field duplicate

J = value is estimated

U = not detected above the reported concentration

UG/L = micrograms per liter

Table 2 - Validated Sample Results
Data Validation Report
October 2017 Per- and Polyfluoroalkyl Substances Groundwater Sampling
Cold Regions Research and Engineering Laboratory
Hanover, New Hampshire

		Location ID	WELL:CECRL10	WELL:CECRL11
		Sample Name	CECRL-10	CECRL-11
		Sample Date	10/19/2017	10/19/2017
		Sample Type	FS	FS
		Sample Delivery Group	320-32575-1	320-32575-1
Method	Parameter	Units	Result Qualifier	Result Qualifier
537 Modified	6:2 Fluorotelomer sulfonate (6:2 FTS)	UG/L	0.0084 U	0.0083 U
537 Modified	8:2 Fluorotelomer sulfonate (8:2 FTS)	UG/L	0.0084 U	0.0083 U
537 Modified	N-Ethyl perfluorooctane sulfonamide	UG/L	50 U	50 U
537 Modified	N-ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	UG/L	0.0084 U	0.0083 U
537 Modified	N-Methyl perfluorooctane sulfonamide	UG/L	50 U	50 U
537 Modified	N-methyl perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	UG/L	0.0084 U	0.0083 U
537 Modified	Perfluorobutanesulfonic acid (PFBS)	UG/L	0.00084 U	0.00098 J
537 Modified	Perfluorobutanoic acid (PFBA)	UG/L	0.0011 J	0.0023
537 Modified	Perfluorodecanesulfonic acid (PFDS)	UG/L	0.00084 U	0.00083 U
537 Modified	Perfluorodecanoic acid (PFDA)	UG/L	0.00084 U	0.00083 U
537 Modified	Perfluorododecanoic acid (PFDoA)	UG/L	0.0017 U	0.0017 U
537 Modified	Perfluoroheptanesulfonic acid (PFHpS)	UG/L	0.00084 U	0.00083 U
537 Modified	Perfluoroheptanoic acid (PFHpA)	UG/L	0.00084 U	0.00083 U
537 Modified	Perfluorohexanesulfonic acid (PFHxS)	UG/L	0.00084 U	0.00083 U
537 Modified	Perfluorohexanoic acid (PFHxA)	UG/L	0.0017 U	0.00084 J
537 Modified	Perfluorononanoic acid (PFNA)	UG/L	0.00084 U	0.00083 U
537 Modified	Perfluorooctanesulfonamide (FOSA)	UG/L	0.00084 U	0.00083 U
537 Modified	Perfluorooctanesulfonic acid (PFOS)	UG/L	0.0017 U	0.0017 U
537 Modified	Perfluorooctanoic acid (PFOA)	UG/L	0.0017 U	0.0017 U
537 Modified	Perfluoropentanoic acid (PFPeA)	UG/L	0.00084 U	0.0015 J
537 Modified	Perfluorotetradecanoic acid (PFTeDA)	UG/L	0.00084 U	0.00083 U
537 Modified	Perfluorotridecanoic acid (PFTTrDA)	UG/L	0.0025 U	0.0025 U
537 Modified	Perfluoroundecanoic acid (PFUnDA)	UG/L	0.0025 U	0.0025 U

Notes:

EB = equipment blank

FB = field blank

FS = field sample

FD = field duplicate

J = value is estimated

U = not detected above the reported concentration

UG/L = micrograms per liter

Table 3 - Data Validation Action Summary
Data Validation Report
October 2017 Per- and Polyfluoroalkyl Substances Groundwater Sampling
Cold Regions Research and Engineering Laboratory
Hanover, New Hampshire

SDG	Analysis Method	Lab Sample ID	Field Sample ID	Parameter Name	Lab Result	Lab Qual	Validated Result	Val Qual	Val Reason Code	Result Units
320-32575-1	537 Modified	320-32575-7	CECRL-10	Perfluorohexanesulfonic acid (PFHxS)	0.00028	J	0.00084	U	BL1	UG/L
320-32575-1	537 Modified	320-32575-2	CECRL-11	Perfluorohexanesulfonic acid (PFHxS)	0.00025	J	0.00083	U	BL1	UG/L
320-32527-1	537 Modified	320-32527-12	CECRL-07	Perfluorotetradecanoic acid (PFTeDA)	0.00029	J	0.00085	U	BL1	UG/L
320-32575-1	537 Modified	320-32575-5	CECRL-08	Perfluorooctanesulfonamide (FOSA)	0.00051	J	0.00088	U	BL1, BL2	UG/L
320-32575-1	537 Modified	320-32575-1	CECRL-09	Perfluorooctanesulfonamide (FOSA)	0.0005	J	0.00088	U	BL1, BL2	UG/L
320-32575-1	537 Modified	320-32575-7	CECRL-10	Perfluorooctanesulfonamide (FOSA)	0.0011	J	0.00084	U	BL1, BL2	UG/L
320-32575-1	537 Modified	320-32575-2	CECRL-11	Perfluorooctanesulfonamide (FOSA)	0.00098	J	0.00098	U	BL1, BL2	UG/L
320-32575-1	537 Modified	320-32575-6	MW-14-106	Perfluorooctanesulfonamide (FOSA)	0.0004	J	0.00084	U	BL1, BL2	UG/L
320-32527-1	537 Modified	320-32527-4	CECRL-01	Perfluorooctanesulfonamide (FOSA)	0.00044	J	0.00085	U	BL2	UG/L
320-32527-1	537 Modified	320-32527-5	CECRL-01DUP	Perfluorooctanesulfonamide (FOSA)	0.00042	J	0.00084	U	BL2	UG/L
320-32527-1	537 Modified	320-32527-7	CECRL-02	Perfluorooctanesulfonamide (FOSA)	0.00067	J	0.00082	U	BL2	UG/L
320-32527-1	537 Modified	320-32527-12	CECRL-07	Perfluorooctanesulfonamide (FOSA)	0.00056	J	0.00085	U	BL2	UG/L
320-32527-1	537 Modified	320-32527-10	CECRL-12	Perfluorooctanesulfonamide (FOSA)	0.0007	J	0.00083	U	BL2	UG/L
320-32527-1	537 Modified	320-32527-14	CECRL-17	Perfluorooctanesulfonamide (FOSA)	0.0003	J	0.00082	U	BL2	UG/L
320-32527-1	537 Modified	320-32527-15	CECRL-19	Perfluorooctanesulfonamide (FOSA)	0.0013	J	0.00083	U	BL2	UG/L
320-32527-1	537 Modified	320-32527-17	CECRL-20	Perfluorooctanesulfonamide (FOSA)	0.00045	J	0.00083	U	BL2	UG/L
320-32527-1	537 Modified	320-32527-13	MW-14-103A	Perfluorooctanesulfonamide (FOSA)	0.00047	J	0.00084	U	BL2	UG/L
320-32527-1	537 Modified	320-32527-11	MW-14-103B	Perfluorooctanesulfonamide (FOSA)	0.00065	J	0.00082	U	BL2	UG/L
320-32527-1	537 Modified	320-32527-16	MW-14-107	Perfluorooctanesulfonamide (FOSA)	0.00037	J	0.00089	U	BL2	UG/L
320-32527-1	537 Modified	320-32527-4	CECRL-01	Perfluorobutanesulfonic acid (PFBS)	0.00044	J	0.00044	J	RL	UG/L
320-32527-1	537 Modified	320-32527-5	CECRL-01DUP	Perfluorobutanesulfonic acid (PFBS)	0.00045	J M	0.00045	J	RL	UG/L
320-32527-1	537 Modified	320-32527-7	CECRL-02	Perfluorobutanesulfonic acid (PFBS)	0.00034	J M	0.00034	J	RL	UG/L
320-32527-1	537 Modified	320-32527-9	CECRL-04	Perfluorobutanesulfonic acid (PFBS)	0.0014	J	0.0014	J	RL	UG/L
320-32527-1	537 Modified	320-32527-6	CECRL-05	Perfluorobutanesulfonic acid (PFBS)	0.00061	J	0.00061	J	RL	UG/L
320-32575-1	537 Modified	320-32575-1	CECRL-09	Perfluorobutanesulfonic acid (PFBS)	0.00091	J M	0.00091	J	RL	UG/L
320-32575-1	537 Modified	320-32575-2	CECRL-11	Perfluorobutanesulfonic acid (PFBS)	0.00098	J M	0.00098	J	RL	UG/L
320-32527-1	537 Modified	320-32527-10	CECRL-12	Perfluorobutanesulfonic acid (PFBS)	0.00087	J	0.00087	J	RL	UG/L
320-32527-1	537 Modified	320-32527-13	MW-14-103A	Perfluorobutanesulfonic acid (PFBS)	0.00084	J M	0.00084	J	RL	UG/L
320-32527-1	537 Modified	320-32527-11	MW-14-103B	Perfluorobutanesulfonic acid (PFBS)	0.00082	J M	0.00082	J	RL	UG/L
320-32575-1	537 Modified	320-32575-6	MW-14-106	Perfluorobutanesulfonic acid (PFBS)	0.00028	J M	0.00028	J	RL	UG/L
320-32527-1	537 Modified	320-32527-5	CECRL-01DUP	Perfluorobutanoic acid (PFBA)	0.0016	J M	0.0016	J	RL	UG/L
320-32527-1	537 Modified	320-32527-7	CECRL-02	Perfluorobutanoic acid (PFBA)	0.0014	J	0.0014	J	RL	UG/L
320-32527-1	537 Modified	320-32527-8	CECRL-03	Perfluorobutanoic acid (PFBA)	0.00036	J	0.00036	J	RL	UG/L
320-32575-1	537 Modified	320-32575-5	CECRL-08	Perfluorobutanoic acid (PFBA)	0.00032	J	0.00032	J	RL	UG/L
320-32575-1	537 Modified	320-32575-7	CECRL-10	Perfluorobutanoic acid (PFBA)	0.0011	J	0.0011	J	RL	UG/L
320-32575-1	537 Modified	320-32575-3	MW-14-104	Perfluorobutanoic acid (PFBA)	0.00066	J M	0.00066	J	RL	UG/L
320-32575-1	537 Modified	320-32575-4	MW-14-105	Perfluorobutanoic acid (PFBA)	0.00045	J	0.00045	J	RL	UG/L
320-32575-1	537 Modified	320-32575-6	MW-14-106	Perfluorobutanoic acid (PFBA)	0.00082	J	0.00082	J	RL	UG/L
320-32575-1	537 Modified	320-32575-1	CECRL-09	Perfluorodecanoic acid (PFDA)	0.00044	J	0.00044	J	RL	UG/L
320-32527-1	537 Modified	320-32527-4	CECRL-01	Perfluoroheptanoic acid (PFHpA)	0.00028	J	0.00028	J	RL	UG/L
320-32527-1	537 Modified	320-32527-5	CECRL-01DUP	Perfluoroheptanoic acid (PFHpA)	0.00026	J	0.00026	J	RL	UG/L
320-32527-1	537 Modified	320-32527-8	CECRL-03	Perfluoroheptanoic acid (PFHpA)	0.00029	J	0.00029	J	RL	UG/L
320-32527-1	537 Modified	320-32527-9	CECRL-04	Perfluoroheptanoic acid (PFHpA)	0.00094	J	0.00094	J	RL	UG/L
320-32527-1	537 Modified	320-32527-6	CECRL-05	Perfluoroheptanoic acid (PFHpA)	0.00052	J	0.00052	J	RL	UG/L
320-32527-1	537 Modified	320-32527-10	CECRL-12	Perfluoroheptanoic acid (PFHpA)	0.00022	J	0.00022	J	RL	UG/L
320-32527-1	537 Modified	320-32527-13	MW-14-103A	Perfluoroheptanoic acid (PFHpA)	0.00064	J	0.00064	J	RL	UG/L
320-32527-1	537 Modified	320-32527-11	MW-14-103B	Perfluoroheptanoic acid (PFHpA)	0.00069	J	0.00069	J	RL	UG/L

Table 3 - Data Validation Action Summary
Data Validation Report
October 2017 Per- and Polyfluoroalkyl Substances Groundwater Sampling
Cold Regions Research and Engineering Laboratory
Hanover, New Hampshire

SDG	Analysis Method	Lab Sample ID	Field Sample ID	Parameter Name	Lab Result	Lab Qual	Validated Result	Val Qual	Val Reason Code	Result Units
320-32527-1	537 Modified	320-32527-4	CECRL-01	Perfluorohexanesulfonic acid (PFHxS)	0.00064	J	0.00064	J	RL	UG/L
320-32527-1	537 Modified	320-32527-5	CECRL-01DUP	Perfluorohexanesulfonic acid (PFHxS)	0.00066	J	0.00066	J	RL	UG/L
320-32527-1	537 Modified	320-32527-7	CECRL-02	Perfluorohexanesulfonic acid (PFHxS)	0.00055	J	0.00055	J	RL	UG/L
320-32527-1	537 Modified	320-32527-8	CECRL-03	Perfluorohexanesulfonic acid (PFHxS)	0.0003	J	0.0003	J	RL	UG/L
320-32527-1	537 Modified	320-32527-6	CECRL-05	Perfluorohexanesulfonic acid (PFHxS)	0.00089	J	0.00089	J	RL	UG/L
320-32527-1	537 Modified	320-32527-10	CECRL-12	Perfluorohexanesulfonic acid (PFHxS)	0.00087	J	0.00087	J	RL	UG/L
320-32527-1	537 Modified	320-32527-13	MW-14-103A	Perfluorohexanesulfonic acid (PFHxS)	0.00089	J	0.00089	J	RL	UG/L
320-32527-1	537 Modified	320-32527-11	MW-14-103B	Perfluorohexanesulfonic acid (PFHxS)	0.0009	J	0.0009	J	RL	UG/L
320-32527-1	537 Modified	320-32527-16	MW-14-107	Perfluorohexanesulfonic acid (PFHxS)	0.00027	J	0.00027	J	RL	UG/L
320-32527-1	537 Modified	320-32527-6	CECRL-05	Perfluorohexanoic acid (PFHxA)	0.00098	J	0.00098	J	RL	UG/L
320-32575-1	537 Modified	320-32575-2	CECRL-11	Perfluorohexanoic acid (PFHxA)	0.00084	J	0.00084	J	RL	UG/L
320-32527-1	537 Modified	320-32527-14	CECRL-17	Perfluorohexanoic acid (PFHxA)	0.0029	J M	0.0029	J	RL	UG/L
320-32527-1	537 Modified	320-32527-11	MW-14-103B	Perfluorohexanoic acid (PFHxA)	0.0008	J	0.0008	J	RL	UG/L
320-32575-1	537 Modified	320-32575-6	MW-14-106	Perfluorohexanoic acid (PFHxA)	0.00081	J	0.00081	J	RL	UG/L
320-32575-1	537 Modified	320-32575-1	CECRL-09	Perfluorononanoic acid (PFNA)	0.00033	J	0.00033	J	RL	UG/L
320-32527-1	537 Modified	320-32527-1	FIELDL-17-001	Perfluorooctanesulfonamide (FOSA)	0.0003	J	0.0003	J	RL	UG/L
320-32527-1	537 Modified	320-32527-6	CECRL-05	Perfluorooctanesulfonic acid (PFOS)	0.0012	J	0.0012	J	RL	UG/L
320-32527-1	537 Modified	320-32527-10	CECRL-12	Perfluorooctanesulfonic acid (PFOS)	0.0012	J	0.0012	J	RL	UG/L
320-32527-1	537 Modified	320-32527-13	MW-14-103A	Perfluorooctanesulfonic acid (PFOS)	0.0016	J	0.0016	J	RL	UG/L
320-32527-1	537 Modified	320-32527-11	MW-14-103B	Perfluorooctanesulfonic acid (PFOS)	0.0018	J	0.0018	J	RL	UG/L
320-32527-1	537 Modified	320-32527-9	CECRL-04	Perfluorooctanoic acid (PFOA)	0.0011	J M	0.0011	J	RL	UG/L
320-32527-1	537 Modified	320-32527-6	CECRL-05	Perfluorooctanoic acid (PFOA)	0.0015	J M	0.0015	J	RL	UG/L
320-32575-1	537 Modified	320-32575-1	CECRL-09	Perfluorooctanoic acid (PFOA)	0.0015	J M	0.0015	J	RL	UG/L
320-32527-1	537 Modified	320-32527-10	CECRL-12	Perfluorooctanoic acid (PFOA)	0.00084	J M	0.00084	J	RL	UG/L
320-32527-1	537 Modified	320-32527-13	MW-14-103A	Perfluorooctanoic acid (PFOA)	0.0023	J	0.0023	J	RL	UG/L
320-32527-1	537 Modified	320-32527-11	MW-14-103B	Perfluorooctanoic acid (PFOA)	0.0025	J M	0.0025	J	RL	UG/L
320-32527-1	537 Modified	320-32527-4	CECRL-01	Perfluoropentanoic acid (PFPeA)	0.0012	J	0.0012	J	RL	UG/L
320-32527-1	537 Modified	320-32527-5	CECRL-01DUP	Perfluoropentanoic acid (PFPeA)	0.0011	J M	0.0011	J	RL	UG/L
320-32527-1	537 Modified	320-32527-7	CECRL-02	Perfluoropentanoic acid (PFPeA)	0.00099	J M	0.00099	J	RL	UG/L
320-32527-1	537 Modified	320-32527-8	CECRL-03	Perfluoropentanoic acid (PFPeA)	0.00053	J M	0.00053	J	RL	UG/L
320-32527-1	537 Modified	320-32527-6	CECRL-05	Perfluoropentanoic acid (PFPeA)	0.001	J	0.001	J	RL	UG/L
320-32575-1	537 Modified	320-32575-2	CECRL-11	Perfluoropentanoic acid (PFPeA)	0.0015	J	0.0015	J	RL	UG/L
320-32527-1	537 Modified	320-32527-10	CECRL-12	Perfluoropentanoic acid (PFPeA)	0.00051	J M	0.00051	J	RL	UG/L
320-32527-1	537 Modified	320-32527-13	MW-14-103A	Perfluoropentanoic acid (PFPeA)	0.0011	J	0.0011	J	RL	UG/L
320-32527-1	537 Modified	320-32527-11	MW-14-103B	Perfluoropentanoic acid (PFPeA)	0.0012	J	0.0012	J	RL	UG/L
320-32575-1	537 Modified	320-32575-5	CECRL-08	Perfluorotetradecanoic acid (PFTeDA)	0.00028	J	0.00028	J	RL	UG/L
320-32575-1	537 Modified	320-32575-7	CECRL-10	Perfluorotetradecanoic acid (PFTeDA)	0.00031	J M	0.00031	J	RL	UG/L

Units:

UG/L = microgram per liter

Validation Qualifier:

J = value is estimated

U = not detected above the reported concentration

Validation Reason Codes:

BL1 = Method blank qualifier

BL2 = Field blank qualifier

RL = reporting limit