

March 13, 2019

Fairbanks International Airport
6450 Airport Way, Suite 1
Fairbanks, Alaska 99709

Attn: Ms. Ashley Jaramillo and Angie Spear, Mr. Michael Schechter

**RE: DATA REPORT REV01, [REDACTED] POND
SAMPLING, FAIRBANKS INTERNATIONAL AIRPORT, FAIRBANKS,
ALASKA**

Shannon & Wilson, Inc. has prepared this report to document our water- and sediment-sampling effort at the pond adjacent to the Chena River at [REDACTED]. The pond is located about one-half mile from the southwest end of the Fairbanks International Airport (FAI) primary runway, 2L-20R, in Fairbanks, Alaska. Our sample locations are shown in Figure 1, Vicinity Map, and Figure 2, Water- and Sediment-Sample Locations. The FAI is an active, Alaska Department of Environmental Conservation (ADEC) listed contaminated site due to the presence of per- and polyfluoroalkyl substances (PFAS) in groundwater and surface water (File Number 100.38.277, Hazard ID 26816).

The effort summarized herein was conducted on behalf of the Alaska Department of Transportation & Public Facilities (DOT&PF) under our Professional Services Agreement Number 25-19-1-013 *Per- and Polyfluoroalkyl Substance (PFAS) Related Environmental & Engineering Services* issued on December 19, 2018. Our proposal for this task was authorized on January 22, 2019 by Amendment 2, NTP 4-1.

BACKGROUND

On behalf of the FAI, Shannon & Wilson, Inc. has performed multiple private well searches for water-supply wells downgradient of the FAI beginning in November 2017. To date we have sampled 190 private wells, the majority of which are considered drinking-water wells (Figure 1, Vicinity Map).

As of this writing, 105 private wells have been found to contain PFAS in concentrations exceeding the ADEC action level for drinking-water of 70 parts per trillion (ppt) for the sum of five compounds:

- perfluorooctane sulfonate (PFOS),
- perfluorooctanoic acid (PFOA),
- perfluoroheptanoic acid (PFHpA),
- perfluorohexanesulfonic acid (PFHxS), and
- perfluorononanoic acid (PFNA).

Following ADEC guidance, we consider combined concentrations greater than or equal to 65 ppt to be exceedances of the action level. The migration-to-groundwater soil-cleanup levels for PFOS and PFOA are summarized below; these levels were promulgated in November 2016. There are no soil-cleanup levels for other PFAS analytes.

Exhibit 1: Applicable Regulatory and Action Levels

Media	Compound	Level
Drinking-water	PFOS + PFOA + PFHpA + PFHxS + PFNA	70 ppt ¹
Drinking-water	PFBS	2,000 ppt ²
Soil	PFOS	3.0 ug/kg ⁴
Soil	PFOA	1.7 ug/kg ⁴

Notes: Part per trillion (ppt) is equivalent to nanograms per liter (ng/L).

¹ Action level is reported in ADEC Technical Memorandum. Following ADEC guidance, results are compared to 65 ppt.

² Action levels are reported in ADEC Technical Memorandum.

³ ADEC migration-to-groundwater soil-cleanup levels are reported in 18 AAC 75.341, Table B1.

Most private well exceedances are located between the FAI and the Chena River. We have sampled four water-supply wells at ██████████ – two active drinking-water wells and two unused wells (Figure 1). The PFAS concentrations in each of the four wells exceeded the ADEC action level.

On August 10, 2018, R&M Consultants, Inc. (R&M) collected a surface-water sample and duplicate (SW106 / SW117) from the northeast side of the pond at ██████████ and compared the results to the ADEC action levels for drinking-water. This sample was collected from one foot below the water’s surface. The R&M surface-water sample was analyzed for six PFAS. The sum of 5 PFAS concentration in sample SW106 was 590 ppt, the highest individual PFAS result was 250 ppt PFHxS.

SCOPE OF SERVICES

Our scope of services for this project included:

- collecting surface-water and sediment samples from three locations at the ██████████ pond;
- submitting the samples for determination of six PFAS;
- comparing sample analytical results to applicable regulatory and action levels; and
- preparing this summary report.

We performed our services in general accordance with relevant ADEC guidance documents and 18 Alaska Administrative Code (AAC) 75.335.



Exhibit 1: Photographs looking south on ██████████ pond.

SITE DESCRIPTION

The ██████████ pond is a manmade pond about 1,100 feet by 375 feet created by a dragline for gravel excavation. It is situated approximately 200 feet from the Chena River on a point bar southeast of the river. The current property owner ██████████ reports the pond is 60 feet deep at its center. The Tanana River valley subsurface is characterized by interbedded alluvial sand and gravel, covered in some locations by silty, organic-rich overbank deposits. The Chena River flows northwest to southeast locally via wide meanders. The Chena River is a tributary of the Tanana River, which locally flows west to south (Figure 1). Both rivers exhibit wide seasonal variation in water levels and flow volume between summer and winter.

FIELD ACTIVITIES

This section summarizes field activities performed on January 29, 2019, by Cherissa Dukelow, Environmental Scientist, and Fawn Glassburn, Geologist. These individuals are State of Alaska Qualified Samplers per 18 AAC 75.333[b] and 18 AAC 78.088[b]. Copies of our sample-collection logs and field notes are appended.

Pond Sampling

We collected surface-water and sediment samples at three locations around the pond: one pair each from the north, south and west portions of the pond (Figure 2). We used an ice auger to drill one or more holes in the ice at each location. We used a peristaltic pump and disposable, non-Teflon tubing to collect a water-sample from approximately 9 to 10 feet below the ice surface at each location. We used an Ekman dredge to collect a sediment-sample from the bottom of the pond at each location. We measured the depth of the pond using a plumb bob; the pond ranged from 13.6 to 18.8 feet deep at our sediment-sample locations (measured from the water surface at the time of sampling). We observed the sediment to be silty. We collected field-duplicate samples from the southern sample location.



Exhibit 2: Photographs of pond sediment-sampling using an Ekman dredge.

Sample Custody, Storage, and Transport

Immediately after collection, we placed the sample containers in Ziploc bags and stored them in a designated sample cooler maintained between 0 °C and 6 °C with ice substitute. We are aware of the potential for cross-contamination of PFAS samples from numerous everyday household items. We took appropriate precautions to prevent cross-contamination, including discontinuing the use of personal protective equipment and field supplies known to contain PFAS, using liner bags, hand washing, and donning a fresh pair of disposable nitrile gloves before sample collection.

We shipped sample coolers to TestAmerica in West Sacramento, California using Alaska Air Cargo priority overnight service, also known as Goldstreak. This allowed sufficient time for the laboratory to analyze the samples within holding-time requirements of the analytical method. We submitted the analytical soil-samples for determination of six PFAS by WS-LC-0025, the laboratory's in-house method, or EPA 537 modified.

ANALYTICAL RESULTS

Table 1, Summary of ██████████ Pond Water Analytical Results, and Figure 2 summarize the analytical data for water-samples. The water-sample results are comparable between sample locations. The pond water results exceed the ADEC sum of 5 action level for PFAS.

Table 2, Summary of ██████████ Pond Sediment Analytical Results, and Figure 2 summarize the data for sediment samples collected from the bottom of the pond. Two of the three sediment-sample results exceed the ADEC migration-to-groundwater soil-cleanup level for PFOS (samples 510238-SD01 and 510238-SD02 / SD03). These sediment-sample results do not exceed the PFOA soil-cleanup level.

QUALITY ASSURANCE/QUALITY CONTROL

Quality Assurance/Quality Control (QA/QC) procedures assist in producing data of acceptable quality and reliability. We reviewed the analytical results for laboratory QC samples and conducted our own QA assessment for this project. We reviewed the COC records and laboratory-receipt forms to check custody was not breached, sample holding-times were met, and the samples were properly handled from the point of collection through analysis by the laboratory. Our QA review procedures allowed us to document the accuracy and precision of the analytical data, as well as check the analyses were sufficiently sensitive to detect analytes at levels below regulatory standards.

The laboratory's detection limit (DL) is the lowest analyte concentration that can be measured. The laboratory's limit of quantitation (LOQ) is the lowest analyte concentration that can be routinely measured in the sampled matrix within a specified limit of precision and bias, or the point at which a concentration is considered quantitative. Sample matrix, instrument performance, sample dilutions, and other factors may affect the DL and LOQ. If the analyte is detected between the DL and the LOQ, its concentration is considered an estimate. In our tables, this value is flagged with a 'J'; this flag is applied by the laboratory.

We reviewed the data using the current ADEC Laboratory Data Review Checklist (LDRC) and applied a standardized set of flags. During our QC review, we applied flags indicating estimated data or analytical bias due to QC failures, as follows.

- The PFNA results for field-duplicate samples 510238-SW02 and 510238-SW03 are considered estimated due to a relative percent difference precision failure. These results are flagged 'J' to identify the imprecision.

We consider the results to be acceptable and representative for assessing site conditions at the time and location they were collected, with the applied qualifiers. No samples were rejected as unusable due to QC failures. Details regarding results of our QA analyses are presented in the appended TestAmerica laboratory report 320-47277 and associated LDRC.

The report should not be used without our approval if any of the following occurs:

- Project details change or new information becomes available, such as revised regulatory levels or the discovery of additional source areas.
- Conditions change due to natural forces or human activity at, under, or adjacent to the project site.
- If the site ownership or land use has changed.
- If the land use or site ownership has changed.
- Regulations, laws, or cleanup levels change.
- If the site's regulatory status has changed.

If any of these occur, we should be retained to review the applicability of our analyses. We appreciate this opportunity to be of service to you.

Sincerely,

SHANNON & WILSON, INC.



G. Cherissa Dukelow
Environmental Scientist



Marcy Nadel
Geologist

Enc: Figure 1 – Vicinity Map
Figure 2 – Water- and Sediment-Sample Locations
Table 1 – Summary of ██████████ Pond Water Analytical Results
Table 2 – Summary of ██████████ Pond Sediment Analytical Results
Field Notes
Analytical Laboratory Report and Laboratory Data Review Checklist
Important Information about Your Geotechnical/Environmental Report

Cc: Sammy Loud, DOT&PF Statewide Aviation

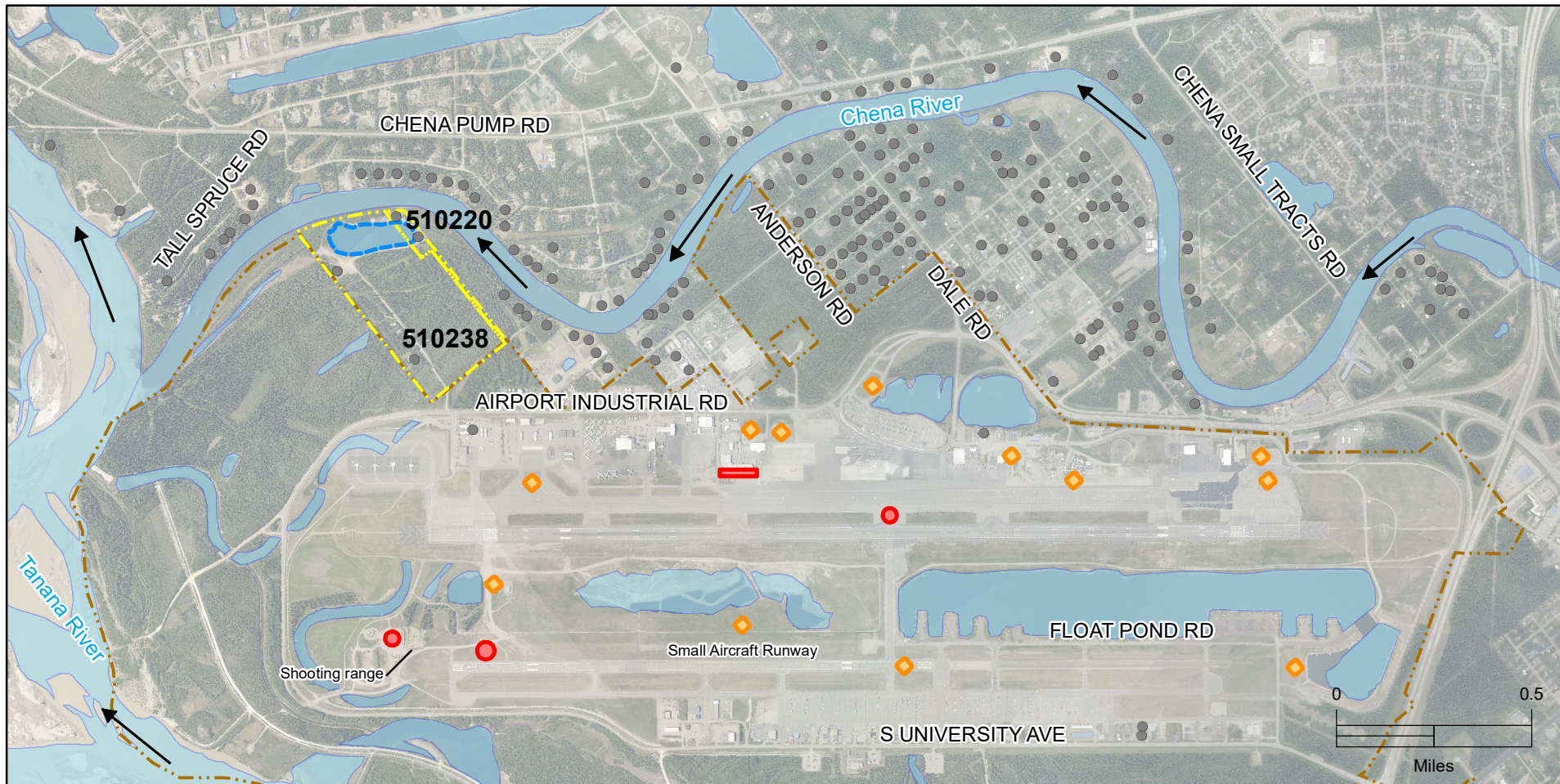
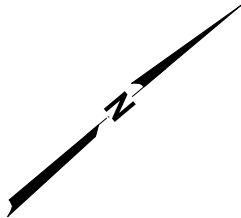


Image source: Pictometry, 2012

LEGEND

- Pond
- Parcels
- FAI Boundary
- Water Body
- Aircraft Rescue and Firefighting (ARFF) Training Sites
- Previously Sampled Private Wells
- ARFF Emergency Response Sites
- River Flow Direction



Fairbanks International Airport Fairbanks, Alaska	
VICINITY MAP	
March 2019	102519-001
SHANNON & WILSON, INC. <small>GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS</small>	
Figure 1	

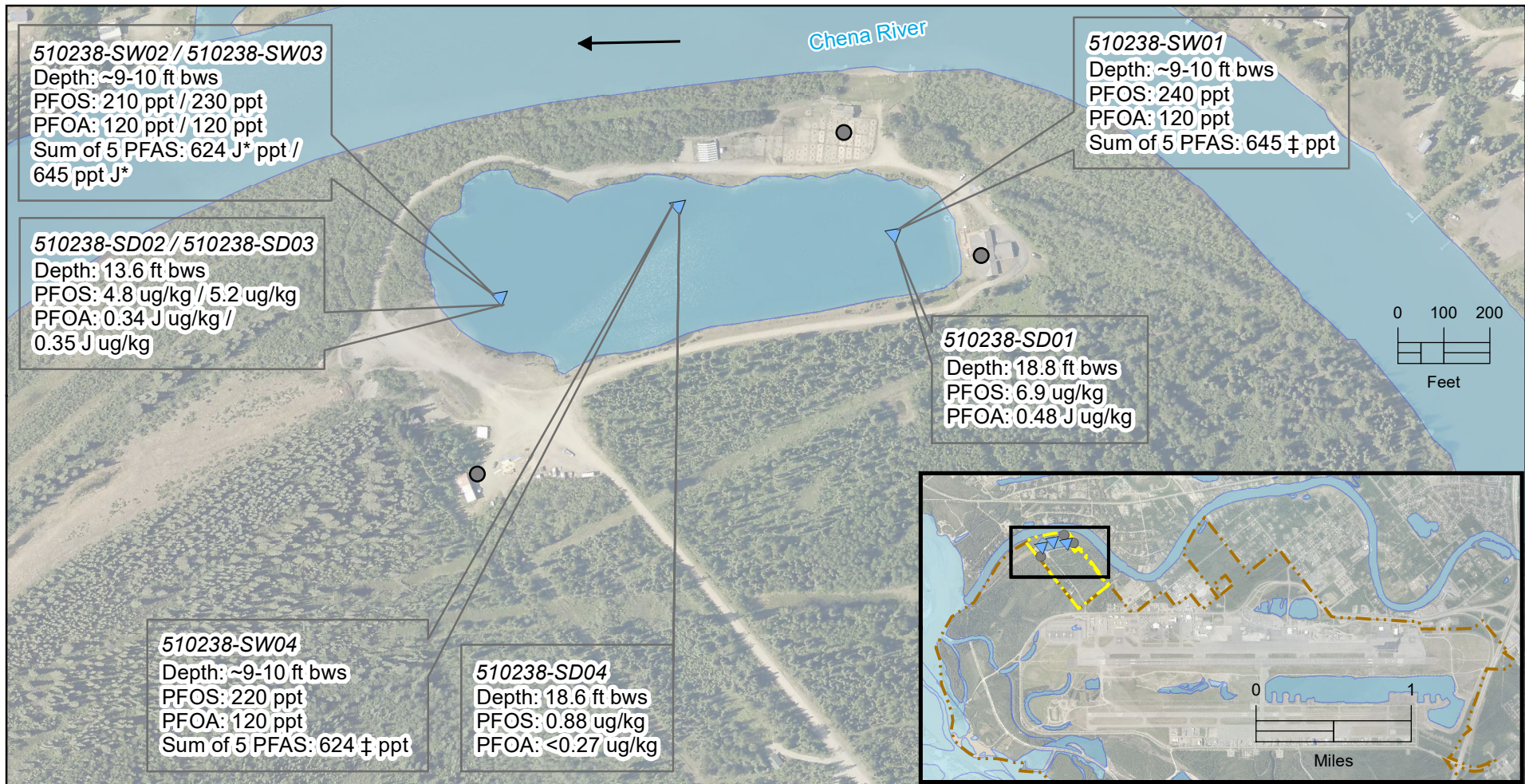
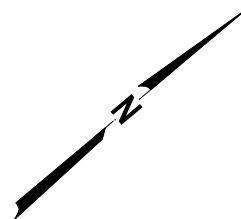


Image source: Pictometry, 2012

LEGEND

- ▲ Sample Location
- Private Wells
- ▭ Parcels
- ▭ FAI Boundary
- Water Body
- ← River Flow Direction
- bws below water surface
- ppt parts per trillion
- ug/kg micrograms per kilogram



Fairbanks International Airport
Fairbanks, Alaska

**WATER- AND SEDIMENT-
SAMPLE LOCATIONS**

March 2019

102519-001

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Figure 2

TABLE 1

SHANNON & WILSON, INC.

SUMMARY OF [REDACTED] POND WATER ANALYTICAL RESULTS

Analyte	Perfluoro-butane sulfonic acid (PFBS)	Perfluoro-heptanoic acid (PFHpA)	Perfluoro-octanoic acid (PFOA)	Perfluoro-nonanoic acid (PFNA)	Perfluoro-hexane sulfonic acid (PFHxS)	Perfluoro-octane sulfonate (PFOS)	Sum of 5 PFAS§
ADEC Action Level	2,000	70§					70§
Sample Name	ppt	ppt	ppt	ppt	ppt	ppt	ppt
510238-SW01	80	15	120	<1.9	270	240	645 ‡
510238-SW02	75	14	120	0.35 J*	280	210	624 J*
510238-SW03 (DUP)	76	14	120	0.97 J*	280	230	645 J*
510238-SW04	78	14	120	<1.8	270	220	624 ‡

§ Sum of 5 PFAS is equal to the sum of PFOS, PFOA, PFHxS, PFHpA, and PFNA. ADEC action level is 70 ppt; results are compared to 65 ppt.

ppt parts per trillion, equivalent to nanograms per liter

Bold Concentration exceeds ADEC action level

DUP Field-duplicate sample

< Analyte not detected; listed as less than the reporting limit (RL) unless otherwise flagged due to quality-control (QC) failures.

J Estimated concentration, detected greater than the method detection limit (MDL) and less than the RL. Flag applied by the laboratory.

J* Result considered estimated due to a QC failure. Flag applied by Shannon & Wilson, Inc.

‡ Minimum concentration, the Sum of 5 PFAS concentration includes one or more result that is not detected greater than the MDL.

TABLE 2

SHANNON & WILSON, INC.

SUMMARY OF [REDACTED] POND SEDIMENT ANALYTICAL RESULTS

Analyte	Perfluorobutane sulfonic acid (PFBS)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorononanoic acid (PFNA)	Perfluorohexane sulfonic acid (PFHxS)	Perfluorooctane sulfonate (PFOS)
Soil-Cleanup Level	-	-	1.7	-	-	3.0
Sample Name	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
510238-SD01	0.12 J	<0.51	0.48 J	<0.51	1.4	6.9
510238-SD02	0.29 J	<0.38	0.34 J	<0.38	0.79	4.8
510238-SD03 (DUP)	0.36 J	<0.39	0.35 J	<0.39	0.68	5.2
510238-SD04	0.034 J	<0.27	<0.27	<0.27	0.18 J	0.88

Alaska Department of Environmental Conservation (ADEC) soil-cleanup levels are reported in 18 AAC 75.341, Table B1 Method Two - Soil Cleanup Levels Table, Migration to Groundwater.

ug/kg micrograms per kilogram

- Soil-cleanup level not established

Bold Concentration exceeds cleanup level

DUP Field-duplicate sample

< Analyte not detected; listed as less than the reporting limit (RL) unless otherwise flagged due to quality-control (QC) failures.

J Estimated concentration, detected greater than the method detection limit (MDL) and less than the RL. Flag applied by the laboratory.

FIELD ACTIVITIES DAILY LOG

Date 1/29/19

Sheet 1 of 1

Project No. 102519

Project Name: [Redacted] Pond

Field Activity Subject: Pond water & sed sample

Description of daily activities and events:

8:30 Field prep, calibrate YSI
9:30 leave office

9:55 Arrive onsite meet w/ [Redacted] & discuss
sample location access.

10:20 Call MDN to check in & ask about sample turn
around time

11:20 Augered hole on northern end of pond

11:50 Collect water sample, 510238-SW01 & sediment sample, 510238-SD01

12:40 Travel to south end of pond, prepare sample labels and
logs

13:00 Augered hole on south end of pond

13:45 Collect water samples, 510238-SW02 and 510238-SW03,
and sediment samples, 510238-SD02 and 510238-SD03.

14:10 Travel to middle/west pond sampling location

14:20 Auger hole on middle/west.

15:30 Collect water sample, 510238-SW04 and sediment sample, 510238-SD04.

16:00 Finish sampling and pack truck.

16:30 Dispose of decant water at edge of property, end of driveway.

17:30 Samples in S&W refrigerator.

Visitors on site:

Changes from plans/specifications and other special orders and important decisions:

Weather conditions: Snowing, overcast, ~25°F

Important telephone calls:

Personnel on site: FLG, GCO

Signature:

Date: 1/29/19

Pond
MONITORING-WELL SAMPLING LOG

Owner/Client Fairbanks International Airport Project No. 102519
 Location North end of pond Date 01/29/19
 Sampling Personnel FLG, GCD Well —
 Weather Conditions SNOWING, overcast Air Temp. (°F) 25 Time started 1145
 Time completed 1200

Sample No. 510238-SW01 Time 1156
 Duplicate — Analysis: — Time — Depth to Water (ft.) —
 Equipment Blank (EB) — Analysis: — Time — Depth to LNAPL (ft.) —
 NAPL Thickness (ft.) —
 Method of NAPL Measurement —

Pump/Controller Peristaltic Pump
 Purging Method portable / dedicated pump Diameter and Type of Casing —
 Pumping Start — Approximate Total Depth of Well Below MP (ft.) —
 Purge Rate (gal./min.) — Measured Total Depth of Well Below MP (ft.) 18.8
 Pumping End — Depth to Water Below MP (ft.) —
 Depth to Ice (if frozen) Below MP (ft.) 2.5
 Feet of Water in Well —
 Gallons per foot —
 Gallons in Well —
 Gallons in Well x3 = —
 (also enter on back) Total Gallons Purged —
 Purge Water Disposal City of N.P. manhole near NPR Gate 1

Monument Condition —
 Casing Condition —
 Wiring Condition —
 (dedicated pumps) —

Measuring Point (MP) Top of Casing (TOC) Monument type: Stickup / Flushmount
N/A Bottom of ice TOP Measurement method: Tape measure N/A
 Top-of-casing to monument (ft.) — Datalogger Type (circle): RT-100 GW-WL-16
 Monument to ground surface (ft.) — N/A AT-200 LT-700 LT-500
 Other: — HOBO
 Datalogger serial #: —
 Measured cable length (ft.) —

- Frost-jacking? Y / N Temperature Logger Present (TidBit)? Y / N
- Lock present and operational
- Well name legible on outside of well (stickup) or inside of well (flushmount)

Notes Pond sample - sample depth = ~9-10 ft.
Sediment sample # = 510238-SD01 1158
(FCKMx Dredge)

WELL CASING VOLUMES N/A

Diameter of Well [ID-inches]	CMT	1 1/4	2	3	4	6	8
Gallons per lineal foot	0.01057	0.08	0.17	0.38	0.66	1.5	2.6

Pond
MONITORING WELL SAMPLING LOG

Owner/Client Fairbanks International Airport
 Location South end of pond
 Sampling Personnel FLG, GCD
 Weather Conditions SNOWING, overcast Air Temp. (°F) 25

Project No. 102519
 Date 01/29/19
 Well —
 Time started 1330
 Time completed 1400

Sample No. 510238-SW02 Time 1345
 Duplicate 510238-SW03 Analysis: _____ Time 1335
 Equipment Blank (EB) — Analysis: _____ Time _____

Depth to Water (ft.) —
 Depth to LNAPL (ft.) —
 NAPL Thickness (ft.) —
 Method of NAPL Measurement —

Pump/Controller Peristaltic Pump
 Purging Method portable / dedicated pump
 Pumping Start —
 Purge Rate (gal./min.) —
 Pumping End —

Diameter and Type of Casing —
 Approximate Total Depth of Well Below MP (ft.) —
 Measured Total Depth of Well Below MP (ft.) 13.6
 Depth to Water Below MP (ft.) —
 Depth to Ice (if frozen) Below MP (ft.) 2.5
 Feet of Water in Well —
 Gallons per foot —
 Gallons in Well —
 Gallons in Well x3 = —
 (also enter on back) Total Gallons Purged —

Pump Set Depth Below MP (ft.) ~9-10 ft.
 KuriTec Tubing (ft.) —
 TruPoly Tubing (ft.) ~220 ft.
 Silicone Tubing (ft.) 0.5 ft.

Purge Water Disposal City of N. P. manhole near NPR Gate 1-
N/A

Monument Condition N/A
 Casing Condition N/A
 Wiring Condition N/A
 (dedicated pumps) _____

Measuring Point (MP) Top of Casing (TOC)
Bottom of ice
TOP
 Top-of-casing to monument (ft.) —
 Monument to ground surface (ft.) —

Monument type: Stickup / Flushmount N/A
 Measurement method: Tape measure N/A
 Datalogger Type (circle): RT-100 GW-WL-16
AT-200 LT-700 LT-500
 Other: HOBO
 Datalogger serial #: —
 Measured cable length (ft) —

- N/A Frost-jacking? Y / N Temperature Logger Present (TidBit)? Y / N
 Lock present and operational
 Well name legible on outside of well (stickup) or inside of well (flushmount)

Notes Pond water sample - sample depth = ~9-10 - ft.
Sediment sample # = 510238 - SD02 13:55
Sediment duplicate # = 510238 - SD03 13:45

(Eckman Dredge)

WELL CASING VOLUMES N/A

Diameter of Well [ID-inches]	CMT	1/4	2	3	4	6	8
Gallons per lineal foot	0.01057	0.08	0.17	0.38	0.66	1.5	2.6

Pond
MONITORING WELL SAMPLING LOG

Owner/Client Fairbanks International Airport Project No. 10
 Location Middle/west Date 01/29/19
 Sampling Personnel FLG, GCD Well SW04
 Weather Conditions Snowing, overcast Air Temp. (°F) 25 Time started 14:15
 Time completed _____

Sample No. 510238-SW04 Time 15:28
 Duplicate - Analysis: _____ Time _____
 Equipment Blank (EB) - Analysis: _____ Time _____
 Depth to Water (ft.) _____
 Depth to LNAPL (ft.) _____
 NAPL Thickness (ft.) _____
 Method of NAPL Measurement _____

Pump/Controller Arista 1/2 hp Pump Diameter and Type of Casing N/A
 Purging Method portable / dedicated pump Approximate Total Depth of Well Below MP (ft.) _____
 Pumping Start N/A Measured Total Depth of Well Below MP (ft.) 18.0
 Purge Rate (gal./min.) N/A Depth to Water Below MP (ft.) _____
 Pumping End N/A Depth to Ice (if frozen) Below MP (ft.) 2.5
 Pump Set Depth Below MP (ft.) ~9-10 ft. Feet of Water in Well _____
 KuriTec Tubing (ft.) _____ Gallons per foot _____
 TruPoly Tubing (ft.) ~20 ft. Gallons in Well _____
 Silicone Tubing (ft.) 0.5 ft. Gallons in Well x3 = _____
 (also enter on back) Total Gallons Purged _____
 Purge Water Disposal City of N. P. manhole near NPR Gate 1

Monument Condition N/A
 Casing Condition N/A
 Wiring Condition N/A
 (dedicated pumps)

Measuring Point (MP) Top of Casing (TOC) Monument type: Stickup / Flushmount N/A
Bottom of ice Measurement method: Tape measure
 Top-of-casing to monument (ft.) N/A Datalogger Type (circle): RT-100 GW-WL-16
 Monument to ground surface (ft.) N/A AT-200 LT-700 LT-500
Other: _____ HOBO
 Datalogger serial #: N/A
 Measured cable length (ft.) N/A

- Frost-jacking? Y / N Temperature Logger Present (TidBit)? Y / N
 Lock present and operational
 Well name legible on outside of well (stickup) or inside of well (flushmount)

Notes Pond water sample depth = ~9-10 ft.
sediment sample # = 510238-SD04 15:40
(ECKMAN Dredge)

WELL CASING VOLUMES N/A

Diameter of Well [ID-inches]	CMT	1 1/4	2	3	4	6	8
Gallons per lineal foot	0.01057	0.08	0.17	0.38	0.66	1.5	2.6

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: 320-47277-1
Client Project/Site: ██████████ Pond

For:
Shannon & Wilson, Inc
2355 Hill Rd.
Fairbanks, Alaska 99709-5244

Attn: Marcy Nadel



Authorized for release by:
2/12/2019 4:00:40 PM

David Alltucker, Project Manager I
(916)374-4383
david.alltucker@testamericainc.com

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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.

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Definitions/Glossary

Client: Shannon & Wilson, Inc
Project/Site: ██████ Pond

TestAmerica Job ID: 320-47277-1

Qualifiers

LCMS

Qualifier	Qualifier Description
B	Compound was found in the blank and sample.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

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: Shannon & Wilson, Inc
Project/Site: ██████ Pond

TestAmerica Job ID: 320-47277-1

Job ID: 320-47277-1

Laboratory: TestAmerica Sacramento

Narrative

Job Narrative
320-47277-1

Receipt

The samples were received on 1/31/2019 12:15 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 6.3° C.

LCMS

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

General Chemistry

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

Organic Prep

Method(s) SHAKE: After the final volume, the following samples were observed to be a yellow color: 510238-SD01 (320-47277-2), 510238-SD02 (320-47277-4) and 510238-SD03 (320-47277-6)

Method(s) SHAKE: After the final volume, the following samples were observed to be a light yellow color: 510238-SD04 (320-47277-8), (320-47277-A-8 MS) and (320-47277-A-8 MSD)

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



Detection Summary

Client: Shannon & Wilson, Inc
 Project/Site: ██████ Pond

TestAmerica Job ID: 320-47277-1

Client Sample ID: 510238-SW01

Lab Sample ID: 320-47277-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanesulfonic acid (PFBS)	80		1.9	0.19	ng/L	1		537 (modified)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	270	B	1.9	0.16	ng/L	1		537 (modified)	Total/NA
Perfluoroheptanoic acid (PFHpA)	15		1.9	0.24	ng/L	1		537 (modified)	Total/NA
Perfluorooctanoic acid (PFOA)	120		1.9	0.80	ng/L	1		537 (modified)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	240		1.9	0.51	ng/L	1		537 (modified)	Total/NA

Client Sample ID: 510238-SD01

Lab Sample ID: 320-47277-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanesulfonic acid (PFBS)	0.12	J	0.51	0.064	ug/Kg	1	☼	537 (modified)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	1.4		0.51	0.079	ug/Kg	1	☼	537 (modified)	Total/NA
Perfluorooctanoic acid (PFOA)	0.48	J	0.51	0.22	ug/Kg	1	☼	537 (modified)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	6.9		1.3	0.51	ug/Kg	1	☼	537 (modified)	Total/NA

Client Sample ID: 510238-SW02

Lab Sample ID: 320-47277-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanesulfonic acid (PFBS)	75		1.9	0.19	ng/L	1		537 (modified)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	280	B	1.9	0.16	ng/L	1		537 (modified)	Total/NA
Perfluoroheptanoic acid (PFHpA)	14		1.9	0.23	ng/L	1		537 (modified)	Total/NA
Perfluorooctanoic acid (PFOA)	120		1.9	0.80	ng/L	1		537 (modified)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	210		1.9	0.51	ng/L	1		537 (modified)	Total/NA
Perfluorononanoic acid (PFNA)	0.35	J	1.9	0.25	ng/L	1		537 (modified)	Total/NA

Client Sample ID: 510238-SD02

Lab Sample ID: 320-47277-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanesulfonic acid (PFBS)	0.29	J	0.38	0.047	ug/Kg	1	☼	537 (modified)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	0.79		0.38	0.059	ug/Kg	1	☼	537 (modified)	Total/NA
Perfluorooctanoic acid (PFOA)	0.34	J	0.38	0.16	ug/Kg	1	☼	537 (modified)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	4.8		0.95	0.38	ug/Kg	1	☼	537 (modified)	Total/NA

Client Sample ID: 510238-SW03

Lab Sample ID: 320-47277-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanesulfonic acid (PFBS)	76		1.9	0.19	ng/L	1		537 (modified)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	280	B	1.9	0.16	ng/L	1		537 (modified)	Total/NA
Perfluoroheptanoic acid (PFHpA)	14		1.9	0.24	ng/L	1		537 (modified)	Total/NA
Perfluorooctanoic acid (PFOA)	120		1.9	0.80	ng/L	1		537 (modified)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	230		1.9	0.51	ng/L	1		537 (modified)	Total/NA
Perfluorononanoic acid (PFNA)	0.97	J	1.9	0.26	ng/L	1		537 (modified)	Total/NA

Client Sample ID: 510238-SD03

Lab Sample ID: 320-47277-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanesulfonic acid (PFBS)	0.36	J	0.39	0.049	ug/Kg	1	☼	537 (modified)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	0.68		0.39	0.061	ug/Kg	1	☼	537 (modified)	Total/NA
Perfluorooctanoic acid (PFOA)	0.35	J	0.39	0.17	ug/Kg	1	☼	537 (modified)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	5.2		0.98	0.39	ug/Kg	1	☼	537 (modified)	Total/NA

This Detection Summary does not include radiochemical test results.

TestAmerica Sacramento

Detection Summary

Client: Shannon & Wilson, Inc
Project/Site: ██████ Pond

TestAmerica Job ID: 320-47277-1

Client Sample ID: 510238-SW04

Lab Sample ID: 320-47277-7

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanesulfonic acid (PFBS)	78		1.8	0.18	ng/L	1		537 (modified)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	270	B	1.8	0.16	ng/L	1		537 (modified)	Total/NA
Perfluoroheptanoic acid (PFHpA)	14		1.8	0.23	ng/L	1		537 (modified)	Total/NA
Perfluorooctanoic acid (PFOA)	120		1.8	0.78	ng/L	1		537 (modified)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	220		1.8	0.50	ng/L	1		537 (modified)	Total/NA

Client Sample ID: 510238-SD04

Lab Sample ID: 320-47277-8

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanesulfonic acid (PFBS)	0.034	J	0.27	0.033	ug/Kg	1	☼	537 (modified)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	0.18	J	0.27	0.041	ug/Kg	1	☼	537 (modified)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	0.88		0.66	0.27	ug/Kg	1	☼	537 (modified)	Total/NA

This Detection Summary does not include radiochemical test results.

TestAmerica Sacramento

Client Sample Results

Client: Shannon & Wilson, Inc
 Project/Site: ██████ Pond

TestAmerica Job ID: 320-47277-1

Client Sample ID: 510238-SW01

Lab Sample ID: 320-47277-1

Date Collected: 01/29/19 11:56

Matrix: Water

Date Received: 01/31/19 12:15

Method: 537 (modified) - Fluorinated Alkyl Substances

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanesulfonic acid (PFBS)	80		1.9	0.19	ng/L		02/06/19 05:32	02/07/19 04:15	1
Perfluorohexanesulfonic acid (PFHxS)	270	B	1.9	0.16	ng/L		02/06/19 05:32	02/07/19 04:15	1
Perfluoroheptanoic acid (PFHpA)	15		1.9	0.24	ng/L		02/06/19 05:32	02/07/19 04:15	1
Perfluorooctanoic acid (PFOA)	120		1.9	0.80	ng/L		02/06/19 05:32	02/07/19 04:15	1
Perfluorooctanesulfonic acid (PFOS)	240		1.9	0.51	ng/L		02/06/19 05:32	02/07/19 04:15	1
Perfluorononanoic acid (PFNA)	ND		1.9	0.26	ng/L		02/06/19 05:32	02/07/19 04:15	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
¹⁸ O ₂ PFHxS	102		25 - 150				02/06/19 05:32	02/07/19 04:15	1
¹³ C ₄ PFHpA	101		25 - 150				02/06/19 05:32	02/07/19 04:15	1
¹³ C ₄ PFOA	97		25 - 150				02/06/19 05:32	02/07/19 04:15	1
¹³ C ₃ PFBS	100		25 - 150				02/06/19 05:32	02/07/19 04:15	1
¹³ C ₄ PFOS	93		25 - 150				02/06/19 05:32	02/07/19 04:15	1
¹³ C ₅ PFNA	99		25 - 150				02/06/19 05:32	02/07/19 04:15	1

Client Sample Results

Client: Shannon & Wilson, Inc
 Project/Site: ██████ Pond

TestAmerica Job ID: 320-47277-1

Client Sample ID: 510238-SD01

Lab Sample ID: 320-47277-2

Date Collected: 01/29/19 11:58

Matrix: Solid

Date Received: 01/31/19 12:15

Percent Solids: 38.1

Method: 537 (modified) - Fluorinated Alkyl Substances

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanesulfonic acid (PFBS)	0.12	J	0.51	0.064	ug/Kg	☼	02/07/19 10:52	02/09/19 07:04	1
Perfluorohexanesulfonic acid (PFHxS)	1.4		0.51	0.079	ug/Kg	☼	02/07/19 10:52	02/09/19 07:04	1
Perfluoroheptanoic acid (PFHpA)	ND		0.51	0.074	ug/Kg	☼	02/07/19 10:52	02/09/19 07:04	1
Perfluorooctanoic acid (PFOA)	0.48	J	0.51	0.22	ug/Kg	☼	02/07/19 10:52	02/09/19 07:04	1
Perfluorooctanesulfonic acid (PFOS)	6.9		1.3	0.51	ug/Kg	☼	02/07/19 10:52	02/09/19 07:04	1
Perfluorononanoic acid (PFNA)	ND		0.51	0.092	ug/Kg	☼	02/07/19 10:52	02/09/19 07:04	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
18O2 PFHxS	98		25 - 150				02/07/19 10:52	02/09/19 07:04	1
13C4 PFHpA	95		25 - 150				02/07/19 10:52	02/09/19 07:04	1
13C4 PFOA	102		25 - 150				02/07/19 10:52	02/09/19 07:04	1
13C3 PFBS	93		25 - 150				02/07/19 10:52	02/09/19 07:04	1
13C4 PFOS	95		25 - 150				02/07/19 10:52	02/09/19 07:04	1
13C5 PFNA	106		25 - 150				02/07/19 10:52	02/09/19 07:04	1

Client Sample Results

Client: Shannon & Wilson, Inc
 Project/Site: ██████ Pond

TestAmerica Job ID: 320-47277-1

Client Sample ID: 510238-SW02

Lab Sample ID: 320-47277-3

Date Collected: 01/29/19 13:45

Matrix: Water

Date Received: 01/31/19 12:15

Method: 537 (modified) - Fluorinated Alkyl Substances

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanesulfonic acid (PFBS)	75		1.9	0.19	ng/L		02/06/19 05:32	02/07/19 04:23	1
Perfluorohexanesulfonic acid (PFHxS)	280	B	1.9	0.16	ng/L		02/06/19 05:32	02/07/19 04:23	1
Perfluoroheptanoic acid (PFHpA)	14		1.9	0.23	ng/L		02/06/19 05:32	02/07/19 04:23	1
Perfluorooctanoic acid (PFOA)	120		1.9	0.80	ng/L		02/06/19 05:32	02/07/19 04:23	1
Perfluorooctanesulfonic acid (PFOS)	210		1.9	0.51	ng/L		02/06/19 05:32	02/07/19 04:23	1
Perfluorononanoic acid (PFNA)	0.35	J	1.9	0.25	ng/L		02/06/19 05:32	02/07/19 04:23	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
¹⁸ O ₂ PFHxS	107		25 - 150				02/06/19 05:32	02/07/19 04:23	1
¹³ C ₄ PFHpA	110		25 - 150				02/06/19 05:32	02/07/19 04:23	1
¹³ C ₄ PFOA	103		25 - 150				02/06/19 05:32	02/07/19 04:23	1
¹³ C ₃ PFBS	109		25 - 150				02/06/19 05:32	02/07/19 04:23	1
¹³ C ₄ PFOS	101		25 - 150				02/06/19 05:32	02/07/19 04:23	1
¹³ C ₅ PFNA	105		25 - 150				02/06/19 05:32	02/07/19 04:23	1

Client Sample Results

Client: Shannon & Wilson, Inc
 Project/Site: ██████ Pond

TestAmerica Job ID: 320-47277-1

Client Sample ID: 510238-SD02

Lab Sample ID: 320-47277-4

Date Collected: 01/29/19 13:55

Matrix: Solid

Date Received: 01/31/19 12:15

Percent Solids: 50.5

Method: 537 (modified) - Fluorinated Alkyl Substances

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanesulfonic acid (PFBS)	0.29	J	0.38	0.047	ug/Kg	☼	02/07/19 10:52	02/09/19 07:12	1
Perfluorohexanesulfonic acid (PFHxS)	0.79		0.38	0.059	ug/Kg	☼	02/07/19 10:52	02/09/19 07:12	1
Perfluoroheptanoic acid (PFHpA)	ND		0.38	0.055	ug/Kg	☼	02/07/19 10:52	02/09/19 07:12	1
Perfluorooctanoic acid (PFOA)	0.34	J	0.38	0.16	ug/Kg	☼	02/07/19 10:52	02/09/19 07:12	1
Perfluorooctanesulfonic acid (PFOS)	4.8		0.95	0.38	ug/Kg	☼	02/07/19 10:52	02/09/19 07:12	1
Perfluorononanoic acid (PFNA)	ND		0.38	0.068	ug/Kg	☼	02/07/19 10:52	02/09/19 07:12	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
18O2 PFHxS	117		25 - 150				02/07/19 10:52	02/09/19 07:12	1
13C4 PFHpA	112		25 - 150				02/07/19 10:52	02/09/19 07:12	1
13C4 PFOA	100		25 - 150				02/07/19 10:52	02/09/19 07:12	1
13C3 PFBS	115		25 - 150				02/07/19 10:52	02/09/19 07:12	1
13C4 PFOS	106		25 - 150				02/07/19 10:52	02/09/19 07:12	1
13C5 PFNA	113		25 - 150				02/07/19 10:52	02/09/19 07:12	1

Client Sample Results

Client: Shannon & Wilson, Inc
 Project/Site: ██████ Pond

TestAmerica Job ID: 320-47277-1

Client Sample ID: 510238-SW03

Lab Sample ID: 320-47277-5

Date Collected: 01/29/19 13:35

Matrix: Water

Date Received: 01/31/19 12:15

Method: 537 (modified) - Fluorinated Alkyl Substances

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanesulfonic acid (PFBS)	76		1.9	0.19	ng/L		02/06/19 05:32	02/07/19 04:30	1
Perfluorohexanesulfonic acid (PFHxS)	280	B	1.9	0.16	ng/L		02/06/19 05:32	02/07/19 04:30	1
Perfluoroheptanoic acid (PFHpA)	14		1.9	0.24	ng/L		02/06/19 05:32	02/07/19 04:30	1
Perfluorooctanoic acid (PFOA)	120		1.9	0.80	ng/L		02/06/19 05:32	02/07/19 04:30	1
Perfluorooctanesulfonic acid (PFOS)	230		1.9	0.51	ng/L		02/06/19 05:32	02/07/19 04:30	1
Perfluorononanoic acid (PFNA)	0.97	J	1.9	0.26	ng/L		02/06/19 05:32	02/07/19 04:30	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
¹⁸ O ₂ PFHxS	107		25 - 150				02/06/19 05:32	02/07/19 04:30	1
¹³ C ₄ PFHpA	110		25 - 150				02/06/19 05:32	02/07/19 04:30	1
¹³ C ₄ PFOA	103		25 - 150				02/06/19 05:32	02/07/19 04:30	1
¹³ C ₃ PFBS	105		25 - 150				02/06/19 05:32	02/07/19 04:30	1
¹³ C ₄ PFOS	99		25 - 150				02/06/19 05:32	02/07/19 04:30	1
¹³ C ₅ PFNA	101		25 - 150				02/06/19 05:32	02/07/19 04:30	1

Client Sample Results

Client: Shannon & Wilson, Inc
 Project/Site: ██████ Pond

TestAmerica Job ID: 320-47277-1

Client Sample ID: 510238-SD03

Lab Sample ID: 320-47277-6

Date Collected: 01/29/19 13:45

Matrix: Solid

Date Received: 01/31/19 12:15

Percent Solids: 49.6

Method: 537 (modified) - Fluorinated Alkyl Substances

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanesulfonic acid (PFBS)	0.36	J	0.39	0.049	ug/Kg	☼	02/07/19 10:52	02/09/19 07:19	1
Perfluorohexanesulfonic acid (PFHxS)	0.68		0.39	0.061	ug/Kg	☼	02/07/19 10:52	02/09/19 07:19	1
Perfluoroheptanoic acid (PFHpA)	ND		0.39	0.057	ug/Kg	☼	02/07/19 10:52	02/09/19 07:19	1
Perfluorooctanoic acid (PFOA)	0.35	J	0.39	0.17	ug/Kg	☼	02/07/19 10:52	02/09/19 07:19	1
Perfluorooctanesulfonic acid (PFOS)	5.2		0.98	0.39	ug/Kg	☼	02/07/19 10:52	02/09/19 07:19	1
Perfluorononanoic acid (PFNA)	ND		0.39	0.071	ug/Kg	☼	02/07/19 10:52	02/09/19 07:19	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
18O2 PFHxS	108		25 - 150				02/07/19 10:52	02/09/19 07:19	1
13C4 PFHpA	103		25 - 150				02/07/19 10:52	02/09/19 07:19	1
13C4 PFOA	104		25 - 150				02/07/19 10:52	02/09/19 07:19	1
13C3 PFBS	100		25 - 150				02/07/19 10:52	02/09/19 07:19	1
13C4 PFOS	100		25 - 150				02/07/19 10:52	02/09/19 07:19	1
13C5 PFNA	103		25 - 150				02/07/19 10:52	02/09/19 07:19	1

Client Sample Results

Client: Shannon & Wilson, Inc
 Project/Site: ██████ Pond

TestAmerica Job ID: 320-47277-1

Client Sample ID: 510238-SW04

Lab Sample ID: 320-47277-7

Date Collected: 01/29/19 15:28

Matrix: Water

Date Received: 01/31/19 12:15

Method: 537 (modified) - Fluorinated Alkyl Substances

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanesulfonic acid (PFBS)	78		1.8	0.18	ng/L		02/06/19 05:32	02/07/19 04:38	1
Perfluorohexanesulfonic acid (PFHxS)	270	B	1.8	0.16	ng/L		02/06/19 05:32	02/07/19 04:38	1
Perfluoroheptanoic acid (PFHpA)	14		1.8	0.23	ng/L		02/06/19 05:32	02/07/19 04:38	1
Perfluorooctanoic acid (PFOA)	120		1.8	0.78	ng/L		02/06/19 05:32	02/07/19 04:38	1
Perfluorooctanesulfonic acid (PFOS)	220		1.8	0.50	ng/L		02/06/19 05:32	02/07/19 04:38	1
Perfluorononanoic acid (PFNA)	ND		1.8	0.25	ng/L		02/06/19 05:32	02/07/19 04:38	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
¹⁸ O ₂ PFHxS	107		25 - 150				02/06/19 05:32	02/07/19 04:38	1
¹³ C ₄ PFHpA	108		25 - 150				02/06/19 05:32	02/07/19 04:38	1
¹³ C ₄ PFOA	100		25 - 150				02/06/19 05:32	02/07/19 04:38	1
¹³ C ₃ PFBS	102		25 - 150				02/06/19 05:32	02/07/19 04:38	1
¹³ C ₄ PFOS	95		25 - 150				02/06/19 05:32	02/07/19 04:38	1
¹³ C ₅ PFNA	102		25 - 150				02/06/19 05:32	02/07/19 04:38	1

Client Sample Results

Client: Shannon & Wilson, Inc
 Project/Site: ██████ Pond

TestAmerica Job ID: 320-47277-1

Client Sample ID: 510238-SD04

Lab Sample ID: 320-47277-8

Date Collected: 01/29/19 15:40

Matrix: Solid

Date Received: 01/31/19 12:15

Percent Solids: 75.7

Method: 537 (modified) - Fluorinated Alkyl Substances

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanesulfonic acid (PFBS)	0.034	J	0.27	0.033	ug/Kg	☼	02/07/19 10:52	02/09/19 07:27	1
Perfluorohexanesulfonic acid (PFHxS)	0.18	J	0.27	0.041	ug/Kg	☼	02/07/19 10:52	02/09/19 07:27	1
Perfluoroheptanoic acid (PFHpA)	ND		0.27	0.038	ug/Kg	☼	02/07/19 10:52	02/09/19 07:27	1
Perfluorooctanoic acid (PFOA)	ND		0.27	0.11	ug/Kg	☼	02/07/19 10:52	02/09/19 07:27	1
Perfluorooctanesulfonic acid (PFOS)	0.88		0.66	0.27	ug/Kg	☼	02/07/19 10:52	02/09/19 07:27	1
Perfluorononanoic acid (PFNA)	ND		0.27	0.048	ug/Kg	☼	02/07/19 10:52	02/09/19 07:27	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
18O2 PFHxS	101		25 - 150				02/07/19 10:52	02/09/19 07:27	1
13C4 PFHpA	108		25 - 150				02/07/19 10:52	02/09/19 07:27	1
13C4 PFOA	105		25 - 150				02/07/19 10:52	02/09/19 07:27	1
13C3 PFBS	101		25 - 150				02/07/19 10:52	02/09/19 07:27	1
13C4 PFOS	103		25 - 150				02/07/19 10:52	02/09/19 07:27	1
13C5 PFNA	110		25 - 150				02/07/19 10:52	02/09/19 07:27	1

Isotope Dilution Summary

Client: Shannon & Wilson, Inc
 Project/Site: ██████ Pond

TestAmerica Job ID: 320-47277-1

Method: 537 (modified) - Fluorinated Alkyl Substances

Matrix: Solid

Prep Type: Total/NA

Percent Isotope Dilution Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	PFHxS (25-150)	PFHpA (25-150)	PFOA (25-150)	3C3-PFB: (25-150)	PFOS (25-150)	PFNA (25-150)
320-47277-2	510238-SD01	98	95	102	93	95	106
320-47277-4	510238-SD02	117	112	100	115	106	113
320-47277-6	510238-SD03	108	103	104	100	100	103
320-47277-8	510238-SD04	101	108	105	101	103	110
320-47277-8 MS	510238-SD04	100	104	103	96	103	107
320-47277-8 MSD	510238-SD04	102	101	100	97	102	108
LCS 320-274716/2-A	Lab Control Sample	106	113	102	90	101	105
LCSD 320-274716/3-A	Lab Control Sample Dup	96	101	97	91	94	96
MB 320-274716/1-A	Method Blank	100	104	100	97	102	106

Surrogate Legend

PFHxS = 18O2 PFHxS
 PFHpA = 13C4 PFHpA
 PFOA = 13C4 PFOA
 13C3-PFBS = 13C3 PFBS
 PFOS = 13C4 PFOS
 PFNA = 13C5 PFNA

Method: 537 (modified) - Fluorinated Alkyl Substances

Matrix: Water

Prep Type: Total/NA

Percent Isotope Dilution Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	PFHxS (25-150)	PFHpA (25-150)	PFOA (25-150)	3C3-PFB: (25-150)	PFOS (25-150)	PFNA (25-150)
320-47277-1	510238-SW01	102	101	97	100	93	99
320-47277-3	510238-SW02	107	110	103	109	101	105
320-47277-5	510238-SW03	107	110	103	105	99	101
320-47277-7	510238-SW04	107	108	100	102	95	102
LCS 320-274341/2-A	Lab Control Sample	104	113	105	104	105	112
MB 320-274341/1-A	Method Blank	107	106	104	105	102	107

Surrogate Legend

PFHxS = 18O2 PFHxS
 PFHpA = 13C4 PFHpA
 PFOA = 13C4 PFOA
 13C3-PFBS = 13C3 PFBS
 PFOS = 13C4 PFOS
 PFNA = 13C5 PFNA

QC Sample Results

Client: Shannon & Wilson, Inc
 Project/Site: ████████ Pond

TestAmerica Job ID: 320-47277-1

Method: 537 (modified) - Fluorinated Alkyl Substances

Lab Sample ID: MB 320-274341/1-A

Matrix: Water

Analysis Batch: 274665

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 274341

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanesulfonic acid (PFBS)	ND		2.0	0.20	ng/L		02/06/19 05:32	02/07/19 03:45	1
Perfluorohexanesulfonic acid (PFHxS)	0.320	J	2.0	0.17	ng/L		02/06/19 05:32	02/07/19 03:45	1
Perfluoroheptanoic acid (PFHpA)	ND		2.0	0.25	ng/L		02/06/19 05:32	02/07/19 03:45	1
Perfluorooctanoic acid (PFOA)	ND		2.0	0.85	ng/L		02/06/19 05:32	02/07/19 03:45	1
Perfluorooctanesulfonic acid (PFOS)	ND		2.0	0.54	ng/L		02/06/19 05:32	02/07/19 03:45	1
Perfluorononanoic acid (PFNA)	ND		2.0	0.27	ng/L		02/06/19 05:32	02/07/19 03:45	1

Isotope Dilution	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
18O2 PFHxS	105		2- / 1- 0	02/04/19 0- 3 2	02/05/19 0- 3-	1
1: C7 PFHpA	104		2- / 1- 0	02/04/19 0- 3 2	02/05/19 0- 3-	1
1: C7 PFOA	107		2- / 1- 0	02/04/19 0- 3 2	02/05/19 0- 3-	1
1: C: PFBS	10-		2- / 1- 0	02/04/19 0- 3 2	02/05/19 0- 3-	1
1: C7 PFOS	102		2- / 1- 0	02/04/19 0- 3 2	02/05/19 0- 3-	1
1: C- PFNA	105		2- / 1- 0	02/04/19 0- 3 2	02/05/19 0- 3-	1

Lab Sample ID: LCS 320-274341/2-A

Matrix: Water

Analysis Batch: 274665

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 274341

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
Perfluorobutanesulfonic acid (PFBS)	35.4	37.4		ng/L		106	73 - 133
Perfluorohexanesulfonic acid (PFHxS)	36.4	37.8		ng/L		104	63 - 123
Perfluoroheptanoic acid (PFHpA)	40.0	41.7		ng/L		104	66 - 126
Perfluorooctanoic acid (PFOA)	40.0	41.4		ng/L		103	64 - 124
Perfluorooctanesulfonic acid (PFOS)	37.1	37.9		ng/L		102	67 - 127
Perfluorononanoic acid (PFNA)	40.0	43.3		ng/L		108	68 - 128

Isotope Dilution	LCS %Recovery	LCS Qualifier	Limits
18O2 PFHxS	107		2- / 1- 0
1: C7 PFHpA	11:		2- / 1- 0
1: C7 PFOA	10-		2- / 1- 0
1: C: PFBS	107		2- / 1- 0
1: C7 PFOS	10-		2- / 1- 0
1: C- PFNA	112		2- / 1- 0

Lab Sample ID: MB 320-274716/1-A

Matrix: Solid

Analysis Batch: 275207

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 274716

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanesulfonic acid (PFBS)	ND		0.20	0.025	ug/Kg		02/07/19 10:52	02/09/19 06:41	1
Perfluorohexanesulfonic acid (PFHxS)	ND		0.20	0.031	ug/Kg		02/07/19 10:52	02/09/19 06:41	1
Perfluoroheptanoic acid (PFHpA)	ND		0.20	0.029	ug/Kg		02/07/19 10:52	02/09/19 06:41	1
Perfluorooctanoic acid (PFOA)	ND		0.20	0.086	ug/Kg		02/07/19 10:52	02/09/19 06:41	1
Perfluorooctanesulfonic acid (PFOS)	ND		0.50	0.20	ug/Kg		02/07/19 10:52	02/09/19 06:41	1
Perfluorononanoic acid (PFNA)	ND		0.20	0.036	ug/Kg		02/07/19 10:52	02/09/19 06:41	1

TestAmerica Sacramento

QC Sample Results

Client: Shannon & Wilson, Inc
 Project/Site: ██████ Pond

TestAmerica Job ID: 320-47277-1

Isotope Dilution	MB MB		Limits	Prepared	Analyzed	Dil Fac
	%Recovery	Qualifier				
18O2 PFHxS	100		2- /1-0	020509 103 2	020909 0431	1
1: C7 PFHpA	107		2- /1-0	020509 103 2	020909 0431	1
1: C7 PFOA	100		2- /1-0	020509 103 2	020909 0431	1
1: C: PFBS	95		2- /1-0	020509 103 2	020909 0431	1
1: C7 PFOS	102		2- /1-0	020509 103 2	020909 0431	1
1: C- PFNA	104		2- /1-0	020509 103 2	020909 0431	1

Lab Sample ID: LCS 320-274716/2-A
Matrix: Solid
Analysis Batch: 275207

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 274716

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Perfluorobutanesulfonic acid (PFBS)	1.77	2.02		ug/Kg		114	73 - 142
Perfluorohexanesulfonic acid (PFHxS)	1.82	1.75		ug/Kg		96	75 - 121
Perfluoroheptanoic acid (PFHpA)	2.00	2.02		ug/Kg		101	76 - 124
Perfluorooctanoic acid (PFOA)	2.00	2.00		ug/Kg		100	76 - 121
Perfluorooctanesulfonic acid (PFOS)	1.86	1.86		ug/Kg		100	69 - 131
Perfluorononanoic acid (PFNA)	2.00	2.01		ug/Kg		101	74 - 126

Isotope Dilution	LCS LCS		Limits
	%Recovery	Qualifier	
18O2 PFHxS	104		2- /1-0
1: C7 PFHpA	111		2- /1-0
1: C7 PFOA	102		2- /1-0
1: C: PFBS	90		2- /1-0
1: C7 PFOS	101		2- /1-0
1: C- PFNA	10-		2- /1-0

Lab Sample ID: LCSD 320-274716/3-A
Matrix: Solid
Analysis Batch: 275207

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 274716

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	Limit
Perfluorobutanesulfonic acid (PFBS)	1.77	1.92		ug/Kg		108	73 - 142	5	30
Perfluorohexanesulfonic acid (PFHxS)	1.82	1.72		ug/Kg		94	75 - 121	2	30
Perfluoroheptanoic acid (PFHpA)	2.00	1.99		ug/Kg		99	76 - 124	2	30
Perfluorooctanoic acid (PFOA)	2.00	1.92		ug/Kg		96	76 - 121	4	30
Perfluorooctanesulfonic acid (PFOS)	1.86	1.93		ug/Kg		104	69 - 131	4	30
Perfluorononanoic acid (PFNA)	2.00	2.10		ug/Kg		105	74 - 126	4	30

Isotope Dilution	LCSD LCSD		Limits
	%Recovery	Qualifier	
18O2 PFHxS	94		2- /1-0
1: C7 PFHpA	101		2- /1-0
1: C7 PFOA	95		2- /1-0
1: C: PFBS	91		2- /1-0
1: C7 PFOS	97		2- /1-0
1: C- PFNA	94		2- /1-0

QC Sample Results

Client: Shannon & Wilson, Inc
 Project/Site: ██████ Pond

TestAmerica Job ID: 320-47277-1

Method: 537 (modified) - Fluorinated Alkyl Substances (Continued)

Lab Sample ID: 320-47277-8 MS

Matrix: Solid
Analysis Batch: 275207

Client Sample ID: 510238-SD04

Prep Type: Total/NA
Prep Batch: 274716

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	Limits
Perfluorobutanesulfonic acid (PFBS)	0.034	J	2.31	2.63		ug/Kg	☼	112	73 - 142
Perfluorohexanesulfonic acid (PFHxS)	0.18	J	2.38	2.51		ug/Kg	☼	98	75 - 121
Perfluoroheptanoic acid (PFHpA)	ND		2.62	2.72		ug/Kg	☼	104	76 - 124
Perfluorooctanoic acid (PFOA)	ND		2.62	2.80		ug/Kg	☼	107	76 - 121
Perfluorooctanesulfonic acid (PFOS)	0.88		2.43	3.47		ug/Kg	☼	107	69 - 131
Perfluorononanoic acid (PFNA)	ND		2.62	2.82		ug/Kg	☼	108	74 - 126
MS MS									
Isotope Dilution	%Recovery	Qualifier	Limits						
18O2 PFHxS	100		2- / 1- 0						
1: C7 PFHpA	107		2- / 1- 0						
1: C7 PFOA	10:		2- / 1- 0						
1: C: PFBS	94		2- / 1- 0						
1: C7 PFOS	10:		2- / 1- 0						
1: C- PFNA	105		2- / 1- 0						

Lab Sample ID: 320-47277-8 MSD

Matrix: Solid
Analysis Batch: 275207

Client Sample ID: 510238-SD04

Prep Type: Total/NA
Prep Batch: 274716

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Perfluorobutanesulfonic acid (PFBS)	0.034	J	2.29	2.51		ug/Kg	☼	108	73 - 142	5	30
Perfluorohexanesulfonic acid (PFHxS)	0.18	J	2.36	2.32		ug/Kg	☼	91	75 - 121	8	30
Perfluoroheptanoic acid (PFHpA)	ND		2.60	2.62		ug/Kg	☼	101	76 - 124	4	30
Perfluorooctanoic acid (PFOA)	ND		2.60	2.69		ug/Kg	☼	104	76 - 121	4	30
Perfluorooctanesulfonic acid (PFOS)	0.88		2.41	3.37		ug/Kg	☼	103	69 - 131	3	30
Perfluorononanoic acid (PFNA)	ND		2.60	2.70		ug/Kg	☼	104	74 - 126	4	30
MSD MSD											
Isotope Dilution	%Recovery	Qualifier	Limits								
18O2 PFHxS	102		2- / 1- 0								
1: C7 PFHpA	101		2- / 1- 0								
1: C7 PFOA	100		2- / 1- 0								
1: C: PFBS	95		2- / 1- 0								
1: C7 PFOS	102		2- / 1- 0								
1: C- PFNA	108		2- / 1- 0								

TestAmerica Sacramento

QC Association Summary

Client: Shannon & Wilson, Inc
 Project/Site: ████████ Pond

TestAmerica Job ID: 320-47277-1

LCMS

Prep Batch: 274341

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-47277-1	510238-SW01	Total/NA	Water	3535	
320-47277-3	510238-SW02	Total/NA	Water	3535	
320-47277-5	510238-SW03	Total/NA	Water	3535	
320-47277-7	510238-SW04	Total/NA	Water	3535	
MB 320-274341/1-A	Method Blank	Total/NA	Water	3535	
LCS 320-274341/2-A	Lab Control Sample	Total/NA	Water	3535	

Analysis Batch: 274665

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-47277-1	510238-SW01	Total/NA	Water	537 (modified)	274341
320-47277-3	510238-SW02	Total/NA	Water	537 (modified)	274341
320-47277-5	510238-SW03	Total/NA	Water	537 (modified)	274341
320-47277-7	510238-SW04	Total/NA	Water	537 (modified)	274341
MB 320-274341/1-A	Method Blank	Total/NA	Water	537 (modified)	274341
LCS 320-274341/2-A	Lab Control Sample	Total/NA	Water	537 (modified)	274341

Prep Batch: 274716

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-47277-2	510238-SD01	Total/NA	Solid	SHAKE	
320-47277-4	510238-SD02	Total/NA	Solid	SHAKE	
320-47277-6	510238-SD03	Total/NA	Solid	SHAKE	
320-47277-8	510238-SD04	Total/NA	Solid	SHAKE	
MB 320-274716/1-A	Method Blank	Total/NA	Solid	SHAKE	
LCS 320-274716/2-A	Lab Control Sample	Total/NA	Solid	SHAKE	
LCSD 320-274716/3-A	Lab Control Sample Dup	Total/NA	Solid	SHAKE	
320-47277-8 MS	510238-SD04	Total/NA	Solid	SHAKE	
320-47277-8 MSD	510238-SD04	Total/NA	Solid	SHAKE	

Analysis Batch: 275207

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-47277-2	510238-SD01	Total/NA	Solid	537 (modified)	274716
320-47277-4	510238-SD02	Total/NA	Solid	537 (modified)	274716
320-47277-6	510238-SD03	Total/NA	Solid	537 (modified)	274716
320-47277-8	510238-SD04	Total/NA	Solid	537 (modified)	274716
MB 320-274716/1-A	Method Blank	Total/NA	Solid	537 (modified)	274716
LCS 320-274716/2-A	Lab Control Sample	Total/NA	Solid	537 (modified)	274716
LCSD 320-274716/3-A	Lab Control Sample Dup	Total/NA	Solid	537 (modified)	274716
320-47277-8 MS	510238-SD04	Total/NA	Solid	537 (modified)	274716
320-47277-8 MSD	510238-SD04	Total/NA	Solid	537 (modified)	274716

General Chemistry

Analysis Batch: 274450

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-47277-2	510238-SD01	Total/NA	Solid	D 2216	
320-47277-4	510238-SD02	Total/NA	Solid	D 2216	
320-47277-6	510238-SD03	Total/NA	Solid	D 2216	
320-47277-8	510238-SD04	Total/NA	Solid	D 2216	

TestAmerica Sacramento

Lab Chronicle

Client: Shannon & Wilson, Inc
 Project/Site: ██████ Pond

TestAmerica Job ID: 320-47277-1

Client Sample ID: 510238-SW01

Date Collected: 01/29/19 11:56

Date Received: 01/31/19 12:15

Lab Sample ID: 320-47277-1

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			264.6 mL	10.00 mL	274341	02/06/19 05:32	MNV	TAL SAC
Total/NA	Analysis	537 (modified)		1			274665	02/07/19 04:15	S1M	TAL SAC

Client Sample ID: 510238-SD01

Date Collected: 01/29/19 11:58

Date Received: 01/31/19 12:15

Lab Sample ID: 320-47277-2

Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1			274450	02/06/19 12:14	DPM	TAL SAC

Client Sample ID: 510238-SD01

Date Collected: 01/29/19 11:58

Date Received: 01/31/19 12:15

Lab Sample ID: 320-47277-2

Matrix: Solid
Percent Solids: 38.1

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	SHAKE			5.15 g	10.00 mL	274716	02/07/19 10:52	KJP	TAL SAC
Total/NA	Analysis	537 (modified)		1			275207	02/09/19 07:04	S1M	TAL SAC

Client Sample ID: 510238-SW02

Date Collected: 01/29/19 13:45

Date Received: 01/31/19 12:15

Lab Sample ID: 320-47277-3

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			266.8 mL	10.00 mL	274341	02/06/19 05:32	MNV	TAL SAC
Total/NA	Analysis	537 (modified)		1			274665	02/07/19 04:23	S1M	TAL SAC

Client Sample ID: 510238-SD02

Date Collected: 01/29/19 13:55

Date Received: 01/31/19 12:15

Lab Sample ID: 320-47277-4

Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1			274450	02/06/19 12:14	DPM	TAL SAC

Client Sample ID: 510238-SD02

Date Collected: 01/29/19 13:55

Date Received: 01/31/19 12:15

Lab Sample ID: 320-47277-4

Matrix: Solid
Percent Solids: 50.5

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	SHAKE			5.22 g	10.00 mL	274716	02/07/19 10:52	KJP	TAL SAC
Total/NA	Analysis	537 (modified)		1			275207	02/09/19 07:12	S1M	TAL SAC

TestAmerica Sacramento

Lab Chronicle

Client: Shannon & Wilson, Inc
 Project/Site: ██████ Pond

TestAmerica Job ID: 320-47277-1

Client Sample ID: 510238-SW03

Lab Sample ID: 320-47277-5

Date Collected: 01/29/19 13:35

Matrix: Water

Date Received: 01/31/19 12:15

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			264.1 mL	10.00 mL	274341	02/06/19 05:32	MNV	TAL SAC
Total/NA	Analysis	537 (modified)		1			274665	02/07/19 04:30	S1M	TAL SAC

Client Sample ID: 510238-SD03

Lab Sample ID: 320-47277-6

Date Collected: 01/29/19 13:45

Matrix: Solid

Date Received: 01/31/19 12:15

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1			274450	02/06/19 12:14	DPM	TAL SAC

Client Sample ID: 510238-SD03

Lab Sample ID: 320-47277-6

Date Collected: 01/29/19 13:45

Matrix: Solid

Date Received: 01/31/19 12:15

Percent Solids: 49.6

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	SHAKE			5.13 g	10.00 mL	274716	02/07/19 10:52	KJP	TAL SAC
Total/NA	Analysis	537 (modified)		1			275207	02/09/19 07:19	S1M	TAL SAC

Client Sample ID: 510238-SW04

Lab Sample ID: 320-47277-7

Date Collected: 01/29/19 15:28

Matrix: Water

Date Received: 01/31/19 12:15

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			271.2 mL	10.00 mL	274341	02/06/19 05:32	MNV	TAL SAC
Total/NA	Analysis	537 (modified)		1			274665	02/07/19 04:38	S1M	TAL SAC

Client Sample ID: 510238-SD04

Lab Sample ID: 320-47277-8

Date Collected: 01/29/19 15:40

Matrix: Solid

Date Received: 01/31/19 12:15

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1			274450	02/06/19 12:14	DPM	TAL SAC

Client Sample ID: 510238-SD04

Lab Sample ID: 320-47277-8

Date Collected: 01/29/19 15:40

Matrix: Solid

Date Received: 01/31/19 12:15

Percent Solids: 75.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	SHAKE			4.98 g	10.00 mL	274716	02/07/19 10:52	KJP	TAL SAC
Total/NA	Analysis	537 (modified)		1			275207	02/09/19 07:27	S1M	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: Shannon & Wilson, Inc
 Project/Site: ██████ Pond

TestAmerica Job ID: 320-47277-1

Laboratory: TestAmerica Sacramento

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Alaska (UST)	State Program	10	17-020	01-20-21
ANAB	DoD / DOE		L2468	01-20-21
Arizona	State Program	9	AZ0708	08-11-19
Arkansas DEQ	State Program	6	88-0691	06-17-19
California	State Program	9	2897	01-31-20
Colorado	State Program	8	CA00044	08-31-19
Connecticut	State Program	1	PH-0691	06-30-19
Florida	NELAP	4	E87570	06-30-19
Georgia	State Program	4	N/A	01-28-19 *
Illinois	NELAP	5	200060	03-17-19
Kansas	NELAP	7	E-10375	10-31-19
Louisiana	NELAP	6	30612	06-30-19
Maine	State Program	1	CA0004	04-14-20
Michigan	State Program	5	9947	01-31-20
Nevada	State Program	9	CA00044	07-31-19
New Hampshire	NELAP	1	2997	04-18-19
New Jersey	NELAP	2	CA005	06-30-19
New York	NELAP	2	11666	03-31-19
Oregon	NELAP	10	4040	01-29-20
Pennsylvania	NELAP	3	68-01272	03-31-19
Texas	NELAP	6	T104704399	05-31-19
US Fish & Wildlife	Federal		LE148388-0	07-31-19
USDA	Federal		P330-18-00239	01-17-21
USEPA UCMR	Federal	1	CA00044	12-31-20
Utah	NELAP	8	CA00044	02-28-19
Vermont	State Program	1	VT-4040	04-30-19
Virginia	NELAP	3	460278	03-14-19
Washington	State Program	10	C581	05-05-19
West Virginia (DW)	State Program	3	9930C	12-31-19
Wyoming	State Program	8	8TMS-L	01-28-19 *

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Method Summary

Client: Shannon & Wilson, Inc
Project/Site: ██████ Pond

TestAmerica Job ID: 320-47277-1

Method	Method Description	Protocol	Laboratory
537 (modified)	Fluorinated Alkyl Substances	EPA	TAL SAC
D 2216	Percent Moisture	ASTM	TAL SAC
3535	Solid-Phase Extraction (SPE)	SW846	TAL SAC
SHAKE	Shake Extraction with Ultrasonic Bath Extraction	SW846	TAL SAC

Protocol References:

ASTM = ASTM International

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

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



Sample Summary

Client: Shannon & Wilson, Inc
Project/Site: ██████ Pond

TestAmerica Job ID: 320-47277-1

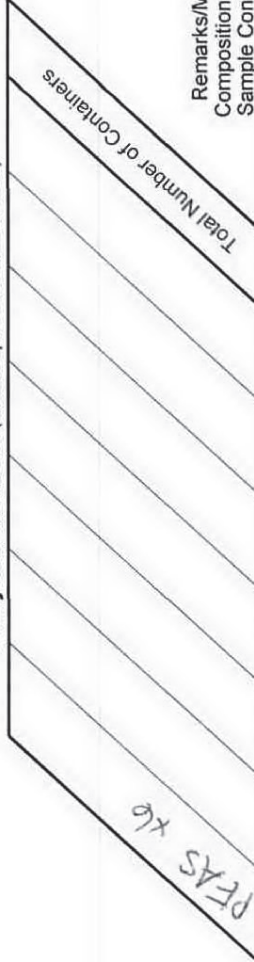
Lab Sample ID	Client Sample ID	Matrix	Collected	Received
320-47277-1	510238-SW01	Water	01/29/19 11:56	01/31/19 12:15
320-47277-2	510238-SD01	Solid	01/29/19 11:58	01/31/19 12:15
320-47277-3	510238-SW02	Water	01/29/19 13:45	01/31/19 12:15
320-47277-4	510238-SD02	Solid	01/29/19 13:55	01/31/19 12:15
320-47277-5	510238-SW03	Water	01/29/19 13:35	01/31/19 12:15
320-47277-6	510238-SD03	Solid	01/29/19 13:45	01/31/19 12:15
320-47277-7	510238-SW04	Water	01/29/19 15:28	01/31/19 12:15
320-47277-8	510238-SD04	Solid	01/29/19 15:40	01/31/19 12:15

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CHAIN-OF-CUSTODY RECORD

Laboratory TestAmerica Page 1 of 1
 Attn: D. Alltucker

Analytical Methods (include preservative if used)



Quote No: _____
 J-Flags: Yes No

Turn Around Time:
 Normal Rush
 Please Specify _____

Sample Identity	Lab No.	Time	Date Sampled	Total Number of Containers	Remarks/Matrix Composition/Grab? Sample Containers
510 238 - SW 01		1150	01/29/19	X	Surface water
510 238 - SD 01		1150	01/29/19	X	Sediment
510 238 - SW 02		1345	01/29/19	X	Surface water
510 238 - SD 02		1355	01/29/19	X	Sediment
510 238 - SW 03		1335	01/29/19	X	Surface water
510 238 - SD 03		1345	01/29/19	X	Sediment
510 238 - SW 04		1528	01/29/19	X	Surface water
510 238 - SD 04		1540	01/29/19	X	Sediment



Project Information	Sample Receipt	Relinquished By: 1.	Relinquished By: 2.	Relinquished By: 3.
Number: 102519	Total No. of Containers: _____	Signature: <u>[Signature]</u>	Signature: _____	Signature: _____
Name: <u>[Redacted]</u> Pond	COC Seals/Intact? Y/N/NA _____	Time: 14:00	Time: _____	Time: _____
Contact: <u>Marcy Nabel</u>	Received Good Cond./Cold _____	Date: 01/30/19	Date: _____	Date: _____
Ongoing Project? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/>	Temp: _____	Printed Name: <u>G. Cherissa Dukebon</u>	Printed Name: _____	Printed Name: _____
Sampler: <u>GCD, FLG</u>	Delivery Method: <u>Cold Streak</u>	Company: <u>Shannon & Wilson, Inc.</u>	Company: _____	Company: _____
Notes: <u>Please bill to 102519</u>		Received By: 1.	Received By: 2.	Received By: 3.
		Signature: <u>[Signature]</u>	Signature: _____	Signature: _____
		Time: 12:15	Time: _____	Time: _____
		Date: 31/3/19	Date: _____	Date: _____
		Printed Name: <u>J. Scrlington</u>	Printed Name: _____	Printed Name: _____
		Company: <u>ITD Sac</u>	Company: _____	Company: _____

Distribution: White - shipment - returned to Shannon & Wilson w/ laboratory report
 Yellow - shipment - for consignee files
 Pink - Shannon & Wilson - job file

7:20
 Corrected

0.3°C SR2-1.19

No. 35772



Login Sample Receipt Checklist

Client: Shannon & Wilson, Inc

Job Number: 320-47277-1

Login Number: 47277

List Source: TestAmerica Sacramento

List Number: 1

Creator: Nelson, Kym D

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	seals
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.	False	gel packs
Cooler Temperature is acceptable.	False	
Cooler Temperature is recorded.	True	Temp Blank 9.7C / Sample 7.3C
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?	True	
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 <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	



Laboratory Data Review Checklist

Completed By:

Adam Wyborny

Title:

Environmental Engineering Staff

Date:

February 13, 2019

CS Report Name:

Fairbanks International Airport (FAI) – [REDACTED] pond

Report Date:

February 12, 2019

Consultant Firm:

Shannon & Wilson, Inc.

Laboratory Name:

TestAmerica Laboratories, Inc.

Laboratory Report Number:

320-47277-1

ADEC File Number:

100.38.277

Hazard Identification Number:

26816

1. Laboratory

- a. Did an ADEC CS approved laboratory receive and
- perform
- all of the submitted sample analyses?

 Yes No

Comments:

The ADEC certified the TestAmerica Laboratories West Sacramento, CA location for the analysis of perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) on February 6, 2018. These compounds were included in the ADEC's Contaminated Sites Laboratory Approval 17-020.

- b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CS approved?

 Yes No

Comments:

Analyses were performed by TestAmerica Laboratories, Inc. in West Sacramento, CA.

2. Chain of Custody (CoC)

- a. CoC information completed, signed, and dated (including released/received by)?

 Yes No

Comments:

- b. Correct Analyses requested?

 Yes No

Comments:

3. Laboratory Sample Receipt Documentation

- a. Sample/cooler temperature documented and within range at receipt (0° to 6° C)?

 Yes No

Comments:

The temperature blank was measured outside the acceptable temperature range of 0 °C to 6 °C upon receipt at the laboratory (9.7 °C).

- b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

 Yes No

Comments:

Analysis of PFAS compounds does not require chemical preservation.

- c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?

 Yes No

Comments:

The sample receipt form notes that the samples were received in good condition.

- d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?

Yes No

Comments:

There were no discrepancies documented by the laboratory beyond the temperature exceedance.

- e. Data quality or usability affected?

Comments:

Due to the high chemical and biological stability of PFAS compounds, it is unlikely the integrity of the project samples was adversely affected by the high cooler temperature. In an e-mail dated August 3, 2015, the ADEC project manager noted that he had spoken with their chemist, who "agrees the high temperature probably would not affect the PFC results." PFAS are also known as PFCs.

4. Case Narrative

- a. Present and understandable?

Yes No

Comments:

- b. Discrepancies, errors, or QC failures identified by the lab?

Yes No

Comments:

The samples arrived in good condition, properly preserved, and that the temperature of the sample cooler upon receipt at the laboratory was 6.3° C.

The case narrative notes that the final extraction volume of the samples *510238-SD01*, *510238-SD02*, and *510238-SD03* was observed to be yellow in color.

The case narrative notes that the final extraction volume of the sample *510238-SD04* and the matrix spike (MS) and MS duplicate (MSD) samples *320-47277-A-8 MS* and *320-47277-A-8 MSD* were observed to be light yellow in color.

- c. Were all corrective actions documented?

Yes No

Comments:

No corrective actions were documented in the case narrative.

- d. What is the effect on data quality/usability according to the case narrative?

Comments:

The case narrative does not note an effect on data quality.

5. Samples Results

a. Correct analyses performed/reported as requested on COC?

 Yes No

Comments:

b. All applicable holding times met?

 Yes No

Comments:

The laboratory indicates that the water samples were analyzed using direct injection and in-line analysis. The 28-day hold time for analysis using direct aqueous injection (DAI) was met for all samples.

c. All soils reported on a dry weight basis?

 Yes No

Comments:

d. Are the reported LOQs less than the Cleanup Level or the minimum required detection level for the project?

 Yes No

Comments:

The LOQ, equivalent to the TestAmerica Reporting Limit (RL), is less than the applicable ADEC regulatory limits for drinking water and soil.

e. Data quality or usability affected?

 Yes No

Comments:

The data quality and/or usability are not affected.

6. QC Samples

a. Method Blank

i. One method blank reported per matrix, analysis and 20 samples?

 Yes No

Comments:

ii. All method blank results less than limit of quantitation (LOQ)?

 Yes No

Comments:

Perfluorohexanesulfonic acid (PFHxS) was detected at an estimated concentration in the method blank sample associated with preparation batch 274341.

iii. If above LOQ, what samples are affected?

Comments:

None; PFHxS was detected in all surface water samples associated with preparation batch 274341 at concentrations greater than ten times that of the concentration detected in the method blank sample.

iv. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

Yes No

Comments:

Qualification of the results was not required; see above.

v. Data quality or usability affected?

Comments:

The data quality and/or usability are not affected.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

Yes No

Comments:

An LCS sample was reported for PFAS analyses in water. No measure of analytical precision was provided for this matrix.

LCS/LCSD and MS/MSD samples were reported for PFAS analyses in soil.

ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?

Yes No

Comments:

N/A; metals and/or inorganics were not analyzed as part of this work order.

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

Yes No

Comments:

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

Yes No

Comments:

- v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

None; analytical accuracy and precision were demonstrated to be within acceptable limits.

- vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

Yes No

Comments:

Qualification of the data was not required; see above.

- vii. Data quality or usability affected? (Use comment box to explain.)

Comments:

The data quality and usability were not affected.

c. Surrogates – Organics Only

- i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?

Yes No

Comments:

The analytical method WS-LC-0025 uses IDA recovery, which entails adding a ¹³C-isotope of each target analyte, and assessing the recovery of each analyte. The isotopically-labeled compounds are discussed as surrogates for this method.

- ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)

Yes No

Comments:

- iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

Yes No

Comments:

N/A; there were no IDA recovery failures associated with this work order.

- iv. Data quality or usability affected?

Comments:

The data quality and usability are not affected; see above.

d. Trip blank – Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): Water and Soil

- i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples?

(If not, enter explanation below.)

Yes No

Comments:

PFAS are not volatile compounds; therefore, a trip blank is not required.

- ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

Yes No

Comments:

N/A; a trip blank is not required.

- iii. All results less than LOQ?

Yes No

Comments:

N/A; a trip blank is not required.

- iv. If above LOQ, what samples are affected?

Comments:

None; a trip blank was not submitted with this work order.

- v. Data quality or usability affected?

Comments:

The data quality and usability were not affected; see above.

e. Field Duplicate

- i. One field duplicate submitted per matrix, analysis and 10 project samples?

Yes No

Comments:

- ii. Submitted blind to lab?

Yes No

Comments:

The field-duplicate pairs 510238-SW02 / 510238-SW03 and 510238-SD02 / 510238-SD03 were submitted with this work order.

- iii. Precision – All relative percent differences (RPD) less than specified DQOs?
(Recommended: 30% water, 50% soil)

$$\text{RPD (\%)} = \text{Absolute value of: } \frac{(R_1 - R_2)}{((R_1 + R_2)/2)} \times 100$$

Where R_1 = Sample Concentration
 R_2 = Field Duplicate Concentration

Yes No

Comments:

The relative precision demonstrated between the PFAS results of the surface water field-duplicate samples 510238-SW02 and 510238-SW03 was within the recommended DQO of 30% for all compounds except perfluorononanoic acid (PFNA).

The relative precision demonstrated between the PFAS results of the sediment field-duplicate samples 510238-SD02 and 510238-SD03 was within the recommended DQO of 50% for all compounds.

- iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

Comments:

The PFNA results of the field-duplicate samples 510238-SW02 and 510238-SW03 are considered estimated due to the precision failure. These results are flagged 'J' to identify the imprecision.

- f. Decontamination or Equipment Blank (If not applicable, a comment stating why must be entered below).

Yes No Not Applicable

Samples for this project are not collected with reusable equipment, therefore a practical potential for equipment based cross-contamination does not exist.

- i. All results less than LOQ?

Yes No

Comments:

N/A; an equipment blank was not submitted with this work order.

- ii. If above LOQ, what samples are affected?

Comments:

None; see above.

- iii. Data quality or usability affected?

Comments:

The data quality and usability were not affected; see above.

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)

a. Defined and appropriate?

Yes No

Comments:

There were no additional flags/qualifiers required for this work order.

Date: March 2019

To: Fairbanks International AirportRe: XXXXXXXXXX Pond Sampling
Data Report

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL/ENVIRONMENTAL REPORT

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include: the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used: (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors which were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports, and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the
ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland