Pace Analytical®
National Center for Testing & Innovation

ANALYTICAL REPORT

May 24, 2019

1 Cp
2 Tc
3 Ss
4 Cn
5 Tr
6 Gl
7 Al
8 Sc

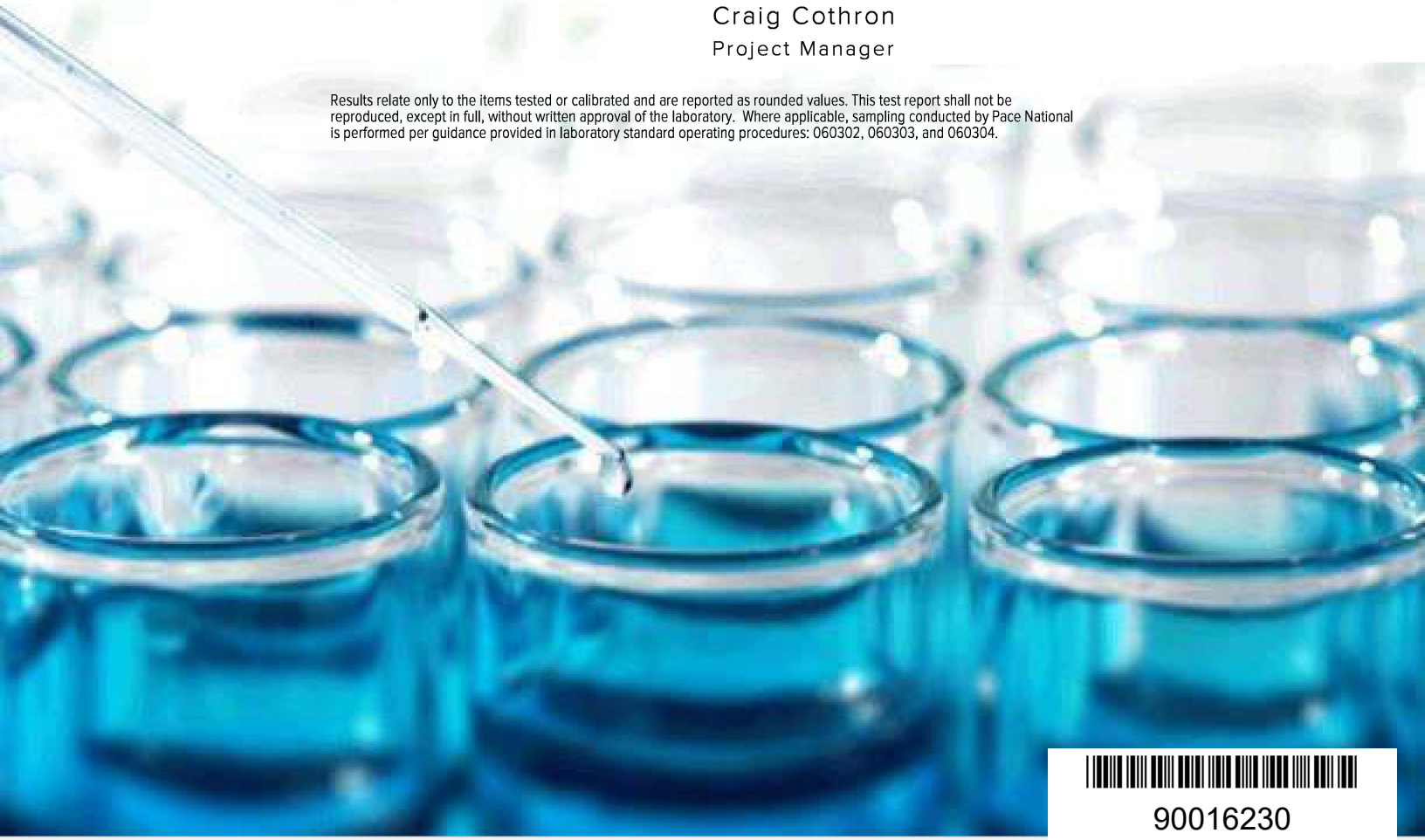
Cardno - Newark, DE

Sample Delivery Group:	L1093437
Samples Received:	04/28/2019
Project Number:	
Description:	
Report To:	Art Saunders 121 Continental Drive Suite 308 Newark, DE 19713

Entire Report Reviewed By:

Craig Cothron
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace National is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.



90016230

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ONE LAB. NATIONWIDE.

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WW-20190427-002- DAY 3 L1093437-01 GW

Collected by	Collected date/time	Received date/time
Katelyn McStrauog	04/27/19 12:30	04/28/19 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Subcontracted Analyses	WG1273334	1	05/22/19 00:00	05/22/19 00:00	CBM	Minneapolis, MN 55414

1 Cp
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All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Craig Cothron
Project Manager

Project Narrative

L1093437 -01 contains subout data that is included after the chain of custody.

This data package consists of this signature page, the laboratory review checklist, and the following reportable data as applicable:

R1 - Field chain-of-custody documentation;

R2 - Sample identification cross-reference;

R3 - Test reports (analytical data sheets) for each environmental sample that includes:

a. Items consistent with NELAC Chapter 5,

b. dilution factors,

c. preparation methods,

d. cleanup methods, and

e. if required for the project, tentatively identified compounds (TICs).

R4 - Surrogate recovery data including:

a. Calculated recovery (%R), and

b. The laboratory's surrogate QC limits.

R5 - Test reports/summary forms for blank samples;

R6 - Test reports/summary forms for laboratory control samples (LCSs) including:

a. LCS spiking amounts,

b. Calculated %R for each analyte, and

c. The laboratory's LCS QC limits.

R7 - Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:

a. Samples associated with the MS/MSD clearly identified,

b. MS/MSD spiking amounts,

c. Concentration of each MS/MSD analyte measured in the parent and spiked samples,

d. Calculated %Rs and relative percent differences (RPDs), and

e. The laboratory's MS/MSD QC limits

R8 - Laboratory analytical duplicate (if applicable) recovery and precision:

a. The amount of analyte measured in the duplicate,

b. The calculated RPD, and

c. The laboratory's QC limits for analytical duplicates.

R9 - List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix.

R10 - Other problems or anomalies.

Release Statement: I am responsible for the release of this laboratory data package. This laboratory is NELAC accredited under the Texas Laboratory Accreditation Program for all the methods, analytes, and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the Exception Reports. By my signature below, I affirm to the best of my knowledge all problems/anomalies observed by the laboratory have been identified in the Laboratory Review Checklist, and no information affecting the quality of the data has been knowingly withheld.

Craig Cothron

Project Manager

1 Cp
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3 Ss
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Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Abbreviations and Definitions

SDG	Sample Delivery Group.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description

The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.

ACCREDITATIONS & LOCATIONS

Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.
* Not all certifications held by the laboratory are applicable to the results reported in the attached report.
* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico [1]	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina [1]	DW21704
Georgia	NELAP	North Carolina [3]	41
Georgia [1]	923	North Dakota	R-140
Idaho	TN00003	Ohio–VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LAO00356
Kentucky [1 6]	90010	South Carolina	84004
Kentucky [2]	16	South Dakota	n/a
Louisiana	AI30792	Tennessee [1 4]	2006
Louisiana [1]	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas [5]	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.

Cardno - Newark, DE

121 Continental Drive Suite 308
Newark, DE 19713

Billing Information:
Accounts Payable
121 Continental Drive Suite 308
Newark, DE 19713

Report to: Art Saunders

Email To: Art.Saunders@cardno.com

Project Description:

City/State Collected:

Phone: 610-220-3957
Fax:

Client Project #

Lab Project # CARDNONDE-ITC

Collected by (print): Katelyn McStravog

Site/Facility ID #

P.O. #

Collected by (signature):

Immediately Packed on Ice N ___ Y X

Rush? (Lab MUST Be Notified)
___ Same Day ___ Five Day
___ Next Day ___ 5 Day (Rad Only)
___ Two Day ___ 10 Day (Rad Only)
___ Three Day

Quote #

Date Results Needed

Pres Chk

Analysis / Container / Preservative

Chain of Custody Page 1 of 2

Pace Analytical® National Center for Testing & Innovation
12065 Lebanon Rd
Mount Juliet, TN 37122
Phone: 615-758-5858
Phone: 800-767-5859
Fax: 615-758-5859

L# 1093437
Table #
Acctnum: CARDNONDE
Template: T149278
Prelogin: P704877
TSR: 034 - Craig Cothron
PB:
Shipped Via:

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	~~Extra Volume 40mlAmb-NoPres~~ Dioxin/Furans 5270/1613	Metals 250mlHDPE-HNO3	OGHEX 1L-Clr-Add HCl	PFAS/PFOS- Sub 1L-HDPE-NoPres	SV8151 1L-Amb-No Pres	~~SV8290 1L-Amb-NoPres~~	Sulfide 125mlAmb-S-NaOH+ZnAc	TOC 250mlAmb-HCl	TSS 1L-HDPE-NoPres	Total Cyanide 250mlHDPEAmb-NaOH	Remarks	Sample # (lab only)
		GW				36	X	X	X	X	X	X	X	X	X	X		
WW-20190427-002-Day3	Comp	WW	—	04/27/19	1230		X	X		X	X		X	X	X			01
WW20190427-002-Day3	Grab	WW	—	04/27/19	1230				X							X		

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other_____

Remarks:

pH _____ Temp _____
Flow _____ Other _____

Samples returned via: __ UPS __ FedEx X Courier _____

Tracking #

Sample Receipt Checklist
COC Seal Present/Intact: NP Y N
COC Signed/Accurate: Y N
Bottles arrive intact: Y N
Correct bottles used: Y N
Sufficient volume sent: Y N
If Applicable
VOA Zero Headspace: Y N
Preservation Correct/Checked: Y N

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Trip Blank Received: Yes / No HCL / MeoH TBR
	4/27/19	16:15		
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Temp: 4.4 °C 1.1+.1=1.2 Bottles Received: 36
	4/27/19	20:00		
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: 4/28/19 Time: 6900

If preservation required by Login: Date/Time

Hold:

Condition: NCF / OK

Pace Analytical Services, LLC.
1700 Elm Street
Minneapolis, MN 55414
Phone: 612.607.1700
Fax: 612.607.6444

www.pacelabs.com

Report Prepared for:

Benita Miller
Pace Analytical National
12065 Lebanon Road
Mount Juliet TN 37122

REPORT OF LABORATORY ANALYSIS FOR PCDD/PCDF

Report Prepared Date:
May 10, 2019

Report Information:

Pace Project #: 10472824
Sample Receipt Date: 04/30/2019
Client Project #: L1093437: WG1273334
Client Sub PO #: L1093437
State Cert #: T104704192

Invoicing & Reporting Options:

The report provided has been invoiced as a Level 3 PCDD/PCDF Report. If an upgrade of this report package is requested, an additional charge may be applied.

Please review the attached invoice for accuracy and forward any questions to Nathan Boberg, your Pace Project Manager.

This report has been reviewed by:

May 10, 2019
Nathan Boberg, Project Manager
612-360-0728
(612) 607-6444 (fax)
nathan.boberg@pacelabs.com

Report of Laboratory Analysis

This report should not be reproduced, except in full, without the written consent of Pace Analytical Services, Inc.

The results relate only to the samples included in this report.

Pace Analytical Services, LLC.
1700 Elm Street
Minneapolis, MN 55414
Phone: 612.607.1700
Fax: 612.607.6444

DISCUSSION

This report presents the results from the analysis performed on one sample submitted by a representative of Pace Analytical National. The sample was analyzed for the presence or absence of polychlorodibenzo-p-dioxins (PCDDs) and polychlorodibenzofurans (PCDFs) using USEPA Method 1613B. The reporting limits were based on signal-to-noise measurements. Estimated Maximum Possible Concentration (EMPC) values were treated as positives in the toxic equivalence calculations.

The recoveries of the isotopically-labeled PCDD/PCDF internal standards in the sample extract ranged from 59-79%. All of the labeled standard recoveries obtained for this project were within the target ranges specified in Method 1613B. Also, since the quantification of the native 2,3,7,8-substituted congeners was based on isotope dilution, the data were automatically corrected for recovery and accurate values were obtained.

Values were flagged "I" where incorrect isotope ratios were obtained. Concentrations below the calibration range were flagged "J" and should be regarded as estimates.

A laboratory method blank was prepared and analyzed with the sample batch as part of our routine quality control procedures. The results show that PCDDs and PCDFs were not detected.

Laboratory spike samples were also prepared with the sample batch using clean reference matrix that had been fortified with native standard materials. The results show that the spiked native compounds were recovered at 97-122% with relative percent differences of 0.9-11.3%. These results were within the target ranges for the method. Matrix spikes were not prepared with the sample batch.

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Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Minnesota Laboratory Certifications

Authority	Certificate #	Authority	Certificate #
A2LA	2926.01	Minnesota - Pet	1240
Alabama	40770	Mississippi	MN00064
Alaska - DW	MN00064	Missouri - DW	10100
Alaska - UST	17-009	Montana	CERT0092
Arizona	AZ0014	Nebraska	NE-OS-18-06
Arkansas - DW	MN00064	Nevada	MN00064
Arkansas - WW	88-0680	New Hampshire	2081
CNMI Saipan	MP0003	New Jersey (NE	MN002
California	2929	New York	11647
Colorado	MN00064	North Carolina	27700
Connecticut	PH-0256	North Carolina -	27700
EPA Region 8+	via MN 027-053	North Carolina -	530
Florida (NELAP	E87605	North Dakota	R-036
Georgia	959	Ohio - DW	41244
Guam	17-001r	Ohio - VAP	CL101
Hawaii	MN00064	Oklahoma	9507
Idaho	MN00064	Oregon - Primar	MN300001
Illinois	200011	Oregon - Secon	MN200001
Indiana	C-MN-01	Pennsylvania	68-00563
Iowa	368	Puerto Rico	MN00064
Kansas	E-10167	South Carolina	74003
Kentucky - DW	90062	South Dakota	NA
Kentucky - WW	90062	Tennessee	TN02818
Louisiana - DE	03086	Texas	T104704192
Louisiana - DW	MN00064	Utah (NELAP)	MN00064
Maine	MN00064	Virginia	460163
Maryland	322	Washington	C486
Massachusetts	M-MN064	West Virginia -	382
Michigan	9909	West Virginia -	9952C
Minnesota	027-053-137	Wisconsin	999407970
Minnesota - De	via MN 027-053	Wyoming - UST	2926.01

REPORT OF LABORATORY ANALYSIS

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Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Reporting Flags

A = Reporting Limit based on signal to noise

B = Less than 10x higher than method blank level

C = Result obtained from confirmation analysis

D = Result obtained from analysis of diluted sample

E = Exceeds calibration range

I = Interferencepresent

J = Estimated value

L = Suppressive interference, analyte may be biased low

Nn = Value obtained from additional analysis

P = PCDEInterference

R = Recovery outside target range

S = Peak saturated

U = Analyte not detected

V = Result verified by confirmation analysis

X = %D Exceeds limits

Y = Calculated using average of daily RFs

* = SeeDiscussion

REPORT OF LABORATORY ANALYSIS

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Appendix A

Sample Management

Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Sample ID Cross Reference

Client Sample ID	Pace Sample ID	Date Received	Sample Type
WW-20190427-002-DAY 3	10472824001	04/30/2019	Water

REPORT OF LABORATORY ANALYSIS

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CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page : 1 Of 1

Section A
Required Client Information:

Company:	Pace Analytical National
Address:	12065 Lebanon Road
	Mount Juliet, TN 37122
Email:	SuboutTeam@pacenational.com
Phone:	(615)773-9756 Fax: (615)758-5859
Requested Due Date:	10-May

Section B
Required Project Information:

Report To:	Pace Analytical National Subout Team
Copy To:	
Purchase Order #:	L1093437
Project Name:	N/A
Project #:	N/A

Section C
Invoice Information:

Attention:	Art Saunders
Company Name:	
Address:	
Pace Quote:	
Pace Project Manager:	Nathan Boberg
Pace Profile #:	38076

Regulatory Agency
State / Location
DE

WO# : 10472824

10472824

SAMPLE ID
One Character per box.
(A-Z, 0-9 / , -)
Sample Ids must be unique

MATRIX	CODE
Drinking Water	DW
Water	WT
Waste Water	WW
Product	P
Soil/Solid	SL
Oil	OL
Wipe	WP
Air	AR
Other	OT
Tissue	TS

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test Y/N	PFAS/PFOS Method 537 & Dioxin/Furans by method 1613 (Requested Analysis Filtered (Y/N))	Residual Chlorine (Y/N)	
1	WW-20190427-002- DAY 3	WT				27-Apr	12:30		4	4									X		ok
2																					
10																					
11																					
12																					

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
	Benita Miller BM	29-Apr	16:46	Pace	4/30/19	850	1.7	Y	Y	Y
Pace Analytical National Batch: WG1273334										
Pace Analytical National SDGs: L1093437										

SAMPLER NAME AND SIGNATURE	
PRINT Name of SAMPLER:	
SIGNATURE of SAMPLER:	DATE Signed:

TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

Pace Analytical	Document Name: **Sample Condition Upon Receipt Form**	Document Revised: 05Apr2019 Page 1 of 1
	Document No.: **F-MN-L-213-rev.27**	Issuing Authority: Pace Minnesota Quality Office

Sample Condition Upon Receipt

Client Name: Pace National

Project #: **WO# : 10472824**
PM: NB3 **Due Date: 05/14/19**
CLIENT: ESC_TN

Courier: ☑ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Pace ☐ SpeeDee ☐ Commercial **See Exception** ☐

Tracking Number: 4876 1094 9690

Custody Seal on Cooler/Box Present? ☑ Yes ☐ No **Seals Intact?** ☑ Yes ☐ No **Biological Tissue Frozen?** ☐ Yes ☐ No ☑ N/A

Packing Material: ☑ Bubble Wrap ☑ Bubble Bags ☐ None ☐ Other: _____ **Temp Blank?** ☑ Yes ☐ No

Thermometer: ☑ T1(0461) ☐ T2(1336) ☐ T3(0459) ☐ T4(0254) ☐ T5(0048) **Type of Ice:** ☑ Wet ☐ Blue ☐ None ☐ Dry ☐ Melted

Note: Each West Virginia Sample must have temp taken (no temp blanks)

Temp should be above freezing to 6°C **Cooler Temp Read w/temp blank:** 1.7 °C **Average Corrected Temp (no temp blank only):** °C **See Exceptions** ☐

Correction Factor: True **Cooler Temp Corrected w/temp blank:** 1.7 °C

USDA Regulated Soil: (☑ N/A, water sample/Other: _____)
Did samples originate in a quarantine zone within the United States: AL, AR, CA, FL, GA, ID, LA, MS, NC, NM, NY, OK, OR, SC, TN, TX or VA (check maps)? ☐ Yes ☐ No
Did samples originate from a foreign source (internationally, including Hawaii and Puerto Rico)? ☐ Yes ☐ No

Date/Initials of Person Examining Contents: HE 4/30/19

If Yes to either question, fill out a Regulated Soil Checklist (F-MN-Q-338) and include with SCUR/COC paperwork.

				COMMENTS:
Chain of Custody Present and Filled Out?	☑ Yes	☐ No		1.
Chain of Custody Relinquished?	☑ Yes	☐ No		2.
Sampler Name and/or Signature on COC?	☐ Yes	☑ No	☐ N/A	3.
Samples Arrived within Hold Time?	☑ Yes	☐ No		4.
Short Hold Time Analysis (<72 hr)?	☐ Yes	☑ No		5. ☐ Fecal Coliform ☐ HPC ☐ Total Coliform/E coli ☐ BOD/cBOD ☐ Hex Chrome ☐ Turbidity ☐ Nitrate ☐ Nitrite ☐ Orthophos ☐ Other_____
Rush Turn Around Time Requested?	☐ Yes	☑ No		6.
Sufficient Volume?	☑ Yes	☐ No		7.
Correct Containers Used?	☑ Yes	☐ No		8.
-Pace Containers Used?	☑ Yes	☐ No		
Containers Intact?	☑ Yes	☐ No		9.
Field Filtered Volume Received for Dissolved Tests?	☐ Yes	☐ No	☑ N/A	10. Is sediment visible in the dissolved container? ☐ Yes ☐ No
Is sufficient information available to reconcile the samples to the COC?	☑ Yes	☐ No		11. If no, write ID/ Date/Time on Container Below: **See Exception** ☐
Matrix: ☑ Water ☐ Soil ☐ Oil ☐ Other_____				
All containers needing acid/base preservation have been checked?	☐ Yes	☐ No	☑ N/A	12. Sample #
All containers needing preservation are found to be in compliance with EPA recommendation? (HNO_3, H_2SO_4, <2pH, NaOH >9 Sulfide, NaOH>12 Cyanide)	☐ Yes	☐ No	☑ N/A	☐ NaOH ☐ HNO_3 ☐ H_2SO_4 ☐ Zinc Acetate
Exceptions: VOA, Coliform, TOC/DOC Oil and Grease, DRO/8015 (water) and Dioxin/PFAS	☐ Yes	☐ No	☑ N/A	Positive for Res. Chlorine? ☐ Yes ☐ No **pH Paper Lot#** **See Exception** ☐
				Res. Chlorine: 0-6 Roll: 0-6 Strip: 0-14 Strip:
Headspace in VOA Vials (greater than 6mm)?	☐ Yes	☐ No	☑ N/A	13. **See Exception** ☐
Trip Blank Present?	☐ Yes	☐ No	☑ N/A	14.
Trip Blank Custody Seals Present?	☐ Yes	☐ No	☑ N/A	Pace Trip Blank Lot # (if purchased): _____

CLIENT NOTIFICATION/RESOLUTION **Field Data Required?** ☐ Yes ☐ No

Person Contacted: _____ Date/Time: _____

Comments/Resolution: Samples collected in Texas.

Project Manager Review: Kristen Hopkins **Date:** 5/1/2019

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers).

Labeled by: HH

Appendix B

Sample Analysis Summary

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Method 1613B Sample Analysis Results

Client - Pace Analytical National

Client's Sample ID	WW-20190427-002-DAY 3		
Lab Sample ID	10472824001		
Filename	Y190509A_11		
Injected By	SMT		
Total Amount Extracted	966 mL	Matrix	Water
% Moisture	NA	Dilution	NA
Dry Weight Extracted	NA	Collected	04/27/2019 12:30
ICAL ID	Y190424	Received	04/30/2019 08:50
CCal Filename(s)	Y190509A_01	Extracted	05/06/2019 12:20
Method Blank ID	BLANK-70325	Analyzed	05/09/2019 15:29

Native Isomers	Conc pg/L	EMPC pg/L	EDL pg/L	Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	ND	-----	2.8	2,3,7,8-TCDF-13C	2.00	65
Total TCDF	ND	-----	2.8	2,3,7,8-TCDD-13C	2.00	67
				1,2,3,7,8-PeCDF-13C	2.00	61
2,3,7,8-TCDD	ND	-----	1.3	2,3,4,7,8-PeCDF-13C	2.00	59
Total TCDD	ND	-----	1.3	1,2,3,7,8-PeCDD-13C	2.00	67
				1,2,3,4,7,8-HxCDF-13C	2.00	67
1,2,3,7,8-PeCDF	ND	-----	1.8	1,2,3,6,7,8-HxCDF-13C	2.00	68
2,3,4,7,8-PeCDF	ND	-----	2.6	2,3,4,6,7,8-HxCDF-13C	2.00	71
Total PeCDF	ND	-----	2.2	1,2,3,7,8,9-HxCDF-13C	2.00	71
				1,2,3,4,7,8-HxCDD-13C	2.00	66
1,2,3,7,8-PeCDD	ND	-----	3.1	1,2,3,6,7,8-HxCDD-13C	2.00	63
Total PeCDD	ND	-----	3.1	1,2,3,4,6,7,8-HpCDF-13C	2.00	74
				1,2,3,4,7,8,9-HpCDF-13C	2.00	71
1,2,3,4,7,8-HxCDF	ND	-----	3.9	1,2,3,4,6,7,8-HpCDD-13C	2.00	79
1,2,3,6,7,8-HxCDF	ND	-----	5.3	OCDD-13C	4.00	65
2,3,4,6,7,8-HxCDF	ND	-----	2.1			
1,2,3,7,8,9-HxCDF	ND	-----	2.0	1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF	ND	-----	3.3	1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	ND	-----	2.7	2,3,7,8-TCDD-37Cl4	0.20	84
1,2,3,6,7,8-HxCDD	ND	-----	2.6			
1,2,3,7,8,9-HxCDD	ND	-----	2.5			
Total HxCDD	ND	-----	2.6			
1,2,3,4,6,7,8-HpCDF	ND	-----	1.8	Total 2,3,7,8-TCDD		
1,2,3,4,7,8,9-HpCDF	ND	-----	1.8	Equivalence: 0.00 pg/L		
Total HpCDF	ND	-----	1.8	(Lower-bound - Using 2005 WHO Factors)		
1,2,3,4,6,7,8-HpCDD	ND	-----	1.6			
Total HpCDD	ND	-----	1.6			
OCDF	ND	-----	2.4			
OCDD	ND	-----	3.3			

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).
EMPC = Estimated Maximum Possible Concentration
EDL = Estimated Detection Limit

ND = Not Detected
NA = Not Applicable
NC = Not Calculated

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Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

2,3,7,8-TCDD Toxic Equivalency (TEQ) Calculations

Pace Analytical National

Client's Sample ID	WW-20190427-002-DAY 3		
Lab Sample ID	10472824001		
Filename	Y190509A_11		
Injected By	SMT		
Total Amount Extracted	966 mL	Matrix	Water
% Moisture	NA	Dilution	NA
Dry Weight Extracted	NA	Collected	04/27/2019 12:30
ICAL ID	Y190424	Received	04/30/2019 08:50
CCal Filename(s)	Y190509A_01	Extracted	05/06/2019 12:20
Method Blank ID	BLANK-70325	Analyzed	05/09/2019 15:29

Parameter	Conc pg/L	RL pg/L	WHO2005	LB	MB	UB
2,3,7,8-TCDF	ND	2.8	0.10000	0.0000	0.1377	0.2753
Total TCDF	ND	2.8	0.00000	0.0000	0.0000	0.0000
2,3,7,8-TCDD	ND	1.3	1.00000	0.0000	0.6512	1.3024
Total TCDD	ND	1.3	0.00000	0.0000	0.0000	0.0000
1,2,3,7,8-PeCDF	ND	1.8	0.03000	0.0000	0.0265	0.0530
2,3,4,7,8-PeCDF	ND	2.6	0.30000	0.0000	0.3841	0.7682
Total PeCDF	ND	2.2	0.00000	0.0000	0.0000	0.0000
1,2,3,7,8-PeCDD	ND	3.1	1.00000	0.0000	1.5320	3.0639
Total PeCDD	ND	3.1	0.00000	0.0000	0.0000	0.0000
1,2,3,4,7,8-HxCDF	ND	3.9	0.10000	0.0000	0.1975	0.3949
1,2,3,6,7,8-HxCDF	ND	5.3	0.10000	0.0000	0.2635	0.5270
2,3,4,6,7,8-HxCDF	ND	2.1	0.10000	0.0000	0.1040	0.2080
1,2,3,7,8,9-HxCDF	ND	2.0	0.10000	0.0000	0.0979	0.1957
Total HxCDF	ND	3.3	0.00000	0.0000	0.0000	0.0000
1,2,3,4,7,8-HxCDD	ND	2.7	0.10000	0.0000	0.1331	0.2661
1,2,3,6,7,8-HxCDD	ND	2.6	0.10000	0.0000	0.1304	0.2607
1,2,3,7,8,9-HxCDD	ND	2.5	0.10000	0.0000	0.1249	0.2499
Total HxCDD	ND	2.6	0.00000	0.0000	0.0000	0.0000
1,2,3,4,6,7,8-HpCDF	ND	1.8	0.01000	0.0000	0.0091	0.0183
1,2,3,4,7,8,9-HpCDF	ND	1.8	0.01000	0.0000	0.0088	0.0175
Total HpCDF	ND	1.8	0.00000	0.0000	0.0000	0.0000
1,2,3,4,6,7,8-HpCDD	ND	1.6	0.01000	0.0000	0.0081	0.0163
Total HpCDD	ND	1.6	0.00000	0.0000	0.0000	0.0000
OCDF	ND	2.4	0.00030	0.0000	0.0004	0.0007
OCDD	ND	3.3	0.00030	0.0000	0.0005	0.0010
				0.00 pg/L	**3.8 pg/L**	**7.6 pg/L**

Final values are valid to only 2 significant figures
TEQs for Totals classes include contributions from non 2,3,7,8 isomers only
LB = Lower Bound, Where "ND", TEQ Conc = 0
MB = Medium Bound, Where "ND", TEQ Conc = (LOD/2) * (TEF Factor)
UB = Upper Bound, Where "ND", TEQ Conc = LOD * (TEF Factor)
RL = Reporting Limit

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Appendix C

QC and Calibration Results Summary

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
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Method 1613B Blank Analysis Results

Lab Sample Name	DFBLKTA		
Lab Sample ID	BLANK-70325	Matrix	Water
Filename	F190509A_04	Dilution	NA
Total Amount Extracted	980 mL	Extracted	05/06/2019 12:20
ICAL ID	F190508	Analyzed	05/09/2019 07:15
CCal Filename(s)	F190508B_19	Injected By	SMT

Native Isomers	Conc pg/L	EMPC pg/L	EDL pg/L		Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	ND	-----	0.47		2,3,7,8-TCDF-13C	2.00	75
Total TCDF	ND	-----	0.47		2,3,7,8-TCDD-13C	2.00	76
					1,2,3,7,8-PeCDF-13C	2.00	75
2,3,7,8-TCDD	ND	-----	1.3		2,3,4,7,8-PeCDF-13C	2.00	75
Total TCDD	ND	-----	1.3		1,2,3,7,8-PeCDD-13C	2.00	85
					1,2,3,4,7,8-HxCDF-13C	2.00	68
1,2,3,7,8-PeCDF	ND	-----	1.2		1,2,3,6,7,8-HxCDF-13C	2.00	72
2,3,4,7,8-PeCDF	ND	-----	0.67		2,3,4,6,7,8-HxCDF-13C	2.00	74
Total PeCDF	ND	-----	0.91		1,2,3,7,8,9-HxCDF-13C	2.00	75
					1,2,3,4,7,8-HxCDD-13C	2.00	68
1,2,3,7,8-PeCDD	ND	-----	1.5		1,2,3,6,7,8-HxCDD-13C	2.00	66
Total PeCDD	ND	-----	1.5		1,2,3,4,6,7,8-HpCDF-13C	2.00	66
					1,2,3,4,7,8,9-HpCDF-13C	2.00	69
1,2,3,4,7,8-HxCDF	ND	-----	0.55		1,2,3,4,6,7,8-HpCDD-13C	2.00	72
1,2,3,6,7,8-HxCDF	ND	-----	0.48		OCDD-13C	4.00	58
2,3,4,6,7,8-HxCDF	ND	-----	0.36				
1,2,3,7,8,9-HxCDF	ND	-----	0.63		1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF	ND	-----	0.50		1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	ND	-----	0.77		2,3,7,8-TCDD-37Cl4	0.20	99
1,2,3,6,7,8-HxCDD	ND	-----	0.77				
1,2,3,7,8,9-HxCDD	ND	-----	0.98				
Total HxCDD	ND	-----	0.84				
1,2,3,4,6,7,8-HpCDF	ND	-----	1.2		Total 2,3,7,8-TCDD		
1,2,3,4,7,8,9-HpCDF	ND	-----	1.1		Equivalence: 0.00089 pg/L		
Total HpCDF	ND	-----	1.2		(Lower-bound - Using 2005 WHO Factors)		
1,2,3,4,6,7,8-HpCDD	ND	-----	0.90				
Total HpCDD	ND	-----	0.90				
OCDF	ND	-----	1.5				
OCDD	-----	3.0	1.8	IJ			

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).
EMPC = Estimated Maximum Possible Concentration
EDL = Estimated Detection Limit

J = Estimated value
I = Interference present

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Minneapolis, MN 55414

Tel: 612-607-1700
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2,3,7,8-TCDD Toxic Equivalency (TEQ) Calculations

Pace Analytical National

Client's Sample ID	DFBLKTA		
Lab Sample ID	BLANK-70325		
Filename	F190509A_04		
Injected By	SMT		
Total Amount Extracted	980 mL	Matrix	Water
% Moisture	NA	Dilution	NA
Dry Weight Extracted	NA	Collected	05/03/2019 18:38
ICAL ID	F190508	Received	05/03/2019 18:38
CCal Filename(s)	F190508B_19	Extracted	05/06/2019 12:20
Method Blank ID		Analyzed	05/09/2019 07:15

Parameter	Conc pg/L	RL pg/L	WHO2005	LB	MB	UB
2,3,7,8-TCDF	ND	0.47	0.10000	0.0000	0.0235	0.0471
Total TCDF	ND	0.47	0.00000	0.0000	0.0000	0.0000
2,3,7,8-TCDD	ND	1.3	1.00000	0.0000	0.6311	1.2622
Total TCDD	ND	1.3	0.00000	0.0000	0.0000	0.0000
1,2,3,7,8-PeCDF	ND	1.2	0.03000	0.0000	0.0173	0.0346
2,3,4,7,8-PeCDF	ND	0.67	0.30000	0.0000	0.1006	0.2012
Total PeCDF	ND	0.91	0.00000	0.0000	0.0000	0.0000
1,2,3,7,8-PeCDD	ND	1.5	1.00000	0.0000	0.7419	1.4838
Total PeCDD	ND	1.5	0.00000	0.0000	0.0000	0.0000
1,2,3,4,7,8-HxCDF	ND	0.55	0.10000	0.0000	0.0274	0.0548
1,2,3,6,7,8-HxCDF	ND	0.48	0.10000	0.0000	0.0241	0.0482
2,3,4,6,7,8-HxCDF	ND	0.36	0.10000	0.0000	0.0179	0.0357
1,2,3,7,8,9-HxCDF	ND	0.63	0.10000	0.0000	0.0313	0.0626
Total HxCDF	ND	0.50	0.00000	0.0000	0.0000	0.0000
1,2,3,4,7,8-HxCDD	ND	0.77	0.10000	0.0000	0.0387	0.0774
1,2,3,6,7,8-HxCDD	ND	0.77	0.10000	0.0000	0.0386	0.0772
1,2,3,7,8,9-HxCDD	ND	0.98	0.10000	0.0000	0.0491	0.0982
Total HxCDD	ND	0.84	0.00000	0.0000	0.0000	0.0000
1,2,3,4,6,7,8-HpCDF	ND	1.2	0.01000	0.0000	0.0062	0.0124
1,2,3,4,7,8,9-HpCDF	ND	1.1	0.01000	0.0000	0.0056	0.0112
Total HpCDF	ND	1.2	0.00000	0.0000	0.0000	0.0000
1,2,3,4,6,7,8-HpCDD	ND	0.90	0.01000	0.0000	0.0045	0.0090
Total HpCDD	ND	0.90	0.00000	0.0000	0.0000	0.0000
OCDF	ND	1.5	0.00030	0.0000	0.0002	0.0005
OCDD	ND	1.8	0.00030	0.0009	0.0009	0.0009
				0.00089 pg/L	**1.8 pg/L**	**3.5 pg/L**

Final values are valid to only 2 significant figures
TEQs for Totals classes include contributions from non 2,3,7,8 isomers only
LB = Lower Bound, Where "ND", TEQ Conc = 0
MB = Medium Bound, Where "ND", TEQ Conc = (LOD/2) * (TEF Factor)
UB = Upper Bound, Where "ND", TEQ Conc = LOD * (TEF Factor)
RL = Reporting Limit

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Method 1613B Laboratory Control Spike Results

Lab Sample ID	LCS-70326		
Filename	F190509A_01	Matrix	Water
Total Amount Extracted	968 mL	Dilution	NA
ICAL ID	F190508	Extracted	05/06/2019 12:20
CCal Filename	F190508B_19	Analyzed	05/09/2019 05:08
Method Blank ID	BLANK-70325	Injected By	SMT

Compound	Cs	Cr	Lower Limit	Upper Limit	% Rec.
2,3,7,8-TCDF	10	10	7.5	15.8	104
2,3,7,8-TCDD	10	12	6.7	15.8	117
1,2,3,7,8-PeCDF	50	53	40.0	67.0	107
2,3,4,7,8-PeCDF	50	52	34.0	80.0	104
1,2,3,7,8-PeCDD	50	49	35.0	71.0	97
1,2,3,4,7,8-HxCDF	50	54	36.0	67.0	109
1,2,3,6,7,8-HxCDF	50	53	42.0	65.0	106
2,3,4,6,7,8-HxCDF	50	51	35.0	78.0	102
1,2,3,7,8,9-HxCDF	50	53	39.0	65.0	106
1,2,3,4,7,8-HxCDD	50	54	35.0	82.0	109
1,2,3,6,7,8-HxCDD	50	56	38.0	67.0	112
1,2,3,7,8,9-HxCDD	50	55	32.0	81.0	109
1,2,3,4,6,7,8-HpCDF	50	53	41.0	61.0	106
1,2,3,4,7,8,9-HpCDF	50	49	39.0	69.0	99
1,2,3,4,6,7,8-HpCDD	50	51	35.0	70.0	101
OCDF	100	100	63.0	170.0	100
OCDD	100	100	78.0	144.0	103
2,3,7,8-TCDD-37Cl4	10	12	3.1	19.1	118
2,3,7,8-TCDF-13C	100	95	22.0	152.0	95
2,3,7,8-TCDD-13C	100	96	20.0	175.0	96
1,2,3,7,8-PeCDF-13C	100	94	21.0	192.0	94
2,3,4,7,8-PeCDF-13C	100	95	13.0	328.0	95
1,2,3,7,8-PeCDD-13C	100	100	21.0	227.0	105
1,2,3,4,7,8-HxCDF-13C	100	83	19.0	202.0	83
1,2,3,6,7,8-HxCDF-13C	100	88	21.0	159.0	88
2,3,4,6,7,8-HxCDF-13C	100	91	22.0	176.0	91
1,2,3,7,8,9-HxCDF-13C	100	92	17.0	205.0	92
1,2,3,4,7,8-HxCDD-13C	100	83	21.0	193.0	83
1,2,3,6,7,8-HxCDD-13C	100	83	25.0	163.0	83
1,2,3,4,6,7,8-HpCDF-13C	100	82	21.0	158.0	82
1,2,3,4,7,8,9-HpCDF-13C	100	85	20.0	186.0	85
1,2,3,4,6,7,8-HpCDD-13C	100	89	26.0	166.0	89
OCDD-13C	200	140	26.0	397.0	70

Cs = Concentration Spiked (ng/mL)
Cr = Concentration Recovered (ng/mL)
Rec. = Recovery (Expressed as Percent)
Control Limit Reference: Method 1613, Table 6, 10/94 Revision
R = Recovery outside of control limits
Nn = Value obtained from additional analysis
* = See Discussion

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Tel: 612-607-1700
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Method 1613B Laboratory Control Spike Results

Lab Sample ID	LCSD-70327		
Filename	F190509A_02	Matrix	Water
Total Amount Extracted	985 mL	Dilution	NA
ICAL ID	F190508	Extracted	05/06/2019 12:20
CCal Filename	F190508B_19	Analyzed	05/09/2019 05:51
Method Blank ID	BLANK-70325	Injected By	SMT

Compound	Cs	Cr	Lower Limit	Upper Limit	% Rec.
2,3,7,8-TCDF	10	11	7.5	15.8	106
2,3,7,8-TCDD	10	12	6.7	15.8	120
1,2,3,7,8-PeCDF	50	55	40.0	67.0	109
2,3,4,7,8-PeCDF	50	56	34.0	80.0	112
1,2,3,7,8-PeCDD	50	51	35.0	71.0	101
1,2,3,4,7,8-HxCDF	50	57	36.0	67.0	113
1,2,3,6,7,8-HxCDF	50	53	42.0	65.0	107
2,3,4,6,7,8-HxCDF	50	51	35.0	78.0	103
1,2,3,7,8,9-HxCDF	50	52	39.0	65.0	105
1,2,3,4,7,8-HxCDD	50	56	35.0	82.0	112
1,2,3,6,7,8-HxCDD	50	61	38.0	67.0	121
1,2,3,7,8,9-HxCDD	50	61	32.0	81.0	122
1,2,3,4,6,7,8-HpCDF	50	55	41.0	61.0	111
1,2,3,4,7,8,9-HpCDF	50	52	39.0	69.0	103
1,2,3,4,6,7,8-HpCDD	50	51	35.0	70.0	102
OCDF	100	110	63.0	170.0	105
OCDD	100	100	78.0	144.0	105
2,3,7,8-TCDD-37Cl4	10	11	3.1	19.1	109
2,3,7,8-TCDF-13C	100	77	22.0	152.0	77
2,3,7,8-TCDD-13C	100	78	20.0	175.0	78
1,2,3,7,8-PeCDF-13C	100	75	21.0	192.0	75
2,3,4,7,8-PeCDF-13C	100	76	13.0	328.0	76
1,2,3,7,8-PeCDD-13C	100	86	21.0	227.0	86
1,2,3,4,7,8-HxCDF-13C	100	68	19.0	202.0	68
1,2,3,6,7,8-HxCDF-13C	100	72	21.0	159.0	72
2,3,4,6,7,8-HxCDF-13C	100	76	22.0	176.0	76
1,2,3,7,8,9-HxCDF-13C	100	75	17.0	205.0	75
1,2,3,4,7,8-HxCDD-13C	100	69	21.0	193.0	69
1,2,3,6,7,8-HxCDD-13C	100	64	25.0	163.0	64
1,2,3,4,6,7,8-HpCDF-13C	100	64	21.0	158.0	64
1,2,3,4,7,8,9-HpCDF-13C	100	67	20.0	186.0	67
1,2,3,4,6,7,8-HpCDD-13C	100	72	26.0	166.0	72
OCDD-13C	200	120	26.0	397.0	58

Cs = Concentration Spiked (ng/mL)
Cr = Concentration Recovered (ng/mL)
Rec. = Recovery (Expressed as Percent)
Control Limit Reference: Method 1613, Table 6, 10/94 Revision
R = Recovery outside of control limits
Nn = Value obtained from additional analysis
* = See Discussion

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Method 1613B

Spike Recovery Relative Percent Difference (RPD) Results

Client	Pace Analytical National		
Spike 1 ID	LCS-70326	Spike 2 ID	LCSD-70327
Spike 1 Filename	F190509A_01	Spike 2 Filename	F190509A_02

Compound	Spike 1 %REC	Spike 2 %REC	%RPD
2,3,7,8-TCDF	104	106	1.9
2,3,7,8-TCDD	117	120	2.5
1,2,3,7,8-PeCDF	107	109	1.9
2,3,4,7,8-PeCDF	104	112	7.4
1,2,3,7,8-PeCDD	97	101	4.0
1,2,3,4,7,8-HxCDF	109	113	3.6
1,2,3,6,7,8-HxCDF	106	107	0.9
2,3,4,6,7,8-HxCDF	102	103	1.0
1,2,3,7,8,9-HxCDF	106	105	0.9
1,2,3,4,7,8-HxCDD	109	112	2.7
1,2,3,6,7,8-HxCDD	112	121	7.7
1,2,3,7,8,9-HxCDD	109	122	11.3
1,2,3,4,6,7,8-HpCDF	106	111	4.6
1,2,3,4,7,8,9-HpCDF	99	103	4.0
1,2,3,4,6,7,8-HpCDD	101	102	1.0
OCDF	100	105	4.9
OCDD	103	105	1.9

%REC = Percent Recovered
RPD = The difference between the two values divided by the mean value

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Method 1613B
Initial Calibration (ICAL) - Response Factor Summary

ICAL ID	**F190508**	Data Files:		Time	Injected
Calibration Date	05/08/2019	CS-1	F190508A_04	11:43	SMT
Instrument	10MSHR05 (F)	CS-2	F190508A_03	11:02	SMT
Column Phase	ZB5-MS 0.25mm	CS-3	F190508A_02	10:00	SMT
Column ID No.	ZB5-MS-629919	CS-4	F190508A_06	13:46	SMT
		CS-5	F190508A_05	13:05	SMT

Isomer	CS-1	CS-2	CS-3	CS-4	CS-5	Ave RF	%RSD
2,3,7,8-TCDF	0.8288	0.8067	0.8548	0.9247	0.9310	0.8692	6.47
2,3,7,8-TCDD	0.7258	0.7466	0.9053	0.8472	0.8884	0.8226	9.97
1,2,3,7,8-PeCDF	0.7848	0.8155	0.9265	0.9294	0.9605	0.8833	8.81
2,3,4,7,8-PeCDF	0.9141	0.9583	1.0049	1.0616	1.0418	0.9961	6.07
1,2,3,7,8-PeCDD	0.7512	0.7742	0.8516	0.8895	0.8836	0.8300	7.67
1,2,3,4,7,8-HxCDF	1.0236	1.1127	1.1608	1.1726	1.2089	1.1357	6.29
1,2,3,6,7,8-HxCDF	1.0014	1.0246	1.1187	1.1501	1.1270	1.0844	6.15
2,3,4,6,7,8-HxCDF	1.0507	1.1409	1.1858	1.2495	1.2346	1.1723	6.85
1,2,3,7,8,9-HxCDF	0.9781	1.0316	1.0873	1.1379	1.1166	1.0703	6.09
1,2,3,4,7,8-HxCDD	0.8555	0.8687	0.9233	0.9402	0.9573	0.9090	4.92
1,2,3,6,7,8-HxCDD	0.8314	0.9043	0.9052	0.9359	0.9359	0.9026	4.73
1,2,3,7,8,9-HxCDD	0.8565	0.8763	0.9003	0.9266	0.9153	0.8950	3.20
1,2,3,4,6,7,8-HpCDF	1.1049	1.1654	1.1997	1.2823	1.2449	1.1994	5.75
1,2,3,4,7,8,9-HpCDF	1.1387	1.1656	1.2257	1.2892	1.2353	1.2109	4.92
1,2,3,4,6,7,8-HpCDD	0.8917	0.9372	0.9719	1.0276	1.0178	0.9692	5.84
OCDF	0.9256	0.9767	0.9981	1.0986	1.0703	1.0139	6.94
OCDD	0.8835	0.9641	0.9292	0.9824	0.9725	0.9464	4.27
Total PeCDF	0.8494	0.8869	0.9657	0.9955	1.0012	0.9397	7.24
Total HxCDF	1.0134	1.0775	1.1381	1.1775	1.1718	1.1157	6.24
Total HxCDD	0.8478	0.8831	0.9096	0.9343	0.9362	0.9022	4.13
Total HpCDF	1.1218	1.1655	1.2127	1.2857	1.2401	1.2052	5.30
2,3,7,8-TCDF-13C	1.2774	1.2742	1.2612	1.2461	1.2611	1.2640	0.98
2,3,7,8-TCDD-13C	1.0321	1.0459	1.0771	1.0111	1.0470	1.0426	2.31
2,3,7,8-TCDD-37Cl4	0.8169	0.9323	0.9533	0.9783	1.0309	0.9424	8.40
1,2,3,7,8-PeCDF-13C	1.0537	1.0775	1.0227	1.0200	1.0592	1.0466	2.36
2,3,4,7,8-PeCDF-13C	1.0512	1.0726	1.0678	1.0115	1.0827	1.0571	2.65
1,2,3,7,8-PeCDD-13C	0.7608	0.7921	0.7924	0.7409	0.7983	0.7769	3.21
1,2,3,4,7,8-HxCDF-13C	1.1556	1.0886	0.9809	1.1450	1.1002	1.0941	6.34
1,2,3,6,7,8-HxCDF-13C	1.2681	1.2256	1.0928	1.2756	1.2214	1.2167	6.03
2,3,4,6,7,8-HxCDF-13C	1.1349	1.0734	0.9911	1.1211	1.0874	1.0816	5.21
1,2,3,7,8,9-HxCDF-13C	1.0058	0.9854	0.8807	0.9933	0.9866	0.9704	5.23
1,2,3,4,7,8-HxCDD-13C	1.0164	0.9810	0.8696	1.0258	1.0080	0.9802	6.53
1,2,3,6,7,8-HxCDD-13C	1.1202	1.1043	1.0208	1.1355	1.1310	1.1024	4.28
1,2,3,4,6,7,8-HpCDF-13C	1.2491	1.2217	1.0875	1.2280	1.2341	1.2041	5.48
1,2,3,4,7,8,9-HpCDF-13C	0.9880	1.0006	0.8771	0.9634	1.0185	0.9695	5.71
1,2,3,4,6,7,8-HpCDD-13C	1.0980	1.0766	0.9822	1.0556	1.0983	1.0621	4.53
OCDD-13C	0.9188	0.9233	0.8338	0.9071	0.9535	0.9073	4.91

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Method 1613B
Initial Calibration (ICAL) - Isotope Ratio Summary

		Data Files:		Time	Injected
ICAL ID	**F190508**	CS-1	F190508A_04	11:43	SMT
Calibration Date	05/08/2019	CS-2	F190508A_03	11:02	SMT
Instrument	10MSHR05 (F)	CS-3	F190508A_02	10:00	SMT
Column Phase	ZB5-MS 0.25mm	CS-4	F190508A_06	13:46	SMT
Column ID No.	ZB5-MS-629919	CS-5	F190508A_05	13:05	SMT

Isomer	CS-1	CS-2	CS-3	CS-4	CS-5	Limits
2,3,7,8-TCDF	0.76	0.79	0.75	0.76	0.78	0.65 - 0.89
2,3,7,8-TCDD	0.79	0.75	0.82	0.76	0.78	0.65 - 0.89
1,2,3,7,8-PeCDF	1.54	1.53	1.61	1.54	1.58	1.32 - 1.78
2,3,4,7,8-PeCDF	1.53	1.60	1.54	1.55	1.54	1.32 - 1.78
1,2,3,7,8-PeCDD	0.55	0.62	0.61	0.61	0.62	0.52 - 0.70
1,2,3,4,7,8-HxCDF	1.30	1.29	1.28	1.26	1.24	1.05 - 1.43
1,2,3,6,7,8-HxCDF	1.22	1.30	1.21	1.26	1.24	1.05 - 1.43
2,3,4,6,7,8-HxCDF	1.27	1.19	1.22	1.24	1.23	1.05 - 1.43
1,2,3,7,8,9-HxCDF	1.43	1.23	1.26	1.21	1.23	1.05 - 1.43
1,2,3,4,7,8-HxCDD	1.26	1.33	1.23	1.24	1.24	1.05 - 1.43
1,2,3,6,7,8-HxCDD	1.23	1.25	1.21	1.22	1.22	1.05 - 1.43
1,2,3,7,8,9-HxCDD	1.25	1.26	1.21	1.22	1.19	1.05 - 1.43
1,2,3,4,6,7,8-HpCDF	1.05	1.00	1.01	1.02	1.03	0.88 - 1.20
1,2,3,4,7,8,9-HpCDF	0.94	1.06	1.03	1.03	1.03	0.88 - 1.20
1,2,3,4,6,7,8-HpCDD	0.95	1.04	1.00	1.00	1.04	0.88 - 1.20
OCDF	0.94	0.93	0.91	0.90	0.92	0.76 - 1.02
OCDD	0.86	0.86	0.88	0.89	0.88	0.76 - 1.02
1,2,3,4-TCDD-13C	0.79	0.79	0.79	0.78	0.78	0.65 - 0.89
1,2,3,7,8,9-HxCDD-13C	1.25	1.24	1.25	1.24	1.21	1.05 - 1.43
2,3,7,8-TCDF-13C	0.76	0.77	0.78	0.75	0.77	0.65 - 0.89
2,3,7,8-TCDD-13C	0.77	0.78	0.78	0.77	0.77	0.65 - 0.89
1,2,3,7,8-PeCDF-13C	1.61	1.56	1.57	1.56	1.57	1.32 - 1.78
2,3,4,7,8-PeCDF-13C	1.54	1.57	1.58	1.56	1.57	1.32 - 1.78
1,2,3,7,8-PeCDD-13C	1.56	1.58	1.56	1.58	1.54	1.32 - 1.78
1,2,3,4,7,8-HxCDF-13C	0.52	0.51	0.51	0.52	0.52	0.43 - 0.59
1,2,3,6,7,8-HxCDF-13C	0.54	0.51	0.50	0.53	0.52	0.43 - 0.59
2,3,4,6,7,8-HxCDF-13C	0.52	0.51	0.53	0.53	0.53	0.43 - 0.59
1,2,3,7,8,9-HxCDF-13C	0.51	0.53	0.53	0.54	0.52	0.43 - 0.59
1,2,3,4,7,8-HxCDD-13C	1.24	1.26	1.25	1.26	1.24	1.05 - 1.43
1,2,3,6,7,8-HxCDD-13C	1.26	1.25	1.25	1.26	1.23	1.05 - 1.43
1,2,3,4,6,7,8-HpCDF-13C	0.45	0.43	0.44	0.45	0.44	0.37 - 0.51
1,2,3,4,7,8,9-HpCDF-13C	0.45	0.44	0.45	0.45	0.44	0.37 - 0.51
1,2,3,4,6,7,8-HpCDD-13C	1.01	1.03	1.03	1.03	1.06	0.88 - 1.20
OCDD-13C	0.89	0.91	0.88	0.91	0.90	0.76 - 1.02

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Method 1613B
Initial Calibration (ICAL) - Response Factor Summary

ICAL ID	**Y190424**	Data Files:		Time	Injected
Calibration Date	04/24/2019	CS-1	Y190424A_03	09:24	SMT
Instrument	10MSHR12 (Y)	CS-2	Y190424A_02	08:38	SMT
Column Phase	ZB-5MS 0.25mm	CS-3	Y190424A_01	07:53	SMT
Column ID No.	629920	CS-4	Y190424A_05	11:02	SMT
		CS-5	Y190424A_04	10:17	SMT

Isomer	CS-1	CS-2	CS-3	CS-4	CS-5	Ave RF	%RSD
2,3,7,8-TCDF	0.8729	0.8432	0.8526	0.8809	0.8890	0.8677	2.22
2,3,7,8-TCDD	0.8562	0.8631	1.0213	0.9314	0.9495	0.9243	7.35
1,2,3,7,8-PeCDF	0.8497	0.8338	0.9059	0.8703	0.8977	0.8715	3.52
2,3,4,7,8-PeCDF	0.9341	0.9523	0.9597	0.9958	1.0220	0.9728	3.65
1,2,3,7,8-PeCDD	0.8708	0.8847	0.8802	0.8955	0.9296	0.8921	2.55
1,2,3,4,7,8-HxCDF	1.1439	1.0967	1.1776	1.1920	1.2166	1.1654	3.99
1,2,3,6,7,8-HxCDF	1.0426	1.0679	1.1267	1.1055	1.1348	1.0955	3.59
2,3,4,6,7,8-HxCDF	1.1427	1.1191	1.1823	1.1952	1.1819	1.1642	2.75
1,2,3,7,8,9-HxCDF	1.1115	1.0464	1.0803	1.1213	1.1439	1.1007	3.45
1,2,3,4,7,8-HxCDD	0.8497	0.8896	0.9286	0.9506	0.9602	0.9157	5.00
1,2,3,6,7,8-HxCDD	0.9208	0.9452	0.9241	0.9304	0.9459	0.9333	1.25
1,2,3,7,8,9-HxCDD	0.8968	0.8994	0.9503	0.9396	0.9360	0.9244	2.66
1,2,3,4,6,7,8-HpCDF	1.2000	1.2714	1.2416	1.2860	1.2831	1.2564	2.87
1,2,3,4,7,8,9-HpCDF	1.2820	1.2744	1.2895	1.3181	1.3172	1.2962	1.56
1,2,3,4,6,7,8-HpCDD	0.9267	0.9265	0.9872	1.0193	0.9930	0.9705	4.32
OCDF	1.1150	1.0519	1.0618	1.1832	1.1582	1.1140	5.18
OCDD	0.9688	0.9932	0.9766	1.0446	1.0045	0.9975	2.98
Total PeCDF	0.8919	0.8930	0.9328	0.9331	0.9599	0.9221	3.17
Total HxCDF	1.1101	1.0825	1.1417	1.1535	1.1693	1.1314	3.08
Total HxCDD	0.8891	0.9114	0.9343	0.9402	0.9473	0.9245	2.59
Total HpCDF	1.2410	1.2729	1.2655	1.3020	1.3002	1.2763	2.00
2,3,7,8-TCDF-13C	1.4049	1.4326	1.4451	1.3939	1.4340	1.4221	1.52
2,3,7,8-TCDD-13C	1.0663	1.1017	1.1494	1.0553	1.1115	1.0968	3.43
2,3,7,8-TCDD-37Cl4	1.0375	1.0723	1.1203	1.0857	1.1501	1.0932	3.98
1,2,3,7,8-PeCDF-13C	1.0503	1.0587	1.0139	1.0630	1.1470	1.0666	4.59
2,3,4,7,8-PeCDF-13C	1.0164	1.0405	1.0773	1.0337	1.1320	1.0600	4.34
1,2,3,7,8-PeCDD-13C	0.7177	0.7227	0.7651	0.7403	0.8302	0.7552	6.07
1,2,3,4,7,8-HxCDF-13C	1.0423	1.0440	0.8810	1.0422	0.9857	0.9990	7.05
1,2,3,6,7,8-HxCDF-13C	1.1538	1.1790	0.9850	1.1883	1.1393	1.1291	7.34
2,3,4,6,7,8-HxCDF-13C	1.1032	1.0959	0.9475	1.1004	1.0598	1.0614	6.22
1,2,3,7,8,9-HxCDF-13C	0.9479	0.9666	0.8920	0.9829	0.9583	0.9495	3.65
1,2,3,4,7,8-HxCDD-13C	0.9555	0.9770	0.8521	0.9886	0.9648	0.9476	5.78
1,2,3,6,7,8-HxCDD-13C	1.0622	1.0827	0.9902	1.0797	1.0742	1.0578	3.65
1,2,3,4,6,7,8-HpCDF-13C	1.0365	1.0626	0.9680	1.0737	1.0649	1.0411	4.15
1,2,3,4,7,8,9-HpCDF-13C	0.8316	0.8411	0.7866	0.8572	0.8769	0.8387	4.03
1,2,3,4,6,7,8-HpCDD-13C	0.8976	0.9280	0.8651	0.9239	0.9580	0.9145	3.82
OCDD-13C	0.6505	0.6988	0.6782	0.7086	0.7707	0.7014	6.37

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Method 1613B
Initial Calibration (ICAL) - Isotope Ratio Summary

ICAL ID	**Y190424**	Data Files:		Time	Injected
Calibration Date	04/24/2019	CS-1	Y190424A_03	09:24	SMT
Instrument	10MSHR12 (Y)	CS-2	Y190424A_02	08:38	SMT
Column Phase	ZB-5MS 0.25mm	CS-3	Y190424A_01	07:53	SMT
Column ID No.	629920	CS-4	Y190424A_05	11:02	SMT
		CS-5	Y190424A_04	10:17	SMT

Isomer	CS-1	CS-2	CS-3	CS-4	CS-5	Limits
2,3,7,8-TCDF	0.83	0.83	0.77	0.77	0.78	0.65 - 0.89
2,3,7,8-TCDD	0.83	0.80	0.76	0.77	0.77	0.65 - 0.89
1,2,3,7,8-PeCDF	1.43	1.56	1.53	1.53	1.55	1.32 - 1.78
2,3,4,7,8-PeCDF	1.53	1.60	1.54	1.59	1.56	1.32 - 1.78
1,2,3,7,8-PeCDD	0.65	0.62	0.61	0.60	0.61	0.52 - 0.70
1,2,3,4,7,8-HxCDF	1.26	1.27	1.26	1.27	1.27	1.05 - 1.43
1,2,3,6,7,8-HxCDF	1.26	1.30	1.26	1.27	1.29	1.05 - 1.43
2,3,4,6,7,8-HxCDF	1.26	1.27	1.26	1.28	1.25	1.05 - 1.43
1,2,3,7,8,9-HxCDF	1.16	1.18	1.26	1.25	1.26	1.05 - 1.43
1,2,3,4,7,8-HxCDD	1.18	1.22	1.24	1.24	1.22	1.05 - 1.43
1,2,3,6,7,8-HxCDD	1.30	1.26	1.25	1.23	1.23	1.05 - 1.43
1,2,3,7,8,9-HxCDD	1.31	1.24	1.26	1.23	1.22	1.05 - 1.43
1,2,3,4,6,7,8-HpCDF	1.14	1.11	1.04	1.04	1.03	0.88 - 1.20
1,2,3,4,7,8,9-HpCDF	0.96	1.11	1.00	1.05	1.02	0.88 - 1.20
1,2,3,4,6,7,8-HpCDD	1.03	1.05	1.05	1.03	1.05	0.88 - 1.20
OCDF	0.85	0.88	0.91	0.87	0.90	0.76 - 1.02
OCDD	0.76	0.91	0.88	0.88	0.89	0.76 - 1.02
1,2,3,4-TCDD-13C	0.78	0.78	0.79	0.78	0.80	0.65 - 0.89
1,2,3,7,8,9-HxCDD-13C	1.24	1.25	1.23	1.25	1.24	1.05 - 1.43
2,3,7,8-TCDF-13C	0.79	0.78	0.76	0.76	0.77	0.65 - 0.89
2,3,7,8-TCDD-13C	0.79	0.77	0.79	0.78	0.78	0.65 - 0.89
1,2,3,7,8-PeCDF-13C	1.53	1.56	1.55	1.56	1.57	1.32 - 1.78
2,3,4,7,8-PeCDF-13C	1.54	1.54	1.55	1.57	1.55	1.32 - 1.78
1,2,3,7,8-PeCDD-13C	1.56	1.55	1.59	1.59	1.61	1.32 - 1.78
1,2,3,4,7,8-HxCDF-13C	0.52	0.51	0.52	0.51	0.52	0.43 - 0.59
1,2,3,6,7,8-HxCDF-13C	0.52	0.51	0.54	0.51	0.51	0.43 - 0.59
2,3,4,6,7,8-HxCDF-13C	0.51	0.52	0.50	0.51	0.51	0.43 - 0.59
1,2,3,7,8,9-HxCDF-13C	0.52	0.53	0.52	0.50	0.50	0.43 - 0.59
1,2,3,4,7,8-HxCDD-13C	1.26	1.25	1.25	1.26	1.26	1.05 - 1.43
1,2,3,6,7,8-HxCDD-13C	1.23	1.21	1.22	1.25	1.24	1.05 - 1.43
1,2,3,4,6,7,8-HpCDF-13C	0.45	0.45	0.45	0.44	0.44	0.37 - 0.51
1,2,3,4,7,8,9-HpCDF-13C	0.44	0.45	0.46	0.44	0.45	0.37 - 0.51
1,2,3,4,6,7,8-HpCDD-13C	1.04	1.01	1.04	1.03	1.03	0.88 - 1.20
OCDD-13C	0.88	0.91	0.89	0.88	0.89	0.76 - 1.02

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Method 1613B Analysis Results
PCDD/PCDF Calibration Verification
Labeled Analytes

Lab Name	CS3/CPM-11321-150		
Filename	F190508B_19	Instrument ID	10MSHR05 (F)
Injected By	SMT	GC Column ID	ZB5-MS-629919
Analyzed	05/09/2019 04:26	ICAL ID	F190508

Native Isomers	m/z's Forming Ratio (1)	Ion Abund. Ratio	QC Limits (2)	Conc Found	Conc. Range (ng/ml) (3)
Labeled Compounds					
1,2,3,4-TCDD-13C	M/M+2	0.78	0.65 - 0.89	-----	-----
2,3,7,8-TCDD-13C	M/M+2	0.79	0.65 - 0.89	102.3	82 - 121
1,2,3,7,8-PeCDD-13C	M+2/M+4	1.55	1.32 - 1.78	100.1	62 - 160
1,2,3,4,7,8-HxCDD-13C	M+2/M+4	1.25	1.05 - 1.43	91.4	85 - 117
1,2,3,6,7,8-HxCDD-13C	M+2/M+4	1.25	1.05 - 1.43	93.2	85 - 118
1,2,3,7,8,9-HxCDD-13C	M+2/M+4	1.23	1.05 - 1.43	-----	-----
1,2,3,4,6,7,8-HpCDD-13C	M+2/M+4	1.05	0.88 - 1.20	94.8	72 - 138
OCDD-13C	M+2/M+4	0.90	0.76 - 1.02	178.9	96 - 415
2,3,7,8-TCDF-13C	M/M+2	0.76	0.65 - 0.89	99.6	71 - 140
1,2,3,7,8-PeCDF-13C	M+2/M+4	1.58	1.32 - 1.78	94.8	76 - 130
2,3,4,7,8-PeCDF-13C	M+2/M+4	1.56	1.32 - 1.78	99.1	77 - 130
1,2,3,4,7,8-HxCDF-13C	M/M+2	0.52	0.43 - 0.59	92.2	76 - 131
1,2,3,6,7,8-HxCDF-13C	M/M+2	0.52	0.43 - 0.59	90.0	70 - 143
2,3,4,6,7,8-HxCDF-13C	M/M+2	0.51	0.43 - 0.59	90.5	73 - 137
1,2,3,7,8,9-HxCDF-13C	M/M+2	0.51	0.43 - 0.59	90.9	74 - 135
1,2,3,4,6,7,8-HpCDF-13C	M/M+2	0.46	0.37 - 0.51	92.1	78 - 129
1,2,3,4,7,8,9-HpCDF-13C	M/M+2	0.45	0.37 - 0.51	91.2	77 - 129
Cleanup Standard					
2,3,7,8-TCDD-37Cl4	M+2/M+4	(4)		10.4	7.9 - 12.7

1. See Table 8, Method 1613, for m/z specifications.

2. Ion Abundance Ratio Control Limits from Table 9, Method 1613.

3. Contract-required concentration range as specified in Table 6, Method 1613, under VER (10/94 Revision).

4. No ion abundance ratio; report concentration found.

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Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Method 1613B Analysis Results
PCDD/PCDF Calibration Verification
Native Analytes

Lab Name	CS3/CPM-11321-150		
Filename	F190508B_19	Instrument ID	10MSHR05 (F)
Injected By	SMT	GC Column ID	ZB5-MS-629919
Analyzed	05/09/2019 04:26	ICAL ID	F190508

Native Isomers	m/z's Forming Ratio (1)	Ion Abund. Ratio	QC Limits (2)	Conc Found	Conc. Range (ng/ml) (3)
2,3,7,8-TCDD	M/M+2	0.76	0.65 - 0.89	11.0	7.8 - 12.9
1,2,3,7,8-PeCDD	M+2/M+4	0.62	0.52 - 0.70	51.8	39 - 65
1,2,3,4,7,8-HxCDD	M+2/M+4	1.24	1.05 - 1.43	50.8	39 - 64
1,2,3,6,7,8-HxCDD	M+2/M+4	1.20	1.05 - 1.43	51.4	39 - 64
1,2,3,7,8,9-HxCDD	M+2/M+4	1.22	1.05 - 1.43	52.3	41 - 61
1,2,3,4,6,7,8-HpCDD	M+2/M+4	1.03	0.88 - 1.20	51.8	43 - 58
OCDD	M+2/M+4	0.92	0.76 - 1.02	101.0	79 - 126
2,3,7,8-TCDF	M/M+2	0.76	0.65 - 0.89	9.5	8.4 - 12.0
1,2,3,7,8-PeCDF	M+2/M+4	1.57	1.32 - 1.78	54.3	41 - 60
2,3,4,7,8-PeCDF	M+2/M+4	1.59	1.32 - 1.78	50.8	41 - 61
1,2,3,4,7,8-HxCDF	M+2/M+4	1.24	1.05 - 1.43	49.7	45 - 56
1,2,3,6,7,8-HxCDF	M+2/M+4	1.25	1.05 - 1.43	51.0	44 - 57
2,3,4,6,7,8-HxCDF	M+2/M+4	1.23	1.05 - 1.43	51.2	44 - 57
1,2,3,7,8,9-HxCDF	M+2/M+4	1.27	1.05 - 1.43	50.8	45 - 56
1,2,3,4,6,7,8-HpCDF	M+2/M+4	1.02	0.88 - 1.20	52.2	45 - 55
1,2,3,4,7,8,9-HpCDF	M+2/M+4	1.04	0.88 - 1.20	50.1	43 - 58
OCDF	M+2/M+4	0.90	0.76 - 1.02	99.4	63 - 159

1. See Table 8, Method 1613, for m/z specifications.

2. Ion Abundance Ratio Control Limits from Table 9, Method 1613.

3. Contract-required concentration range as specified in Table 6, Method 1613, under VER (10/94 Revision).

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Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Method 1613B Analysis Results
PCDD/PCDF Calibration Verification
Labeled Analytes

Lab Name	CS3/CPM-11321-150		
Filename	Y190509A_01	Instrument ID	10MSHR12 (Y)
Injected By	SMT	GC Column ID	629920
Analyzed	05/09/2019 07:41	ICAL ID	Y190424

Native Isomers	m/z's Forming Ratio (1)	Ion Abund. Ratio	QC Limits (2)	Conc Found	Conc. Range (ng/ml) (3)
Labeled Compounds					
1,2,3,4-TCDD-13C	M/M+2	0.78	0.65 - 0.89	-----	-----
2,3,7,8-TCDD-13C	M/M+2	0.77	0.65 - 0.89	104.6	82 - 121
1,2,3,7,8-PeCDD-13C	M+2/M+4	1.56	1.32 - 1.78	99.4	62 - 160
1,2,3,4,7,8-HxCDD-13C	M+2/M+4	1.26	1.05 - 1.43	88.6	85 - 117
1,2,3,6,7,8-HxCDD-13C	M+2/M+4	1.23	1.05 - 1.43	93.6	85 - 118
1,2,3,7,8,9-HxCDD-13C	M+2/M+4	1.22	1.05 - 1.43	-----	-----
1,2,3,4,6,7,8-HpCDD-13C	M+2/M+4	1.00	0.88 - 1.20	106.0	72 - 138
OCDD-13C	M+2/M+4	0.87	0.76 - 1.02	200.2	96 - 415
2,3,7,8-TCDF-13C	M/M+2	0.75	0.65 - 0.89	98.4	71 - 140
1,2,3,7,8-PeCDF-13C	M+2/M+4	1.52	1.32 - 1.78	92.5	76 - 130
2,3,4,7,8-PeCDF-13C	M+2/M+4	1.57	1.32 - 1.78	97.5	77 - 130
1,2,3,4,7,8-HxCDF-13C	M/M+2	0.52	0.43 - 0.59	86.7	76 - 131
1,2,3,6,7,8-HxCDF-13C	M/M+2	0.52	0.43 - 0.59	81.9	70 - 143
2,3,4,6,7,8-HxCDF-13C	M/M+2	0.54	0.43 - 0.59	83.8	73 - 137
1,2,3,7,8,9-HxCDF-13C	M/M+2	0.50	0.43 - 0.59	88.4	74 - 135
1,2,3,4,6,7,8-HpCDF-13C	M/M+2	0.45	0.37 - 0.51	102.5	78 - 129
1,2,3,4,7,8,9-HpCDF-13C	M/M+2	0.44	0.37 - 0.51	97.1	77 - 129
Cleanup Standard					
2,3,7,8-TCDD-37Cl4	M+2/M+4	(4)		10.0	7.9 - 12.7

1. See Table 8, Method 1613, for m/z specifications.

2. Ion Abundance Ratio Control Limits from Table 9, Method 1613.

3. Contract-required concentration range as specified in Table 6, Method 1613, under VER (10/94 Revision).

4. No ion abundance ratio; report concentration found.

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Tel: 612-607-1700
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Method 1613B Analysis Results
PCDD/PCDF Calibration Verification
Native Analytes

Lab Name	CS3/CPM-11321-150		
Filename	Y190509A_01	Instrument ID	10MSHR12 (Y)
Injected By	SMT	GC Column ID	629920
Analyzed	05/09/2019 07:41	ICAL ID	Y190424

Native Isomers	m/z's Forming Ratio (1)	Ion Abund. Ratio	QC Limits (2)	Conc Found	Conc. Range (ng/ml) (3)
2,3,7,8-TCDD	M/M+2	0.78	0.65 - 0.89	10.6	7.8 - 12.9
1,2,3,7,8-PeCDD	M+2/M+4	0.62	0.52 - 0.70	48.0	39 - 65
1,2,3,4,7,8-HxCDD	M+2/M+4	1.24	1.05 - 1.43	50.4	39 - 64
1,2,3,6,7,8-HxCDD	M+2/M+4	1.22	1.05 - 1.43	48.2	39 - 64
1,2,3,7,8,9-HxCDD	M+2/M+4	1.21	1.05 - 1.43	50.9	41 - 61
1,2,3,4,6,7,8-HpCDD	M+2/M+4	1.01	0.88 - 1.20	48.6	43 - 58
OCDD	M+2/M+4	0.89	0.76 - 1.02	98.4	79 - 126
2,3,7,8-TCDF	M/M+2	0.78	0.65 - 0.89	9.6	8.4 - 12.0
1,2,3,7,8-PeCDF	M+2/M+4	1.57	1.32 - 1.78	50.4	41 - 60
2,3,4,7,8-PeCDF	M+2/M+4	1.55	1.32 - 1.78	48.2	41 - 61
1,2,3,4,7,8-HxCDF	M+2/M+4	1.23	1.05 - 1.43	48.0	45 - 56
1,2,3,6,7,8-HxCDF	M+2/M+4	1.24	1.05 - 1.43	50.5	44 - 57
2,3,4,6,7,8-HxCDF	M+2/M+4	1.23	1.05 - 1.43	50.9	44 - 57
1,2,3,7,8,9-HxCDF	M+2/M+4	1.27	1.05 - 1.43	49.0	45 - 56
1,2,3,4,6,7,8-HpCDF	M+2/M+4	0.99	0.88 - 1.20	48.7	45 - 55
1,2,3,4,7,8,9-HpCDF	M+2/M+4	1.00	0.88 - 1.20	51.0	43 - 58
OCDF	M+2/M+4	0.94	0.76 - 1.02	91.7	63 - 159

1. See Table 8, Method 1613, for m/z specifications.

2. Ion Abundance Ratio Control Limits from Table 9, Method 1613.

3. Contract-required concentration range as specified in Table 6, Method 1613, under VER (10/94 Revision).

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www.pacelabs.com

Report Prepared for:

Benita Miller
Pace Analytical National
12065 Lebanon Road
Mount Juliet TN 37122

REPORT OF LABORATORY ANALYSIS FOR PFAAs

Report Information:

Pace Project #: 10472825
Sample Receipt Date: 04/30/2019
Client Project #: L1093437: WG1273334
Client Sub PO #: L1093437
State Cert #: 2926.01

Invoicing & Reporting Options:

This report has been reviewed by:

May 23, 2019

Nathan Boberg, Project Manager
612-360-0728
(612) 607-6444 (fax)
nathan.boberg@pacelabs.com

Report Prepared Date:
May 23, 2019

Report of Laboratory Analysis

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The results relate only to the samples included in this report.

DISCUSSION

This report presents the results from the analyses performed on one samples submitted by a representative of ESC_TN. The samples were analyzed for one perfluorinated compound using a modified version of USEPA Method 537. Reporting limits were set to the quantitation limits.

A laboratory method blank was prepared and analyzed with the sample batch as part of our routine quality control procedures. The results show the blank was free of the target perfluorinated compounds at the reporting limits. This indicates that the sample processing procedures did not significantly contribute to the analyte content determined for the sample material.

Laboratory spike samples were also prepared with the sample batch using clean reference matrix that had been fortified with native standards. The recovery results were within the method limits. The RPDs (relative percent differences) between one designated spike and its duplicate were within the method limits. These spikes indicate that the extraction process was performed as expected.

Recoveries for two of the three isotopically-labeled surrogate standards in the sample extracts were within the target ranges specified in the method. The 10472825001-R sample had a recovery for the surrogate labeled 13C2_PFHxA that was higher than the method limit (flagged "Fail"), which appears to be matrix related. However, this surrogate does not correlate with the analyte of interest and therefore no adverse impact is expected on the sample.

The 10472825001-R sample had recoveries for the labeled PFPrOPrA and 13C4_PFOA internal standards that were lower than the method limit, which appears to be matrix related. However, these internal standards do not correlate with the analyte of interest and therefore no adverse impact is expected on the sample.

Results for selected analytes were taken from secondary dilutions of the sample extracts in order to bring the results within the calibration range or to reduce the impact of matrix effects. The affected values were flagged "D" on the results tables.

It should be noted that Pace Analytical has not yet completed the certification process for all analytes in this method. Therefore, the results have been marked "N2" as qualified. Results for the low level spikes that were below the calibration range were flagged "J".

Pace Analytical Services, LLC
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Minneapolis, MN 55414

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Minnesota Laboratory Certifications

Authority	Certificate #	Authority	Certificate #
A2LA	2926.01	Minnesota - Pet	1240
Alabama	40770	Mississippi	MN00064
Alaska - DW	MN00064	Missouri - DW	10100
Alaska - UST	17-009	Montana	CERT0092
Arizona	AZ0014	Nebraska	NE-OS-18-06
Arkansas - DW	MN00064	Nevada	MN00064
Arkansas - WW	88-0680	New Hampshire	2081
CNMI Saipan	MP0003	New Jersey (NE	MN002
California	2929	New York	11647
Colorado	MN00064	North Carolina	27700
Connecticut	PH-0256	North Carolina -	27700
EPA Region 8+	via MN 027-053	North Carolina -	530
Florida (NELAP	E87605	North Dakota	R-036
Georgia	959	Ohio - DW	41244
Guam	17-001r	Ohio - VAP	CL101
Hawaii	MN00064	Oklahoma	9507
Idaho	MN00064	Oregon - Primar	MN300001
Illinois	200011	Oregon - Secon	MN200001
Indiana	C-MN-01	Pennsylvania	68-00563
Iowa	368	Puerto Rico	MN00064
Kansas	E-10167	South Carolina	74003
Kentucky - DW	90062	South Dakota	NA
Kentucky - WW	90062	Tennessee	TN02818
Louisiana - DE	03086	Texas	T104704192
Louisiana - DW	MN00064	Utah (NELAP)	MN00064
Maine	MN00064	Virginia	460163
Maryland	322	Washington	C486
Massachusetts	M-MN064	West Virginia -	382
Michigan	9909	West Virginia -	9952C
Minnesota	027-053-137	Wisconsin	999407970
Minnesota - De	via MN 027-053	Wyoming - UST	2926.01

REPORT OF LABORATORY ANALYSIS

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Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Reporting Flags

A = Reporting Limit based on signal to noise

B = Less than 10x higher than method blank level

C = Result obtained from confirmation analysis

D = Result obtained from analysis of diluted sample

E = Exceeds calibration range

I = Interferencepresent

J = Estimated value

L = Suppressive interference, analyte may be biased low

Nn = Value obtained from additional analysis

P = PCDEInterference

R = Recovery outside target range

S = Peak saturated

U = Analyte not detected

V = Result verified by confirmation analysis

X = %D Exceeds limits

Y = Calculated using average of daily RFs

* = SeeDiscussion

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Appendix A

Sample Management

Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Sample ID Cross Reference

Client Sample ID	Pace Sample ID	Date Received	Sample Type
WW-20190427-002-DAY 3	10472825001	04/30/2019	Water
WW-20190427-002-DAY 3	10472825001-R	04/30/2019	Water

REPORT OF LABORATORY ANALYSIS

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CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page : 1 Of 1

Section A
Required Client Information:

Company:	Pace Analytical National
Address:	12065 Lebanon Road
	Mount Juliet, TN 37122
Email:	SuboutTeam@pacenational.com
Phone:	(615)773-9756 Fax: (615)758-5859
Requested Due Date:	10-May

Section B
Required Project Information:

Report To:	Pace Analytical National Subout Team
Copy To:	
Purchase Order #:	L1093437
Project Name:	N/A
Project #:	N/A

Section C
Invoice Information:

Attention:	Art Saunders
Company Name:	
Address:	
Pace Quote:	
Pace Project Manager:	Nathan Boberg
Pace Profile #:	38076

Regulatory Agency	State / Location
	DE

WO#: 10472825

10472825

SAMPLE ID
One Character per box.
(A-Z, 0-9 / , -)
Sample Ids must be unique

MATRIX	CODE
Drinking Water	DW
Water	WT
Waste Water	WW
Product	P
Soil/Solid	SL
Oil	OL
Wipe	WP
Air	AR
Other	OT
Tissue	TS

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test (Y/N)	PFAS/PFOS Method 537 & Dioxin/Furans by method 1613	Residual Chlorine (Y/N)	
1	WW-20190427-002- DAY 3	WT				27-Apr	12:30		4	4									X		ok
2																					
10																					
11																					
12																					

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
	Benita Miller	29-Apr	16:46	Pace	4/30/19	850	1.7	Y	Y	Y
Pace Analytical National Batch: WG1273334										
Pace Analytical National SDGs: L1093437										

SAMPLER NAME AND SIGNATURE		TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
PRINT Name of SAMPLER:					
SIGNATURE of SAMPLER:	DATE Signed:				

Pace Analytical	Document Name: Sample Condition Upon Receipt Form	Document Revised: 05Apr2019 Page 1 of 1
	Document No.: F-MN-L-213-rev.27	Issuing Authority: Pace Minnesota Quality Office

Sample Condition Upon Receipt

Client Name: Pace National

Project #: **WO#: 10472825**

PM: NB3 **Due Date: 05/14/19**

CLIENT: ESC_TN

Courier: ☑ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Pace ☐ SpeeDee ☐ Commercial See Exception ☐

Tracking Number: 4876 1094 9690

Custody Seal on Cooler/Box Present? ☑ Yes ☐ No **Seals Intact?** ☑ Yes ☐ No **Biological Tissue Frozen?** ☐ Yes ☐ No ☑ N/A

Packing Material: ☑ Bubble Wrap ☑ Bubble Bags ☐ None ☐ Other: _____ **Temp Blank?** ☑ Yes ☐ No

Thermometer: ☑ T1(0461) ☐ T2(1336) ☐ T3(0459) ☐ T4(0254) ☐ T5(0048) **Type of Ice:** ☑ Wet ☐ Blue ☐ None ☐ Dry ☐ Melted

Note: Each West Virginia Sample must have temp taken (no temp blanks)

Temp should be above freezing to 6°C **Cooler Temp Read w/temp blank:** 1.7 °C

Correction Factor: True **Cooler Temp Corrected w/temp blank:** 1.7 °C

Average Corrected Temp (no temp blank only): _____ °C See Exceptions ☐

USDA Regulated Soil: (☑ N/A, water sample/Other: _____)

Did samples originate in a quarantine zone within the United States: AL, AR, CA, FL, GA, ID, LA, MS, NC, NM, NY, OK, OR, SC, TN, TX or VA (check maps)? ☐ Yes ☐ No

Did samples originate from a foreign source (internationally, including Hawaii and Puerto Rico)? ☐ Yes ☐ No

Date/Initials of Person Examining Contents: HF 4/30/19

If Yes to either question, fill out a Regulated Soil Checklist (F-MN-Q-338) and include with SCUR/COC paperwork.

		COMMENTS:
Chain of Custody Present and Filled Out?	☑ Yes ☐ No	1.
Chain of Custody Relinquished?	☑ Yes ☐ No	2.
Sampler Name and/or Signature on COC?	☐ Yes ☑ No ☐ N/A	3.
Samples Arrived within Hold Time?	☑ Yes ☐ No	4.
Short Hold Time Analysis (<72 hr)?	☐ Yes ☑ No	5. ☐ Fecal Coliform ☐ HPC ☐ Total Coliform/E coli ☐ BOD/cBOD ☐ Hex Chrome ☐ Turbidity ☐ Nitrate ☐ Nitrite ☐ Orthophos ☐ Other_____
Rush Turn Around Time Requested?	☐ Yes ☑ No	6.
Sufficient Volume?	☑ Yes ☐ No	7.
Correct Containers Used?	☑ Yes ☐ No	8.
-Pace Containers Used?	☑ Yes ☐ No	
Containers Intact?	☑ Yes ☐ No	9.
Field Filtered Volume Received for Dissolved Tests?	☐ Yes ☐ No ☑ N/A	10. Is sediment visible in the dissolved container? ☐ Yes ☐ No
Is sufficient information available to reconcile the samples to the COC?	☑ Yes ☐ No	11. **If no, write ID/ Date/Time on Container Below:** See Exception ☐
Matrix: ☑ Water ☐ Soil ☐ Oil ☐ Other_____		
All containers needing acid/base preservation have been checked?	☐ Yes ☐ No ☑ N/A	12. Sample #
All containers needing preservation are found to be in compliance with EPA recommendation? (HNO_3, H_2SO_4, <2pH, NaOH >9 Sulfide, NaOH>12 Cyanide)	☐ Yes ☐ No ☑ N/A	☐ NaOH ☐ HNO_3 ☐ H_2SO_4 ☐ Zinc Acetate
Exceptions: VOA, Coliform, TOC/DOC Oil and Grease, DRO/8015 (water) and Dioxin/PFAS	☐ Yes ☐ No ☑ N/A	Positive for Res. Chlorine? ☐ Yes ☐ No **pH Paper Lot#** See Exception ☐
		Res. Chlorine | 0-6 Roll | 0-6 Strip | 0-14 Strip
Headspace in VOA Vials (greater than 6mm)?	☐ Yes ☐ No ☑ N/A	13. See Exception ☐
Trip Blank Present?	☐ Yes ☐ No ☑ N/A	14.
Trip Blank Custody Seals Present?	☐ Yes ☐ No ☑ N/A	Pace Trip Blank Lot # (if purchased): _____

CLIENT NOTIFICATION/RESOLUTION

Person Contacted: _____ Date/Time: _____ **Field Data Required?** ☐ Yes ☐ No

Comments/Resolution: Samples collected in Texas.

Project Manager Review: Kristen Hoffberg Date: 5/1/2019

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers).

Labeled by: HF

QC Matric lot #: 187814 **TRIZMA Lot #:** 183004/18F285 **Extract Start:** 05/08/19 10:30
Time of Spiking: 05/08/19 10:30 **Optima H2O Lot #:** 187814 **Extract End:** 05/08/19 12:00
SPE Cartridge: 5322-0024 **Methanol Lot #:** 187805 **Setup By:** PY
Balance: 10BALQ

	Lot Number	Amount	Initials	Expiration	Dispenser	Witness
Internal	12332-184	100	PY	11/03/19	Q503	NH
Surrogate	12332-165	100	PY	10/19/19	Q523	NH
Native Lo	12332-167	10	PY	10/19/19	Q523	NH
Native Mid	12332-167	100	PY	10/19/19	Q523	NH
Native Hi						
GenX IS	12332-175	200	PY	10/25/19	Q497	NH

#	Sample ID	GenX IS	Surrogate	Natives	Full Bottle Weight	Empty Bottle Weight	Amount Extracted	Comments
1	BLANK-70381	X	X		293.8	37.4	256.4	
2	LCS-70382	X	X	X	280.6	36.7	243.9	
3	LCS-70383	X	X	X	287.0	36.7	250.3	
4	LCSD-70384	X	X	X	297.2	36.7	260.5	
5	10472941001-R	X	X		63.5	36.7	26.8	
6	10472941002-R	X	X		63.2	13.0	50.2	
7	10472552001-R	X	X		38.2	12.9	25.3	
8	10472552002-R	X	X		37.9	12.8	25.1	
9	10472552003-R	X	X		282.9	12.8	270.1	
10	10472552006-R	X	X		291.3	37.5	253.7	
11	10472823001-R	X	X		302.9	27.4	275.5	
12	10472825001-R	X	X		308.2	28.2	280.0	
13	10472552002-R-D	X	X		39.6	13.0	26.7	

EB-24552

Appendix B

Sample Analysis Summary

Pace Analytical Services, LLC
1700 Elm Street, Suite 200
Minneapolis, MN 55414
(612) 607-1700

Method 537 (Modified)

Sample Analysis Summary

Client's Sample ID	WW-20190427-002-DAY 3	Date Extracted	05/08/2019
Lab Sample ID	10472825001-R	Total Amount Extracted	280 mL
Filename	B190515C_008	ICAL ID	190515A02
Matrix	Industrial_Wate	Starting CCal	B190515C_002
Collected	04/27/2019	Ending CCal	B190515C_012
Received	04/30/2019	Method Blank Filename	B190510A_003

Compound	Concentration (ng/L)		PQL (ng/L)	MDL (ng/L)	Dilution	Analyzed	CAS No.	Qual.
PFOS	130	D	3.4	1.1	2	05/17/2019 06:46	1763-23-1	N2

Surrogate Standards

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	8.1	404	70 - 130	Fail
13C2_PFDA	2.0	1.6	81	70 - 130	Pass
d5-EtFOSAA	8.0	9.0	112	70 - 130	Pass

Internal Standards

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPrOPrA	92100	87991 - 263973	106647 - 213294	Fail
13C2_PFOA	83509	209570 - 628710	282331 - 564662	Fail
13C4_PFOS	479335	280766 - 842297	383802 - 767605	Pass

50-150% of Ical area
70-140% of the preceding CCV area

N2 = The lab does not hold NELAC/TNI accreditation for this parameter but other accreditations/certifications may apply. A complete list of accreditations/certifications is available upon request.

Appendix C

QC and Calibration Results Summary

Pace Analytical Services, LLC
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Method 537 (Modified) Blank Analysis Summary

Lab Sample ID	BLANK-70381	Total Amount Extracted	256 mL
Filename	B190510A_003	ICAL ID	190509B02
Matrix	Water	Starting CCal	B190510A_001
Date Extracted	05/08/2019	Ending CCal	B190510A_014

Compound	Concentration (ng/L)	PQL (ng/L)	MDL (ng/L)	Dilution	Analyzed	CAS No.	Qual.
PFOS	ND	1.9	0.61	1	05/10/2019 10:14	1763-23-1	N2

Surrogate Standards

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	1.7	85	70 - 130	Pass
13C2_PFDA	2.0	2.0	99	70 - 130	Pass
d5-EtFOSAA	8.0	6.7	84	70 - 130	Pass

Internal Standards

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPrOPrA	155277	85724 - 257173	146887 - 293774	Pass
13C2_PFOA	457435	226773 - 680320	322102 - 644204	Pass
13C4_PFOS	641464	306835 - 920505	430300 - 860601	Pass
d3-MeFOSAA	169931	91759 - 275277	126038 - 252076	Pass

50-150% of Ical area
70-140% of the preceding CCV area

N2 = The lab does not hold NELAC/TNI accreditation for this parameter but other accreditations/certifications may apply. A complete list of accreditations/certifications is available upon request.

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Method 537 (Modified) Laboratory Control Sample (LCS)

LCS Lab Sample ID	LCS-70383		
LCS Filename	B190510A_005	Matrix	Water
Total Amount Extracted	250mL	Dilution	1
ICAL ID	190509B02	Extracted	05/08/2019
Start CCal Filename	B190510A_001	Analyzed	05/10/2019 10:38
End CCal Filename	B190510A_014	Injected By	WM
Method Blank Filename	B190510A_003		

Compound	**Spiked** (ng/L)	**Recovered** (ng/L)	**Recovery** %	**Limits**
PFOS	19	20	104	70.0 - 130.0

Surrogate Standards

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	1.9	96	70 - 130	Pass
13C2_PFDA	2.0	2.1	107	70 - 130	Pass
d5-EtFOSAA	8.0	7.4	93	70 - 130	Pass

Internal Standards

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPrOPrA	167699	85724 - 257173	146887 - 293774	Pass
13C2_PFOA	422108	226773 - 680320	322102 - 644204	Pass
13C4_PFOS	572673	306835 - 920505	430300 - 860601	Pass
d3-MeFOSAA	163053	91759 - 275277	126038 - 252076	Pass

50-150% of Ical area
70-140% of the preceding CCV area

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Method 537 (Modified) Laboratory Control Sample (LCS)

LCS Lab Sample ID	LCS-70382		
LCS Filename	B190510C_022	Matrix	Water
Total Amount Extracted	244mL	Dilution	1
ICAL ID	190510B02	Extracted	05/08/2019
Start CCal Filename	B190510C_015	Analyzed	05/10/2019 23:05
End CCal Filename	B190510C_027	Injected By	WM
Method Blank Filename	B190510A_003		

Compound	**Spiked** (ng/L)	**Recovered** (ng/L)	**Recovery** %	**Limits**
PFOS	2.0	1.4 J	70	50.0 - 150.0

Surrogate Standards

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	1.8	88	70 - 130	Pass
13C2_PFDA	2.0	1.9	96	70 - 130	Pass
d5-EtFOSAA	8.0	7.1	88	70 - 130	Pass

Internal Standards

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPrOPrA	141325	72165 - 216496	99173 - 198347	Pass
13C2_PFOA	460611	232407 - 697222	321886 - 643773	Pass
13C4_PFOS	621549	311285 - 933856	420558 - 841116	Pass
d3-MeFOSAA	176764	95258 - 285775	133038 - 266077	Pass

50-150% of Ical area
70-140% of the preceding CCV area

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Method 537 (Modified) Laboratory Control Sample Duplicate (LCSD)

LCSD Lab Sample ID	LCSD-70384		
LCSD Filename	B190510A_006	LCS Filename	B190510C_022
Total Amount Extracted	260mL	Matrix	Water
ICAL ID	190509B02	Dilution	1
Start CCal Filename	B190510A_001	Extracted	05/08/2019
End CCal Filename	B190510A_014	Analyzed	05/10/2019 10:49
Method Blank Filename	B190510A_003	Injected By	WM

Compound	**Spiked** (ng/L)	**Recovered** (ng/L)	**Recovery** %	**Recovery Limits**	**RPD** %
PFOS	1.8	1.1 J	60	50.0 - 150.0	22

Surrogate Standards

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	1.7	85	70 - 130	Pass
13C2_PFDA	2.0	1.9	97	70 - 130	Pass
d5-EtFOSAA	8.0	6.6	83	70 - 130	Pass

Internal Standards

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPrOPrA	160269	85724 - 257173	146887 - 293774	Pass
13C2_PFOA	477131	226773 - 680320	322102 - 644204	Pass
13C4_PFOS	656488	306835 - 920505	430300 - 860601	Pass
d3-MeFOSAA	171770	91759 - 275277	126038 - 252076	Pass

50-150% of Ical area
70-140% of the preceding CCV area

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PFAA Initial Calibration Response Factor Summary

ICAL ID	**190509B02**	Data Files:	CS-1	B190509B_001	15:22
Calibration Date	05/09/2019		CS-2	B190509B_002	15:33
Instrument	10LCMS02		CS-3	B190509B_003	15:45
Column Phase	C18		CS-4	B190509B_004	15:57
Column ID No.	H18-061776		CS-5	B190509B_005	16:09
Analyst	NH		CS-6	B190509B_006	16:20

Response Factors

Compound	Type	CAL1	CAL2	CAL3	CAL4	CAL5	CAL6	Slope	R^2
13C3_PFPrOPrA	L	11000	10500	10400	10600	10800	11100	10700	0.999
13C2_PFOA	L	227000	229000	223000	226000	231000	225000	227000	1.000
13C4_PFOS	L	104000	108000	108000	105000	109000	107000	107000	1.000
d3-MeFOSAA	L	22500	23400	22100	22700	23700	23200	22900	0.999
13C2_PFHxA	L	1.24	1.26	1.27	1.24	1.26	1.27	1.26	1.000
13C2_PFDA	L	11.0	10.8	11.0	11.1	10.9	10.7	10.9	1.000
d5-EtFOSAA	L	0.974	0.939	0.962	0.943	0.976	0.887	0.947	0.999
PFBA	L	0.849	0.793	0.837	0.821	0.799	0.838	0.830	1.000
PFPeA	L	0.969	0.944	0.999	0.991	0.946	0.944	0.947	1.000
PFBS	L	0.484	0.454	0.476	0.473	0.470	0.484	0.481	1.000
PFHxA	L	1.03	1.00	1.03	0.996	1.00	0.942	0.957	0.999
PFPrOPrA	L	1.45	1.37	1.59	1.46	1.36	1.36	1.37	0.999
PFHpA	L	1.07	1.01	1.04	1.08	1.01	0.993	1.00	1.000
NaDONA	L	22.9	23.5	23.6	23.4	22.1	19.1	19.9	0.994
PFHxS	L	0.377	0.338	0.377	0.367	0.377	0.364	0.366	1.000
PFOA	L	0.981	0.957	0.976	0.948	0.966	0.916	0.928	1.000
PFNA	L	1.95	1.81	1.81	1.88	1.78	1.75	1.77	1.000
PFOS	L	1.05	0.983	0.962	1.03	1.00	1.01	1.01	1.000
PFDA	L	7.85	7.58	8.02	8.12	7.73	7.65	7.69	1.000
PFUdA	L	12.3	11.9	12.6	11.8	11.4	11.2	11.3	1.000
N-MeFOSAA	L	1.12	0.952	1.09	1.05	1.05	1.04	1.04	1.000
N-EtFOSAA	L	1.11	0.999	1.10	1.12	1.13	1.05	1.07	0.999
PFDS	L	4.99	4.87	5.23	5.01	5.08	4.99	5.01	1.000
PFDoA	L	7.42	6.95	7.52	7.35	7.13	7.07	7.10	1.000
PFTrDA	L	7.04	6.72	7.17	7.08	6.92	6.92	6.93	1.000
PFTeDA	L	2.77	2.57	2.54	2.50	2.56	2.55	2.55	1.000
PFHxDA	L	4.08	4.21	3.69	3.70	3.69	3.66	3.67	1.000
PFODA	L	2.27	2.05	2.13	2.11	2.11	2.17	2.16	1.000

Slope: Linear calibration

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PFAA Initial Calibration Recovery Summary

ICAL ID	**190509B02**	Data Files:	CS-1	B190509B_001	15:22
Calibration Date	05/09/2019		CS-2	B190509B_002	15:33
Instrument	10LCMS02		CS-3	B190509B_003	15:45
Column Phase	C18		CS-4	B190509B_004	15:57
Column ID No.	H18-061776		CS-5	B190509B_005	16:09
Analyst	NH		CS-6	B190509B_006	16:20

%Recoveries

Compound	CAL1	CAL2	CAL3	CAL4	CAL5	CAL6
13C3_PFPrOPrA	102	98	97	99	100	104
13C2_PFOA	100	101	98	100	102	99
13C4_PFOS	97	101	101	99	102	100
d3-MeFOSAA	98	102	96	99	103	101
13C2_PFHxA	99	100	101	99	100	101
13C2_PFDA	101	99	101	101	100	98
d5-EtFOSAA	103	99	102	100	103	94
PFBA	102	96	101	99	96	101
PFPeA	102	100	105	105	100	100
PFBS	101	94	99	98	98	101
PFHxA	108	105	107	104	105	98
PFPrOPrA	106	100	116	107	99	99
PFHpA	107	101	103	108	101	99
NaDONA	115	118	119	117	111	96
PFHxS	103	92	103	100	103	99
PFOA	106	103	105	102	104	99
PFNA	110	102	103	106	101	99
PFOS	104	97	95	102	99	100
PFDA	102	99	104	106	101	99
PFUdA	109	105	111	104	101	99
N-MeFOSAA	107	91	104	100	101	100
N-EtFOSAA	103	93	103	104	106	98
PFDS	99	97	104	100	101	100
PFDoA	105	98	106	104	100	100
PFTrDA	102	97	103	102	100	100
PFTeDA	109	101	100	98	100	100
PFHxDA	111	115	100	101	100	100
PFODA	105	95	99	98	98	101

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Method 537 (Modified) Calibration Verification Summary

ICV

Lab Calibration ID	ICV-12332-185	Instrument ID	10LCMS02
Run File Name	B190509B_008	Column ID	H18-061776
Injected By	WM	Ical ID	190509B02
Analyzed	05/09/2019 16:44		

Compound	Known Conc.	Conc. Found	%Recovery	Recovery Limits	Area
PFOS	19	19	97	50.0-150.0	494162

Surrogate Standards

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	2.0	98	70 - 130	Pass
13C2_PFDA	2.0	1.9	93	70 - 130	Pass
d5-EtFOSAA	8.0	7.5	94	70 - 130	Pass

Internal Standards

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPrOPrA	146739	85724 - 257173	---	Pass
13C2_PFOA	438498	226773 - 680320	---	Pass
13C4_PFOS	603590	306835 - 920505	---	Pass
d3-MeFOSAA	184461	91759 - 275277	---	Pass

50-150% of Ical area
70-140% of the preceding CCV area

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PFAA Initial Calibration Response Factor Summary

ICAL ID	**190510B02**	Data Files:	CS-1	B190510B_009	18:23
Calibration Date	05/10/2019		CS-2	B190510B_003	17:13
Instrument	10LCMS02		CS-3	B190510B_004	17:25
Column Phase			CS-4	B190510B_005	17:36
Column ID No.			CS-5	B190510B_006	17:48
Analyst	WM		CS-6	B190510B_007	18:00

Response Factors

Compound	Type	CAL1	CAL2	CAL3	CAL4	CAL5	CAL6	Slope	R^2
13C3_PFPrOPrA	L	8820	9280	9450	9250	8340	8990	9020	0.998
13C2_PFOA	L	236000	235000	239000	232000	224000	228000	232000	1.000
13C4_PFOS	L	110000	108000	110000	110000	106000	107000	108000	1.000
d3-MeFOSAA	L	21600	23800	24800	24000	24600	24100	23800	0.998
13C2_PFHxA	L	1.21	1.23	1.27	1.24	1.31	1.25	1.25	0.999
13C2_PFDA	L	11.5	11.6	10.8	11.4	11.2	10.6	11.2	0.999
d5-EtFOSAA	L	0.932	0.957	0.907	0.935	0.882	0.863	0.913	0.999
PFBA	L	0.876	0.769	0.813	0.808	0.841	0.805	0.812	1.000
PFPeA	L	1.02	0.939	0.963	1.00	1.01	0.949	0.963	0.999
PFBS	L	0.507	0.433	0.466	0.470	0.478	0.467	0.469	1.000
PFHxA	L	1.20	1.11	1.08	1.02	1.06	0.959	0.983	0.998
PFPrOPrA	L	1.75	1.51	1.62	1.75	1.67	1.66	1.66	1.000
PFHpA	L	1.06	1.02	1.05	1.06	1.05	0.995	1.01	0.999
NaDONA	L	30.3	26.8	27.7	28.5	29.2	0.000	29.0	1.000
PFHxS	L	0.374	0.338	0.369	0.377	0.372	0.365	0.367	1.000
PFOA	L	1.00	0.957	0.931	0.950	0.974	0.925	0.935	1.000
PFNA	L	1.78	1.79	1.95	1.93	1.87	1.73	1.77	0.999
PFOS	L	1.06	1.01	0.990	0.968	0.984	0.975	0.977	1.000
PFDA	L	8.37	7.47	7.94	8.17	7.78	7.57	7.64	1.000
PFUdA	L	12.5	11.5	12.0	12.3	11.2	10.8	11.0	0.999
N-MeFOSAA	L	0.941	0.968	1.08	1.06	1.02	1.03	1.03	1.000
N-EtFOSAA	L	1.13	1.07	1.16	1.11	1.07	1.06	1.06	1.000
PFDS	L	5.31	4.50	4.49	4.57	4.55	4.49	4.51	1.000
PFDoA	L	7.63	7.87	7.30	7.43	7.24	6.81	6.93	0.999
PFTrDA	L	7.18	7.66	7.26	7.52	7.17	7.05	7.10	1.000
PFTeDA	L	2.42	2.52	2.48	2.61	2.47	2.52	2.52	1.000
PFHxDA	L	3.71	3.56	3.58	3.77	3.72	3.67	3.68	1.000
PFODA	L	2.10	1.97	2.10	2.20	2.10	2.01	2.04	0.999

Slope: Linear calibration

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PFAA Initial Calibration Recovery Summary

ICAL ID	**190510B02**	Data Files:	CS-1	B190510B_009	18:23
Calibration Date	05/10/2019		CS-2	B190510B_003	17:13
Instrument	10LCMS02		CS-3	B190510B_004	17:25
Column Phase			CS-4	B190510B_005	17:36
Column ID No.			CS-5	B190510B_006	17:48
Analyst	WM		CS-6	B190510B_007	18:00

%Recoveries

Compound	CAL1	CAL2	CAL3	CAL4	CAL5	CAL6
13C3_PFPrOPrA	98	103	105	103	92	100
13C2_PFOA	102	101	103	100	96	98
13C4_PFOS	101	100	101	101	98	99
d3-MeFOSAA	91	100	104	101	103	101
13C2_PFHxA	97	98	101	99	105	100
13C2_PFDA	103	104	97	102	100	94
d5-EtFOSAA	102	105	99	102	97	95
PFBA	108	95	100	100	104	99
PFPeA	106	97	100	104	105	99
PFBS	108	92	99	100	102	100
PFHxA	122	113	110	104	108	98
PFPrOPrA	105	91	97	105	100	100
PFHpA	105	101	104	105	104	99
NaDONA	105	92	96	98	101	0
PFHxS	102	92	100	103	101	99
PFOA	107	102	100	102	104	99
PFNA	101	101	110	109	106	98
PFOS	109	104	101	99	101	100
PFDA	110	98	104	107	102	99
PFUdA	114	105	109	112	102	99
N-MeFOSAA	92	94	105	103	99	100
N-EtFOSAA	106	100	109	105	101	99
PFDS	118	100	100	101	101	100
PFDoA	110	114	105	107	104	98
PFTrDA	101	108	102	106	101	99
PFTeDA	96	100	98	104	98	100
PFHxDA	101	97	97	102	101	100
PFODA	103	97	103	108	103	99

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Method 537 (Modified) Calibration Verification Summary

ICV

Lab Calibration ID	ICV-12332-185	Instrument ID	10LCMS02
Run File Name	B190510B_011	Column ID	
Injected By	WM	Ical ID	190510B02
Analyzed	05/10/2019 18:47		

Compound	Known Conc.	Conc. Found	%Recovery	Recovery Limits	Area
PFOS	19	19	100	50.0-150.0	500481

Surrogate Standards

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	2.0	101	70 - 130	Pass
13C2_PFDA	2.0	2.1	106	70 - 130	Pass
d5-EtFOSAA	8.0	8.8	111	70 - 130	Pass

Internal Standards

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPrOPrA	143175	72165 - 216496	---	Pass
13C2_PFOA	430803	232407 - 697222	---	Pass
13C4_PFOS	615956	311285 - 933856	---	Pass
d3-MeFOSAA	160615	95258 - 285775	---	Pass

50-150% of Ical area
70-140% of the preceding CCV area

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PFAA Initial Calibration Response Factor Summary

ICAL ID	**190515A02**	Data Files:	CS-1	B190515A_017	13:00
Calibration Date	05/15/2019		CS-2	B190515A_018	13:12
Instrument	10LCMS02		CS-3	B190515A_019	13:24
Column Phase	C18		CS-4	B190515A_020	13:35
Column ID No.	H18-061776		CS-5	B190515A_021	13:47
Analyst	NH		CS-6	B190515A_022	13:59

Response Factors

Compound	Type	CAL1	CAL2	CAL3	CAL4	CAL5	CAL6	Slope	R^2
13C3_PFPrOPrA	L	10400	11000	11600	11500	10400	11100	11000	0.998
13C2_PFOA	L	212000	210000	212000	207000	216000	199000	210000	0.999
13C4_PFOS	L	97900	99400	102000	97800	97100	93200	97800	0.999
d3-MeFOSAA	L	45000	46000	43500	44400	45500	43400	44600	1.000
13C2_PFHxA	L	1.12	1.17	1.13	1.15	1.13	1.17	1.14	1.000
13C2_PFDA	L	5.83	5.32	5.69	5.64	5.93	5.50	5.65	0.999
d5-EtFOSAA	L	0.960	0.911	1.01	0.942	0.903	0.873	0.932	0.998
PFBA	L	0.739	0.742	0.707	0.718	0.686	0.735	0.725	0.999
PFPeA	L	0.857	0.832	0.877	0.900	0.853	0.885	0.880	1.000
PFBS	L	0.446	0.466	0.456	0.460	0.442	0.472	0.466	0.999
PFHxA	L	0.953	0.897	0.912	0.917	0.902	0.914	0.912	1.000
PFPrOPrA	L	1.64	1.45	1.46	1.39	1.52	1.47	1.48	1.000
PFHpA	L	0.998	0.992	1.00	0.998	0.963	0.976	0.975	1.000
NaDONA	L	22.8	21.7	20.4	19.4	20.7	18.3	18.9	0.997
PFHxS	L	0.362	0.361	0.348	0.358	0.368	0.374	0.372	1.000
PFOA	L	0.935	0.981	0.950	0.971	0.900	0.946	0.938	1.000
PFNA	L	1.96	1.82	1.86	1.94	1.86	1.84	1.85	1.000
PFOS	L	0.984	0.939	0.994	0.987	1.01	1.01	1.01	1.000
PFDA	L	4.28	4.38	4.15	4.10	4.09	4.05	4.06	1.000
PFUdA	L	7.36	6.35	7.29	6.82	6.74	6.08	6.25	0.998
N-MeFOSAA	L	0.993	0.975	1.12	1.02	1.02	1.02	1.02	1.000
N-EtFOSAA	L	1.15	1.13	1.19	1.17	1.17	1.08	1.11	0.999
PFDS	L	2.40	2.38	2.52	2.49	2.38	2.49	2.47	1.000
PFDoA	L	4.52	4.40	4.70	4.54	4.26	4.42	4.40	1.000
PFTrDA	L	4.49	4.34	4.67	4.52	4.34	4.52	4.48	1.000
PFTeDA	L	1.62	1.50	1.67	1.63	1.58	1.59	1.59	1.000
PFHxDA	L	2.82	2.69	2.60	2.56	2.48	2.59	2.57	1.000
PFODA	L	1.51	1.39	1.44	1.51	1.45	1.57	1.54	0.999

Slope: Linear calibration

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PFAA Initial Calibration Recovery Summary

ICAL ID	**190515A02**	Data Files:	CS-1	B190515A_017	13:00
Calibration Date	05/15/2019		CS-2	B190515A_018	13:12
Instrument	10LCMS02		CS-3	B190515A_019	13:24
Column Phase	C18		CS-4	B190515A_020	13:35
Column ID No.	H18-061776		CS-5	B190515A_021	13:47
Analyst	NH		CS-6	B190515A_022	13:59

%Recoveries

Compound	CAL1	CAL2	CAL3	CAL4	CAL5	CAL6
13C3_PFPrOPrA	95	100	106	104	95	101
13C2_PFOA	101	100	101	99	103	95
13C4_PFOS	100	102	104	100	99	95
d3-MeFOSAA	101	103	98	99	102	97
13C2_PFHxA	98	102	99	101	99	102
13C2_PFDA	103	94	101	100	105	97
d5-EtFOSAA	103	98	108	101	97	94
PFBA	102	102	98	99	95	101
PFPeA	97	95	100	102	97	101
PFBS	96	100	98	99	95	101
PFHxA	105	98	100	101	99	100
PFPrOPrA	111	98	99	94	103	100
PFHpA	102	102	103	102	99	100
NaDONA	121	115	108	103	110	97
PFHxS	97	97	94	96	99	101
PFOA	100	105	101	104	96	101
PFNA	106	98	101	105	101	99
PFOS	98	93	99	98	100	100
PFDA	105	108	102	101	101	100
PFUdA	118	102	117	109	108	97
N-MeFOSAA	97	95	110	100	100	100
N-EtFOSAA	104	102	108	106	106	98
PFDS	97	96	102	101	97	101
PFDoA	103	100	107	103	97	100
PFTrDA	100	97	104	101	97	101
PFTeDA	102	94	105	102	99	100
PFHxDA	110	105	101	99	96	101
PFODA	98	91	93	98	94	102

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Method 537 (Modified) Calibration Verification Summary

ICV

Lab Calibration ID	ICV-12332-185	Instrument ID	10LCMS02
Run File Name	B190515A_024	Column ID	H18-061776
Injected By	WM	Ical ID	190515A02
Analyzed	05/15/2019 14:22		

Compound	Known Conc.	Conc. Found	%Recovery	Recovery Limits	Area
PFOS	19	19	98	50.0-150.0	459614

Surrogate Standards

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	1.9	97	70 - 130	Pass
13C2_PFDA	2.0	2.0	99	70 - 130	Pass
d5-EtFOSAA	8.0	8.0	101	70 - 130	Pass

Internal Standards

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPrOPrA	175893	87991 - 263973	---	Pass
13C2_PFOA	408510	209570 - 628710	---	Pass
13C4_PFOS	555795	280766 - 842297	---	Pass
d3-MeFOSAA	347544	178513 - 535540	---	Pass

50-150% of Ical area
70-140% of the preceding CCV area

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Method 537 (Modified) Calibration Verification Summary

CCV

Lab Calibration ID	CAL-12332-186-01	Instrument ID	10LCMS02
Run File Name	B190510A_001	Column ID	H18-061776
Injected By	WM	Ical ID	190509B02
Analyzed	05/10/2019 09:51	Level	Low

Compound	Known Conc.	Conc. Found	%Recovery	Recovery Limits	Area
PFOS	1.9	1.9	101	50.0-150.0	52361

Surrogate Standards

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	2.0	101	70 - 130	Pass
13C2_PFDA	2.0	2.0	101	70 - 130	Pass
d5-EtFOSAA	8.0	7.8	97	70 - 130	Pass

Internal Standards

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPrOPrA	209839	85724 - 257173	---	Pass
13C2_PFOA	460145	226773 - 680320	---	Pass
13C4_PFOS	614715	306835 - 920505	---	Pass
d3-MeFOSAA	180054	91759 - 275277	---	Pass

50-150% of Ical area
70-140% of the preceding CCV area

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Method 537 (Modified) Calibration Verification Summary

CCV

Lab Calibration ID	CAL-12332-186-03	Instrument ID	10LCMS02
Run File Name	B190510A_014	Column ID	H18-061776
Injected By	WM	Ical ID	190509B02
Analyzed	05/10/2019 12:23	Level	Mid

Compound	Known Conc.	Conc. Found	%Recovery	Recovery Limits	Area
PFOS	9.6	9.2	96	70.0-130.0	258260

Surrogate Standards

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	2.1	103	70 - 130	Pass
13C2_PFDA	2.0	2.1	106	70 - 130	Pass
d5-EtFOSAA	8.0	7.8	97	70 - 130	Pass

Internal Standards

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPrOPrA	170208	85724 - 257173	146887 - 293774	Pass
13C2_PFOA	460059	226773 - 680320	322102 - 644204	Pass
13C4_PFOS	638000	306835 - 920505	430300 - 860601	Pass
d3-MeFOSAA	187232	91759 - 275277	126038 - 252076	Pass

50-150% of Ical area
70-140% of the preceding CCV area

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Method 537 (Modified) Calibration Verification Summary

CCV

Lab Calibration ID	CAL-12332-186-05	Instrument ID	10LCMS02
Run File Name	B190510C_015	Column ID	
Injected By	WM	Ical ID	190510B02
Analyzed	05/10/2019 21:43	Level	High

Compound	Known Conc.	Conc. Found	%Recovery	Recovery Limits	Area
PFOS	38	42	109	70.0-130.0	1064301

Surrogate Standards

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	2.0	101	70 - 130	Pass
13C2_PFDA	2.0	1.9	96	70 - 130	Pass
d5-EtFOSAA	8.0	7.8	97	70 - 130	Pass

Internal Standards

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPrOPrA	141676	72165 - 216496	103649 - 207299	Pass
13C2_PFOA	459838	232407 - 697222	324995 - 649989	Pass
13C4_PFOS	600797	311285 - 933856	443011 - 886023	Pass
d3-MeFOSAA	190055	95258 - 285775	124258 - 248516	Pass

50-150% of Ical area
70-140% of the preceding CCV area

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Method 537 (Modified) Calibration Verification Summary

CCV

Lab Calibration ID	CAL-12332-186-01	Instrument ID	10LCMS02
Run File Name	B190510C_027	Column ID	
Injected By	WM	Ical ID	190510B02
Analyzed	05/11/2019 00:04	Level	Low

Compound	Known Conc.	Conc. Found	%Recovery	Recovery Limits	Area
PFOS	1.9	2.0	102	50.0-150.0	53904

Surrogate Standards

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	1.9	96	70 - 130	Pass
13C2_PFDA	2.0	1.9	94	70 - 130	Pass
d5-EtFOSAA	8.0	8.4	105	70 - 130	Pass

Internal Standards

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPrOPrA	172897	72165 - 216496	99173 - 198347	Pass
13C2_PFOA	482120	232407 - 697222	321886 - 643773	Pass
13C4_PFOS	645153	311285 - 933856	420558 - 841116	Pass
d3-MeFOSAA	192784	95258 - 285775	133038 - 266077	Pass

50-150% of Ical area
70-140% of the preceding CCV area

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Method 537 (Modified) Calibration Verification Summary

CCV

Lab Calibration ID	CAL-12332-186-01	Instrument ID	10LCMS02
Run File Name	B190515C_002	Column ID	H18-061776
Injected By	WM	Ical ID	190515A02
Analyzed	05/16/2019 01:53	Level	Low

Compound	Known Conc.	Conc. Found	%Recovery	Recovery Limits	Area
PFOS	1.9	1.7	90	50.0-150.0	41763

Surrogate Standards

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	1.9	97	70 - 130	Pass
13C2_PFDA	2.0	2.2	109	70 - 130	Pass
d5-EtFOSAA	8.0	8.5	107	70 - 130	Pass

Internal Standards

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPrOPrA	152353	87991 - 263973	---	Pass
13C2_PFOA	403330	209570 - 628710	---	Pass
13C4_PFOS	548289	280766 - 842297	---	Pass
d3-MeFOSAA	316039	178513 - 535540	---	Pass

50-150% of Ical area
70-140% of the preceding CCV area

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Method 537 (Modified) Calibration Verification Summary

CCV

Lab Calibration ID	CAL-12332-186-03	Instrument ID	10LCMS02
Run File Name	B190515C_012	Column ID	H18-061776
Injected By	WM	Ical ID	190515A02
Analyzed	05/16/2019 03:51	Level	Mid

Compound	Known Conc.	Conc. Found	%Recovery	Recovery Limits	Area
PFOS	9.6	9.7	101	70.0-130.0	225391

Surrogate Standards

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	2.0	101	70 - 130	Pass
13C2_PFDA	2.0	2.0	99	70 - 130	Pass
d5-EtFOSAA	8.0	7.7	97	70 - 130	Pass

Internal Standards

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPrOPrA	160087	87991 - 263973	106647 - 213294	Pass
13C2_PFOA	394852	209570 - 628710	282331 - 564662	Pass
13C4_PFOS	530092	280766 - 842297	383802 - 767605	Pass
d3-MeFOSAA	345031	178513 - 535540	221228 - 442455	Pass

50-150% of Ical area
70-140% of the preceding CCV area

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Method 537 (Modified) Calibration Verification Summary

CCV

Lab Calibration ID	CAL-12332-186-01	Instrument ID	10LCMS02
Run File Name	B190516E_002	Column ID	H18-061776
Injected By	WM	Ical ID	190515A02
Analyzed	05/17/2019 01:52	Level	Low

Compound	Known Conc.	Conc. Found	%Recovery	Recovery Limits	Area
PFOS	1.9	1.8	94	50.0-150.0	46551

Surrogate Standards

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	1.9	95	70 - 130	Pass
13C2_PFDA	2.0	2.3	113	70 - 130	Pass
d5-EtFOSAA	8.0	8.7	109	70 - 130	Pass

Internal Standards

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPrOPrA	207736	87991 - 263973	149387 - 298773	Pass
13C2_PFOA	426758	209570 - 628710	301590 - 603181	Pass
13C4_PFOS	585306	280766 - 842297	402348 - 804697	Pass
d3-MeFOSAA	333773	178513 - 535540	248040 - 496079	Pass

50-150% of Ical area
70-140% of the preceding CCV area

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Method 537 (Modified) Calibration Verification Summary

CCV

Lab Calibration ID	CAL-12332-186-03	Instrument ID	10LCMS02
Run File Name	B190516E_038	Column ID	H18-061776
Injected By	WM	Ical ID	190515A02
Analyzed	05/17/2019 08:55	Level	Mid

Compound	Known Conc.	Conc. Found	%Recovery	Recovery Limits	Area
PFOS	9.6	9.3	97	70.0-130.0	240599

Surrogate Standards

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	2.0	98	70 - 130	Pass
13C2_PFDA	2.0	2.1	103	70 - 130	Pass
d5-EtFOSAA	8.0	8.7	109	70 - 130	Pass

Internal Standards

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPrOPrA	192251	87991 - 263973	145415 - 290831	Pass
13C2_PFOA	419272	209570 - 628710	298730 - 597461	Pass
13C4_PFOS	587621	280766 - 842297	409714 - 819429	Pass
d3-MeFOSAA	347485	178513 - 535540	233641 - 467282	Pass

50-150% of Ical area
70-140% of the preceding CCV area