# 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: | L1093333 |
| Samples Received: | 04/27/2019 |
| Project Number: | |
| Description: | |
| Report To: | Art Saunders<br>121 Continental Drive Suite 308<br>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.

90016229

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ONE LAB. NATIONWIDE.


| | |
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## WW-20190426-002-DAY2 L1093333-01 WW

| Collected by | Collected date/time | Received date/time |
|---|---|---|
| Rachel N. | 04/26/19 06:36 | 04/27/19 08:00 |

| Method | Batch | Dilution | Preparation date/time | Analysis date/time | Analyst | Location |
|---|---|---|---|---|---|---|
| Subcontracted Analyses | WG1273455 | 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

L1093333 -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
2 Tc
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 |

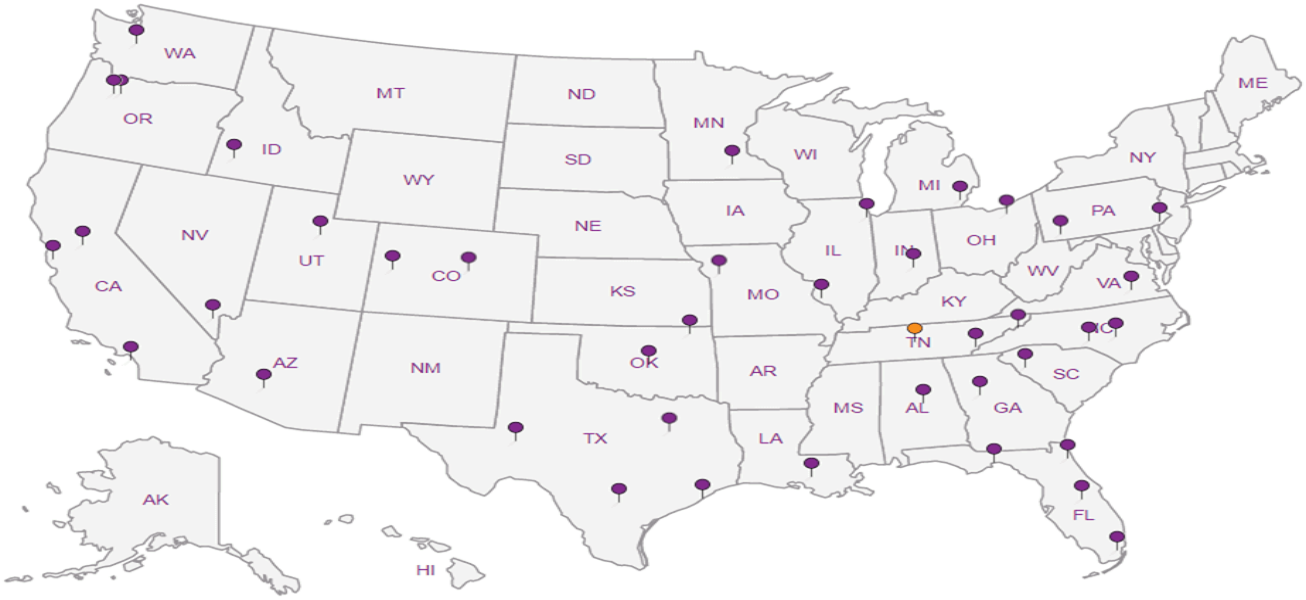
## Third Party Federal Accreditations

| | | | |
|---|---|---|---|
| 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): Richard Mitchell
Site/Facility ID #
P.O. #
Collected by (signature):
Quote #
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

Date Results Needed

Pres Chk

Analysis / Container / Preservative

Chain of Custody Page 1 of 1

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# L1093333
B193
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~~ Dexins/Furans 8290/1613 | Metals 250mlHDPE-HNO3 (2) | 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 (2) | TSS 1L-HDPE-NoPres | Total Cyanide 250mlHDPEAmb-NaOH (>12) | Remarks | Sample # (lab only) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ~~GW~~ | | | | 36 | X | X | X | X | X | X | X | X | X | X | | |
| WW-20190426-002-Day2 | Comp | WW | — | 4/26/19 | ~~1/12~~ 0636 | 3 | X | X | | X | X | | X | X | X | | | -01 |
| WW-20190426-002-Day2 | Grab | WW | — | 4/25/19 | 1325 | 2 | | | X | | | | | | | X | | |
| | | | | 4/27 | | | | | | | | | | | | | | |

* 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

RAD SCREEN: <0.5 mR

| Relinquished by : (Signature) | Date: | Time: | Received by: (Signature) | Trip Blank Received: Yes / No HCL / MeoH TBR | |
|---|---|---|---|---|---|
| | 4/26/19 | 16:38 | | / | |
| **Relinquished by : (Signature)** | **Date:** | **Time:** | **Received by: (Signature)** | **Temp: 13BF°C 2.2+.1=2.3** | **Bottles Received: 3 3** |
| | 4/26/19 | 20:00 | | | |
| **Relinquished by : (Signature)** | **Date:** | **Time:** | **Received for lab by: (Signature)** | **Date:** | **Time:** |
| | | | | 4/27/19 | 0800 |

If preservation required by Login: Date/Time

Hold:

Condition: NCF / OK

**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): Richard Natiamu
Site/Facility ID #
P.O. #
Collected by (Signature):
Quote #
Immediately Packed on Ice N ___ Y X

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

Date Results Needed

Pres Chk

Analysis / Container / Preservative

Chain of Custody Page 4 of 4

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 #
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 | ~~***CBOD*** 500mlHDPE-NoPres~~ 1,2 - Dibromoethane 8011 | ***CR6, TDS*** 250mlHDPE-NoPres | 8081/8082 100ml Amb-NoPres | 8141 100ml Amb NoPres | 8270AP9 100ml Amb NoPres | COD, NH3, PT, TKN 250mlHDPE-H2SO4 | ~~COLIFORT Microbiological~~ 8151 2,4,5 - TP Silvex | Chloride, pH, CHLORR 250mlHDPE-NoPres | Ethylene Glycol 40mlAmb-NoPres | ~~Extra Volume 1L Amb No Pres~~ Volatiles 8260 | Remarks | Sample # (lab only) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ~~GW~~ | | | | 36 | X | X | X | X | X | X | X | X | X | X | | |
| WW-20190426-002-Day2Comp | | WW | — | 4/26/19 | 0636 | | X | X | X | X | X | X | X | X | X | X | | -01 |
| | | | | 4/25/19 | 1325 | | | | | | | | | | | | | |

* 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 X 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
RAD SCREEN: <0.5 mR/hr

| Relinquished by : (Signature) | Date: | Time: | Received by: (Signature) | Trip Blank Received: Yes / No HCL / MeoH TBR | |
|---|---|---|---|---|---|
| | 4/26/19 | 16:38 | | | |
| Relinquished by : (Signature) | Date: | Time: | Received by: (Signature) | Temp: 4.3BF °C 1.2+.1=2.3 | Bottles Received: 33 |
| | 4/26/19 | 20:00 | | | |
| Relinquished by : (Signature) | Date: | Time: | Received for lab by: (Signature) | Date: | Time: |
| | | | | 4/27/19 | 0800 |

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 Information:

**Pace Project #: 10472822**
**Sample Receipt Date: 04/30/2019**
**Client Project #: L1093333: WG1273455**
**Client Sub PO #: L1093333**
**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 Prepared Date:**
May 10, 2019

## 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 73-96%. 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 = Interference present

J = Estimated value

L = Suppressive interference, analyte may be biased low

Nn = Value obtained from additional analysis

P = PCDE Interference

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

* = See Discussion



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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-20190426-002-DAY2 | 10472822001 | 04/30/2019 | Water |

## REPORT OF LABORATORY ANALYSIS

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

# CHAIN-OF-CUSTODY / Analytical Request Document

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



**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: | 1-May |

**Section B**
**Required Project Information:**

| | |
|---|---|
| Report To: | Pace Analytical National Subout Team |
| Copy To: | |
| Purchase Order #: | L1093333 |
| 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# : 10472822**

10472822

| ITEM # | SAMPLE ID (One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique) | 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 & Dioxin and Furans | Residual Chlorine (Y/N) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | WW-20190426-002-DAY2 | WT | | | | 26-Apr | 6:36 | | 4 | 4 | | | | | | | | | X | | CON |
| 2 | | | | | | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | | | | | | | | | |

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

| ADDITIONAL COMMENTS | RELINQUISHED BY / AFFILIATION | DATE | TIME | ACCEPTED BY / AFFILIATION | DATE | TIME | SAMPLE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Benita Miller BM | 29-Apr | 16:49 | Pace | 4/30/19 | 850 | 1.7 | Y | Y | Y |
| Pace Analytical National Batch: WG1273455 | | | | | | | | | | |
| **Pace Analytical National SDGs: L1093333** | | | | | | | | | | |
| **Location: Minneapolis, MN 55414** | | | | | | | | | | |

**PFAS/PFOS Method 537 and Dioxin and Furans by method 1613**

| 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#: 10472822**

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

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

**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 Hofer **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

# 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-20190426-002-DAY2 | | |
| Lab Sample ID | 10472822001 | | |
| Filename | Y190509A_10 | | |
| Injected By | SMT | | |
| Total Amount Extracted | 965 mL | Matrix | Water |
| % Moisture | NA | Dilution | NA |
| Dry Weight Extracted | NA | Collected | 04/26/2019 06:36 |
| 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 14:44 |

| Native Isomers | Conc pg/L | EMPC pg/L | EDL pg/L | Internal Standards | ng's Added | Percent Recovery |
|---|---|---|---|---|---|---|
| 2,3,7,8-TCDF | ND | ----- | 1.1 | 2,3,7,8-TCDF-13C | 2.00 | 81 |
| Total TCDF | ND | ----- | 1.1 | 2,3,7,8-TCDD-13C | 2.00 | 84 |
| | | | | 1,2,3,7,8-PeCDF-13C | 2.00 | 75 |
| 2,3,7,8-TCDD | ND | ----- | 0.99 | 2,3,4,7,8-PeCDF-13C | 2.00 | 73 |
| Total TCDD | ND | ----- | 0.99 | 1,2,3,7,8-PeCDD-13C | 2.00 | 81 |
| | | | | 1,2,3,4,7,8-HxCDF-13C | 2.00 | 84 |
| 1,2,3,7,8-PeCDF | ND | ----- | 1.8 | 1,2,3,6,7,8-HxCDF-13C | 2.00 | 85 |
| 2,3,4,7,8-PeCDF | ND | ----- | 2.2 | 2,3,4,6,7,8-HxCDF-13C | 2.00 | 85 |
| Total PeCDF | ND | ----- | 2.0 | 1,2,3,7,8,9-HxCDF-13C | 2.00 | 88 |
| | | | | 1,2,3,4,7,8-HxCDD-13C | 2.00 | 82 |
| 1,2,3,7,8-PeCDD | ND | ----- | 2.8 | 1,2,3,6,7,8-HxCDD-13C | 2.00 | 79 |
| Total PeCDD | ND | ----- | 2.8 | 1,2,3,4,6,7,8-HpCDF-13C | 2.00 | 92 |
| | | | | 1,2,3,4,7,8,9-HpCDF-13C | 2.00 | 83 |
| 1,2,3,4,7,8-HxCDF | ND | ----- | 2.6 | 1,2,3,4,6,7,8-HpCDD-13C | 2.00 | 96 |
| 1,2,3,6,7,8-HxCDF | ND | ----- | 2.1 | OCDD-13C | 4.00 | 80 |
| 2,3,4,6,7,8-HxCDF | ND | ----- | 2.5 | | | |
| 1,2,3,7,8,9-HxCDF | ND | ----- | 2.1 | 1,2,3,4-TCDD-13C | 2.00 | NA |
| Total HxCDF | ND | ----- | 2.3 | 1,2,3,7,8,9-HxCDD-13C | 2.00 | NA |
| 1,2,3,4,7,8-HxCDD | ND | ----- | 3.0 | 2,3,7,8-TCDD-37Cl4 | 0.20 | 93 |
| 1,2,3,6,7,8-HxCDD | ND | ----- | 1.8 | | | |
| 1,2,3,7,8,9-HxCDD | ND | ----- | 2.0 | | | |
| Total HxCDD | ND | ----- | 2.3 | | | |
| 1,2,3,4,6,7,8-HpCDF | ND | ----- | 1.4 | Total 2,3,7,8-TCDD | | |
| 1,2,3,4,7,8,9-HpCDF | ND | ----- | 1.1 | Equivalence: 0.00 pg/L | | |
| Total HpCDF | ND | ----- | 1.2 | (Lower-bound - Using 2005 WHO Factors) | | |
| 1,2,3,4,6,7,8-HpCDD | ND | ----- | 1.8 | | | |
| Total HpCDD | ND | ----- | 1.8 | | | |
| OCDF | ND | ----- | 2.8 | | | |
| OCDD | ND | ----- | 4.1 | | | |

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

## 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

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

Pace Analytical National

| | | | |
|---|---|---|---|
| Client's Sample ID | WW-20190426-002-DAY2 | | |
| Lab Sample ID | 10472822001 | | |
| Filename | Y190509A_10 | | |
| Injected By | SMT | | |
| Total Amount Extracted | 965 mL | Matrix | Water |
| % Moisture | NA | Dilution | NA |
| Dry Weight Extracted | NA | Collected | 04/26/2019 06:36 |
| 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 14:44 |

| Parameter | Conc pg/L | RL pg/L | WHO2005 | LB | MB | UB |
|---|---|---|---|---|---|---|
| 2,3,7,8-TCDF | ND | 1.1 | 0.10000 | 0.0000 | 0.0539 | 0.1078 |
| Total TCDF | ND | 1.1 | 0.00000 | 0.0000 | 0.0000 | 0.0000 |
| 2,3,7,8-TCDD | ND | 0.99 | 1.00000 | 0.0000 | 0.4959 | 0.9918 |
| Total TCDD | ND | 0.99 | 0.00000 | 0.0000 | 0.0000 | 0.0000 |
| 1,2,3,7,8-PeCDF | ND | 1.8 | 0.03000 | 0.0000 | 0.0264 | 0.0527 |
| 2,3,4,7,8-PeCDF | ND | 2.2 | 0.30000 | 0.0000 | 0.3349 | 0.6698 |
| Total PeCDF | ND | 2.0 | 0.00000 | 0.0000 | 0.0000 | 0.0000 |
| 1,2,3,7,8-PeCDD | ND | 2.8 | 1.00000 | 0.0000 | 1.3956 | 2.7912 |
| Total PeCDD | ND | 2.8 | 0.00000 | 0.0000 | 0.0000 | 0.0000 |
| 1,2,3,4,7,8-HxCDF | ND | 2.6 | 0.10000 | 0.0000 | 0.1323 | 0.2646 |
| 1,2,3,6,7,8-HxCDF | ND | 2.1 | 0.10000 | 0.0000 | 0.1048 | 0.2097 |
| 2,3,4,6,7,8-HxCDF | ND | 2.5 | 0.10000 | 0.0000 | 0.1249 | 0.2497 |
| 1,2,3,7,8,9-HxCDF | ND | 2.1 | 0.10000 | 0.0000 | 0.1071 | 0.2142 |
| Total HxCDF | ND | 2.3 | 0.00000 | 0.0000 | 0.0000 | 0.0000 |
| 1,2,3,4,7,8-HxCDD | ND | 3.0 | 0.10000 | 0.0000 | 0.1490 | 0.2980 |
| 1,2,3,6,7,8-HxCDD | ND | 1.8 | 0.10000 | 0.0000 | 0.0876 | 0.1753 |
| 1,2,3,7,8,9-HxCDD | ND | 2.0 | 0.10000 | 0.0000 | 0.1013 | 0.2025 |
| Total HxCDD | ND | 2.3 | 0.00000 | 0.0000 | 0.0000 | 0.0000 |
| 1,2,3,4,6,7,8-HpCDF | ND | 1.4 | 0.01000 | 0.0000 | 0.0068 | 0.0137 |
| 1,2,3,4,7,8,9-HpCDF | ND | 1.1 | 0.01000 | 0.0000 | 0.0055 | 0.0110 |
| Total HpCDF | ND | 1.2 | 0.00000 | 0.0000 | 0.0000 | 0.0000 |
| 1,2,3,4,6,7,8-HpCDD | ND | 1.8 | 0.01000 | 0.0000 | 0.0089 | 0.0178 |
| Total HpCDD | ND | 1.8 | 0.00000 | 0.0000 | 0.0000 | 0.0000 |
| OCDF | ND | 2.8 | 0.00030 | 0.0000 | 0.0004 | 0.0008 |
| OCDD | ND | 4.1 | 0.00030 | 0.0000 | 0.0006 | 0.0012 |
| | | | | **0.00 pg/L** | **3.1 pg/L** | **6.3 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

## REPORT OF LABORATORY ANALYSIS

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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
Fax: 612- 607-6444

# 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

## 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

# 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

## 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

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

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

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

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

# 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** | | | | |
| 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 | 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 |

## REPORT OF LABORATORY ANALYSIS

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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 |

**REPORT OF LABORATORY ANALYSIS**

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Fax: 612- 607-6444

# 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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# 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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# 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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# 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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## 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 #: 10472823**
**Sample Receipt Date: 04/30/2019**
**Client Project #: L1093333: WG1273455**
**Client Sub PO #: L1093333**
**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 sample 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 10472823001-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 10472823001-R sample had a recovery for the labeled PFPrOPrA internal standard that was lower than the method limit, which appears to be matrix related. The affected target analytes for this sample are PFPrOPrA (GenX) and NaDONA. However, this internal standard does 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
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 = Interference present

J = Estimated value

L = Suppressive interference, analyte may be biased low

Nn = Value obtained from additional analysis

P = PCDE Interference

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

* = See Discussion



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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-20190426-002-DAY2 | 10472823001 | 04/30/2019 | Water |
| WW-20190426-002-DAY2 | 10472823001-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: | 1-May |

**Section B — Required Project Information:**

| | |
|---|---|
| Report To: | Pace Analytical National Subout Team |
| Copy To: | |
| Purchase Order #: | L1093333 |
| 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#: 10472823

10472823

| ITEM # | SAMPLE ID (One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique) | 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 & Dioxin and Furans | Residual Chlorine (Y/ | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | WW-20190426-002-DAY2 | WT | | | | 26-Apr | 6:36 | | 4 | 4 | | | | | | | | | X | | CSI |
| 2 | | | | | | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | | | | | | | | | |

Requested Analysis Filtered (Y/N)

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

| ADDITIONAL COMMENTS | RELINQUISHED BY / AFFILIATION | DATE | TIME | ACCEPTED BY / AFFILIATION | DATE | TIME | SAMPLE CONDITIONS | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Benita Miller BM | 29-Apr | 16:49 | Pace | 4/30/19 | 850 | 1.7 | Y | Y | Y |
| Pace Analytical National Batch: WG1273455 | | | | | | | | | | |
| Pace Analytical National SDGs: L1093333 | | | | | | | | | | |
| Location: Minneapolis, MN 55414 | | | | | | | | | | |

PFAS/PFOS Method 537 and Dioxin and Furans by method 1613

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#: 10472823**

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

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

**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? -Pace Containers Used? | ☑ Yes ☐ No ☑ Yes ☐ No | 8. |
| 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? Matrix: ☑ Water ☐ Soil ☐ Oil ☐ Other _____ | ☑ Yes ☐ No | 11. If no, write ID/ Date/Time on Container Below: **See Exception** ☐ |
| 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: Kirsten Hoffing 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-20190426-002-DAY2 | Date Extracted | 05/08/2019 |
| Lab Sample ID | 10472823001-R | Total Amount Extracted | 276 mL |
| Filename | B190515C_004 | ICAL ID | 190515A02 |
| Matrix | Industrial_Wate | Starting CCal | B190515C_002 |
| Collected | 04/26/2019 | 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 | 2100 | D | 170 | 57 | 100 | 05/17/2019 02:16 | 1763-23-1 | N2 |

**Surrogate Standards**

| SS Compound | Spiked | Found | %Recovery | Limits | Pass/Fail |
|---|---|---|---|---|---|
| 13C2_PFHxA | 2.0 | 15 | 766 | 70 - 130 | Fail |
| 13C2_PFDA | 2.0 | 1.4 | 70 | 70 - 130 | Pass |
| d5-EtFOSAA | 8.0 | 8.8 | 109 | 70 - 130 | Pass |

**Internal Standards**

| IS Compound | Area | Ical Limits | CCV Limits | Pass/Fail |
|---|---|---|---|---|
| 13C3_PFPrOPrA | 72225 | 87991 - 263973 | 106647 - 213294 | Fail |
| d3-MeFOSAA | 427685 | 178513 - 535540 | 221228 - 442455 | Pass |
| 13C2_PFOA | 432146 | 209570 - 628710 | 298730 - 597461 | Pass |
| 13C4_PFOS | 585135 | 280766 - 842297 | 409714 - 819429 | 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**
1700 Elm Street, Suite 200
Minneapolis, MN 55414
(612) 607-1700

# 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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(612) 607-1700

# 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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(612) 607-1700

# 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

**Pace Analytical Services, LLC**
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(612) 607-1700

# 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

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

# 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

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

# 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