

Report Prepared for:

Luke Keyzer
City of Otsego MI
117 E. Orleans St.
Otsego MI 49078

**REPORT OF
LABORATORY
ANALYSIS
FOR PCBs**

Report Prepared Date:

September 20, 2018

Report Information:


Pace Project #: 10446574
Sample Receipt Date: 09/07/2018
Client Project #: Dioxins+PCB's
Client Sub PO #: N/A
State Cert #: 9909

Invoicing & Reporting Options:

The report provided has been invoiced as a Level 2 PCB 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 Joanne Richardson, your Pace Project Manager.

This report has been reviewed by:



September 20, 2018

Joanne Richardson,
(612) 607-6453
(612) 607-6444 (fax)



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 three samples submitted by a representative of the City of Otsego, MI. The samples were analyzed for the presence or absence of selected polychlorinated biphenyl (PCB) congeners using USEPA Method 1668A. Reporting limits were set to the signal to noise based estimated detection limits and adjusted for the amount of sample extracted. Values reported to the EDL were flagged "A" with levels below the calibration range flagged "J" as estimated concentrations.

The dilution level noted on the data tables is being adjusted to allow the correct values to populate the electronic deliverables as well as the data tables. Samples and MDL extracts were analyzed at elevated volumes. That volume is being treated as a 1x dilution for calculation purposes, with larger dilutions being factored from that volume.

The recoveries of the isotopically-labeled PCB internal standards in the sample extracts ranged from 73-103%. All of the labeled standard recoveries obtained for this project were within the target ranges specified in Method 1668A. Since the quantification of the native congeners was based on isotope dilution and internal standard methodology, the data were automatically corrected for variation in recovery and accurate values were obtained.

Incorrect isotope ratios were obtained for selected PCB congeners. The affected congeners were flagged "I" on the results table. Any associated target analyte detections were provided under the estimated maximum possible concentration (EMPC) column on the results table. If EMPCs were reported for congeners with WHO toxicity factors, the EMPC levels were included in the calculation of the toxic equivalence.

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 to be free of PCB congeners within the reporting range. This indicates that the sample preparation procedures did not significantly contribute to the PCB content of the sample extracts.

Laboratory spike samples were also prepared with the sample batch using reference material that had been fortified with native standards. The results show that the spiked native analytes were recovered at 92-102% with relative percent differences of 0.0-9.2%. These results were within the target ranges for this method. Matrix spikes were not prepared with this sample set.

REPORT OF LABORATORY ANALYSIS

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Minnesota Laboratory Certifications

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

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Appendix A

Sample Management



WO#: 10446574

CHAIN-OF-CUSTODY / Analytical Request Do
 The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed



Section A Required Client Information: Company: City of Otsego Report To: City of Otsego
 Address: 117 E. Orleans St. Copy To: City of Otsego
 Email To: otsego@cityofotsego.org Purchase Order No.: MI 49078
 Phone: 369-492-4581 Fax: 369-492-4581 Project Name: Dioxins + PCB's
 Requested Due Date/TAT: ASAP Project Number: 38786

Section B Required Project Information: Invoice Information: Attention: City of Otsego
 Company Name: City of Otsego
 Address: 117 E. Orleans St.
 Face Quote Reference: Jeanne Richardson
 Face Project Manager: 38786
 Face Profile #: MI

Section C Regulatory Agency: 2300162
 NPDES GROUND WATER DRINKING WATER
 UST RCRA OTHER

Site Location: MI STATE: MI

ITEM #	Section D Required Client Information	Matrix Codes MATRIX / CODE	COLLECTED		SAMPLE TYPE (G=GRAB C=COMP)	MATRIX CODE (see valid codes to left)	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	Requested Analysis Filtered (Y/N)	Preservatives	# OF CONTAINERS	Y/N	Analysis Test	PCBS - Men + Mon	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
			COMPOSITE START	COMPOSITE END/GRAB																
1	Well 3	DW	1:05		G	DW G														001
2		DW	1:07		G	DW G														002
3		DW		1:00	G	DW G														003
4		DW		1:02	G	DW G														004
5	Well 4	DW	12:40		G	DW G														005
6		DW	12:45		G	DW G														006
7		DW		12:47	G	DW G														007
8		DW		12:49	G	DW G														008
9	Well 5	DW	1:25		G	DW G														009
10		DW	1:27		G	DW G														010
11		DW		1:20	G	DW G														011
12		DW		1:22	G	DW G														012


ADDITIONAL COMMENTS

DATE: 2/7/18 TIME: 14:19
 RECEIVED BY: BOCS
 SAMPLE CONDITIONS: Y N
 Temp in °C: 0.2
 Received on Ice (Y/N): Y
 Sealed Cooler (Y/N): N
 Samples Intact (Y/N): Y

SAMPLER NAME AND SIGNATURE
 PRINT Name of SAMPLER: Luke Keyzer
 SIGNATURE of SAMPLER: Luke Keyzer
 DATE Signed (MM/DD/YY): 09/06/18

ORIGINAL

Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days. F-ALL-C-010-rev.00, 09Nov2017

	Document Name: Sample Condition Upon Receipt Form	Document Revised: 02May2018 Page 1 of 2
	Document No.: F-MN-L-213-rev.23	Issuing Authority: Pace Minnesota Quality Office

Sample Condition Upon Receipt

Client Name: CITY OF OTSEGO Project #: WO#: 10446574

WO#: 10446574
 PM: JMR Due Date: 09/21/18
 CLIENT: City of Otse

Courier: Fed Ex UPS USPS Client
 Commercial Pace SpeedDee Other:
 Tracking Number: 12 V88 770 01 5086 2697
5149 1500

Custody Seal on Cooler/Box Present? Yes No Seals Intact? Yes No
 Optional: Proj. Due Date: Proj. Name:

Packing Material: Bubble Wrap Bubble Bags None Other: Temp Blank? Yes No

Thermometer G87A9170600254 G87A9155100842
 Used: Type of Ice: Wet Blue None Dry Melted

Cooler Temp Read (°C): 0.2/1.9 Cooler Temp Corrected (°C): 0.2/1.9 Biological Tissue Frozen? Yes No N/A
 Temp should be above freezing to 6°C Correction Factor: PLUS Date and Initials of Person Examining Contents: JMR 9/7/18

USDA Regulated Soil (N/A, water sample)
 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?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	1.
Chain of Custody Filled Out?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	2.
Chain of Custody Relinquished?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	3.
Sampler Name and/or Signature on COC?	<input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	4.
Samples Arrived within Hold Time?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	5.
Short Hold Time Analysis (<72 hr)?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	6.
Rush Turn Around Time Requested?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	7.
Sufficient Volume?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	8.
Correct Containers Used?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	9.
-Pace Containers Used?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Containers Intact?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	10.
Filtered Volume Received for Dissolved Tests?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	11. Note if sediment is visible in the dissolved container
Is sufficient information available to reconcile the samples to the COC? Matrix: <u>WT</u>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	12. <u>Date on containers says 9/6/18</u>
All containers needing acid/base preservation have been checked?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	13. <input type="checkbox"/> HNO ₃ <input type="checkbox"/> H ₂ SO ₄ <input type="checkbox"/> NaOH Positive for Res. Chlorine? Y N
All containers needing preservation are found to be in compliance with EPA recommendation? (HNO ₃ , H ₂ SO ₄ , <2pH, NaOH >9 Sulfide, NaOH >12 Cyanide) Exceptions: VOA, Coliform, TOC/DOC Oil and Grease, DRO/8015 (water) and Dioxin/PFAS	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Sample #
Headspace in VOA Vials (>6mm)?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Initial when completed: Lot # of added preservative:
Trip Blank Present?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	14.
Trip Blank Custody Seals Present?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	15.
Pace Trip Blank Lot # (if purchased):		

CLIENT NOTIFICATION/RESOLUTION

Person Contacted: _____ Date/Time: _____
 Comments/Resolution: _____

Field Data Required? Yes No

Project Manager Review: Joanne Richardson Date: 9-7-18

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).

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

REPORT OF LABORATORY ANALYSIS

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Appendix B

Sample Analysis Summary



Method 1668A Polychlorobiphenyl Sample Analysis Results

Client - City of Otsego MI

Client's Sample ID	Well 3 A,B,C,D		
Lab Sample ID	10446574001		
Filename	P180916B_08		
Injected By	BAL		
Total Amount Extracted	981 mL	Matrix	Water
% Moisture	NA	Dilution	NA
Dry Weight Extracted	NA	Collected	09/06/2018 13:05
ICAL ID	P180916B01	Received	09/07/2018 09:40
CCal Filename(s)	P180916B_02	Extracted	09/11/2018 12:35
Method Blank ID	BLANK-64623	Analyzed	09/17/2018 08:09

PCB Isomer	IUPAC	RT	Ratio	ng's Added	ng's Found	% Recovery
Labeled Analytes						
13C-3,4,4',5'-TeCB	81	34.290	0.82	2.0	1.82	91
13C-3,3',4,4'-TeCB	77	34.860	0.79	2.0	1.91	96
13C-2,3,3',4,4'-PeCB	105	38.453	1.59	2.0	1.88	94
13C-2,3,4,4',5'-PeCB	114	37.782	1.62	2.0	1.73	86
13C-2,3',4,4',5'-PeCB	118	37.229	1.61	2.0	1.78	89
13C-2,3',4,4',5'-PeCB	123	36.894	1.48	2.0	1.71	85
13C-3,3',4,4',5'-PeCB	126	41.588	1.58	2.0	2.06	103
13C-HxCB (156/157)	156/157	44.661	1.27	4.0	3.24	81
13C-2,3',4,4',5,5'-HxCB	167	43.454	1.22	2.0	1.56	78
13C-3,3',4,4',5,5'-HxCB	169	47.914	1.24	2.0	1.82	91
13C-2,3,3',4,4',5,5'-HpCB	189	50.446	1.06	2.0	1.75	87
Recovery Standards						
13C-2,2',5,5'-TeCB	52	24.845	0.79	2.0	NA	NA
13C-2,2',4,5,5'-PeCB	101	32.093	1.55	2.0	NA	NA
13C-2,2',3,4,4',5'-HxCB	138	40.415	1.28	2.0	NA	NA
13C-2,2',3,3',4,4',5,5'-OoCB	194	52.278	0.95	2.0	NA	NA

Conc = Concentration
EML = Method Specified Reporting Limit (1668A)
EMPC = Estimated Maximum Possible Concentration
A = Limit of Detection based on signal to noise
B = Less than 10 times higher than method blank level
R = Recovery outside of Method 1668A control limits
Nn = Value obtained from additional analyses

ND = Not Detected
NA = Not Applicable
NC = Not Calculated
* = See Discussion
X = Outside QC Limits
RT = Retention Time
I = Interference
ng's = Nanograms

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**Method 1668A Polychlorobiphenyl
 Sample Analysis Results**

Client Sample ID Well 3 A,B,C,D
 Lab Sample ID 10446574001
 Filename P180916B_08

IUPAC	Co-elutions	RT	Ratio	Concentration ng/L	EMPC ng/L	EML ng/L
77		---	---	ND A	---	0.0153
81		---	---	ND A	---	0.0158
105		---	---	ND A	---	0.0152
114		---	---	ND A	---	0.0169
118		37.246	1.57	0.0343 JA	---	0.0138
123		---	---	ND A	---	0.0152
126		---	---	ND A	---	0.0169
156	156/157	---	---	ND A	---	0.0112
157	156/157	---	---	ND A	---	0.0112
167		---	---	ND A	---	0.00658
169		---	---	ND A	---	0.00657
189		---	---	ND A	---	0.00931

Conc = Concentration
 EML = Method Specified Reporting Limit (1668A)
 EMPC = Estimated Maximum Possible Concentration
 A = Limit of Detection based on signal to noise
 B = Less than 10 times higher than method blank level
 R = Recovery outside of Method 1668A control limits
 Nn = Value obtained from additional analyses

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Method 1668A Toxic Equivalency (TEQ) Calculations
 City of Otsego MI

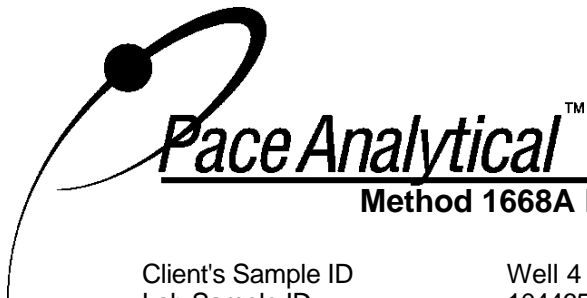
Client's Sample ID	Well 3 A,B,C,D		
Lab Sample ID	10446574001		
Filename	P180916B_08		
Injected By	BAL		
Total Amount Extracted	981 mL	Matrix	Water
% Moisture	NA	Dilution	NA
Dry Weight Extracted	NA	Collected	09/06/2018 13:05
ICAL ID	P180916B01	Received	09/07/2018 09:40
CCal Filename(s)	P180916B_02	Extracted	09/11/2018 12:35
Method Blank ID	BLANK-64623	Analyzed	09/17/2018 08:09

Parameter	Conc ng/L	RL ng/L	WHO2005	LB	MB	UB
77	ND	0.015	0.00010	0.0000	0.0000	0.0000
81	ND	0.016	0.00030	0.0000	0.0000	0.0000
105	ND	0.015	0.00003	0.0000	0.0000	0.0000
114	ND	0.017	0.00003	0.0000	0.0000	0.0000
118	0.034	0.014	0.00003	0.0000	0.0000	0.0000
123	ND	0.015	0.00003	0.0000	0.0000	0.0000
126	ND	0.017	0.10000	0.0000	0.0008	0.0017
156/157	ND	0.011	0.00003	0.0000	0.0000	0.0000
167	ND	0.0066	0.00003	0.0000	0.0000	0.0000
169	ND	0.0066	0.03000	0.0000	0.0001	0.0002
189	ND	0.0093	0.00003	0.0000	0.0000	0.0000
				0.0000010 ng/L	0.00095 ng/L	0.0019 ng/L

Final values are valid to only 3 significant figures
 LB = Lower Bound, Where "ND", TEQ Conc = 0
 MB = Medium Bound, Where "ND", TEQ Conc = (LOD/2) * (TEF Factor)
 UB = Upper Bound, Where "ND", TEQ Conc = LOD * (TEF Factor)
 RL = Reporting Limit

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Method 1668A Polychlorobiphenyl Sample Analysis Results

Client - City of Otsego MI

Client's Sample ID	Well 4 A,B,C,D		
Lab Sample ID	10446574005		
Filename	P180916B_09		
Injected By	BAL		
Total Amount Extracted	961 mL	Matrix	Water
% Moisture	NA	Dilution	NA
Dry Weight Extracted	NA	Collected	09/06/2018 12:40
ICAL ID	P180916B01	Received	09/07/2018 09:40
CCal Filename(s)	P180916B_02	Extracted	09/11/2018 12:35
Method Blank ID	BLANK-64623	Analyzed	09/17/2018 09:09

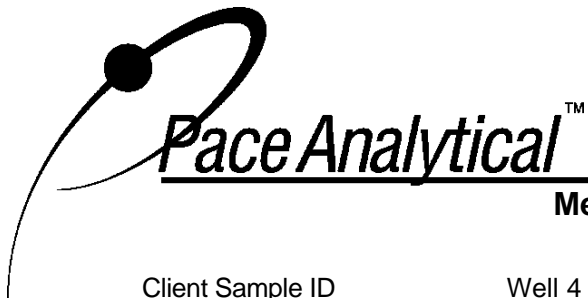
PCB Isomer	IUPAC	RT	Ratio	ng's Added	ng's Found	% Recovery
Labeled Analytes						
13C-3,4,4',5'-TeCB	81	34.256	0.80	2.0	1.64	82
13C-3,3',4,4'-TeCB	77	34.842	0.82	2.0	1.73	86
13C-2,3,3',4,4'-PeCB	105	38.436	1.60	2.0	1.56	78
13C-2,3,4,4',5'-PeCB	114	37.782	1.59	2.0	1.48	74
13C-2,3',4,4',5'-PeCB	118	37.212	1.55	2.0	1.47	73
13C-2,3,4,4',5'-PeCB	123	36.876	1.55	2.0	1.47	74
13C-3,3',4,4',5'-PeCB	126	41.588	1.63	2.0	1.79	89
13C-HxCB (156/157)	156/157	44.644	1.27	4.0	3.17	79
13C-2,3',4,4',5,5'-HxCB	167	43.437	1.30	2.0	1.53	76
13C-3,3',4,4',5,5'-HxCB	169	47.897	1.27	2.0	1.83	92
13C-2,3,3',4,4',5,5'-HpCB	189	50.424	1.08	2.0	1.62	81
Recovery Standards						
13C-2,2',5,5'-TeCB	52	24.828	0.77	2.0	NA	NA
13C-2,2',4,5,5'-PeCB	101	32.076	1.56	2.0	NA	NA
13C-2,2',3,4,4',5'-HxCB	138	40.397	1.24	2.0	NA	NA
13C-2,2',3,3',4,4',5,5'-OoCB	194	52.256	0.89	2.0	NA	NA

Conc = Concentration
 EML = Method Specified Reporting Limit (1668A)
 EMPC = Estimated Maximum Possible Concentration
 A = Limit of Detection based on signal to noise
 B = Less than 10 times higher than method blank level
 R = Recovery outside of Method 1668A control limits
 Nn = Value obtained from additional analyses

ND = Not Detected
 NA = Not Applicable
 NC = Not Calculated
 * = See Discussion
 X = Outside QC Limits
 RT = Retention Time
 I = Interference
 ng's = Nanograms

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**Method 1668A Polychlorobiphenyl
 Sample Analysis Results**

Client Sample ID Well 4 A,B,C,D
 Lab Sample ID 10446574005
 Filename P180916B_09

IUPAC	Co-elutions	RT	Ratio	Concentration ng/L	EMPC ng/L	EML ng/L
77		---	---	ND A	---	0.0171
81		---	---	ND A	---	0.0165
105		---	---	ND A	---	0.0176
114		---	---	ND A	---	0.0182
118		37.245	0.72 I	--- JA	0.0148	0.0144
123		---	---	ND A	---	0.0173
126		---	---	ND A	---	0.0178
156	156/157	---	---	ND A	---	0.0139
157	156/157	---	---	ND A	---	0.0139
167		---	---	ND A	---	0.00827
169		---	---	ND A	---	0.00788
189		---	---	ND A	---	0.00952

Conc = Concentration
 EML = Method Specified Reporting Limit (1668A)
 EMPC = Estimated Maximum Possible Concentration
 A = Limit of Detection based on signal to noise
 B = Less than 10 times higher than method blank level
 R = Recovery outside of Method 1668A control limits
 Nn = Value obtained from additional analyses

ND = Not Detected
 NA = Not Applicable
 NC = Not Calculated
 * = See Discussion
 X = Outside QC Limits
 RT = Retention Time
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Method 1668A Toxic Equivalency (TEQ) Calculations
 City of Otsego MI

Client's Sample ID	Well 4 A,B,C,D		
Lab Sample ID	10446574005		
Filename	P180916B_09		
Injected By	BAL		
Total Amount Extracted	961 mL	Matrix	Water
% Moisture	NA	Dilution	NA
Dry Weight Extracted	NA	Collected	09/06/2018 12:40
ICAL ID	P180916B01	Received	09/07/2018 09:40
CCal Filename(s)	P180916B_02	Extracted	09/11/2018 12:35
Method Blank ID	BLANK-64623	Analyzed	09/17/2018 09:09

Parameter	Conc ng/L	RL ng/L	WHO2005	LB	MB	UB
77	ND	0.017	0.00010	0.0000	0.0000	0.0000
81	ND	0.017	0.00030	0.0000	0.0000	0.0000
105	ND	0.018	0.00003	0.0000	0.0000	0.0000
114	ND	0.018	0.00003	0.0000	0.0000	0.0000
118	ND	0.014	0.00003	0.0000	0.0000	0.0000
123	ND	0.017	0.00003	0.0000	0.0000	0.0000
126	ND	0.018	0.10000	0.0000	0.0009	0.0018
156/157	ND	0.014	0.00003	0.0000	0.0000	0.0000
167	ND	0.0083	0.00003	0.0000	0.0000	0.0000
169	ND	0.0079	0.03000	0.0000	0.0001	0.0002
189	ND	0.0095	0.00003	0.0000	0.0000	0.0000
			0.00000044 ng/L	0.0010 ng/L	0.0020 ng/L	

Final values are valid to only 3 significant figures
 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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Method 1668A Polychlorobiphenyl Sample Analysis Results

Client - City of Otsego MI

Client's Sample ID	Well 5 A,B,C,D		
Lab Sample ID	10446574009		
Filename	P180916B_10		
Injected By	BAL		
Total Amount Extracted	954 mL	Matrix	Water
% Moisture	NA	Dilution	NA
Dry Weight Extracted	NA	Collected	09/06/2018 13:25
ICAL ID	P180916B01	Received	09/07/2018 09:40
CCal Filename(s)	P180916B_02	Extracted	09/11/2018 12:35
Method Blank ID	BLANK-64623	Analyzed	09/17/2018 10:09

PCB Isomer	IUPAC	RT	Ratio	ng's Added	ng's Found	% Recovery
Labeled Analytes						
13C-3,4,4',5'-TeCB	81	34.273	0.77	2.0	1.63	82
13C-3,3',4,4'-TeCB	77	34.859	0.80	2.0	1.67	83
13C-2,3,3',4,4'-PeCB	105	38.452	1.52	2.0	1.70	85
13C-2,3,4,4',5'-PeCB	114	37.765	1.56	2.0	1.65	83
13C-2,3',4,4',5'-PeCB	118	37.229	1.58	2.0	1.58	79
13C-2,3,4,4',5'-PeCB	123	36.876	1.59	2.0	1.63	82
13C-3,3',4,4',5'-PeCB	126	41.588	1.57	2.0	1.95	97
13C-HxCB (156/157)	156/157	44.628	1.25	4.0	3.37	84
13C-2,3',4,4',5,5'-HxCB	167	43.437	1.27	2.0	1.63	81
13C-3,3',4,4',5,5'-HxCB	169	47.914	1.25	2.0	1.85	92
13C-2,3,3',4,4',5,5'-HpCB	189	50.446	1.06	2.0	1.81	91
Recovery Standards						
13C-2,2',5,5'-TeCB	52	24.845	0.80	2.0	NA	NA
13C-2,2',4,5,5'-PeCB	101	32.093	1.62	2.0	NA	NA
13C-2,2',3,4,4',5'-HxCB	138	40.397	1.27	2.0	NA	NA
13C-2,2',3,3',4,4',5,5'-OoCB	194	52.278	0.89	2.0	NA	NA

Conc = Concentration
EML = Method Specified Reporting Limit (1668A)
EMPC = Estimated Maximum Possible Concentration
A = Limit of Detection based on signal to noise
B = Less than 10 times higher than method blank level
R = Recovery outside of Method 1668A control limits
Nn = Value obtained from additional analyses

ND = Not Detected
NA = Not Applicable
NC = Not Calculated
* = See Discussion
X = Outside QC Limits
RT = Retention Time
I = Interference
ng's = Nanograms

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**Method 1668A Polychlorobiphenyl
 Sample Analysis Results**

Client Sample ID Well 5 A,B,C,D
 Lab Sample ID 10446574009
 Filename P180916B_10

IUPAC	Co-elutions	RT	Ratio	Concentration ng/L	EMPC ng/L	EML ng/L
77		---	---	ND A	---	0.0123
81		---	---	ND A	---	0.0147
105		---	---	ND A	---	0.0167
114		---	---	ND A	---	0.0158
118		37.262	0.96 I	--- JA	0.0159	0.0145
123		---	---	ND A	---	0.0122
126		---	---	ND A	---	0.0183
156	156/157	---	---	ND A	---	0.0118
157	156/157	---	---	ND A	---	0.0118
167		---	---	ND A	---	0.00659
169		---	---	ND A	---	0.00796
189		---	---	ND A	---	0.00915

Conc = Concentration
 EML = Method Specified Reporting Limit (1668A)
 EMPC = Estimated Maximum Possible Concentration
 A = Limit of Detection based on signal to noise
 B = Less than 10 times higher than method blank level
 R = Recovery outside of Method 1668A control limits
 Nn = Value obtained from additional analyses

ND = Not Detected
 NA = Not Applicable
 NC = Not Calculated
 * = See Discussion
 X = Outside QC Limits
 RT = Retention Time
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 ng's = Nanograms

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Method 1668A Toxic Equivalency (TEQ) Calculations
 City of Otsego MI

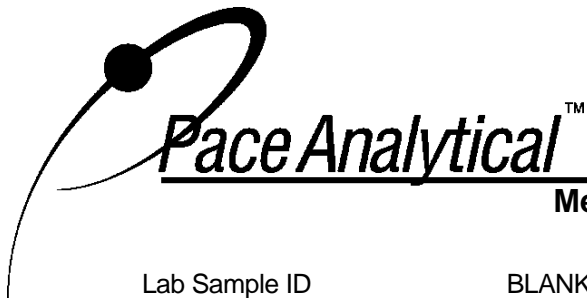
Client's Sample ID	Well 5 A,B,C,D		
Lab Sample ID	10446574009		
Filename	P180916B_10		
Injected By	BAL		
Total Amount Extracted	954 mL	Matrix	Water
% Moisture	NA	Dilution	NA
Dry Weight Extracted	NA	Collected	09/06/2018 13:25
ICAL ID	P180916B01	Received	09/07/2018 09:40
CCal Filename(s)	P180916B_02	Extracted	09/11/2018 12:35
Method Blank ID	BLANK-64623	Analyzed	09/17/2018 10:09

Parameter	Conc ng/L	RL ng/L	WHO2005	LB	MB	UB
77	ND	0.012	0.00010	0.0000	0.0000	0.0000
81	ND	0.015	0.00030	0.0000	0.0000	0.0000
105	ND	0.017	0.00003	0.0000	0.0000	0.0000
114	ND	0.016	0.00003	0.0000	0.0000	0.0000
118	ND	0.015	0.00003	0.0000	0.0000	0.0000
123	ND	0.012	0.00003	0.0000	0.0000	0.0000
126	ND	0.018	0.10000	0.0000	0.0009	0.0018
156/157	ND	0.012	0.00003	0.0000	0.0000	0.0000
167	ND	0.0066	0.00003	0.0000	0.0000	0.0000
169	ND	0.0080	0.03000	0.0000	0.0001	0.0002
189	ND	0.0091	0.00003	0.0000	0.0000	0.0000
			0.00000048 ng/L	0.0010 ng/L	0.0021 ng/L	

Final values are valid to only 3 significant figures
 LB = Lower Bound, Where "ND", TEQ Conc = 0
 MB = Medium Bound, Where "ND", TEQ Conc = (LOD/2) * (TEF Factor)
 UB = Upper Bound, Where "ND", TEQ Conc = LOD * (TEF Factor)
 RL = Reporting Limit

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**Method 1668A Polychlorobiphenyl
Blank Analysis Results**

Lab Sample ID	BLANK-64623		
Filename	P180916B_06		
Injected By	BAL	Matrix	Water (Non Potable)
Total Amount Extracted	1030 mL	Extracted	09/11/2018 12:35
ICAL ID	P180916B01	Analyzed	09/17/2018 06:09
CCal Filename(s)	P180916B_02	Dilution	NA

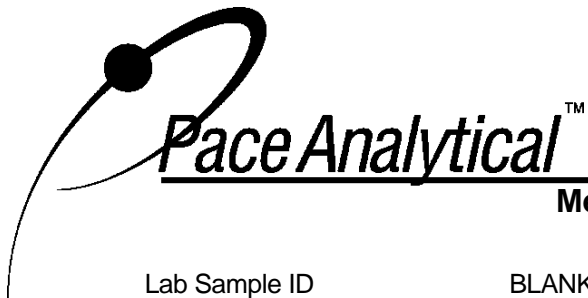
PCB Isomer	IUPAC	RT	Ratio	ng's Added	ng's Found	% Recovery
Labeled Analytes						
13C-3,4,4',5'-TeCB	81	34.273	0.79	2.0	1.51	75
13C-3,3',4,4'-TeCB	77	34.860	0.79	2.0	1.55	78
13C-2,3,3',4,4'-PeCB	105	38.453	1.62	2.0	1.56	78
13C-2,3,4,4',5'-PeCB	114	37.782	1.60	2.0	1.55	78
13C-2,3',4,4',5'-PeCB	118	37.229	1.58	2.0	1.50	75
13C-2,3',4,4',5'-PeCB	123	36.894	1.61	2.0	1.52	76
13C-3,3',4,4',5'-PeCB	126	41.588	1.65	2.0	1.67	83
13C-HxCB (156/157)	156/157	44.628	1.31	4.0	3.06	76
13C-2,3',4,4',5,5'-HxCB	167	43.454	1.24	2.0	1.49	74
13C-3,3',4,4',5,5'-HxCB	169	47.914	1.25	2.0	1.72	86
13C-2,3,3',4,4',5,5'-HpCB	189	50.446	1.09	2.0	1.57	79
Recovery Standards						
13C-2,2',5,5'-TeCB	52	24.845	0.80	2.0	NA	NA
13C-2,2',4,5,5'-PeCB	101	32.093	1.61	2.0	NA	NA
13C-2,2',3,4,4',5'-HxCB	138	40.415	1.26	2.0	NA	NA
13C-2,2',3,3',4,4',5,5'-OoCB	194	52.278	0.91	2.0	NA	NA

Conc = Concentration
EML =Method Specified Reporting Limit (1668A)
EMPC = Estimated Maximum Possible Concentration
A = Limit of Detection based on signal to noise
B = Less than 10 times higher than method blank level
R = Recovery outside of Method 1668A control limits
Nn = Value obtained from additional analyses

ND = Not Detected
NA = Not Applicable
NC = Not Calculated
* = See Discussion
X = Outside QC Limits
RT = Retention Time
I = Interference
ng's = Nanograms

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**Method 1668A Polychlorobiphenyl
 Blank Analysis Results**

Lab Sample ID BLANK-64623
 Filename P180916B_06

IUPAC	Co-elutions	RT	Ratio	Concentration ng/L	EMPC ng/L	EML ng/L
77		---	---	ND	---	0.0167
81		---	---	ND	---	0.0159
105		---	---	ND	---	0.0190
114		---	---	ND	---	0.0187
118		---	---	ND	---	0.0146
123		---	---	ND	---	0.0183
126		---	---	ND	---	0.0177
156	156/157	---	---	ND	---	0.0113
157	156/157	---	---	ND	---	0.0113
167		---	---	ND	---	0.00877
169		---	---	ND	---	0.00844
189		---	---	ND	---	0.00729

Conc = Concentration
 EML =Method Specified Reporting Limit (1668A)
 EMPC = Estimated Maximum Possible Concentration
 A = Limit of Detection based on signal to noise
 B = Less than 10 times higher than method blank level
 R = Recovery outside of Method 1668A control limits
 ng/L = Nanograms per liter

ND = Not Detected
 NA = Not Applicable
 NC = Not Calculated
 * = See Discussion
 X = Outside QC Limits
 RT = Retention Time
 I = Interference

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Method 1668A Toxic Equivalency (TEQ) Calculations
 City of Otsego MI

Client's Sample ID	CBLKGF		
Lab Sample ID	BLANK-64623		
Filename	P180916B_06		
Injected By	BAL		
Total Amount Extracted	1030 mL	Matrix	Water (Non Potable)
% Moisture	NA	Dilution	NA
Dry Weight Extracted	NA	Collected	09/10/2018 13:41
ICAL ID	P180916B01	Received	09/10/2018 13:41
CCal Filename(s)	P180916B_02	Extracted	09/11/2018 12:35
Method Blank ID		Analyzed	09/17/2018 06:09

Parameter	Conc ng/L	RL ng/L	WHO2005	LB	MB	UB
77	ND	0.017	0.00010	0.0000	0.0000	0.0000
81	ND	0.016	0.00030	0.0000	0.0000	0.0000
105	ND	0.019	0.00003	0.0000	0.0000	0.0000
114	ND	0.019	0.00003	0.0000	0.0000	0.0000
118	ND	0.015	0.00003	0.0000	0.0000	0.0000
123	ND	0.018	0.00003	0.0000	0.0000	0.0000
126	ND	0.018	0.10000	0.0000	0.0009	0.0018
156/157	ND	0.011	0.00003	0.0000	0.0000	0.0000
167	ND	0.0088	0.00003	0.0000	0.0000	0.0000
169	ND	0.0084	0.03000	0.0000	0.0001	0.0003
189	ND	0.0073	0.00003	0.0000	0.0000	0.0000

0.00 ng/L 0.0010 ng/L 0.0020 ng/L

Final values are valid to only 3 significant figures
 LB = Lower Bound, Where "ND", TEQ Conc = 0
 MB = Medium Bound, Where "ND", TEQ Conc = (LOD/2) * (TEF Factor)
 UB = Upper Bound, Where "ND", TEQ Conc = LOD * (TEF Factor)
 RL = Reporting Limit

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**Method 1668A Polychlorobiphenyls
 Laboratory Control Spike Analysis Results**

Lab Sample ID	LCS-64624	Matrix	Water (Non Potable)
Filename	P180916B_03	Dilution	NA
Total Amount Extracted	1030 mL	Extracted	09/11/2018 12:35
ICAL ID	P180916B01	Analyzed	09/17/2018 03:10
CCal Filename(s)	P180916B_02	Injected By	BAL
Method Blank ID	BLANK-64623		

PCB Isomer	Native Analytes			Labeled Analytes		
	Spiked (ng)	Found (ng)	% Recovery	Spiked (ng)	Found (ng)	% Recovery
81	1.0	0.979	98	2.0	1.73	86
77	1.0	0.965	97	2.0	1.73	87
105	1.0	0.988	99	2.0	1.72	86
114	1.0	0.946	95	2.0	1.71	85
118	1.0	0.969	97	2.0	1.66	83
123	1.0	0.984	98	2.0	1.72	86
126	1.0	0.934	93	2.0	1.86	93
156/157	2.0	2.03	101	4.0	3.09	77
167	1.0	0.997	100	2.0	1.55	78
169	1.0	0.917	92	2.0	1.79	90
189	1.0	1.00	100	2.0	1.72	86

R = Recovery outside of method 1668A control limits
 Nn = Result obtained from alternate analysis
 ND = Not Detected
 NA = Not Applicable
 NC = Not Calculated
 * = See Discussion
 ng = Nanograms
 I = Interference

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**Method 1668A Polychlorobiphenyls
 Laboratory Control Spike Analysis Results**

Lab Sample ID	LCSD-64625	Matrix	Water (Non Potable)
Filename	P180916B_04	Dilution	NA
Total Amount Extracted	1040 mL	Extracted	09/11/2018 12:35
ICAL ID	P180916B01	Analyzed	09/17/2018 04:10
CCal Filename(s)	P180916B_02	Injected By	BAL
Method Blank ID	BLANK-64623		

PCB Isomer	Native Analytes			Labeled Analytes		
	Spiked (ng)	Found (ng)	% Recovery	Spiked (ng)	Found (ng)	% Recovery
81	1.0	0.953	95	2.0	1.97	99
77	1.0	0.928	93	2.0	2.01	100
105	1.0	0.992	99	2.0	2.01	100
114	1.0	0.953	95	2.0	2.03	101
118	1.0	1.01	101	2.0	1.92	96
123	1.0	0.981	98	2.0	1.98	99
126	1.0	1.02	102	2.0	2.24	112
156/157	2.0	1.98	99	4.0	3.86	96
167	1.0	0.957	96	2.0	1.97	98
169	1.0	0.934	93	2.0	2.26	113
189	1.0	0.992	99	2.0	2.03	101

R = Recovery outside of method 1668A control limits
 Nn = Result obtained from alternate analysis
 ND = Not Detected
 NA = Not Applicable
 NC = Not Calculated
 * = See Discussion
 ng = Nanograms
 I = Interference

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Method 1668A

Spike Recovery Relative Percent Difference (RPD) Results

Client City of Otsego MI

Spike 1 ID LCS-64624
 Spike 1 Filename P180916B_03

Spike 2 ID LCSD-64625
 Spike 2 Filename P180916B_04

Compound	IUPAC	Spike 1 %REC	Spike 2 %REC	%RPD
3,3',4,4'-TeCB	77	97	93	4.2
3,4,4',5'-TeCB	81	98	95	3.1
2,3,3',4,4'-PeCB	105	99	99	0.0
2,3,4,4',5'-PeCB	114	95	95	0.0
2,3',4,4',5'-PeCB	118	97	101	4.0
2,3',4,4',5'-PeCB	123	98	98	0.0
3,3',4,4',5'-PeCB	126	93	102	9.2
(156/157)	156/157	101	99	2.0
2,3',4,4',5,5'-HxCB	167	100	96	4.1
3,3',4,4',5,5'-HxCB	169	92	93	1.1
2,3,3',4,4',5,5'-HpCB	189	100	99	1.0

%REC = Percent Recovered

RPD = The difference between the two values divided by the mean value

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