GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

ALASKA CALIFORNIA COLORADO FLORIDA MISSOURI OREGON WASHINGTON WISCONSIN

December 30, 2015

City of Fairbanks Engineering Division 800 Cushman Street Fairbanks, Alaska 99701

Attn: Mr. Jackson Fox

#### RE: RESULTS OF OFF-SITE WELL SAMPLING, CITY OF FAIRBANKS REGIONAL FIRE TRAINING CENTER BURN PIT, FAIRBANKS, ALASKA

Shannon & Wilson, Inc. prepared this report to document our well-sampling activities at the Regional Fire Training Center (RFTC) at 1710 30<sup>th</sup> Avenue in Fairbanks, Alaska. The objective of this sampling was to determine whether select off-site wells have been affected by groundwater contamination associated with the burn pit at the RFTC.

### BACKGROUND

The burn pit, or "combustible liquids pit," was constructed in 1984 and used for approximately 20 years in firefighting exercises. These exercises consisted of filling the pit with water, adding fuel such as gasoline or diesel to float on the water, and igniting and extinguishing fires. The burn pit has not been used since about 2005 and the City is taking steps to decommission it. Firefighting agents used during training in the City of Fairbanks burn pit include water, proteinbased foam, and aqueous film-forming foam (AFFF). Perfluorinated compounds (PFCs) are chemicals potentially associated with AFFF. Perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) are PFCs commonly found at sites where AFFFs were used. Due to their persistence, toxicity, and bioaccumulative potential, these compounds are of increasing concern to environmental and health agencies.

In our 2015 Phase 2 site investigation, we sampled five soil borings and five temporary well points around the burn pit. Concentrations of diesel range organics and residual range organics in the groundwater samples exceeded Alaska Department of Environmental Conservation (ADEC) groundwater-cleanup levels. In addition, concentrations of PFOS and PFOA exceeded U.S. Environmental Protection Agency (EPA) Provisional Health Advisories for drinking water and ADEC-proposed groundwater-cleanup levels. In our September 1, 2015, meeting with ADEC representatives, they requested that off-site wells be sampled to determine if PFC contamination is present.

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### **OBJECTIVE AND SCOPE OF SERVICES**

The objective of our services was to determine if PFCs found at the subject site are present in certain publicly owned off-site wells, as authorized by our Professional Services Contract, Amendment Number 2 (Agreement). Our services were limited to sampling a groundwater monitoring well on Davis Road and an irrigation well in the Fairbanks North Star Borough (FNSB) South Davis Park, and preparing a brief report.

## FIELD ACTIVITIES AND OBSERVATIONS

We performed a preliminary well search for monitoring wells Shannon & Wilson installed for an unrelated project in the area northwest of the RFTC site in addition to wells listed on the Alaska Department of Natural Resources Well Log Tracking System (WELTS). Based on this search, we found several wells in the site vicinity; two wells were selected for sampling. We collected water samples from an existing Alaska Department of Transportation and Public Facilities (ADOT&PF) monitoring well on Davis Road and an FNSB irrigation well northwest of the burn pit (Figure 1).

On November 3, 2015, Tiffany Green, a geologist from the Shannon & Wilson Fairbanks office, purged and sampled monitoring well MW-507, a 2-inch-diameter well with a depth of 40 feet below the ground surface (bgs). She treated purge water using our granulated activated carbon (GAC) filter, and discharged the treated water to the ground surface at the monitoring well. She collected a groundwater sample and a field-duplicate sample for laboratory analysis of PFCs.

On November 6, Scott Hummel, scientist with the Shannon & Wilson Fairbanks office, sampled the eastern irrigation well at the Interior Girls Softball Association (IGSA) softball fields (Figure 1). He purged the well using the existing well pump, treated purge water using the GAC filter, and discharged the treated water to the ground surface. The irrigation well is 117 feet deep. He collected a groundwater sample for PFC analysis.

We submitted the samples to TestAmerica, Inc., for analysis of PFCs by WS-LC-0025.

## ANALYTICAL RESULTS

Analytical results for the groundwater samples are summarized in the attached Table 1. PFOS was detected in the sample and its field duplicate sample from the monitoring well at concentrations of 59 nanograms per liter (ng/L) and 63 ng/L, respectively. PFOA was detected in

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both the sample and duplicate at 21 ng/L. Other PFC analytes were detected at concentrations ranging from an estimated 0.54 ng/L to 61 ng/L (Table 1).

PFOS was detected in the sample from the irrigation well at a concentration of 35 ng/L. PFOA was detected in the sample at 5.8 ng/L. Other PFC analytes were detected at concentrations ranging from an estimated 0.41 ng/L to 47 ng/L (Table 1).

## 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 also conducted our own QA assessment for this project. We reviewed the chain-of-custody record and laboratory-receipt form to check that 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.

We reviewed analytical sample results (TestAmerica Work Orders 320-15805 and 320-15867) for this project. The laboratory reports, including the case narratives describing the laboratory QA results in detail, are included with the completed ADEC data-review checklists as an attachment. Details regarding the results of our QA review are presented in the attached *Quality Assurance/Quality Control Summary*.

By working in accordance with our proposed scope of services, we consider the samples we collected for this project to be representative of site conditions at the locations and times they were obtained. Based on our QA review, no samples were rejected as unusable due to QC failures, and our completeness goal of obtaining 85-percent useable data was met. In general, the quality of the analytical data for this project does not appear to have been compromised by analytical irregularities and is adequate for the purposes of our assessment.

### CONCLUSIONS AND RECOMMENDATIONS

PFOS and PFOA were detected in water samples from monitoring well MW-507 and the irrigation well at the IGSA softball fields, but their reported concentrations did not exceed their EPA preliminary health advisory levels or ADEC proposed groundwater-cleanup levels. The profiles of individual PFC compounds detected and ratios of individual concentration

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magnitudes in the off-site groundwater samples are similar to those in the on-site groundwater samples. Therefore, it is our opinion the two data sets are reasonably inferred to be associated with a common source.

We recommend a search for wells within a half mile of the subject site and sampling of wells in the search area be performed to determine if off-site exposure to PFC concentrations exceeding health-based screening levels may be occurring.

## LIMITATIONS

The observations and conclusions described in this report are based solely on the scope of service described in and implemented pursuant to the Amendment 2 to the Professional Services Contract dated October 27, 2015, between the City of Fairbanks and Shannon & Wilson, Inc. Shannon & Wilson is not liable for failing to discover any condition whose discovery required the performance of services not authorized by the Agreement.

This report was prepared for the exclusive use of our Client and their representatives to document environmental conditions at a selected monitoring well and irrigation well described in this report. Interpretations and recommendations made by Shannon & Wilson are based solely upon information available to Shannon & Wilson at the time the interpretations and recommendations are made.

Within the limitations of scope, schedule, and budget, Shannon & Wilson has prepared this report in a professional manner, using that level of skill and care normally exercised for similar projects under similar conditions by reputable and competent environmental consultants currently practicing in this area.

This report presents results of groundwater samples from a monitoring well and irrigation well northwest of the City of Fairbanks Regional Fire Training Center. The data presented in this report are based on the sampling and analysis we performed; they should not be construed as a guarantee of the groundwater quality at the site. Our sampling was intended to confirm the presence or absence of selected contaminants at the sampled locations. It is possible our subsurface tests do not represent the highest levels of contamination. In addition, conclusions cannot be drawn on the presence or absence of contaminants for which laboratory analyses were not performed. As a result, the sampling and analysis performed can only provide you with our

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judgment as to the environmental characteristics of the site, and in no way guarantees others will reach the same conclusions.

The observed levels of contamination may be dependent upon changes due to natural forces or human activity. In addition, changes in government codes, regulations, or laws may occur. Due to such changes, or other factors beyond our control, our observations and recommendations applicable to this site may need to be revised. If substantial time has elapsed between submission of this report and the start of activities or action based upon it, we recommend this report be reviewed to determine the applicability of the conclusions. We have prepared and included as an attachment, "*Important Information about Your Geotechnical/Environmental Report*," to assist you and others in understanding the use and limitations of our reports.

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Shannon & Wilson appreciates this opportunity to be of service. If you have any questions concerning this report, please contact me (907) 479-0600.

Sincerely,

#### SHANNON & WILSON, INC.

Julie Keener, P.E. Senior Engineer

Reviewed by Christopher Darrah, C.P.G., CPESC Senior Associate

- Enc: Figure 1 Off-Site Well PFOS and PFOA Concentrations Table 1 – Summary of Well-Water Sample Analytical Results Copy of Field Notes Analytical Laboratory Reports and ADEC Data Review Checklists Quality Assurance/Quality Control Summary Important Information about your Geotechnical/Environmental Report
- c: Robert Burgess, ADEC Janice Wiegers, ADEC



TABLE 1 SUMMARY OF WELL-WATER SAMPLE ANALYTICAL RESULTS

	ADEC				Sample Number (Location	)
	Proposed	EPA		MW-507-45	MW-607-45	Pump #1, Field #3
Analyte	GCL	PHA Level	Units	(MW-507)	(MW-507)	(IGSA irrigation well)
Perfluorobutanoic acid (PFBA)			ng/L	19	17	7.1
Perfluoropentanoic acid (PFPeA)	_	_	ng/L	44	41	13
Perfluorohexanoic acid (PFHxA)	—	—	ng/L	40 B	41 B	23 B
Perfluoroheptanoic acid (PFHpA)	_	—	ng/L	20	20	5.0
Perfluorooctanoic acid (PFOA)	600	400	ng/L	21	21	5.8
Perfluorononanoic acid (PFNA)	—	—	ng/L	34	33	1.0 J
Perfluorodecanoic acid (PFDA)	_	—	ng/L	0.54 J	<1.9	0.41 J
Perfluoroundecanoic acid (PFUnA)	—	—	ng/L	<1.8 B*	<1.9 B*	<1.8 B*
Perfluorododecanoic acid (PFDoA)	—	—	ng/L	0.64 J	<1.9	<1.8
Perfluorotridecanoic Acid (PFTriA)	—	—	ng/L	<1.8	<1.9	<1.8
Perfluorotetradecanoic acid (PFTeA)	_	—	ng/L	<1.8 B*	<1.9 B*	<1.8 B*
Perfluoro-n-hexadecanoic acid (PFHxDA)	_	_	ng/L	<1.8	<1.9	<1.8
Perfluoro-n-octandecanoic acid (PFODA)	—	—	ng/L	<1.8	<1.9	0.78 J
Perfluorobutane Sulfonate (PFBS)	_	—	ng/L	3.3	3.6	12
Perfluorohexane Sulfonate (PFHxS)	_	_	ng/L	58 B	61 B	47 B
Perfluoro-1-heptanesulfonate (PFHpS)	—	—	ng/L	8.4	7.3	1.4 J
Perfluorodecane sulfonate (PFDS)	—	—	ng/L	<1.8	<1.9	<1.8
Perfluorooctane Sulfonate (PFOS)	400	200	ng/L	59	63	35
Perfluorooctane Sulfonamide (FOSA)	—	—	ng/L	1.0 J	<1.9	1.1 J

Notes: Sample *MW*-607-45 is a field duplicate of sample *MW*-507-45.

ng/L nanograms per liter

GCL Groundwater-cleanup level

PHA Preliminary Health Advisory

— ADEC proposed groundwater-cleanup level or EPA PHA Level not established.

< Analyte concentration not reported above given reporting limit (RL).

J Estimated concentration, between method detection limit and RL; flag applied by laboratory.

B Compound was found in the blank and sample; flag applied by laboratory.

B\* Analyte considered not detected at the RL due to a method-blank detection; flag applied by Shannon & Wilson.

## 

Date 11/2/15 Sheet 1 of 1 Project No. 31-1-11735
Field activity subject: OFF-site well Sampling
Description of daily activities and events:
1000 Pack gear & calibrate YSI
1100 Arrive at South Davis soccer fields
-Locks on well houses were frozen, thawed with
- Found both wells to be frozen. SWI acquired
permission to turn on heat trace \$ return
· tomorrow (1113/15).
1230 Arrive at MW-507-45
- Lock frozen, slight rust; MW-506 monument
1245 Return to SWI for tarch. needs repair
1300 Thawed lock at MW-507-45 Junpacked gea
& found pund inoperable. Decon & packed
gear. Weather conditions deterior aling.
1430 Return to office, dry gear, and test pump. - Repack for tomorrow (11/3) \$ load new pum
1530 Wrap up project for the days
Visitors on site: None
Changes from plans/specifications and other special orders and important decisions:
Weather conditions: ~10-20F, blowing snow, low visibility.
Important telephone calls: TTT for trouble-shooting type while
Personnel on site:
Signature: Mary Dan Date: 11 2 15

## FIELD ACTIVITIES DAILY LOG

	Date 11 3 2015 Sheet 1 of 1
	Project No. 31-1-11735
Project Name	: City of Fairbanks Burn Pit
Field activity	subject: Off-site well sampling
Description of	f daily activities and events:
0000	Calibrate VCL & mark representation apport
0930/	Caribrane 1st & pack remaining year
0 1000	Arrive at South Davis soccer fields
	- Thanked locks \$ took Depth-to-water
	measurement on well house #2.
	- Turned on dedicated pump; no water pressure
1.00-0	continue to trouble shoct.
	- Set up to deploy sus, pump. Pump stuck
	"I Foot into well. Climbed into well house to
	which is blocking pump; dedicated well pump
	- Check well house the comp iscus Masonials
	currently possible at this site.
	our reining persience and rais and
01100	Arrive at MW-507-45, unpack, & set up gear.
. 1150	Sample taken, duplicate taken.
	- remove & decon pump
(1) A	
<u>• 1200</u>	Load gear & head back to SWI office
• 1930	Unpack, prep samples for 1114 shipping,
	the set of
0/330	Wrap up project for the day.
	, ,
Visitors on site	: None
Changes from	plans/specifications and other special orders and important decisions:
2	
Weather cond	itions: <u>Cloudy</u> , ~DOF
Important tele	phone calls:
Personnel on s	site://
Signature:	1 d/an Date: 11/2/15

## MONITORING WELL SAMPLING LOG

Owner/Client City of Fa	when	15			Project N	1725-000
Location MW-507-1	15			7	Dat	e 11215
Sampling Personnel				_	We	MAUN-507-45
Weather Conditions	DETROP	ir Temp. (°F	) JOF	- 1	Time starte Fime complete	d 1000 b
Sample No. <u>Mw-so</u> Duplicate <u>Mw-oo</u> Equipment Blank <u>FB-507</u>	TXB	Time Time Time		_		
Purging Method <u>Whale F</u> Co Pumping Start <u>1132</u> Purge Rate (gal./min.) <u>wi</u> Pumping End <u>1154</u> Pump Set Depth Below MP (ft.) <u>~ 32</u> Tubing (ft.) <u>~ 45</u>	<u>in</u> trailer	- B Approxir Meas	D nate Total I ured Total I De Depth to I	iameter and Depth of Wel Depth of Wel epth to Water Ice (if frozen) Feet o	Type of Casin I Below MP (ft. I Below MP (ft. Below MP (ft. Below MP (ft. f Water in We Gallons per foo Gallons in We	$\frac{93'' PVC}{45}$
				Purge Wate	r Volume (gal.	20
Monument Condition		Purge Wa	ter Disposa	GAL	to drain	age ditch
Casing Condition						
Measuring Point (MP) <u>Top of Casing (TOC)</u> Top-of-casing to monument (ft Monument to ground surface (ft	.) <u>ರ್</u> ಶು )&.୧	Monument	type:	Stickup	Flushmount	
Lock present and operational Well name legible on outside of Evidence of frost-jacking	well Jacked	to sou	uth - a	gainst	metal c	casing
Notes "Filled GAC w/ pur start purge 3 GA	rai wat C disa	er star sharge	ting ( at 113	) 1120. 32	Let sit	for w Smin,
	WELL C	ASING VOL	JMES			
Diameter of Well [ID-inches]	11/4	2	3	4	6	8
Gallons per lineal foot	0.08	0.17	0.38	0.66	1.5	2.6

Well No.

## MONITORING WELL SAMPLING LOG

Fie	ld Parameter	Instrument YS/	pro plus 💪 Circle;	Parameters	stabilized or >	3 well volumes
	Sample Ob	oservations No	ne			
		Notes Tu	ibid at pun	p sta	-t- wh	on Filling GAC
		EIEL D	DADAMETERS Intohili	ter re	main) C	Aec.r -
		FIELD	PARAINE LERS [Stabil.	zation chien		
		Dissolved			000 (	
-	Temp. (°C)	Oxygen (mg/L)	Conductivity (µS/cm)	pH	URP (mV)	Turbidity / Obs
Time	[± 0.2°C]	[± 0.10]	[± 3%]	[± 0,1]		Turbially 7 Obs.
1150	purge	start -	201 2	4 06		02.00-
1155	0.7	2:50	551.2	Con all	-64.0	CIECO
1136	0.1	1.67	301.0	6.99	-74,3	year
1144	Gert	1.56	350.8	7.00	- 10.9	CLEAR
1144	0.1	1.39	500.4	1.01	-00.4	clear
1147	0.1	1.51	344.0	1.02	5.60-	clear
1150	0 7	1+59	549.4	1,03	1 + 10-	clear
11:27	samp	le				
1144	DUP					
_						
	-					
	1					
						4

## Laboratory Test America

Analysis	Sample Containers	Preservatives
PFCs WS-LC-0025	250-mL plastic bottle	none

Well No.

## FIELD ACTIVITIES DAILY LOG

Date 11-6-15
Project No. 172 C - COL 2
Project Name: CoF Buch Pit Sempling
Field activity subject: Off-site coffbull fields
Description of daily activities and events:
0910 - asked to sample project for JAK
been familiarized w/ project proposal requirements test opers.
"Site HSP - signed
· Sample Method - analytes - PFCs to Test America.
· Call for Deep Sample pump @ TTT: ProActive Pro (pickup @ 12)
Understand to be meeting client or representative Joe Ribar
@ softball fields for mw / imigation well access.
* may be possible to use existing well pump / distribution for
sample purge/collection.
1210 off project
13:0 pickup pump, equipment, pack truck, calibrate YSI Proplas D
1410 call Doe Ribar w/ IGSA to confirm 1430 - pushed meet
time to 13945 for road safety.
1445 meet w/ ma Riber - heat - trace tape works on
Pump #1, field #3 location. water flows, needed
to remove x1 value to thaw.
Called Pitting into AK Rubbers Proving - APW Dicking of a t
a little losten oute to cofficial freido - wrong female adapter.
1555 Called to find correct adaptors - APW to pick-up, and
counter back, 11/4" OD / 7/8" ID.
1620 begin connections. flow - fill GAC down and prime GAC, whit 5 mins.
purce hose having issue flowing - translesheet w/ new kuri-tec
1700 begin recording parameters for sample collection owned only some
1740 clean up site - approx 35 gallens treated & telas a site
1805 return to office
1830 off project
Visitors on site:
Changes from plans/specifications and other special orders and important decisions:
hose connection from imigation spigot larger than stal garden hose.
needed to trouble short
Weather conditions:
Important telephone calls: <u>called in support for supplies / connections</u> .
Personnel on site: SwH APW/ALF for support
Signature: Date: 11-9-15

## MONITORING WELL SAMPLING LOG

Owner/Client Location Sampling Personnel Weather Conditions	City of F FOSA South SWIT Snowing	airbanh Davis Ai	Soffb Soffb	M frela ) 305	ls -	Project No. Date Well Time started Time completed	1735-00 11-6-15 Pump #1, Field #3 1650 1450 1800
Sample No. Duplicate Equipment Blank	Pump #1, F	Fireld #3	Time Time Time	1732	-		
Purging Method Pumping Start Purge Rate (gal./min.) Pumping End Pump Set Depth Be	imguton pump 1701 Variable V731 ow MP (ft.) unk Tubing (ft.) 135	- Ekwi-h	Approxin Measu	Di nate Total D ured Total D Dej Depth to k	ameter and lepth of Wel pth to Wate ce (if frozen Feet c ( Purge Wate	Type of Casing II Below MP (ft.) II Below MP (ft.) I Below MP (ft.) Below MP (ft.) Of Water in Well Gallons per foot Gallons in Well or Volume (gal.)	N/A N/A N/A Unk Unk Unk Wnk ~ 30
Monument Condition	good		Purge Wat	er Disposal	GACO	Drum - pi	inze to field
Casing Condition	good - not	obser	eel.				
Measuring Point (MP) Top-of-ca Monument	<u>Top of Casing (TOC)</u> sing to monument (ft. to ground surface (ft.)	- ),	Monument	type:	Stickup	Flushmount	
<ul> <li>□ Lock prese</li> <li>□ Well name</li> <li>□ Evidence o</li> </ul>	nt and operational legible on outside of v frost-jacking	NIA vell NIA NIA	×				
Notes							
	NIA	WELL CA	ASING VOL	UMES			
Diameter of Well [ID-inches]		11⁄4	2	3	4	6	8
Gallons per lineal foot		0.08	0.17	0.38	0.66	1.5	26
Notes  Diameter of Well [ID-inches] Gallons per lineal foot	NIA	WELL CA 11/4 0.08	ASING VOL	UMES 3 0.38	4 0.66	6	8

ч.

## MONITORING WELL SAMPLING LOG

Field Parameter Instrument YSI pro plus Circle: Parameters stabilized or >3 well volumes Sample Observations

Notes

17

FIELD PARAMETERS [stabilization criteria]

Time	Temp. (°C) [± 0.2°C]	Dissolved Oxygen (mg/L) [± 0.10]	Conductivity (µS/cm) [± 3%]	рН [± 0.1]	ORP (mV) [± 10mV]	Turbidity / Obs.
1701 1711 1714 1714 1710 1710 1720 1729	4.7 21 3.1 4.0 4.2 4.3 4.3 4.3	(105 CAC Dru 0,45 0,39 0,32 0,31 0,30 4 time	4 306.0 m ms filling 4 270,6 298,4 301.3 299,5 200,2	7.20	-189.6 -173.7 -173.7 -173.0 -176.2 -172.9 -169.8	clear pump, /res clear ii ii ii clear.

Analysis	Sample Containers	Preservatives
PFCs WS-LC-0025	250-mL plastic bottle	none

Pump #1, Field #3 Well No.



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: 320-15805-1

TestAmerica Sample Delivery Group: 31-1-11735-003 Client Project/Site: Burn Pit, Alaska

## For:

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

Attn: Julie Keener



Authorized for release by: 11/16/2015 12:27:07 PM David Alltucker, Project Manager I (916)374-4383 david.alltucker@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.

..... Links **Review your project** results through **Total**Access Have a Question? Ask-The Expert Visit us at: www.testamericainc.com

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3

### Qualifiers

## LCMS

LCIVIS		
Qualifier	Qualifier Description	
*	Isotope Dilution analyte is outside acceptance limits.	 5
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.	J
В	Compound was found in the blank and sample.	

## Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.	
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis	 8
%R	Percent Recovery	
CFL	Contains Free Liquid	9
CNF	Contains no Free Liquid	
DER	Duplicate error ratio (normalized absolute difference)	
Dil Fac	Dilution Factor	
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample	
DLC	Decision level concentration	
MDA	Minimum detectable activity	
EDL	Estimated Detection Limit	
MDC	Minimum detectable concentration	12
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	
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)	

#### Job ID: 320-15805-1

#### Laboratory: TestAmerica Sacramento

Narrative

Job Narrative 320-15805-1

#### Receipt

The samples were received on 11/5/2015 10:00 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 3.3° C.

#### LCMS

Method(s) WS-LC-0025: The Isotope Dilution Analyte (IDA) recovery associated with the following samples is below the method recommended limit: MW-507-45 (320-15805-1). Generally, data quality is not considered affected if the IDA signal-to-noise ratio is greater than 10:1, which is achieved for all IDA in the samples.

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 320-91901.

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

#### Client Sample ID: MW-507-45

## Lab Sample ID: 320-15805-1

Lab Sample ID: 320-15805-2

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Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac D	Method	Prep Type
Perfluorobutanoic acid (PFBA)	19		1.8	0.42	ng/L	1	WS-LC-0025	Total/NA
Perfluoropentanoic acid (PFPeA)	44		1.8	0.91	ng/L	1	WS-LC-0025	Total/NA
Perfluorohexanoic acid (PFHxA)	40	В	1.8	0.72	ng/L	1	WS-LC-0025	Total/NA
Perfluoroheptanoic acid (PFHpA)	20		1.8	0.74	ng/L	1	WS-LC-0025	Total/NA
Perfluorooctanoic acid (PFOA)	21		1.8	0.69	ng/L	1	WS-LC-0025	Total/NA
Perfluorononanoic acid (PFNA)	34		1.8	0.60	ng/L	1	WS-LC-0025	Total/NA
Perfluorodecanoic acid (PFDA)	0.54	J	1.8	0.40	ng/L	1	WS-LC-0025	Total/NA
Perfluorododecanoic acid (PFDoA)	0.64	J	1.8	0.54	ng/L	1	WS-LC-0025	Total/NA
Perfluorotetradecanoic acid (PFTeA)	0.39	JB	1.8	0.18	ng/L	1	WS-LC-0025	Total/NA
Perfluorobutane Sulfonate (PFBS)	3.3		1.8	0.84	ng/L	1	WS-LC-0025	Total/NA
Perfluorohexane Sulfonate (PFHxS)	58	В	1.8	0.80	ng/L	1	WS-LC-0025	Total/NA
Perfluoro-1-heptanesulfonate (PFHpS)	8.4		1.8	0.66	ng/L	1	WS-LC-0025	Total/NA
Perfluorooctane Sulfonate (PFOS)	59		1.8	1.2	ng/L	1	WS-LC-0025	Total/NA
Perfluorooctane Sulfonamide (FOSA)	1.0	J	1.8	0.59	ng/L	1	WS-LC-0025	Total/NA

#### Client Sample ID: MW-607-45

#### Analyte Dil Fac D Method **Result Qualifier** RL MDL Unit Prep Type Perfluorobutanoic acid (PFBA) 17 1.9 0.43 ng/L 1 WS-LC-0025 Total/NA Perfluoropentanoic acid (PFPeA) 41 1.9 0.92 ng/L 1 WS-LC-0025 Total/NA Total/NA Perfluorohexanoic acid (PFHxA) 41 B 1.9 0.73 ng/L WS-LC-0025 1 Perfluoroheptanoic acid (PFHpA) 20 1.9 0.75 ng/L 1 WS-LC-0025 Total/NA Perfluorooctanoic acid (PFOA) 21 1.9 0.70 ng/L 1 WS-LC-0025 Total/NA Total/NA Perfluorononanoic acid (PFNA) 33 0.61 ng/L WS-LC-0025 1.9 1 Perfluoroundecanoic acid (PFUnA) 1 Total/NA 1.1 JB 1.9 0.70 ng/L WS-LC-0025 Perfluorotetradecanoic acid (PFTeA) Total/NA 0.40 JВ 1.9 0.19 ng/L 1 WS-LC-0025 0.86 ng/L WS-LC-0025 Perfluorobutane Sulfonate (PFBS) 3.6 1.9 1 Total/NA Perfluorohexane Sulfonate (PFHxS) 61 B 0.81 ng/L 1 WS-LC-0025 Total/NA 1.9 Perfluoro-1-heptanesulfonate 7.3 1.9 0.67 ng/L 1 WS-LC-0025 Total/NA (PFHpS) Perfluorooctane Sulfonate (PFOS) 63 1.2 ng/L WS-LC-0025 Total/NA 1.9 1

This Detection Summary does not include radiochemical test results.

## **Client Sample Results**

RL

1.8

1.8

MDL Unit

0.42 ng/L

0.91 ng/L

D

Prepared

Client: Shannon & Wilson Project/Site: Burn Pit, Alaska

#### Client Sample ID: MW-507-45 Date Collected: 11/03/15 11:52

Method: WS-LC-0025 - Perfluorinated Hydrocarbons

Result Qualifier

19

44

120

86

74

Date Received: 11/05/15 10:00

Perfluorobutanoic acid (PFBA)

Perfluoropentanoic acid (PFPeA)

Analyte

13C4 PFOS

13C4-PFHpA

13C5 PFPeA

#### Lab Sample ID: 320-15805-1 Matrix: Water

11/10/15 13:30 11/12/15 16:18

11/10/15 13:30 11/12/15 16:18

Analyzed

Dil Fac 1 6 1

Perfluorohexanoic acid (PFHxA)	40	В	1.8	0.72	ng/L	11/10/15 13:30	11/12/15 16:18	1
Perfluoroheptanoic acid (PFHpA)	20		1.8	0.74	ng/L	11/10/15 13:30	11/12/15 16:18	1
Perfluorooctanoic acid (PFOA)	21		1.8	0.69	ng/L	11/10/15 13:30	11/12/15 16:18	1
Perfluorononanoic acid (PFNA)	34		1.8	0.60	ng/L	11/10/15 13:30	11/12/15 16:18	1
Perfluorodecanoic acid (PFDA)	0.54	J	1.8	0.40	ng/L	11/10/15 13:30	11/12/15 16:18	1
Perfluoroundecanoic acid (PFUnA)	ND		1.8	0.69	ng/L	11/10/15 13:30	11/12/15 16:18	1
Perfluorododecanoic acid (PFDoA)	0.64	J	1.8	0.54	ng/L	11/10/15 13:30	11/12/15 16:18	1
Perfluorotridecanoic Acid (PFTriA)	ND		1.8	0.51	ng/L	11/10/15 13:30	11/12/15 16:18	1
Perfluorotetradecanoic acid (PFTeA)	0.39	JB	1.8	0.18	ng/L	11/10/15 13:30	11/12/15 16:18	1
Perfluoro-n-hexadecanoic acid (PFHxDA)	ND		1.8	0.11	ng/L	11/10/15 13:30	11/12/15 16:18	1
Perfluoro-n-octandecanoic acid (PFODA)	ND		1.8	0.62	ng/L	11/10/15 13:30	11/12/15 16:18	1
Perfluorobutane Sulfonate (PFBS)	3.3		1.8	0.84	ng/L	11/10/15 13:30	11/12/15 16:18	1
Perfluorohexane Sulfonate (PFHxS)	58	В	1.8	0.80	ng/L	11/10/15 13:30	11/12/15 16:18	1
Perfluoro-1-heptanesulfonate (PFHpS)	8.4		1.8	0.66	ng/L	11/10/15 13:30	11/12/15 16:18	1
Perfluorodecane sulfonate (PFDS)	ND		1.8	1.1	ng/L	11/10/15 13:30	11/12/15 16:18	1
Perfluorooctane Sulfonate (PFOS)	59		1.8	1.2	ng/L	11/10/15 13:30	11/12/15 16:18	1
Perfluorooctane Sulfonamide (FOSA)	1.0	J	1.8	0.59	ng/L	11/10/15 13:30	11/12/15 16:18	1
Isotope Dilution	%Recovery	Qualifier	Limits			Prepared	Analyzed	Dil Fac
13C8 FOSA	14	*	25 - 150			11/10/15 13:30	11/12/15 16:18	1
13C4 PFBA	59		25 - 150			11/10/15 13:30	11/12/15 16:18	1
13C2 PFHxA	94		25 - 150			11/10/15 13:30	11/12/15 16:18	1
13C4 PFOA	86		25 - 150			11/10/15 13:30	11/12/15 16:18	1
13C5 PFNA	81		25 - 150			11/10/15 13:30	11/12/15 16:18	1
13C2 PFDA	79		25 - 150			11/10/15 13:30	11/12/15 16:18	1
13C2 PFUnA	83		25 - 150			11/10/15 13:30	11/12/15 16:18	1
13C2 PFDoA	73		25 - 150			11/10/15 13:30	11/12/15 16:18	1
18O2 PFHxS	115		25 - 150			11/10/15 13:30	11/12/15 16:18	1

#### Client Sample ID: MW-607-45 Date Collected: 11/03/15 11:42 Date Received: 11/05/15 10:00

Method: WS-LC-0025 - Perfluorinated Hydrocarbons											
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac		
Perfluorobutanoic acid (PFBA)	17		1.9	0.43	ng/L		11/10/15 13:30	11/12/15 16:40	1		
Perfluoropentanoic acid (PFPeA)	41		1.9	0.92	ng/L		11/10/15 13:30	11/12/15 16:40	1		
Perfluorohexanoic acid (PFHxA)	41	В	1.9	0.73	ng/L		11/10/15 13:30	11/12/15 16:40	1		
Perfluoroheptanoic acid (PFHpA)	20		1.9	0.75	ng/L		11/10/15 13:30	11/12/15 16:40	1		
Perfluorooctanoic acid (PFOA)	21		1.9	0.70	ng/L		11/10/15 13:30	11/12/15 16:40	1		

25 - 150

25 - 150

25 - 150

**TestAmerica Sacramento** 

11/10/15 13:30 11/12/15 16:18

11/10/15 13:30 11/12/15 16:18

11/10/15 13:30 11/12/15 16:18

Lab Sample ID: 320-15805-2

Page 6 of 17

Matrix: Water

1

1

1

## **Client Sample Results**

#### Client Sample ID: MW-607-45 Date Collected: 11/03/15 11:42 Date Received: 11/05/15 10:00

Method: WS-LC-0025 - Perfluorinated Hydrocarbons (Continued)

### Lab Sample ID: 320-15805-2 Matrix: Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorononanoic acid (PFNA)	33		1.9	0.61	ng/L		11/10/15 13:30	11/12/15 16:40	1
Perfluorodecanoic acid (PFDA)	ND		1.9	0.41	ng/L		11/10/15 13:30	11/12/15 16:40	1
Perfluoroundecanoic acid (PFUnA)	1.1	JB	1.9	0.70	ng/L		11/10/15 13:30	11/12/15 16:40	1
Perfluorododecanoic acid (PFDoA)	ND		1.9	0.55	ng/L		11/10/15 13:30	11/12/15 16:40	1
Perfluorotridecanoic Acid (PFTriA)	ND		1.9	0.51	ng/L		11/10/15 13:30	11/12/15 16:40	1
Perfluorotetradecanoic acid (PFTeA)	0.40	JB	1.9	0.19	ng/L		11/10/15 13:30	11/12/15 16:40	1
Perfluoro-n-hexadecanoic acid (PFHxDA)	ND		1.9	0.11	ng/L		11/10/15 13:30	11/12/15 16:40	1
Perfluoro-n-octandecanoic acid (PFODA)	ND		1.9	0.63	ng/L		11/10/15 13:30	11/12/15 16:40	1
Perfluorobutane Sulfonate (PFBS)	3.6		1.9	0.86	ng/L		11/10/15 13:30	11/12/15 16:40	1
Perfluorohexane Sulfonate (PFHxS)	61	В	1.9	0.81	ng/L		11/10/15 13:30	11/12/15 16:40	1
Perfluoro-1-heptanesulfonate (PFHpS)	7.3		1.9	0.67	ng/L		11/10/15 13:30	11/12/15 16:40	1
Perfluorodecane sulfonate (PFDS)	ND		1.9	1.1	ng/L		11/10/15 13:30	11/12/15 16:40	1
Perfluorooctane Sulfonate (PFOS)	63		1.9	1.2	ng/L		11/10/15 13:30	11/12/15 16:40	1
Perfluorooctane Sulfonamide (FOSA)	ND		1.9	0.60	ng/L		11/10/15 13:30	11/12/15 16:40	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
13C8 FOSA	25		25 - 150				11/10/15 13:30	11/12/15 16:40	1
13C4 PFBA	65		25 - 150				11/10/15 13:30	11/12/15 16:40	1
13C2 PFHxA	102		25 - 150				11/10/15 13:30	11/12/15 16:40	1
13C4 PFOA	99		25 - 150				11/10/15 13:30	11/12/15 16:40	1
13C5 PFNA	97		25 - 150				11/10/15 13:30	11/12/15 16:40	1
13C2 PFDA	94		25 - 150				11/10/15 13:30	11/12/15 16:40	1
13C2 PFUnA	96		25 - 150				11/10/15 13:30	11/12/15 16:40	1
13C2 PFDoA	76		25 - 150				11/10/15 13:30	11/12/15 16:40	1
18O2 PFHxS	117		25 - 150				11/10/15 13:30	11/12/15 16:40	1
13C4 PFOS	137		25 - 150				11/10/15 13:30	11/12/15 16:40	1
13C4-PFHpA	97		25 - 150				11/10/15 13:30	11/12/15 16:40	1
13C5 PFPeA	84		25 - 150				11/10/15 13:30	11/12/15 16:40	1

## Method: WS-LC-0025 - Perfluorinated Hydrocarbons

Matrix: Water

Pre	p Tv	/pe: '	Total	/NA
	r .,	P		

_			Perce	ent Isotope	Dilution Re	covery (Ac	ceptance L	imits)	
		3C8 FOS/	3C4 PFB/	3C2 PFHx	3C4 PFO/	3C5 PFN/	3C2 PFD/	3C2 PFUn	3C2 PFDo
Lab Sample ID	Client Sample ID	(25-150)	(25-150)	(25-150)	(25-150)	(25-150)	(25-150)	(25-150)	(25-150)
320-15805-1	MW-507-45	14 *	59	94	86	81	79	83	73
320-15805-2	MW-607-45	25	65	102	99	97	94	96	76
LCS 320-91901/2-A	Lab Control Sample	72	102	103	107	105	102	103	95
MB 320-91901/1-A	Method Blank	78	114	115	136	123	121	114	95
			Perc	ent Isotope	Dilution Re	covery (Ac	ceptance L	imits)	
		BO2 PFHx	3C4 PFOS	3C4-PFHp	3C5 PFPe				
Lab Sample ID	Client Sample ID	(25-150)	(25-150)	(25-150)	(25-150)				
320-15805-1	MW-507-45	115	120	86	74				
320-15805-2	MW-607-45	117	137	97	84				
LCS 320-91901/2-A	Lab Control Sample	98	91	100	100				
MB 320-91901/1-A	Method Blank	113	90	112	109				
Surrogate Legend									
13C8 FOSA = 13C8 F	FOSA								
13C4 PFBA = 13C4 F	PFBA								
13C2 PFHxA = 13C2	PFHxA								
13C4 PFOA = 13C4 F	PFOA								
13C5 PFNA = 13C5 F	PFNA								
13C2 PFDA = 13C2 F	PFDA								
13C2 PFUnA = 13C2	PFUnA								
13C2 PFDoA = 13C2	PFDoA								
18O2 PFHxS = 18O2	PFHxS								
13C4 PFOS = 13C4 F	PFOS								
13C4-PFHpA = 13C4	-PFHpA								
13C5 PFPeA = 13C5	PFPeA								

**Client Sample ID: Method Blank** 

Prep Type: Total/NA

### Method: WS-LC-0025 - Perfluorinated Hydrocarbons

#### Lab Sample ID: MB 320-91901/1-A Matrix: Water

Analysis Batch: 92192								Prep Batch:	: 91901
	MB	MB							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		2.0	0.46	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluoropentanoic acid (PFPeA)	ND		2.0	0.99	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluorohexanoic acid (PFHxA)	1.01	J	2.0	0.79	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluoroheptanoic acid (PFHpA)	ND		2.0	0.80	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluorooctanoic acid (PFOA)	ND		2.0	0.75	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluorononanoic acid (PFNA)	ND		2.0	0.65	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluorodecanoic acid (PFDA)	ND		2.0	0.44	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluoroundecanoic acid (PFUnA)	0.833	J	2.0	0.75	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluorododecanoic acid (PFDoA)	ND		2.0	0.58	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluorotridecanoic Acid (PFTriA)	ND		2.0	0.55	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluorotetradecanoic acid (PFTeA)	0.561	J	2.0	0.20	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluoro-n-hexadecanoic acid (PFHxDA)	ND		2.0	0.12	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluoro-n-octandecanoic acid (PFODA)	ND		2.0	0.67	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluorobutane Sulfonate (PFBS)	ND		2.0	0.92	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluorohexane Sulfonate (PFHxS)	1.78	J	2.0	0.87	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluoro-1-heptanesulfonate (PFHpS)	ND		2.0	0.71	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluorodecane sulfonate (PFDS)	ND		2.0	1.2	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluorooctane Sulfonate (PFOS)	ND		2.0	1.3	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluorooctane Sulfonamide (FOSA)	ND		2.0	0.64	ng/L		11/10/15 13:30	11/12/15 15:36	1
	MB	МВ							
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
13C8 FOSA	78		25 - 150				11/10/15 13:30	11/12/15 15:36	1
13C4 PFBA	114		25 - 150				11/10/15 13:30	11/12/15 15:36	1
13C2 PFHxA	115		25 - 150				11/10/15 13:30	11/12/15 15:36	1
13C4 PFOA	136		25 - 150				11/10/15 13:30	11/12/15 15:36	1
13C5 PFNA	123		25 - 150				11/10/15 13:30	11/12/15 15:36	1
13C2 PFDA	121		25 - 150				11/10/15 13:30	11/12/15 15:36	1
13C2 PFUnA	114		25 - 150				11/10/15 13:30	11/12/15 15:36	1
13C2 PFDoA	95		25 - 150				11/10/15 13:30	11/12/15 15:36	1
18O2 PFHxS	113		25 - 150				11/10/15 13:30	11/12/15 15:36	1
13C4 PFOS	90		25 - 150				11/10/15 13:30	11/12/15 15:36	1
13C4-PFHpA	112		25 - 150				11/10/15 13:30	11/12/15 15:36	1
13C5 PFPeA	109		25 - 150				11/10/15 13:30	11/12/15 15:36	1

#### Lab Sample ID: LCS 320-91901/2-A Matrix: Water Analysis Batch: 92192

#### Prep Batch: 91901 Spike LCS LCS %Rec. Analyte Added Result Qualifier Unit D %Rec Limits Perfluorobutanoic acid (PFBA) 40.0 45.8 114 60 - 140 ng/L Perfluoropentanoic acid (PFPeA) 40.0 40.8 102 60 - 140 ng/L 40.0 42.4 Perfluorohexanoic acid (PFHxA) ng/L 106 60 - 140 Perfluoroheptanoic acid (PFHpA) 40.0 45.1 ng/L 113 60 - 140 Perfluorooctanoic acid (PFOA) 40.0 39.7 99 ng/L 60 - 140 Perfluorononanoic acid (PFNA) 40.0 42.5 ng/L 106 60 - 140 Perfluorodecanoic acid (PFDA) 40.0 51.1 ng/L 128 60 - 140

TestAmerica Sacramento

Prep Type: Total/NA

**Client Sample ID: Lab Control Sample** 

8

13C2 PFDoA

18O2 PFHxS

13C4 PFOS

13C4-PFHpA

13C5 PFPeA

**8** 9

## Method: WS-LC-0025 - Perfluorinated Hydrocarbons (Continued)

95

98

91

100

100

Lab Sample ID: LCS 320-91901/2-A Matrix: Water Analysis Batch: 92192						Clie	ent Sa	mple ID	: Lab Control Sample Prep Type: Total/NA Prep Batch: 91901
			Spike	LCS	LCS				%Rec.
Analyte			Added	Result	Qualifier	Unit	D	%Rec	Limits
Perfluoroundecanoic acid			40.0	48.0		ng/L		120	60 - 140
(PFUnA)									
Perfluorododecanoic acid			40.0	46.3		ng/L		116	60 - 140
(PFDoA)									
Perfluorotridecanoic Acid			40.0	33.2		ng/L		83	50 - 150
(PFTriA)									
Perfluorotetradecanoic acid			40.0	30.3		ng/L		76	50 - 150
(PFTeA)									
Perfluoro-n-hexadecanoic acid			40.0	32.2		ng/L		80	50 - 150
(PFHxDA)						· · · · <u>.</u> · · · ·			
Perfluoro-n-octandecanoic acid			40.0	59.9		ng/L		150	50 - 150
(PFODA)			05.4	40.0				407	50, 450
Perfluorobutane Sulfonate			35.4	48.3		ng/L		137	50 - 150
(PFBS)			07.0	44.0		·•• •• /]		110	CO 110
Perfluorohexane Sulfonate			37.8	44.9		ng/L		119	60 - 140
(PFHXS)			20.1	45.0		na/l		110	50 150
			30.1	40.2		ng/L		119	50 - 150
(PFHpS)			38.6	46.2		ng/l		120	50 150
			50.0	40.2		ng/L		120	30 - 130
(FFDS) Perfluorooctane Sulfonate			38.2	49.4		na/l		129	60 - 140
			00.2	+0.+		ng/L		120	00-140
Perfluorooctane Sulfonamide			40.0	48.4		na/l		121	60 - 140
(FOSA)									
	LCS	LCS							
Isotope Dilution	%Recovery	Qualifier	Limits						
13C8 FOSA	72		25 - 150						
13C4 PFBA	102		25 - 150						
13C2 PEHxA	103		25 - 150						
13C4 PEOA	107		25_150						
13C5 DENA	105		25 150						
1303 F INA 1202 BEDA	100		25 - 150						
	102		25 - 150						
(PFHxS) Perfluoro-1-heptanesulfonate (PFHpS) Perfluorodecane sulfonate (PFDS) Perfluorooctane Sulfonate (PFOS) Perfluorooctane Sulfonamide (FOSA) <b>Isotope Dilution</b> 13C8 FOSA 13C4 PFBA 13C2 PFHxA 13C2 PFHxA 13C2 PFDA 13C2 PFDA 13C2 PFUnA	LCS %Recovery 72 102 103 107 105 102 103	LCS Qualifier	38.1 38.6 38.2 40.0 <u>Limits</u> 25 - 150 25 - 150 25 - 150 25 - 150 25 - 150 25 - 150 25 - 150	45.2 46.2 49.4 48.4		ng/L ng/L ng/L ng/L		119 120 129 121	50 - 150 50 - 150 60 - 140 60 - 140

25 - 150

25 - 150

25 - 150

25 - 150

25 - 150

WS-LC-0025

## LCMS

#### Prep Batch: 91901

MB 320-91901/1-A

Method Blank

· · · · ·					
Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-15805-1	MW-507-45	Total/NA	Water	3535	
320-15805-2	MW-607-45	Total/NA	Water	3535	
LCS 320-91901/2-A	Lab Control Sample	Total/NA	Water	3535	
MB 320-91901/1-A	Method Blank	Total/NA	Water	3535	
Analysis Batch: 921	92				
Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-15805-1	MW-507-45	Total/NA	Water	WS-LC-0025	91901
320-15805-2	MW-607-45	Total/NA	Water	WS-LC-0025	91901
LCS 320-91901/2-A	Lab Control Sample	Total/NA	Water	WS-LC-0025	91901

Total/NA

Water

91901

Lab Sample ID: 320-15805-1

Lab Sample ID: 320-15805-2

Matrix: Water

Matrix: Water

#### Client Sample ID: MW-507-45 Date Collected: 11/03/15 11:52 Date Received: 11/05/15 10:00

Date Received.													
	Batch	Batch		Dil	Initial	Final	Batch	Prepared					
Prep Type	Туре	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab			
Total/NA	Prep	3535			543.7 mL	1.0 mL	91901	11/10/15 13:30	JER	TAL SAC			
Total/NA	Analysis	WS-LC-0025		1	543.7 mL	1.0 mL	92192	11/12/15 16:18	JRB	TAL SAC			

#### Client Sample ID: MW-607-45 Date Collected: 11/03/15 11:42 Date Received: 11/05/15 10:00

-	Batch	Batch		Dil	Initial	Final	Batch	Prepared				
Prep Туре	Туре	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab		
Total/NA	Prep	3535			535 mL	1.0 mL	91901	11/10/15 13:30	JER	TAL SAC		
Total/NA	Analysis	WS-LC-0025		1	535 mL	1.0 mL	92192	11/12/15 16:40	JRB	TAL SAC		

#### Laboratory References:

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

## **Certification Summary**

Client: Shannon & Wilson Project/Site: Burn Pit, Alaska

## Laboratory: TestAmerica Sacramento

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

Authority	Program	EPA Region	Certification ID	Expiration Date
A2LA	DoD ELAP		2928-01	01-31-16
laska (UST)	State Program	10	UST-055	12-18-15
rizona	State Program	9	AZ0708	08-11-16
kansas DEQ	State Program	6	88-0691	06-17-16
fornia	State Program	9	2897	01-31-16
rado	State Program	8	N/A	08-31-16
ecticut	State Program	1	PH-0691	06-30-17
da	NELAP	4	E87570	06-30-16
aii	State Program	9	N/A	01-29-16
IS	NELAP	5	200060	03-17-16
as	NELAP	7	E-10375	01-31-16
ana	NELAP	6	30612	06-30-16
gan	State Program	5	9947	01-31-16
Ja	State Program	9	CA44	07-31-16
Jersey	NELAP	2	CA005	06-30-16
York	NELAP	2	11666	04-01-16
n	NELAP	10	CA200005	01-29-16
sylvania	NELAP	3	9947	03-31-16
\$	NELAP	6	T104704399-15-9	05-31-16
ish & Wildlife	Federal		LE148388-0	02-28-16
4	Federal		P330-11-00436	12-30-17
YA UCMR	Federal	1	CA00044	11-06-16
	NELAP	8	QUAN1	02-28-16
ia	NELAP Secondary AB	3	460278	03-14-16
ington	State Program	10	C581	05-04-16
t Virginia (DW)	State Program	3	9930C	12-31-15
ning	State Program	8	8TMS-Q	01-29-16

#### Client: Shannon & Wilson Project/Site: Burn Pit, Alaska

Method	Method Description	Protocol	Laboratory
WS-LC-0025	Perfluorinated Hydrocarbons	TAL SOP	TAL SAC
Protocol Ret	erences:		

#### TAL SOP = TestAmerica Laboratories, Standard Operating Procedure

#### Laboratory References:

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

## **Sample Summary**

Client: Shannon & Wilson Project/Site: Burn Pit, Alaska TestAmerica Job ID: 320-15805-1 SDG: 31-1-11735-003

Project/Site: Burn	Pit, Alaska		SDG: 31-	1-11735-003	
Lab Sample ID	Client Sample ID	Matrix	Collected	Received	
320-15805-1	MW-507-45	Water	11/03/15 11:52	11/05/15 10:00	
320-15805-2	MW-607-45	Water	11/03/15 11:42	11/05/15 10:00	
					5
					8
					9
					13

Chain of	Temperature on Receipt $\frac{1}{2} \int C$	<u>lestAmerica</u>	
Custoay Hecora	Drinking Water? Yes 🗆 No 🕅	THE LEADER IN ENVIRONMENTAL TESTING	
Client Shannon 3 wil son	Project Manager	Date Date Chain of Oustody W	Number 04
Address 2255 Hull Road	Releptione Number (Area Code)/Fax Number 007 - 456	Lab Number Page	of
City Fairbank & Ak 997	9 Sile Contact Lab Contact	Analysis (Attach list if more space is needed)	
Project Name and Location (State) Bit V N Pit Alaska	Carrier Waybil Number Fed Ex 8015 88909592	Special I	Instructions/
Contract Purchase Order/Clucke No. 31 - 1 - 1 1755	Matrix Containers Preservativ	& Condition	ns of Receipt
Sample I.D. No. and Description (Containers for each sample may be combined on one line)	HOEN IDH EONH FOSZH saudun IIOS Pas smoenby IIV		
III ST-LOG-MW	3) acis IIISA X X X	*	
MW- 607-45	3 BOUSING X END	4	
			[
Possible Hazard Identification 🕵 Non-Hazard 🛛 Flammable 🔲 Skin Imtant 🗍 P.	oison B 🗌 Unknown 🗍 Return to Client 🕅 Disposal By L	ab Archive For Months longer than 1 month)	eretained
Tum Around Time Required	21 Days IS Other Study	is (Specify)	
T. Hampushed By	Date Time 1 Received By	1 1 1 1 - 5 - 16	Time no
2. Relinquished By	Date Time 2. Received By	UN Put Date	Time
3. Relinquished By	Date Time 3. Received By	Date	Time
Comments	-		
DISTRIBUTION: WHITE - Returned to Client with Report; CANA	4FV - Stays with the Sample, PINK - Field Copy		
	14	4 5 6 7 8 9 10 11 12 13	1 2 3

•

11/16/2015

Client: Shannon & Wilson

#### Login Number: 15805 List Number: 1 Creator: Nelson, Kym D

Question	Answer	Comment
Radioactivity wasn't checked or is = background as measured by a survey meter.</td <td>True</td> <td></td>	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?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	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	

Job Number: 320-15805-1 SDG Number: 31-1-11735-003

List Source: TestAmerica Sacramento

## **Laboratory Data Review Checklist**

Completed by:	Julie Keener, P.E.
Title:	Senior EngineerDate:November 17, 2015
CS Report Name	Burn Pit Off-Site Well Sampling Report Date: November 16, 2015
Consultant Firm:	Shannon & Wilson, Inc.
Laboratory Name	e: TestAmerica, Inc. Laboratory Report Number: 15805
ADEC File Num	ber: 102.38.182 ADEC RecKey Number:
1. <u>Laboratory</u> a. Did ar	n ADEC CS approved laboratory receive and <u>perform</u> all of the submitted sample analyses? ]Yes $\Box$ No $\bigotimes$ NA (Please explain.) Comments:
ADEC 1	has not approved an analytical laboratory for this analysis.
b. If the labora	samples were transferred to another "network" laboratory or sub-contracted to an alternate atory, was the laboratory performing the analyses ADEC CS approved? Yes No NA (Please explain.) Comments:
Analyse	es were performed by TestAmerica, Inc. in Folsom, California.
2. <u>Chain of Cus</u> a. COC	tody (COC) information completed, signed, and dated (including released/received by)? Yes No NA (Please explain.) Comments:
b. Corre	ct analyses requested? Yes No NA (Please explain.) Comments:
3. <u>Laboratory Sa</u> a. Samp	ample Receipt Documentationle/cooler temperature documented and within range at receipt $(4^\circ \pm 2^\circ C)$ ?YesNoNoNA (Please explain.)Comments:

The temperature blank or cooler was measured within the acceptable temperature range of 0  $^{\circ}$ C to 6  $^{\circ}$ C upon receipt at the laboratory, as specified in the EPA publication SW-846. This range has been approved by ADEC.

b. Sample preservation acceptable – acidified waters, N Volatile Chlorinated Solvents, etc.)?	Methanol preserved VOC soil (GRO, BTEX,
$\square$ Yes $\square$ No $\square$ NA (Please explain.)	Comments:
No preservative was required.	
<ul> <li>c. Sample condition documented – broken, leaking (Me ∑Yes  No  NA (Please explain.)</li> </ul>	ethanol), zero headspace (VOC vials)? Comments:
The sample-receipt form notes that the samples were r	received in good condition.
d. If there were any discrepancies, were they document containers/preservation, sample temperature outside samples, etc.?	ted? For example, incorrect sample of acceptable range, insufficient or missing
$\Box$ Yes $\Box$ No $\boxtimes$ NA (Please explain.)	Comments:
There were no discrepancies.	
e. Data quality or usability affected? (Please explain.)	Comments:
No, the data quality and usability were not affected.	
Case Narrative a. Present and understandable? Yes No NA (Please explain.)	Comments:
<ul> <li>b. Discrepancies, errors or QC failures identified by the ☐Yes ☐ No ⊠NA (Please explain.)</li> </ul>	e lab? Comments:
No discrepancies, errors, or QC failures were noted by	/ the laboratory.
c. Were all corrective actions documented? ☐Yes ☐ No ⊠NA (Please explain.)	Comments:
No corrective action was required.	
d. What is the effect on data quality/usability according	g to the case narrative? Comments:
There was no effect on data quality or usability.	
Samples Results a. Correct analyses performed/reported as requested or Yes No NA (Please explain.)	n COC? Comments:

5.

4.

	<ul> <li>b. All applicable holding times met?</li> <li>∑Yes □ No □NA (Please explain.)</li> </ul>	Comments:
	<ul> <li>c. All soils reported on a dry weight basis?</li> <li>☐Yes ☐ No ☑NA (Please explain.)</li> </ul>	Comments:
	No soil samples were submitted.	
	d. Are the reported PQLs less than the Cleanup Level or project?	the minimum required detection level for the
	$\square$ Yes $\square$ No $\square$ NA (Please explain.)	Comments:
	PFOS and PFOA reporting limits are less than applicab levels.	le ADEC proposed groundwater cleanup
	e. Data quality or usability affected?	Comments:
	The data quality and usability were not affected.	
<u>QC</u>	C Samples a. Method Blank i. One method blank reported per matrix, analys ⊠Yes □ No □NA (Please explain.)	is and 20 samples? Comments:
	<ul> <li>ii. All method blank results less than PQL?</li> <li>☐Yes ☐ No ☐NA (Please explain.)</li> </ul>	Comments:
	PFHxA, PFUnA and PFHxS were detected in the method than their PQLs (reporting limits, or RLs), and PFTeA v concentration greater than its RL.	od blank at estimated concentrations less was detected in the method blank at a
	iii. If above PQL, what samples are affected?	
	Samples MW-507-45 and MW-607-45 were associated	with the method blank containing

Samples MW-507-45 and MW-607-45 were associated with the method blank containing detectable perfluorinated compounds. The results for analytes PFHxA and PFHxS were unaffected by the method-blank detections because they were present at concentrations at least 10-fold greater than the method-blank concentrations.

The results for analytes PFUnA and PFTeA in samples MW-507-45 and MW-607-45 were affected because they were present at concentrations within a factor of five of the method-blank concentrations. The PFUnA and PFTeA concentrations in these samples will be flagged "B\*" and considered not detected at the RL for these analytes.

#### Comments:

iv. Do the affected sample(s) have data flags and if so, are the data flags clearly defined?  $\forall$  Yes  $\Box$  No  $\Box$ NA (Please explain.) Comments:

The PFUnA and PFTeA concentrations in samples MW-507-45 and MW-607-45 will be flagged "B\*" and considered not detected at the RL for these analytes.

v. Data quality or usability affected? (Please explain.)

Comments:

Yes; see above.

- 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 □NA (Please explain.) Comments:

LCS sample results were reported.

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

 $\Box$ Yes  $\Box$  No  $\boxtimes$ NA (Please explain.)

Comments:

Metals/inorganics were not analyzed in this sample set.

- 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 □NA (Please explain.)
- 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)

 $\bigvee$ Yes  $\square$  No  $\square$ NA (Please explain.)

Comments:

Duplicate field samples were analyzed, but there were no LCS/LCSD or MS/MSD duplicate analyses conducted. The field-duplicate RPD was within acceptable limits.

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

No samples were affected. The recoveries and RPDs were within acceptable limits.

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?  $\Box$  Yes  $\Box$  No  $\bigotimes$ NA (Please explain.) Comments:

The data were not affected and did not require flags.

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? Xes No NA (Please explain.) Comments:

The analytical method used isotopic dilution, which entails adding a 13C-isotope of each target analyte and assessing the recovery of each analyte; the isotopically labeled compounds are the 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)

 $\forall$ Yes  $\Box$  No  $\Box$ NA (Please explain.)

Comments:

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

 $\Box$ Yes  $\Box$  No  $\boxtimes$ NA (Please explain.)

Comments:

The data did not require flags.

iv. Data quality or usability affected? (Use the comment box to explain.) Comments:

The data quality and usability were not affected.

- d. Trip blank Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): <u>Water and</u> <u>Soil</u>
  - i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples? (If not, enter explanation below.)
     Yes No XNA (Please explain.)
     Comments:

Comments.

PFCs are not volatile compounds and therefore a trip blank is not required.

ii. Is the cooler used to transport the trip blank and (If not a comment explaining why must be ent	d VOA samples clearly indicated on the COC?
$\square$ Yes $\square$ No $\square$ NA (Please explain.)	Comments:
No trip blank was submitted.	
iii. All results less than PQL? □Yes □ No ⊠NA (Please explain.)	Comments:
No trip blank was submitted.	
iv. If above PQL, what samples are affected?	Comments:
No trip blank was submitted.	
v. Data quality or usability affected? (Please expla	ain.) Comments:
Data quality and usability are not affected.	
e. Field Duplicate	reis and 10 maris at some less?
$\square$ Yes $\square$ No $\square$ NA (Please explain.)	Comments:
ii. Submitted blind to lab? ⊠Yes □ No □NA (Please explain.)	Comments:
The field duplicate pair MW-507-45/MW-607-45 was in	cluded with this work order.
<ul><li>iii. Precision – All relative percent differences (RP (Recommended: 30% water, 50% soil)</li></ul>	PD) less than specified DQOs?
RPD (%) = Absolute value of: $(R_1-R_2)$ $((R_1-R_2)/2)$ x	100
$R_1 = \text{Sample Concentration}$ $R_2 = \text{Field Duplicate Concentration}$ $Yes \square \text{ No } \square \text{NA (Please explain.)}$	Comments:
The RPD values for the analytes met QC criteria.	

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

Comments:		
Data quality and usability are not affected; the RPD values for the analytes met QC criteria.		
f. Decontamination or Equipment Blank (If not used	l explain why).	
Yes No NA (Please explain.)	Comments:	
Previous results from other projects have shown our	decontamination methods to be sufficient to	
prevent cross-contamination.		
i. All results less than PQL?		
Yes No No NA (Please explain.)	Comments:	
An equipment blank was not submitted for this proje	ect.	
ii. If above PQL, what samples are affected?		
	Comments:	
N/A: an equipment blank was not submitted for this	project.	
	<b>L</b> -1	
iii. Data quality or usability affected? (Please	explain.)	
	Comments:	
Data quality/usability were not affected. The subme PFC-contaminated site.	rsible pump has not been used previously at a	
her Data Flags/Qualifiers (ACOE, AFCEE, Lab Specif	<u>ic, etc.)</u>	
$\Box Yes \Box No \Box NA (Please explain.)$	Comments:	
The data quality and usability were not affected, so	no data flags or qualifiers were required.	



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: 320-15867-1

TestAmerica Sample Delivery Group: IGSA Irrigation Wells Client Project/Site: City of Fairbanks Fire Training Area

## For:

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

Attn: Julie Keener



Authorized for release by: 11/16/2015 12:28:17 PM David Alltucker, Project Manager I (916)374-4383 david.alltucker@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.



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## **Definitions/Glossary**

#### Client: Shannon & Wilson Project/Site: City of Fairbanks Fire Training Area

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#### Qualifiers

## LCMS

LUNIS		
Qualifier	Qualifier Description	
*	Isotope Dilution analyte is outside acceptance limits.	
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.	
В	Compound was found in the blank and sample.	

## Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.	
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis	 8
%R	Percent Recovery	
CFL	Contains Free Liquid	9
CNF	Contains no Free Liquid	
DER	Duplicate error ratio (normalized absolute difference)	
Dil Fac	Dilution Factor	
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample	
DLC	Decision level concentration	
MDA	Minimum detectable activity	
EDL	Estimated Detection Limit	
MDC	Minimum detectable concentration	12
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	
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)	

#### Job ID: 320-15867-1

#### Laboratory: TestAmerica Sacramento

#### Narrative

Job Narrative 320-15867-1

#### Receipt

The sample was received on 11/10/2015 9:30 AM; the sample arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 2.0° C.

#### LCMS

Method(s) WS-LC-0025: The Isotope Dilution Analyte (IDA) recovery associated with the following samples is below the method recommended limit: PUMP #1, FIELD #3 (320-15867-1). Generally, data quality is not considered affected if the IDA signal-to-noise ratio is greater than 10:1, which is achieved for all IDA in the samples.

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 320-91901.

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

## **Detection Summary**

#### Client: Shannon & Wilson Project/Site: City of Fairbanks Fire Training Area

## Client Sample ID: PUMP #1, FIELD #3

Client Sample ID: PUMP #1	, FIELD i	#3				Lab Sa	Lab Sample ID: 320-15867-1			
Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac D	Method	Prep Type		
Perfluorobutanoic acid (PFBA)	7.1		1.8	0.42	ng/L	1	WS-LC-0025	Total/NA		
Perfluoropentanoic acid (PFPeA)	13		1.8	0.91	ng/L	1	WS-LC-0025	Total/NA		
Perfluorohexanoic acid (PFHxA)	23	В	1.8	0.72	ng/L	1	WS-LC-0025	Total/NA		
Perfluoroheptanoic acid (PFHpA)	5.0		1.8	0.74	ng/L	1	WS-LC-0025	Total/NA		
Perfluorooctanoic acid (PFOA)	5.8		1.8	0.69	ng/L	1	WS-LC-0025	Total/NA		
Perfluorononanoic acid (PFNA)	1.0	J	1.8	0.60	ng/L	1	WS-LC-0025	Total/NA		
Perfluorodecanoic acid (PFDA)	0.41	J	1.8	0.40	ng/L	1	WS-LC-0025	Total/NA		
Perfluoroundecanoic acid (PFUnA)	0.83	JB	1.8	0.69	ng/L	1	WS-LC-0025	Total/NA		
Perfluorotetradecanoic acid (PFTeA)	0.18	JB	1.8	0.18	ng/L	1	WS-LC-0025	Total/NA		
Perfluoro-n-octandecanoic acid (PFODA)	0.78	J	1.8	0.62	ng/L	1	WS-LC-0025	Total/NA		
Perfluorobutane Sulfonate (PFBS)	12		1.8	0.84	ng/L	1	WS-LC-0025	Total/NA		
Perfluorohexane Sulfonate (PFHxS)	47	В	1.8	0.80	ng/L	1	WS-LC-0025	Total/NA		
Perfluoro-1-heptanesulfonate (PFHpS)	1.4	J	1.8	0.65	ng/L	1	WS-LC-0025	Total/NA		
Perfluorooctane Sulfonate (PFOS)	35		1.8	1.2	ng/L	1	WS-LC-0025	Total/NA		
Perfluorooctane Sulfonamide (FOSA)	1.1	J	1.8	0.59	ng/L	1	WS-LC-0025	Total/NA		

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This Detection Summary does not include radiochemical test results.

## **Client Sample Results**

Client: Shannon & Wilson Project/Site: City of Fairbanks Fire Training Area TestAmerica Job ID: 320-15867-1 SDG: IGSA Irrigation Wells

Lab Sample ID: 320-15867-1

Matrix: Water

## Client Sample ID: PUMP #1, FIELD #3 Date Collected: 11/06/15 17:32

Date Received: 11/10/15 09:30

Method: WS-LC-0025 - Perfluo	rinated Hy	drocarbon	S						
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	7.1		1.8	0.42	ng/L		11/10/15 13:30	11/12/15 17:01	1
Perfluoropentanoic acid (PFPeA)	13		1.8	0.91	ng/L		11/10/15 13:30	11/12/15 17:01	1
Perfluorohexanoic acid (PFHxA)	23	В	1.8	0.72	ng/L		11/10/15 13:30	11/12/15 17:01	1
Perfluoroheptanoic acid (PFHpA)	5.0		1.8	0.74	ng/L		11/10/15 13:30	11/12/15 17:01	1
Perfluorooctanoic acid (PFOA)	5.8		1.8	0.69	ng/L		11/10/15 13:30	11/12/15 17:01	1
Perfluorononanoic acid (PFNA)	1.0	J	1.8	0.60	ng/L		11/10/15 13:30	11/12/15 17:01	1
Perfluorodecanoic acid (PFDA)	0.41	J	1.8	0.40	ng/L		11/10/15 13:30	11/12/15 17:01	1
Perfluoroundecanoic acid (PFUnA)	0.83	JB	1.8	0.69	ng/L		11/10/15 13:30	11/12/15 17:01	1
Perfluorododecanoic acid (PFDoA)	ND		1.8	0.54	ng/L		11/10/15 13:30	11/12/15 17:01	1
Perfluorotridecanoic Acid (PFTriA)	ND		1.8	0.51	ng/L		11/10/15 13:30	11/12/15 17:01	1
Perfluorotetradecanoic acid (PFTeA)	0.18	JB	1.8	0.18	ng/L		11/10/15 13:30	11/12/15 17:01	1
Perfluoro-n-hexadecanoic acid (PFHxDA)	ND		1.8	0.11	ng/L		11/10/15 13:30	11/12/15 17:01	1
Perfluoro-n-octandecanoic acid (PFODA)	0.78	J	1.8	0.62	ng/L		11/10/15 13:30	11/12/15 17:01	1
Perfluorobutane Sulfonate (PFBS)	12		1.8	0.84	ng/L		11/10/15 13:30	11/12/15 17:01	1
Perfluorohexane Sulfonate (PFHxS)	47	В	1.8	0.80	ng/L		11/10/15 13:30	11/12/15 17:01	1
Perfluoro-1-heptanesulfonate (PFHpS)	1.4	J	1.8	0.65	ng/L		11/10/15 13:30	11/12/15 17:01	1
Perfluorodecane sulfonate (PFDS)	ND		1.8	1.1	ng/L		11/10/15 13:30	11/12/15 17:01	1
Perfluorooctane Sulfonate (PFOS)	35		1.8	1.2	ng/L		11/10/15 13:30	11/12/15 17:01	1
Perfluorooctane Sulfonamide (FOSA)	1.1	J	1.8	0.59	ng/L		11/10/15 13:30	11/12/15 17:01	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
13C8 FOSA	16	*	25 - 150				11/10/15 13:30	11/12/15 17:01	1
13C4 PFBA	50		25 - 150				11/10/15 13:30	11/12/15 17:01	1
13C2 PFHxA	90		25 - 150				11/10/15 13:30	11/12/15 17:01	1
13C4 PFOA	108		25 - 150				11/10/15 13:30	11/12/15 17:01	1
13C5 PFNA	95		25 - 150				11/10/15 13:30	11/12/15 17:01	1
13C2 PFDA	105		25 - 150				11/10/15 13:30	11/12/15 17:01	1
13C2 PFUnA	98		25 - 150				11/10/15 13:30	11/12/15 17:01	1
13C2 PFDoA	76		25 - 150				11/10/15 13:30	11/12/15 17:01	1
18O2 PFHxS	136		25 - 150				11/10/15 13:30	11/12/15 17:01	1
13C4 PFOS	215	*	25 - 150				11/10/15 13:30	11/12/15 17:01	1
13C4-PFHpA	97		25 - 150				11/10/15 13:30	11/12/15 17:01	1
13C5 PFPeA	71		25 - 150				11/10/15 13:30	11/12/15 17:01	1

5

6

## Method: WS-LC-0025 - Perfluorinated Hydrocarbons

Matrix: Water

13C4-PFHpA = 13C4-PFHpA 13C5 PFPeA = 13C5 PFPeA

Pre	р Ту	pe: '	Total	/NA
	r .,	P		

			Perce	ent Isotope	Dilution Re	covery (Ac	ceptance L	imits)	
		3C8 FOS/	3C4 PFB/	3C2 PFHx	3C4 PFO/	3C5 PFN/	3C2 PFD/	3C2 PFUn	3C2 PFDo
Lab Sample ID	Client Sample ID	(25-150)	(25-150)	(25-150)	(25-150)	(25-150)	(25-150)	(25-150)	(25-150)
320-15867-1	PUMP #1, FIELD #3	16 *	50	90	108	95	105	98	76
LCS 320-91901/2-A	Lab Control Sample	72	102	103	107	105	102	103	95
MB 320-91901/1-A	Method Blank	78	114	115	136	123	121	114	95
			Perce	ent Isotope	Dilution Re	covery (Ac	ceptance L	imits)	
		BO2 PFHx	3C4 PFO	3C4-PFHp	3C5 PFPe				
Lab Sample ID	Client Sample ID	(25-150)	(25-150)	(25-150)	(25-150)				
320-15867-1	PUMP #1, FIELD #3	136	215 *	97	71				
LCS 320-91901/2-A	Lab Control Sample	98	91	100	100				
MB 320-91901/1-A	Method Blank	113	90	112	109				
Surrogate Legend									
13C8 FOSA = 13C8 F	OSA								
13C4 PFBA = 13C4 P	'FBA								
13C2 PFHxA = 13C2	PFHxA								
13C4 PFOA = 13C4 F	PFOA								
13C5 PFNA = 13C5 P	PFNA								
13C2 PFDA = 13C2 P	PFDA								
13C2 PFUnA = 13C2	PFUnA								
13C2 PFDoA = 13C2	PFDoA								
18O2 PFHxS = 18O2	PFHxS								
13C4 PFOS = 13C4 F	PFOS								

**Client Sample ID: Method Blank** 

Prep Type: Total/NA

5

8

### Method: WS-LC-0025 - Perfluorinated Hydrocarbons

#### Lab Sample ID: MB 320-91901/1-A Matrix: Water

Analysis Batch: 92192								Prep Batch	: 91901
	MB	MB							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	ND		2.0	0.46	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluoropentanoic acid (PFPeA)	ND		2.0	0.99	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluorohexanoic acid (PFHxA)	1.01	J	2.0	0.79	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluoroheptanoic acid (PFHpA)	ND		2.0	0.80	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluorooctanoic acid (PFOA)	ND		2.0	0.75	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluorononanoic acid (PFNA)	ND		2.0	0.65	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluorodecanoic acid (PFDA)	ND		2.0	0.44	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluoroundecanoic acid (PFUnA)	0.833	J	2.0	0.75	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluorododecanoic acid (PFDoA)	ND		2.0	0.58	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluorotridecanoic Acid (PFTriA)	ND		2.0	0.55	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluorotetradecanoic acid (PFTeA)	0.561	J	2.0	0.20	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluoro-n-hexadecanoic acid (PFHxDA)	ND		2.0	0.12	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluoro-n-octandecanoic acid (PFODA)	ND		2.0	0.67	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluorobutane Sulfonate (PFBS)	ND		2.0	0.92	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluorohexane Sulfonate (PFHxS)	1.78	J	2.0	0.87	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluoro-1-heptanesulfonate (PFHpS)	ND		2.0	0.71	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluorodecane sulfonate (PFDS)	ND		2.0	1.2	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluorooctane Sulfonate (PFOS)	ND		2.0	1.3	ng/L		11/10/15 13:30	11/12/15 15:36	1
Perfluorooctane Sulfonamide (FOSA)	ND		2.0	0.64	ng/L		11/10/15 13:30	11/12/15 15:36	1
	MB	MB							
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
13C8 FOSA	78		25 - 150				11/10/15 13:30	11/12/15 15:36	1
13C4 PFBA	114		25 - 150				11/10/15 13:30	11/12/15 15:36	1
13C2 PFHxA	115		25 - 150				11/10/15 13:30	11/12/15 15:36	1
13C4 PFOA	136		25 - 150				11/10/15 13:30	11/12/15 15:36	1
13C5 PFNA	123		25 - 150				11/10/15 13:30	11/12/15 15:36	1
13C2 PFDA	121		25 - 150				11/10/15 13:30	11/12/15 15:36	1
13C2 PFUnA	114		25 - 150				11/10/15 13:30	11/12/15 15:36	1
13C2 PFDoA	95		25 - 150				11/10/15 13:30	11/12/15 15:36	1
18O2 PFHxS	113		25 - 150				11/10/15 13:30	11/12/15 15:36	1
13C4 PFOS	90		25 - 150				11/10/15 13:30	11/12/15 15:36	1
13C4-PFHpA	112		25 - 150				11/10/15 13:30	11/12/15 15:36	1
13C5 PFPeA	109		25 - 150				11/10/15 13:30	11/12/15 15:36	1

#### Lab Sample ID: LCS 320-91901/2-A Matrix: Water Analysis Batch: 92192

Analysis Batch: 92192							Prep Bat	ch: 91901
	Spike	LCS	LCS				%Rec.	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Perfluorobutanoic acid (PFBA)	40.0	45.8		ng/L		114	60 - 140	
Perfluoropentanoic acid (PFPeA)	40.0	40.8		ng/L		102	60 - 140	
Perfluorohexanoic acid (PFHxA)	40.0	42.4		ng/L		106	60 - 140	
Perfluoroheptanoic acid (PFHpA)	40.0	45.1		ng/L		113	60 - 140	
Perfluorooctanoic acid (PFOA)	40.0	39.7		ng/L		99	60 - 140	
Perfluorononanoic acid (PFNA)	40.0	42.5		ng/L		106	60 <sub>-</sub> 140	
Perfluorodecanoic acid (PFDA)	40.0	51.1		ng/L		128	60 - 140	

TestAmerica Sacramento

Prep Type: Total/NA

Client Sample ID: Lab Control Sample

13C2 PFUnA

13C2 PFDoA

18O2 PFHxS

13C4 PFOS

13C4-PFHpA

13C5 PFPeA

## Method: WS-LC-0025 - Perfluorinated Hydrocarbons (Continued)

103

95

98

91

100

100

Lab Sample ID: LCS 320-9 Matrix: Water	91901/2-A					Clie	ent Sa	mple ID	: Lab Control Sample Prep Type: Total/NA
Analysis Batch: 92192									Prep Batch: 91901
-			Spike	LCS	LCS				%Rec.
Analyte			Added	Result	Qualifier	Unit	D	%Rec	Limits
Perfluoroundecanoic acid			40.0	48.0		ng/L		120	60 - 140
(PFUnA)									
Perfluorododecanoic acid			40.0	46.3		ng/L		116	60 - 140
(PFDoA)									
Perfluorotridecanoic Acid			40.0	33.2		ng/L		83	50 - 150
(PFTriA)			40.0					=0	50 (50
Perfluorotetradecanoic acid			40.0	30.3		ng/L		76	50 - 150
(PFIeA)			40.0	20.0		na/l		00	50 150
			40.0	32.2		ng/L		00	50 - 150
(PERXDA)			40.0	59.9		na/l		150	50 150
			40.0	00.0		ng/L		100	50-150
Perfluorobutane Sulfonate			35.4	48.3		na/L		137	50 - 150
(PFBS)						5			
Perfluorohexane Sulfonate			37.8	44.9		ng/L		119	60 - 140
(PFHxS)									
Perfluoro-1-heptanesulfonate			38.1	45.2		ng/L		119	50 - 150
(PFHpS)									
Perfluorodecane sulfonate			38.6	46.2		ng/L		120	50 - 150
(PFDS)									
Perfluorooctane Sulfonate			38.2	49.4		ng/L		129	60 - 140
(PFOS)			40.0	40.4				404	CO 440
			40.0	48.4		ng/L		121	60 - 140
(FUSA)	105	105							
Isotopo Dilution	% Bacovary	Qualifiar	Limite						
	70 72	Quaimer							
1304 PERA	12		25-150						
13C4 PFBA	102		25 - 150						
13C2 PFHXA	103		25 - 150						
13C4 PFOA	107		25 - 150						
13C5 PFNA	105		25 - 150						
13C2 PFDA	102		25 - 150						

25 - 150

25 - 150

25 - 150

25 - 150

25 - 150

25 - 150

## **QC** Association Summary

Client: Shannon & Wilson Project/Site: City of Fairbanks Fire Training Area TestAmerica Job ID: 320-15867-1 SDG: IGSA Irrigation Wells

## LCMS

#### Prep Batch: 91901

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-15867-1	PUMP #1, FIELD #3	Total/NA	Water	3535	
LCS 320-91901/2-A	Lab Control Sample	Total/NA	Water	3535	
MB 320-91901/1-A	Method Blank	Total/NA	Water	3535	
– Analysis Batch: 921	92				

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-15867-1	PUMP #1, FIELD #3	Total/NA	Water	WS-LC-0025	91901
LCS 320-91901/2-A	Lab Control Sample	Total/NA	Water	WS-LC-0025	91901
MB 320-91901/1-A	Method Blank	Total/NA	Water	WS-LC-0025	91901

## Lab Chronicle

#### Client: Shannon & Wilson Project/Site: City of Fairbanks Fire Training Area

TestAmerica Job ID: 320-15867-1 SDG: IGSA Irrigation Wells

Lab Sample ID: 320-15867-1

Matrix: Water

#### Client Sample ID: PUMP #1, FIELD #3 Date Collected: 11/06/15 17:32 Date Received: 11/10/15 09:30

_	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Туре	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3535			544.8 mL	1.0 mL	91901	11/10/15 13:30	JER	TAL SAC
Total/NA	Analysis	WS-LC-0025		1	544.8 mL	1.0 mL	92192	11/12/15 17:01	JRB	TAL SAC

#### Laboratory References:

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

## **Certification Summary**

#### Client: Shannon & Wilson Project/Site: City of Fairbanks Fire Training Area

### Laboratory: TestAmerica Sacramento

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

_ Authority	Program	EPA Region	Certification ID	Expiration Date
A2LA	DoD ELAP		2928-01	01-31-16
Alaska (UST)	State Program	10	UST-055	12-18-15
Arizona	State Program	9	AZ0708	08-11-16
Arkansas DEQ	State Program	6	88-0691	06-17-16
California	State Program	9	2897	01-31-16
Colorado	State Program	8	N/A	08-31-16
Connecticut	State Program	1	PH-0691	06-30-17
Florida	NELAP	4	E87570	06-30-16
Hawaii	State Program	9	N/A	01-29-16
Illinois	NELAP	5	200060	03-17-16
Kansas	NELAP	7	E-10375	01-31-16
Louisiana	NELAP	6	30612	06-30-16
Michigan	State Program	5	9947	01-31-16
Nevada	State Program	9	CA44	07-31-16
New Jersey	NELAP	2	CA005	06-30-16
New York	NELAP	2	11666	04-01-16
Oregon	NELAP	10	CA200005	01-29-16
Pennsylvania	NELAP	3	9947	03-31-16
Texas	NELAP	6	T104704399-15-9	05-31-16
US Fish & Wildlife	Federal		LE148388-0	02-28-16
USDA	Federal		P330-11-00436	12-30-17
USEPA UCMR	Federal	1	CA00044	11-06-16
Utah	NELAP	8	QUAN1	02-28-16
Virginia	NELAP Secondary AB	3	460278	03-14-16
Washington	State Program	10	C581	05-04-16
West Virginia (DW)	State Program	3	9930C	12-31-15
Wyoming	State Program	8	8TMS-Q	01-29-16

#### Client: Shannon & Wilson Project/Site: City of Fairbanks Fire Training Area

Method	Method Description	Protocol	Laboratory
WS-LC-0025	Perfluorinated Hydrocarbons	TAL SOP	TAL SAC
Protocol Ref	erences:		
TAL SOP	= TestAmerica Laboratories, Standard Operating Procedure		
Laboratory F	References:		
TAL SAC	= TestAmerica Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-56	00	

## Sample Summary

#### Client: Shannon & Wilson Project/Site: City of Fairbanks Fire Training Area

TestAmerica Job ID: 320-15867-1 SDG: IGSA Irrigation Wells

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
320-15867-1	PUMP #1, FIELD #3	Water	11/06/15 17:32	11/10/15 09:30

TestAmerica Sacramento		Chain c	of Custody Recor	σ	TestAmerica
BSU Kiverside Parkway					THE LEADER IN ENVIRONMENTAL TESTING
West Sacramento, CA 95605 phone 916.373.5600 fax	Regulatory Program: 「	DW NPDES	RCRA Cother: None		TestAmerica Laboratories, Inc.
Client Contact	Project Manager: Julie Keene	S I	ite Contact: Swy	Date: 11/9/2015	COC No.
Shannon & Wilson, Inc.	Tel/Fax: 907-478-3144 44		ab Contact:	Carrier: Fed Ex	1 of 1 COCs
2355 Hill Road	Analysis Turnaround	d Time			Sampter: SWH
Fairbanks, AK 99709		VORKING DAYS			For Lab Use Only:
(907) 458-3144 Phone	TAT If different from Below		u :s		Walk-in Client:
(907) 479-5691 FAX	Z weeks	<u>\ N</u>	(bue:		Lab Sampling:
Project Name: City of Fairbanks Fire Training Area	1 week	<u>1 A .</u>	)22 (		
Site: IGSA Irrigation Wells	2 days	/ <b>ə</b> lc	00-C		Job / SDG No.:
PO# 21-1-11255-023	1 day		)7-S		
Sample Identification	Sample Time Cacomp.	Matrix Cont.	Perform (V		Sample Specific Notes:
Pump #1, Field #3	11/6/2015 1732 Grab	GW 2 h	1 <mark>//</mark> 2		iron-rich wher (eventedon)
Pag					
e 1					
5 of					
16					
		نىنىغىرى ھۆلەر يېرىكى - مەرىپ <u>مەنىلى كەرىمى</u> مەرىپىدىرى ھۆلەر يېرىكى - مەرىپ مەنىلى كەرىپى		320-15867 Chair	n of Custody
La statistica de			l Samolo Dienosal / A fao may	ha acceccad if camplec are retai	ired (ander then 1 month)
Possible nazaro identification: Are any samples from a listed EPA Hazardous Waste? Pleas Comments Section if the lab is to dispose of the sample.	e List any EPA Waste Codes for the	sample in the			
Non-Hazard Elammable Skin Irritant	Polson B Ur	nwomi	Return to Client	🕻 Disposal by Lab	e for Months
Special Instructions/QC Requirements & Comments:					
Clistody Seals Intact	Custody Seal No.:		Cooler Temp. ("C): (	Obs'd. 2.0 Corr'd: 2.0	Therm ID No.: 1
Relinquished by:	Company: Shannon & Wilson, Inc.	Date/Time;	Received by	Company	
Relinquished by:	Company:	Date/Time:	Reglived by:	Company:	Date/Time:
16/7					
Relinquished by:	Company:	Date/Time:	Received in Laboratory by	Company:	Date/Time:
				Form No.	CA-C-WI-002, Rev. 4.3, dated 12/05/2013
			1 1 1		
		<b>5</b>	1 2 3 4	7 7 9	

Client: Shannon & Wilson

#### Login Number: 15867 List Number: 1 Creator: Nelson, Kym D

Question	Answer	Comment
Radioactivity wasn't checked or is = background as measured by a survey meter.</td <td>True</td> <td></td>	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?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	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	

Job Number: 320-15867-1

SDG Number: IGSA Irrigation Wells

List Source: TestAmerica Sacramento

## **Laboratory Data Review Checklist**

Completed by:	Julie Keener, P.E.
Title:	Senior EngineerDate:November 17, 2015
CS Report Name	Burn Pit Off-Site Well Sampling Report Date: November 16, 2015
Consultant Firm:	Shannon & Wilson, Inc.
Laboratory Name	e: TestAmerica, Inc. Laboratory Report Number: 15867
ADEC File Num	ber: 102.38.182 ADEC RecKey Number:
1. <u>Laboratory</u> a. Did an	n ADEC CS approved laboratory receive and <u>perform</u> all of the submitted sample analyses? Yes No NA (Please explain.) Comments:
ADEC	has not approved an analytical laboratory for this analysis.
b. If the labora	samples were transferred to another "network" laboratory or sub-contracted to an alternate atory, was the laboratory performing the analyses ADEC CS approved? Yes No NA (Please explain.) Comments:
Analyse	es were performed by TestAmerica, Inc. in Folsom, California.
2. <u>Chain of Cus</u> a. COC	tody (COC) information completed, signed, and dated (including released/received by)? Yes No NA (Please explain.) Comments:
b. Corre	ct analyses requested? Yes No NA (Please explain.) Comments:
3. <u>Laboratory S</u> a. Samp	ample Receipt Documentationle/cooler temperature documented and within range at receipt $(4^\circ \pm 2^\circ C)$ ?YesNoNoNA (Please explain.)Comments:

The temperature blank or cooler was measured within the acceptable temperature range of 0  $^{\circ}$ C to 6  $^{\circ}$ C upon receipt at the laboratory, as specified in the EPA publication SW-846. This range has been approved by ADEC.

b. Sample preservation acceptable – acidified waters, N Volatile Chlorinated Solvents, etc.)?	Methanol preserved VOC soil (GRO, BTEX,
$\square$ Yes $\square$ No $\square$ NA (Please explain.)	Comments:
No preservative was required.	
<ul> <li>c. Sample condition documented – broken, leaking (M ∑Yes  No  NA (Please explain.)</li> </ul>	ethanol), zero headspace (VOC vials)? Comments:
The sample-receipt form notes that the samples were r	received in good condition.
d. If there were any discrepancies, were they document containers/preservation, sample temperature outside samples, etc.?	ted? For example, incorrect sample of acceptable range, insufficient or missing
$\Box$ Yes $\Box$ No $\boxtimes$ NA (Please explain.)	Comments:
There were no discrepancies.	
e. Data quality or usability affected? (Please explain.)	Comments:
No, the data quality and usability were not affected.	
Case Narrative a. Present and understandable? Yes No NA (Please explain.)	Comments:
<ul> <li>b. Discrepancies, errors or QC failures identified by the ☐Yes ☐ No ⊠NA (Please explain.)</li> </ul>	e lab? Comments:
No discrepancies, errors, or QC failures were noted by	/ the laboratory.
c. Were all corrective actions documented? ☐Yes ☐ No ⊠NA (Please explain.)	Comments:
No corrective action was required.	
d. What is the effect on data quality/usability according	g to the case narrative? Comments:
There was no effect on data quality or usability.	
Samples Results a. Correct analyses performed/reported as requested or Yes No NA (Please explain.)	n COC? Comments:

5.

4.

b. All applicabl	e holding times met? ] No	Comments:
c. All soils repo	rted on a dry weight basis? ] No ⊠NA (Please explain.)	Comments:
No soil sample	s were submitted.	
d. Are the repor project?	ted PQLs less than the Cleanup Lev	vel or the minimum required detection level for th
Yes [	] No NA (Please explain.)	Comments:
PFOS and PFO levels.	A reporting limits are less than app	licable ADEC proposed groundwater cleanup
e. Data quality	or usability affected?	Comments:
The data qualit	y and usability were not affected.	
. <u>QC Samples</u> a. Method Blan i. One r ⊠Yes [	k hethod blank reported per matrix, a ] No □NA (Please explain.)	nalysis and 20 samples? Comments:
ii. All m ⊠Yes [	ethod blank results less than PQL? ] No  MA (Please explain.)	Comments:
PFHxA, PFUn. than their PQLs concentration g	A and PFHxS were detected in the r (reporting limits, or RLs), and PFT reater than its RL.	method blank at estimated concentrations less CeA was detected in the method blank at a
iii. If abo	ve PQL, what samples are affected	?
Sample "Pump perfluorinated c method-blank d	#1, Field #3" was associated with t ompounds. The results for analytes etections because they were present	he method blank containing detectable PFHxA and PFHxS were unaffected by the t at concentrations at least 10-fold greater than

The results for analytes PFUnA and PFTeA in sample "Pump #1, Field #3" were affected because they were present at concentrations within a factor of five of the method-blank concentrations. The PFUnA and PFTeA concentrations in this sample will be flagged "B\*" and considered not detected at the RL for these analytes.

#### Comments:

iv. Do the affected sample(s) have data flags and if so, are the data flags clearly defined?  $\forall$  Yes  $\Box$  No  $\Box$ NA (Please explain.) Comments:

The PFUnA and PFTeA concentrations sample "Pump #1, Field #3" will be flagged "B\*" and considered not detected at the RL for these analytes.

v. Data quality or usability affected? (Please explain.)

Comments:

Yes; see above.

- 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 □NA (Please explain.) Comments:

LCS sample results were reported.

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

 $\Box$ Yes  $\Box$  No  $\boxtimes$ NA (Please explain.)

Comments:

Metals/inorganics were not analyzed in this sample set.

- 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 □NA (Please explain.)
- - 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 NA (Please explain.)

Duplicate field samples were analyzed for this project (in another work order), but there were no LCS/LCSD or MS/MSD duplicate analyses conducted. The field-duplicate RPD was within acceptable limits.

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

No samples were affected. The recoveries and RPDs were within acceptable limits.

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?  $\Box$  Yes  $\Box$  No  $\bigotimes$ NA (Please explain.) Comments:

The data were not affected and did not require flags.

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? Xes No NA (Please explain.) Comments:

The analytical method used isotopic dilution, which entails adding a 13C-isotope of each target analyte and assessing the recovery of each analyte; the isotopically labeled compounds are the 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)

 $\forall$ Yes  $\Box$  No  $\Box$ NA (Please explain.)

Comments:

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

 $\Box$ Yes  $\Box$  No  $\boxtimes$ NA (Please explain.)

Comments:

The data did not require flags.

iv. Data quality or usability affected? (Use the comment box to explain.) Comments:

The data quality and usability were not affected.

- d. Trip blank Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): <u>Water and</u> <u>Soil</u>
  - i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples? (If not, enter explanation below.)
     Yes No XNA (Please explain.)
     Comments:

comments.

PFCs are not volatile compounds and therefore a trip blank is not required.

ii. Is the cooler used to transport the trip blank at (If not, a comment explaining why must be er	nd VOA samples clearly indicated on the COC?
$\square$ Yes $\square$ No $\square$ NA (Please explain.)	Comments:
No trip blank was submitted.	
iii. All results less than PQL? □Yes □ No ⊠NA (Please explain.)	Comments:
No trip blank was submitted.	
iv. If above PQL, what samples are affected?	Comments:
No trip blank was submitted.	
v. Data quality or usability affected? (Please exp	plain.) Comments:
Data quality and usability are not affected.	
e. Field Duplicate	
i. One field duplicate submitted per matrix, anal ∑Yes □ No □NA (Please explain.)	lysis and 10 project samples? Comments:
A field duplicate was submitted in the previous sample	e set, work order 15805.
ii. Submitted blind to lab? □Yes □ No ⊠NA (Please explain.)	Comments:
A field duplicate was not included with this work order	r.
<ul><li>iii. Precision – All relative percent differences (R</li><li>(Recommended: 30% water, 50% soil)</li></ul>	RPD) less than specified DQOs?
RPD (%) = Absolute value of: $(R_1-R_2)$	x 100
$((R_1+R_2)/2)$	
Where $R_1 =$ Sample Concentration $R_2 =$ Field Duplicate Concentration $\Box$ Yes $\Box$ No $\Box$ NA (Please explain.)	n Comments:
A field duplicate was not submitted with this work orde	er.

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

Comments:

	Comments.
	Data quality and usability are not affected.
	f. Decontamination or Equipment Blank (If not used explain why).
Г	$\Box$ Yes $\boxtimes$ No $\Box$ NA (Please explain.)Comments:
	Previous results from other projects have shown our decontamination methods to be sufficient to prevent cross-contamination
ļ	
	i. All results less than PQL?
	$  Yes \square No \square NA (Please explain.) $ Comments:
	An equipment blank was not submitted for this project.
	ii. If above PQL, what samples are affected?
	Comments:
	N/A; an equipment blank was not submitted for this project.
	iii Data quality og ugahility offagtad2 (Dlagge avgleig)
	m. Data quanty or usability affected? (Please explain.)
	PFC-contaminated site.
Dth	er Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)
	a. Defined and appropriate?

## RESULTS OF OFF-SITE WELL SAMPLING QUALITY ASSURANCE/QUALITY CONTROL SUMMARY

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 also conducted our own QA assessment for this project. We reviewed the chain-of-custody (COC) records and laboratory-receipt forms to check that custody was not breached, sample holding-times were met, and the samples were kept properly chilled (between 0 °C and 6 °C) during shipping. 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 applies the letter 'J' to a detection less than the limit of quantitation (LOQ) but greater than the detection limit (DL); this "flagged" datum is considered an estimated concentration. We reviewed the data using the current ADEC Laboratory Data Review Checklist and applied a standardized set of flags to any data brought into question during the review.

Laboratory QC procedures included evaluating surrogate recovery, performing continuing calibration checks, analyzing method blanks, and checking laboratory control samples (LCSs) to assess accuracy. An LCS duplicate was not analyzed. The laboratory report indicated there was insufficient volume available to perform a matrix spike/matrix spike duplicate analysis associated with these work orders, so there was no measurement of laboratory analytical precision.

We reviewed analytical results reported by TestAmerica in work orders 320-15805-1 and 320-15867-1. The laboratory reports and associated ADEC data-review checklists are attached to this report. The following is a summary of our QA/QC review.

## Sample Handling

The temperature blanks and cooler temperatures were within the recommended range of 0  $^{\circ}$ C to 6  $^{\circ}$ C upon receipt of samples at TestAmerica in California. The samples were in good condition upon receipt at the laboratory. There were no sample-handling anomalies.

## **Analytical Sensitivity**

The reporting limits for PFOS and PFOA were less than the ADEC proposed groundwater-

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cleanup levels and the EPA provisional health advisories. There are no regulatory levels for the other PFC analytes.

Laboratory method blanks (MBs) were analyzed in association with samples collected for this project to check for contributions to the analytical results possibly attributable to laboratory-based contamination.

Perfluorohexanoic acid (PFHxA), perfluoroundecanoic acid (PFUnA), and perfluorohexane sulfonate (PFHxS) were detected in the method blank at estimated concentrations less than their reporting limits (RLs), and perfluorotetradecanoic acid (PFTeA) was detected in the method blank at a concentration greater than its RL.

Samples *MW-507-45*, *MW-607-45* and *Pump #1*, *Field #3* were associated with the method blank containing detectable perfluorinated compounds. The results for analytes PFHxA and PFHxS in these samples were unaffected by the method-blank detections because they were present at concentrations at least 10-fold greater than the method-blank concentrations. The results for analytes PFUnA and PFTeA in samples *MW-507-45*, *MW-607-45* and *Pump #1*, *Field #3* were affected because they were present at concentrations within a factor of five of the method-blank concentrations. The PFUnA and PFTeA concentrations in these samples will be flagged with a "B\*" and considered not detected at the RL for these analytes.

There were no trip blanks required for the PFC sample set submitted to TestAmerica, as no volatile analytes were measured.

Overall, analytical sensitivity was sufficient for the purposes of this investigation.

## Accuracy

The laboratory assessed the accuracy of their analytical procedure through use of the isotope dilution method, which entails adding a <sup>13</sup>C-isotope of each target analyte and assessing the recovery of each analyte; the isotopically labeled compounds serve as the surrogate compounds for this method. The laboratory also analyzed a laboratory control sample (LCS) for each work order.

The <sup>13</sup>C-isotope recoveries for each compound were within the analytical control limits, as were the LCS recoveries, indicating the analytical results are accurate. As noted previously, there was insufficient volume available to perform a matrix-spike analysis.

Overall, the data for this project are considered to be accurate, and are usable as qualified.

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## Precision

As noted previously, there was insufficient volume available to perform a matrix-spike (MS) or MS duplicate analysis. We collected one set of duplicate samples to evaluate the precision of analytical measurements and the reproducibility of our sampling technique. The duplicate-sample set was *MW-507-45* and *MW-607-45*. To evaluate precision of the data, we calculated the relative percent difference (RPD; the difference between the sample and its field duplicate divided by the mean of the two); RPD can be evaluated only if the results of the analysis for both the sample and its duplicate exceed the method-detection limits. The field-duplicate RPD was within acceptable limits, indicating the analytical results were precise.

## **Data Quality Summary**

By working in accordance with our proposed scope of services, the samples we collected are considered to be representative of site conditions at the locations and times they were obtained. Based on our QA review, no samples were rejected as unusable due to QC failures, and our completeness goal of obtaining 85 percent useable data was met. In general, the quality of the analytical data for this project does not appear to have been compromised by analytical irregularities. The data are considered usable as qualified for the purposes of this project.

The laboratory reports for the project's samples, including the case narratives describing the laboratory QA results in detail, are included with the ADEC laboratory-review checklists as attachments to this report.



Attachment to and part of Report: 31-1-11735-003

Date: December 15, 2015

To:	Mr. Jackson Fox, City of Fairbanks
Re:	Off-Site Well Sampling, City of Fairbanks Regional Fire Training Center Burn Pit, Fairbanks, Alaska

## 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 estimation 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