1435 Norjohn Court, Unit 1, Burlington, ON, Canada L7L 0E6

SVOC DATA PACKAGE

Client Project Information

Project ID:
Project Description:
Contact: Emily Jones

ALSE Project Information

Project ID: FLS100

Contact: Breanne Dusureault
Submission ID(s): L2310263

Final Package Review by: _____

Date Reviewed: 23-Oct-19

1435 Norjohn Court, Unit 1, Burlington, ON, Canada L7L 0E6

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SECTION 1: PROJECT NARRATIVE

ALSE Project Information

Project ID: FLS100

Contact: Breanne Dusureault

Submission ID(s): L2310263

Analytical Method: PCDD/F by EPA TO9A

Client Project Information

Project ID:

Project Description:

Contact: Emily Jones

ALS Sample ID	Client Sample Descriptions	Matrix	Date Sampled	Date Received	Date Extracted	Date Analyzed
L2310263-1	HEISER-25764410	Puf	11-Jul-19	16-Jul-19	12-Aug-19	16-Aug-19
L2310263-2	CITY-45764407	Puf	11-Jul-19	16-Jul-19	12-Aug-19	16-Aug-19
L2310263-3	RES-25764409	Puf	11-Jul-19	16-Jul-19	12-Aug-19	16-Aug-19
WG3116369-1	Method Blank	MEDIA	n/a	n/a	12-Aug-19	16-Aug-19
WG3116369-4	Method Blank	REAGENT	n/a	n/a	12-Aug-19	16-Aug-19
WG3116369-2	Laboratory Control Sample	QC	n/a	n/a	12-Aug-19	16-Aug-19

Comments and Notes:

a) Sample Integrity:

The samples were received in good condition at 6.8 degrees C.

b) Instrumental Analysis:

The recovery of the labelled standard 13C12-1,2,3,4,6,7,8-HpCDF was above the method control limit for the pre-run continuing calibration verification (CCV). The recoveries are within limits for the post-run CCV and the samples. However, the reported recoveries for this standard may be elevated. No bias to native target data is expected.

The recoveries of select field standards are below the method control limit.

I certify that this data package is in compliance with the terms and condition of the contract , both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this data package (hardcopy and/or electronic version) has been authorized by the Laboratory Manager or his designee, as verified by the following signature.

Steve Kennedy, Technical Supervisor

23-Oct-19
Date

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SECTION 2a:

CERTIFICATE OF ANALYSIS

SAMPLE AND QUALITY CONTROL SUMMARIES

1435 Norjohn Court, Unit 1, Burlington, ON, Canada L7L 0E6
Phone: 905-331-3111, FAX: 905-331-4567

Certificate of Analysis

ALS Project Contact:	Breanne Dusureault	**Client Name:**	Floyd Snider
ALS Project ID:	FLS100	**Client Address:**	601 Union Street, Suite 600
ALS WO#:	L2310263		Seattle, WA 98101
Date of Report	25-Oct-19		USA
Date of Sample Receipt	16-Jul-19	**Client Contact:**	Emily Jones
		Client Project ID:	

COMMENTS: **PCDD/F by EPA TO9A**
Analysis by HRGC/HRMS (modified EPA 1613B)

The recoveries of select field standards are below the method control limit.

Certified by:

Steve Kennedy
Technical Supervisor

ALS Life Sciences

Sample Analysis Summary Report

Sample Name	**HEISER-25764410**	**CITY-45764407**	**RES-25764409**
ALS Sample ID	L2310263-1	L2310263-2	L2310263-3
Sample Size	1	1	1
Sample size units	Puf	Puf	Puf
Percent Moisture	n/a	n/a	n/a
Sample Matrix	PUF	PUF	PUF
Sampling Date	11-Jul-19	11-Jul-19	11-Jul-19
Extraction Date	12-Aug-19	12-Aug-19	12-Aug-19
Target Analytes	**pg**	**pg**	**pg**
2,3,7,8-TCDD	<1.4	<2.1	<2.0
1,2,3,7,8-PeCDD	<0.61	<1.0	<0.89
1,2,3,4,7,8-HxCDD	<0.85	<1.2	<1.1
1,2,3,6,7,8-HxCDD	<0.78	<1.1	<1.0
1,2,3,7,8,9-HxCDD	<0.81	<1.1	<1.1
1,2,3,4,6,7,8-HpCDD	<1.3	<1.4	<2.4
OCDD	<6.5	8.24	<5.9
2,3,7,8-TCDF	<0.99	<1.2	<1.2
1,2,3,7,8-PeCDF	<0.65	<0.82	<0.93
2,3,4,7,8-PeCDF	<0.58	<0.73	<0.84
1,2,3,4,7,8-HxCDF	<0.65	<0.67	<0.70
1,2,3,6,7,8-HxCDF	<0.61	<0.62	<0.65
2,3,4,6,7,8-HxCDF	<0.65	<0.66	<0.69
1,2,3,7,8,9-HxCDF	<0.74	<1.1	<1.3
1,2,3,4,6,7,8-HpCDF	<0.55	<0.81	<0.89
1,2,3,4,7,8,9-HpCDF	<0.65	<0.84	<1.1
OCDF	<1.5	<1.3	<1.7
Field Spike Standards	**% Rec**	**% Rec**	**% Rec**
37Cl4-2,3,7,8-TCDD	82	80	87
13C12-1,2,3,4,7,8-HxCDD	78	78	80
13C12-2,3,4,7,8-PeCDF	79	80	91
13C12-1,2,3,4,7,8-HxCDF	58	56	70
13C12-1,2,3,4,7,8,9-HpCDF	69	61	75
Extraction Standards			
13C12-2,3,7,8-TCDD	70	92	64
13C12-1,2,3,7,8-PeCDD	82	119	81
13C12-1,2,3,6,7,8-HxCDD	84	108	82
13C12-1,2,3,4,6,7,8-HpCDD	81	120	76
13C12-OCDD	68	118	57
13C12-2,3,7,8-TCDF	86	102	85
13C12-1,2,3,7,8-PeCDF	93	120	89
13C12-1,2,3,6,7,8-HxCDF	88	110	86
13C12-1,2,3,4,6,7,8-HpCDF	90	118	83
Cleanup Standard			
13C12-1,2,3,7,8,9-HxCDF	86	117	89
Homologue Group Totals	**pg**	**pg**	**pg**
Total-TCDD	<1.4	<2.1	<2.0
Total-PeCDD	<0.61	<1.0	<0.89
Total-HxCDD	<0.85	<1.2	<1.1
Total-HpCDD	<0.75	<0.68	<2.4
Total-TCDF	<0.99	<1.2	<1.2
Total-PeCDF	<0.65	<0.82	<0.93
Total-HxCDF	<0.74	<0.76	<0.79
Total-HpCDF	<0.65	<0.84	<1.1
Toxic Equivalency - (WHO 2005)			
Lower Bound PCDD/F TEQ (WHO 2005)	0.00	0.00247	0.00
Mid Point PCDD/F TEQ (WHO 2005)	1.43	2.14	2.06
Upper Bound PCDD/F TEQ (WHO 2005)	2.84	4.14	3.99

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Quality Control Summary Report

Sample Name	Method Blank	Method Blank	Laboratory Control Sample
ALS Sample ID	WG3116369-1	WG3116369-4	WG3116369-2
Sample Size	1	1	1
Sample size units	Puf	Puf	n/a
Percent Moisture	n/a	n/a	n/a
Sample Matrix	MEDIA	REAGENT	QC
Sampling Date	n/a	n/a	n/a
Extraction Date	12-Aug-19	12-Aug-19	12-Aug-19
Target Analytes	**pg**	**pg**	**% Rec**
2,3,7,8-TCDD	<2.3	<2.0	105
1,2,3,7,8-PeCDD	<1.3	<1.1	106
1,2,3,4,7,8-HxCDD	<1.4	<1.5	102
1,2,3,6,7,8-HxCDD	<1.3	<1.3	109
1,2,3,7,8,9-HxCDD	<1.3	<1.4	117
1,2,3,4,6,7,8-HpCDD	<2.3	<2.1	102
OCDD	<6.2	8.95	97
2,3,7,8-TCDF	<1.5	<1.4	102
1,2,3,7,8-PeCDF	<1.1	<0.82	109
2,3,4,7,8-PeCDF	<0.97	<0.74	101
1,2,3,4,7,8-HxCDF	<0.97	<0.79	102
1,2,3,6,7,8-HxCDF	<0.90	<0.73	115
2,3,4,6,7,8-HxCDF	<0.97	<0.78	111
1,2,3,7,8,9-HxCDF	1.11	<0.93	112
1,2,3,4,6,7,8-HpCDF	<1.2	<0.76	103
1,2,3,4,7,8,9-HpCDF	<1.4	<0.90	101
OCDF	3.42	2.42	98
Field Spike Standards	**% Rec**	**% Rec**	**% Rec**
37Cl4-2,3,7,8-TCDD	NS	NS	NS
13C12-1,2,3,4,7,8-HxCDD	NS	NS	NS
13C12-2,3,4,7,8-PeCDF	NS	NS	NS
13C12-1,2,3,4,7,8-HxCDF	NS	NS	NS
13C12-1,2,3,4,7,8,9-HpCDF	NS	NS	NS
Extraction Standards			
13C12-2,3,7,8-TCDD	48	52	69
13C12-1,2,3,7,8-PeCDD	60	68	93
13C12-1,2,3,6,7,8-HxCDD	56	59	77
13C12-1,2,3,4,6,7,8-HpCDD	59	67	100
13C12-OCDD	48	54	102
13C12-2,3,7,8-TCDF	67	67	80
13C12-1,2,3,7,8-PeCDF	68	73	97
13C12-1,2,3,6,7,8-HxCDF	69	62	82
13C12-1,2,3,4,6,7,8-HpCDF	71	74	104
Cleanup Standard			
13C12-1,2,3,7,8,9-HxCDF	66	70	89
Homologue Group Totals	**pg**	**pg**	
Total-TCDD	<2.3	<2.0	
Total-PeCDD	<1.3	<1.1	
Total-HxCDD	<1.4	<1.5	
Total-HpCDD	<2.3	<1.1	
Total-TCDF	<1.5	<1.4	
Total-PeCDF	<1.1	<0.82	
Total-HxCDF	1.11	<0.89	
Total-HpCDF	<1.4	<0.90	
Toxic Equivalency - (WHO 2005)			
Lower Bound PCDD/F TEQ (WHO 2005)	0.112	0.00341	
Mid Point PCDD/F TEQ (WHO 2005)	2.52	2.19	
Upper Bound PCDD/F TEQ (WHO 2005)	4.92	4.27	

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Continuing Calibration Summary Report

Sample Name	CCV	CCV
ALS Sample ID	H7-19-CCV-0534	H7-19-CCV-0535
Sample Size	1	1
Sample size units	n/a	n/a
Percent Moisture	n/a	n/a
Sample Matrix	QC	QC
Sampling Date	n/a	n/a
Extraction Date	n/a	n/a
Target Analytes	**% Rec**	**% Rec**
2,3,7,8-TCDD	122	121
1,2,3,7,8-PeCDD	114	110
1,2,3,4,7,8-HxCDD	96	91
1,2,3,6,7,8-HxCDD	111	104
1,2,3,7,8,9-HxCDD	99	95
1,2,3,4,6,7,8-HpCDD	110	113
OCDD	110	108
2,3,7,8-TCDF	125	125
1,2,3,7,8-PeCDF	109	112
2,3,4,7,8-PeCDF	125	114
1,2,3,4,7,8-HxCDF	98	88
1,2,3,6,7,8-HxCDF	114	109
2,3,4,6,7,8-HxCDF	108	111
1,2,3,7,8,9-HxCDF	104	110
1,2,3,4,6,7,8-HpCDF	103	104
1,2,3,4,7,8,9-HpCDF	105	104
OCDF	121	117
Field Spike Standards	**% Rec**	**% Rec**
37Cl4-2,3,7,8-TCDD	107	111
13C12-1,2,3,4,7,8-HxCDD	86	84
13C12-2,3,4,7,8-PeCDF	110	100
13C12-1,2,3,4,7,8-HxCDF	89	84
13C12-1,2,3,4,7,8,9-HpCDF	95	95
Extraction Standards		
13C12-2,3,7,8-TCDD	105	96
13C12-1,2,3,7,8-PeCDD	105	96
13C12-1,2,3,6,7,8-HxCDD	113	102
13C12-1,2,3,4,6,7,8-HpCDD	122	104
13C12-OCDD	111	112
13C12-2,3,7,8-TCDF	129	101
13C12-1,2,3,7,8-PeCDF	128	108
13C12-1,2,3,6,7,8-HxCDF	119	109
13C12-1,2,3,4,6,7,8-HpCDF	145	125
Cleanup Standard		
13C12-1,2,3,7,8,9-HxCDF	110	108

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SECTION 2b: INDIVIDUAL SAMPLE REPORTS

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Sample Analysis Report

Sample Name	**HEISER-25764410**	Sampling Date	11-Jul-19		
ALS Sample ID	L2310263-1	Extraction Date	12-Aug-19		Approved:
Analysis Method	EPA TO9A	Sample Size	1	Puf	*T.Patterson*
Analysis Type	Sample	Percent Moisture	n/a		--e-signature--
Sample Matrix	PUF	Split Ratio	2		19-Aug-2019

Run Information	**Run 1**
Filename	7-190816A13
Run Date	16-Aug-19 06:34
Final Volume	10 uL
Dilution Factor	1
Analysis Units	pg
Instrument - Column	HRMS-7 DB5MSUSR826231H

Target Analytes	**TEF (WHO 2005)**	**Ret. Time**	**Conc. pg**	**EDL pg**	**Flags**	**EMPC pg**	**LQL**
2,3,7,8-TCDD	1	NotFnd	<1.4	1.4	U		10
1,2,3,7,8-PeCDD	1	NotFnd	<0.61	0.61	U		50
1,2,3,4,7,8-HxCDD	0.1	NotFnd	<0.85	0.85	U		50
1,2,3,6,7,8-HxCDD	0.1	NotFnd	<0.78	0.78	U		50
1,2,3,7,8,9-HxCDD	0.1	NotFnd	<0.81	0.81	U		50
1,2,3,4,6,7,8-HpCDD	0.01	35.90	<1.3	0.75	M,J,R	1.3	50
OCDD	0.0003	37.40	<6.5	1.1	M,J,R	6.5	100
2,3,7,8-TCDF	0.1	NotFnd	<0.99	0.99	U		10
1,2,3,7,8-PeCDF	0.03	NotFnd	<0.65	0.65	U		50
2,3,4,7,8-PeCDF	0.3	NotFnd	<0.58	0.58	U		50
1,2,3,4,7,8-HxCDF	0.1	NotFnd	<0.65	0.65	U		50
1,2,3,6,7,8-HxCDF	0.1	NotFnd	<0.61	0.61	U		50
2,3,4,6,7,8-HxCDF	0.1	34.13	<0.65	0.65	M,U	0.47	50
1,2,3,7,8,9-HxCDF	0.1	34.53	<0.74	0.74	M,U		50
1,2,3,4,6,7,8-HpCDF	0.01	NotFnd	<0.55	0.55	U		50
1,2,3,4,7,8,9-HpCDF	0.01	NotFnd	<0.65	0.65	U		50
OCDF	0.0003	37.48	<1.5	0.83	M,J,R	1.5	100
Field Spike Standards	**pg**		**% Rec**	**Limits**			
37Cl4-2,3,7,8-TCDD	600	28.14	82	70-130			
13C12-1,2,3,4,7,8-HxCDD	6000	34.21	78	70-130			
13C12-2,3,4,7,8-PeCDF	6000	31.94	79	70-130			
13C12-1,2,3,4,7,8-HxCDF	6000	33.72	58	70-130			
13C12-1,2,3,4,7,8,9-HpCDF	6000	36.14	69	70-130			
Extraction Standards							
13C12-2,3,7,8-TCDD	4000	28.11	70	40-130			
13C12-1,2,3,7,8-PeCDD	4000	32.16	82	40-130			
13C12-1,2,3,6,7,8-HxCDD	4000	34.26	84	40-130			
13C12-1,2,3,4,6,7,8-HpCDD	4000	35.89	81	25-130			
13C12-OCDD	8000	37.39	68	25-130			
13C12-2,3,7,8-TCDF	4000	27.19	86	40-130			
13C12-1,2,3,7,8-PeCDF	4000	31.23	93	40-130			
13C12-1,2,3,6,7,8-HxCDF	4000	33.79	88	40-130			
13C12-1,2,3,4,6,7,8-HpCDF	4000	35.33	90	25-130			
Cleanup Standard	**pg**						
13C12-1,2,3,7,8,9-HxCDF	4000	34.54	86	40-130			

Homologue Group Totals	**# peaks**	**Conc. pg**	**EDL pg**		
Total-TCDD	0	<1.4	1.4	U	10
Total-PeCDD	0	<0.61	0.61	U	50
Total-HxCDD	0	<0.85	0.85	U	50
Total-HpCDD	0	<0.75	0.75	U	50
Total-TCDF	0	<0.99	0.99	U	10
Total-PeCDF	0	<0.65	0.65	U	50
Total-HxCDF	0	<0.74	0.74	U	50
Total-HpCDF	0	<0.65	0.65	U	50

Toxic Equivalency - (WHO 2005)	**pg**
Lower Bound PCDD/F TEQ (WHO 2005)	0.00
Mid Point PCDD/F TEQ (WHO 2005)	1.43
Upper Bound PCDD/F TEQ (WHO 2005)	2.84

EDL	Indicates the Estimated Detection Limit, based on the measured background noise for this target in this sample.
TEF	Indicates the Toxic Equivalency Factor
TEQ	Indicates the Toxic Equivalency
M	Indicates that a peak has been manually integrated.
U	Indicates that this compound was not detected above the EDL.
J	Indicates that a target analyte was detected below the calibrated range.
R	Indicates that the ion abundance ratio for this compound did not meet the acceptance criterion.
LQL	Lower Quantification Limit, based on the lowest calibration level corrected for sample size, splits and dilutions.
EMPC	Estimated Maximum Possible Concentration – elevated detection limit due to interference or positive id criterion failure

ALS Life Sciences

Sample Analysis Report

Sample Name	**CITY-45764407**	Sampling Date	11-Jul-19		
ALS Sample ID	L2310263-2	Extraction Date	12-Aug-19		Approved:
Analysis Method	EPA TO9A	Sample Size	1	Puf	*T.Patterson*
Analysis Type	Sample	Percent Moisture	n/a		--e-signature--
Sample Matrix	PUF	Split Ratio	2		19-Aug-2019

Run Information	**Run 1**
Filename	7-190816A14
Run Date	16-Aug-19 07:16
Final Volume	10 uL
Dilution Factor	1
Analysis Units	pg
Instrument - Column	HRMS-7 DB5MSUSR826231H

Target Analytes	**TEF (WHO 2005)**	**Ret. Time**	**Conc. pg**	**EDL pg**	**Flags**	**EMPC pg**	**LQL**
2,3,7,8-TCDD	1	NotFnd	<2.1	2.1	U		10
1,2,3,7,8-PeCDD	1	NotFnd	<1.0	1.0	U		50
1,2,3,4,7,8-HxCDD	0.1	NotFnd	<1.2	1.2	U		50
1,2,3,6,7,8-HxCDD	0.1	NotFnd	<1.1	1.1	U		50
1,2,3,7,8,9-HxCDD	0.1	NotFnd	<1.1	1.1	U		50
1,2,3,4,6,7,8-HpCDD	0.01	35.88	<1.4	0.68	M,J,R	1.4	50
OCDD	0.0003	37.38	8.24	0.85	M,J		100
2,3,7,8-TCDF	0.1	NotFnd	<1.2	1.2	U		10
1,2,3,7,8-PeCDF	0.03	NotFnd	<0.82	0.82	U		50
2,3,4,7,8-PeCDF	0.3	NotFnd	<0.73	0.73	U		50
1,2,3,4,7,8-HxCDF	0.1	NotFnd	<0.67	0.67	U		50
1,2,3,6,7,8-HxCDF	0.1	NotFnd	<0.62	0.62	U		50
2,3,4,6,7,8-HxCDF	0.1	NotFnd	<0.66	0.66	U		50
1,2,3,7,8,9-HxCDF	0.1	34.53	<1.1	0.76	M,J,R	1.1	50
1,2,3,4,6,7,8-HpCDF	0.01	35.31	<0.81	0.71	M,J,R	0.81	50
1,2,3,4,7,8,9-HpCDF	0.01	NotFnd	<0.84	0.84	U		50
OCDF	0.0003	37.47	<1.3	0.88	M,J,R	1.3	100

Field Spike Standards	**pg**		**% Rec**	**Limits**
37Cl4-2,3,7,8-TCDD	600	28.15	80	70-130
13C12-1,2,3,4,7,8-HxCDD	6000	34.20	78	70-130
13C12-2,3,4,7,8-PeCDF	6000	31.94	80	70-130
13C12-1,2,3,4,7,8-HxCDF	6000	33.71	56	70-130
13C12-1,2,3,4,7,8,9-HpCDF	6000	36.12	61	70-130
Extraction Standards				
13C12-2,3,7,8-TCDD	4000	28.14	92	40-130
13C12-1,2,3,7,8-PeCDD	4000	32.15	119	40-130
13C12-1,2,3,6,7,8-HxCDD	4000	34.25	108	40-130
13C12-1,2,3,4,6,7,8-HpCDD	4000	35.88	120	25-130
13C12-OCDD	8000	37.38	118	25-130
13C12-2,3,7,8-TCDF	4000	27.22	102	40-130
13C12-1,2,3,7,8-PeCDF	4000	31.23	120	40-130
13C12-1,2,3,6,7,8-HxCDF	4000	33.78	110	40-130
13C12-1,2,3,4,6,7,8-HpCDF	4000	35.31	118	25-130
Cleanup Standard	**pg**			
13C12-1,2,3,7,8,9-HxCDF	4000	34.52	117	40-130

Homologue Group Totals	**# peaks**	**Conc. pg**	**EDL pg**		
Total-TCDD	0	<2.1	2.1	U	10
Total-PeCDD	0	<1.0	1.0	U	50
Total-HxCDD	0	<1.2	1.2	U	50
Total-HpCDD	0	<0.68	0.68	U	50
Total-TCDF	0	<1.2	1.2	U	10
Total-PeCDF	0	<0.82	0.82	U	50
Total-HxCDF	0	<0.76	0.76	U	50
Total-HpCDF	0	<0.84	0.84	U	50

Toxic Equivalency - (WHO 2005)	**pg**
Lower Bound PCDD/F TEQ (WHO 2005)	0.00247
Mid Point PCDD/F TEQ (WHO 2005)	2.14
Upper Bound PCDD/F TEQ (WHO 2005)	4.14

EDL	Indicates the Estimated Detection Limit, based on the measured background noise for this target in this sample.
TEF	Indicates the Toxic Equivalency Factor
TEQ	Indicates the Toxic Equivalency
M	Indicates that a peak has been manually integrated.
U	Indicates that this compound was not detected above the EDL.
J	Indicates that a target analyte was detected below the calibrated range.
R	Indicates that the ion abundance ratio for this compound did not meet the acceptance criterion.
LQL	Lower Quantification Limit, based on the lowest calibration level corrected for sample size, splits and dilutions.
EMPC	Estimated Maximum Possible Concentration – elevated detection limit due to interference or positive id criterion failure

ALS Life Sciences

Sample Analysis Report

Sample Name	**RES-25764409**	Sampling Date	11-Jul-19		
ALS Sample ID	L2310263-3	Extraction Date	12-Aug-19		Approved:
Analysis Method	EPA TO9A	Sample Size	1	Puf	*T.Patterson*
Analysis Type	Sample	Percent Moisture	n/a		--e-signature--
Sample Matrix	PUF	Split Ratio	2		19-Aug-2019

Run Information	**Run 1**
Filename	7-190816A15
Run Date	16-Aug-19 07:58
Final Volume	10 uL
Dilution Factor	1
Analysis Units	pg
Instrument - Column	HRMS-7 DB5MSUSR826231H

Target Analytes	**TEF (WHO 2005)**	**Ret. Time**	**Conc. pg**	**EDL pg**	**Flags**	**EMPC pg**	**LQL**
2,3,7,8-TCDD	1	NotFnd	<2.0	2.0	U		10
1,2,3,7,8-PeCDD	1	NotFnd	<0.89	0.89	U		50
1,2,3,4,7,8-HxCDD	0.1	NotFnd	<1.1	1.1	U		50
1,2,3,6,7,8-HxCDD	0.1	NotFnd	<1.0	1.0	U		50
1,2,3,7,8,9-HxCDD	0.1	NotFnd	<1.1	1.1	U		50
1,2,3,4,6,7,8-HpCDD	0.01	NotFnd	<2.4	2.4	U		50
OCDD	0.0003	37.39	<5.9	2.3	M,J,R	5.9	100
2,3,7,8-TCDF	0.1	NotFnd	<1.2	1.2	U		10
1,2,3,7,8-PeCDF	0.03	NotFnd	<0.93	0.93	U		50
2,3,4,7,8-PeCDF	0.3	NotFnd	<0.84	0.84	U		50
1,2,3,4,7,8-HxCDF	0.1	NotFnd	<0.70	0.70	U		50
1,2,3,6,7,8-HxCDF	0.1	NotFnd	<0.65	0.65	U		50
2,3,4,6,7,8-HxCDF	0.1	NotFnd	<0.69	0.69	U		50
1,2,3,7,8,9-HxCDF	0.1	34.54	<1.3	0.79	M,J,R	1.3	50
1,2,3,4,6,7,8-HpCDF	0.01	NotFnd	<0.89	0.89	U		50
1,2,3,4,7,8,9-HpCDF	0.01	NotFnd	<1.1	1.1	U		50
OCDF	0.0003	NotFnd	<1.7	1.7	U		100
Field Spike Standards	**pg**		**% Rec**	**Limits**			
37Cl4-2,3,7,8-TCDD	600	28.14	87	70-130			
13C12-1,2,3,4,7,8-HxCDD	6000	34.20	80	70-130			
13C12-2,3,4,7,8-PeCDF	6000	31.94	91	70-130			
13C12-1,2,3,4,7,8-HxCDF	6000	33.71	70	70-130			
13C12-1,2,3,4,7,8,9-HpCDF	6000	36.13	75	70-130			
Extraction Standards							
13C12-2,3,7,8-TCDD	4000	28.11	64	40-130			
13C12-1,2,3,7,8-PeCDD	4000	32.15	81	40-130			
13C12-1,2,3,6,7,8-HxCDD	4000	34.25	82	40-130			
13C12-1,2,3,4,6,7,8-HpCDD	4000	35.88	76	25-130			
13C12-OCDD	8000	37.38	57	25-130			
13C12-2,3,7,8-TCDF	4000	27.19	85	40-130			
13C12-1,2,3,7,8-PeCDF	4000	31.23	89	40-130			
13C12-1,2,3,6,7,8-HxCDF	4000	33.78	86	40-130			
13C12-1,2,3,4,6,7,8-HpCDF	4000	35.32	83	25-130			
Cleanup Standard	**pg**						
13C12-1,2,3,7,8,9-HxCDF	4000	34.52	89	40-130			

Homologue Group Totals	**# peaks**	**Conc. pg**	**EDL pg**			
Total-TCDD	0	<2.0	2.0	U		10
Total-PeCDD	0	<0.89	0.89	U		50
Total-HxCDD	0	<1.1	1.1	U		50
Total-HpCDD	0	<2.4	2.4	U		50
Total-TCDF	0	<1.2	1.2	U		10
Total-PeCDF	0	<0.93	0.93	U		50
Total-HxCDF	0	<0.79	0.79	U		50
Total-HpCDF	0	<1.1	1.1	U		50

Toxic Equivalency - (WHO 2005)	**pg**
Lower Bound PCDD/F TEQ (WHO 2005)	0.00
Mid Point PCDD/F TEQ (WHO 2005)	2.06
Upper Bound PCDD/F TEQ (WHO 2005)	3.99

EDL	Indicates the Estimated Detection Limit, based on the measured background noise for this target in this sample.
TEF	Indicates the Toxic Equivalency Factor
TEQ	Indicates the Toxic Equivalency
M	Indicates that a peak has been manually integrated.
U	Indicates that this compound was not detected above the EDL.
J	Indicates that a target analyte was detected below the calibrated range.
R	Indicates that the ion abundance ratio for this compound did not meet the acceptance criterion.
LQL	Lower Quantification Limit, based on the lowest calibration level corrected for sample size, splits and dilutions.
EMPC	Estimated Maximum Possible Concentration – elevated detection limit due to interference or positive id criterion failure

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SVOC DATA PACKAGE

SECTION 3: METHOD SUMMARY

PCDD/F METHOD SUMMARY
Methods 23/0023A/1613B/8290/TO-9A

Introduction:

This summary is to provide ALSE Burlington PCDD/F method details in order to provide persons reviewing or validating this data package sufficient information to re-construct the sample calculation, data verification and review. It incorporates the analysis of PCDD/F via the following reference methods:

US EPA Office of Water, Method 1613B
US EPA Office of Solid Waste, SW846 Methods 8290A and 0023/8290A
US EPA Office of Research & Development Method TO-9A.
US EPA Office of Air Quality Planning & Standards Method 23.

Any deviations to what is listed herein would be listed in the project narrative.

To avoid the confusion and conflicting nomenclature within the methods, we have defined the labeled standards in terms relating to the time of addition to the sample or extract. Therefore;

The Field or Sampling Standards are added prior to field sampling
The Extraction Standards are added prior to extraction
The Clean-up Standards are added prior to extract clean-up
The Injection Standards are added prior to extract injection.

Calibration Standard Levels:

Six levels of standard are available for calibration as listed in Table 1. The low point (the CS0) is below method requirements and therefore is optional.

Table 1: Calibration Standards

		CS0	CS1	CS2	CS3	CS4	CS5
Natives	2,3,7,8-TCDD	0.1	0.5	2	10	40	200
	2,3,7,8-TCDF	0.1	0.5	2	10	40	200
	1,2,3,7,8-PeCDD	0.5	2.5	10	50	200	1000
	1,2,3,7,8-PeCDF	0.5	2.5	10	50	200	1000
	2,3,4,7,8-PeCDF	0.5	2.5	10	50	200	1000
	1,2,3,4,7,8-HxCDD	0.5	2.5	10	50	200	1000
	1,2,3,6,7,8-HxCDD	0.5	2.5	10	50	200	1000
	1,2,3,7,8,9-HxCDD	0.5	2.5	10	50	200	1000
	1,2,3,4,7,8-HxCDF	0.5	2.5	10	50	200	1000
	1,2,3,6,7,8-HxCDF	0.5	2.5	10	50	200	1000
	1,2,3,7,8,9-HxCDF	0.5	2.5	10	50	200	1000
	2,3,4,6,7,8-HxCDF	0.5	2.5	10	50	200	1000
	1,2,3,4,6,7,8-HpCDD	0.5	2.5	10	50	200	1000
	1,2,3,4,6,7,8-HpCDF	0.5	2.5	10	50	200	1000
	1,2,3,4,7,8,9-HpCDF	0.5	2.5	10	50	200	1000
	OCDD	1	5	20	100	400	2000
	OCDF	1	5	20	100	400	2000
Labeled	2,3,7,8-TCDD-$^{13}C_{12}$	100	100	100	100	100	100
	2,3,7,8-TCDF-$^{13}C_{12}$	100	100	100	100	100	100
	1,2,3,7,8-PeCDD-$^{13}C_{12}$	100	100	100	100	100	100
	1,2,3,7,8-PeCDF-$^{13}C_{12}$	100	100	100	100	100	100
	2,3,4,7,8-PeCDF-$^{13}C_{12}$	100	100	100	100	100	100
	1,2,3,4,7,8-HxCDD-$^{13}C_{12}$	100	100	100	100	100	100
	1,2,3,6,7,8-HxCDD-$^{13}C_{12}$	100	100	100	100	100	100
	1,2,3,4,7,8-HxCDF-$^{13}C_{12}$	100	100	100	100	100	100
	1,2,3,6,7,8-HxCDF-$^{13}C_{12}$	100	100	100	100	100	100
	1,2,3,7,8,9-HxCDF-$^{13}C_{12}$	100	100	100	100	100	100
	2,3,4,6,7,8-HxCDF-$^{13}C_{12}$	100	100	100	100	100	100
	1,2,3,4,6,7,8-HpCDD-$^{13}C_{12}$	100	100	100	100	100	100
	1,2,3,4,6,7,8-HpCDF-$^{13}C_{12}$	100	100	100	100	100	100
	1,2,3,4,7,8,9-HpCDF-$^{13}C_{12}$	100	100	100	100	100	100
	OCDD-$^{13}C_{12}$	200	200	200	200	200	200
	2,3,7,8-TCDD-$^{37}Cl_4$	0.1	0.5	2	10	40	200
Injection	1,2,3,4-TCDD-$^{13}C_{12}$	100	100	100	100	100	100
	1,2,3,7,8,9-HxCDD-$^{13}C_{12}$	100	100	100	100	100	100

Calibration Control Limits

The initial and continuing calibration control limits for all methods are presented in Table 2 below. For the initial calibration CS1 and for each calibration verification CS3, the signal to noise ratio for each quantification ion for labelled and non-labelled analytes must be greater than or equal to 10:1

Table 2: Calibration Control Limits

	1613B		TO9A & TO-9A		8290A	
	Initial Cal.	Cal. Ver.	Initial Cal.	Cal. Ver.	Initial Cal.	Cal. Ver.
	%RSD	ng/mL	%RSD	% Diff	%RSD	% Diff
Natives						
2,3,7,8-TCDD	20	7.8-12.9	25	25	20	20*
2,3,7,8-TCDF	20	8.4-12.0	25	25	20	20*
1,2,3,7,8-PeCDD	20	39-65	25	25	20	20*
1,2,3,7,8-PeCDF	20	41-60	25	25	20	20*
2,3,4,7,8-PeCDF	20	41-61	25	25	20	20*
1,2,3,4,7,8-HxCDD	20	39-64	25	25	20	20*
1,2,3,6,7,8-HxCDD	20	39-64	25	25	20	20*
1,2,3,7,8,9-HxCDD	35	41-61	25	25	20	20*
1,2,3,4,7,8-HxCDF	20	45-56	25	25	20	20*
1,2,3,6,7,8-HxCDF	20	44-57	25	25	20	20*
1,2,3,7,8,9-HxCDF	20	45-56	25	25	20	20*
2,3,4,6,7,8-HxCDF	20	44-57	25	25	20	20*
1,2,3,4,6,7,8-HpCDD	20	43-58	25	25	20	20*
1,2,3,4,6,7,8-HpCDF	20	45-55	25	25	20	20*
1,2,3,4,7,8,9-HpCDF	20	43-58	25	25	20	20*
OCDD	20	79-126	25	25	20	20*
OCDF	35	63-159	30	30	20	20*
Labels						
2,3,7,8-TCDD-$^{13}C_{12}$	35	82-121	25	25	30	30**
2,3,7,8-TCDF-$^{13}C_{12}$	35	71-140	30	30	30	30**
1,2,3,7,8-PeCDD-$^{13}C_{12}$	35	62-160	30	30	30	30**
1,2,3,7,8-PeCDF-$^{13}C_{12}$	35	76-130	30	30	30	30**
2,3,4,7,8-PeCDF-$^{13}C_{12}$	35	77-130	25	25	30	30**
1,2,3,4,7,8-HxCDD-$^{13}C_{12}$	35	85-117	25	25	30	30**
1,2,3,6,7,8-HxCDD-$^{13}C_{12}$	35	85-118	25	25	30	30**
1,2,3,4,7,8-HxCDF-$^{13}C_{12}$	35	76-131	25	25	30	30**
1,2,3,6,7,8-HxCDF-$^{13}C_{12}$	35	70-143	30	30	30	30**
1,2,3,7,8,9-HxCDF-$^{13}C_{12}$	35	74-135	-	-	-	-
2,3,4,6,7,8-HxCDF-$^{13}C_{12}$	35	73-137	30	30	30	30**
1,2,3,4,6,7,8-HpCDD-$^{13}C_{12}$	35	72-138	30	30	30	30**
1,2,3,4,6,7,8-HpCDF-$^{13}C_{12}$	35	78-129	30	30	30	30**
1,2,3,4,7,8,9-HpCDF-$^{13}C_{12}$	35	77-129	25	25	30	30**
OCDD-$^{13}C_{12}$	35	96-415	30	30	30	30**
2,3,7,8-TCDD-$^{37}Cl_4$	35	7.9-12.7	25	25	30	30**

* 25% is allowed for a post-run verification but when the value is above 20%, then the analyte quantification must be as per 8290A Section 8.3.2.4 and corrective action is required before more samples can be analyzed.
**35% is allowed for a post-run verification but when the value is above 30%, then the analyte quantification must be as per 8290A Section 8.3.2.4 and corrective action is required before more samples can be analyzed.

LCS Criteria:

The laboratory control sample (LCS) or the On-Going Precision and Accuracy (OPR) recovery criteria are listed in Table 3

Table 3: Acceptance Criteria for IPR and OPR[a]

	Test Conc.	IPR		OPR
		s[b]	X[c]	
	ng/L	ng/L	ng/L	ng/L
Natives				
2,3,7,8-TCDD	10	2.8	8.3-12.9	6.7-15.8
2,3,7,8-TCDF	10	2	8.7-13.7	7.5-15.8
1,2,3,7,8-PeCDD	50	7.5	38-66	35-71
1,2,3,7,8-PeCDF	50	7.5	43-62	40-67
2,3,4,7,8-PeCDF	50	8.6	36-75	34-80
1,2,3,4,7,8-HxCDD	50	9.4	39-76	35-82
1,2,3,6,7,8-HxCDD	50	7.7	42-62	38-67
1,2,3,7,8,9-HxCDD	50	11.1	37-71	32-81
1,2,3,4,7,8-HxCDF	50	8.7	41-59	36-67
1,2,3,6,7,8-HxCDF	50	6.7	46-60	42-65
1,2,3,7,8,9-HxCDF	50	6.4	42-61	39-65
2,3,4,6,7,8-HxCDF	50	7.4	37-74	35-78
1,2,3,4,6,7,8-HpCDD	50	7.7	38-65	35-70
1,2,3,4,6,7,8-HpCDF	50	6.3	45-56	41-61
1,2,3,4,7,8,9-HpCDF	50	8.1	43-63	39-69
OCDD	100	19	89-127	78-144
OCDF	100	27	74-146	63-170
Labels				
2,3,7,8-TCDD-$^{13}C_{12}$	100	37	28-134	20-175
2,3,7,8-TCDF-$^{13}C_{12}$	100	35	31-113	22-152
1,2,3,7,8-PeCDD-$^{13}C_{12}$	100	39	27-184	21-227
1,2,3,7,8-PeCDF-$^{13}C_{12}$	100	34	27-156	21-192
2,3,4,7,8-PeCDF-$^{13}C_{12}$	100	38	16-297	13-328
1,2,3,4,7,8-HxCDD-$^{13}C_{12}$	100	41	29-147	21-193
1,2,3,6,7,8-HxCDD-$^{13}C_{12}$	100	38	34-122	25-163
1,2,3,4,7,8-HxCDF-$^{13}C_{12}$	100	43	27-152	19-202
1,2,3,6,7,8-HxCDF-$^{13}C_{12}$	100	35	30-122	21-159
1,2,3,7,8,9-HxCDF-$^{13}C_{12}$	100	40	24-157	17-205
2,3,4,6,7,8-HxCDF-$^{13}C_{12}$	100	37	29-136	22-176
1,2,3,4,6,7,8-HpCDD-$^{13}C_{12}$	100	35	34-129	26-166
1,2,3,4,6,7,8-HpCDF-$^{13}C_{12}$	100	41	32-110	21-158
1,2,3,4,7,8,9-HpCDF-$^{13}C_{12}$	100	40	28-141	20-186
OCDD-$^{13}C_{12}$	200	95	41-276	26-397
2,3,7,8-TCDD-$^{37}Cl_4$	10	3.6	3.9-15.4	3.1-19.1

[a] Assuming a final volume of 20uL
[b] s = standard deviation
[c] X = Average Concentration

Extraction/Clean-up & Sampling Standard Recovery Limts:

Table 4: Extraction, Clean-up, Injection & Sampling Standard Recovery Limits

	1613B or 8290A (non Stack)		TO9A or 0023A/8290A or TO-9A	
	(% Rec.)	Ref.	(% Rec.)	Ref.
Extraction Standard				
2,3,7,8-TCDD-$^{13}C_{12}$	25-164	a	40-130	b
2,3,7,8-TCDF-$^{13}C_{12}$	24-169	a	40-130	b
1,2,3,7,8-PeCDD-$^{13}C_{12}$	25-181	a	40-130	b
1,2,3,7,8-PeCDF-$^{13}C_{12}$	24-185	a	40-130	b
2,3,4,7,8-PeCDF-$^{13}C_{12}$	21-178	a	-	
1,2,3,4,7,8-HxCDD-$^{13}C_{12}$	32-141	a	-	
1,2,3,6,7,8-HxCDD-$^{13}C_{12}$	28-130	a	40-130	b
1,2,3,4,7,8-HxCDF-$^{13}C_{12}$	26-152	a	-	
1,2,3,6,7,8-HxCDF-$^{13}C_{12}$	26-123	a	40-130	b
1,2,3,7,8,9-HxCDF-$^{13}C_{12}$	29-147	a	-	
2,3,4,6,7,8-HxCDF-$^{13}C_{12}$	28-136	a	40-130	c,d
1,2,3,4,6,7,8-HpCDD-$^{13}C_{12}$	23-140	a	25-130	b
1,2,3,4,6,7,8-HpCDF-$^{13}C_{12}$	28-143	a	25-130	b
1,2,3,4,7,8,9-HpCDF-$^{13}C_{12}$	26-138	a	-	
OCDD-$^{13}C_{12}$	17-157	a	25-130	b
Clean-up Standard				
2,3,7,8-TCDD-$^{37}Cl_4$	35-197	a	-	
1,2,3,7,8,9-HxCDF-$^{13}C_{12}$	-		40-130	b
Injection Standard				
1,2,3,4-TCDD-$^{13}C_{12}$	30-300	d	30-300	d
1,2,3,7,8,9-HxCDD-$^{13}C_{12}$	30-300	d	30-300	d
Sampling Standard				
2,3,7,8-TCDD-$^{37}Cl_4$	-		70-130	b
2,3,4,7,8-PeCDF-$^{13}C_{12}$	-		70-130	b
1,2,3,4,7,8-HxCDD-$^{13}C_{12}$	-		70-130	b
1,2,3,4,7,8-HxCDF-$^{13}C_{12}$	-		70-130	b
1,2,3,4,7,8,9-HpCDF-$^{13}C_{12}$	-		70-130	b

References & Notes

[a] from OW method 1613B

[b] from OAQPS method 23

[c] this extraction standard is not required in methods 23 and 0023A/8290A

[d] ALS In-house criteria

Reporting Limits:

Unless indicated in the otherwise, the PCDD/F data is reported down to 2.5:1 signal to noise for each isomer grouping for each extract injection. This is consistent to SW846 8290 defined protocols (i.e. EDL or Estimated Detection Limit) and is commonly applied throughout the industry to all the HRMS PCDD/F methods applicable to this method summary.

Method Blank:

The method blank levels must be below the response to the low calibration standard, CS0 or CS1, whichever low calibration point is being applied to the project.

MS/MSD:

The % relative difference between the MS and MSD spike recoveries should be less than or equal to 20%.

Instrument/Run Performance Criteria:

1. Elution windows must be defined by a 'Window Performance Mix' at the beginning of each 12-hour run sequence
2. GC performance criteria of 25% maximum valley between 2,3,7,8-TCDD and it's neared eluting isomers (DB5) or 2,3,7,8-TCDF and it's nearest eluting isomers (DB225).
3. At the beginning of and just following the end of each 12 hour run sequence, the instrument must be checked to demonstrate a resolution of 10,000 for each quantification window.
4. For method 1613B, the relative retention times (RRT) of the compounds in the daily CS3 calibration verification must fall into the ranges presented in Table 4.
5. For all calibrations, QC samples and field samples, the absolute retention time (RT) for 1,2,3,4-TCDD-13C12 must be >25.0 min on a DB5 column and >15.0 min on a DB225 column.
6. The RT in the daily CS3 verification standards must be within 15 seconds of the CS3 in the initial calibration run.
7. The maximum time between scans within a descriptor is 1 second.
8. Lock mass deviations to the average response must be less than or equal 20%.

Laboratory Duplicates:

The % relative difference between duplicates should be less than or equal to 25% but only where the response is greater than the low calibration standard.

Analyte Identification Criteria:

1. Ion ratio must be within 15% of theoretical or within 10% of the most recent CS3.
2. The retention time (RT) of the peak maxima for each pair of quantification ions must be no more than 2 seconds (i.e. 2 scans) difference.
3. The retention time (RT) of the peak maxima of all 2,3,7,8- substituted native analytes must be within -1 to +3 seconds of the RT of corresponding $^{13}C_{12}$-labelled isomer of that injection run.
4. For those native analytes without a corresponding labelled isomer, the relative retention time (RRT) must be within 0.005 of the relative retention time observed in the daily CS3 run.
5. When there is a significant PCDPE interference observed, then a peak in the PCDF channel is not confirmed to be PCDF. [Significant PCDPE interference is identified when there is a PCDPE parent ion peak 10% or more of the response of a peak at the same RT (i.e. within 2 seconds) in the corresponding PCDF channel.]
6. For any peak to be identified as a positive PCDD/F response, that peak must be within the retention time windows defined by the daily analysis of Window Performance Mixture.

Table 4: Quantitation References and Method 1613B RT References and RRT

Analyte	Stack/Ambient Quantitation Reference	Method 1613B RT Reference Solids/ Waters Quantitation Reference	Method 1613B RRT
Compounds using 1,2,3,4-TCDD-$^{13}C_{12}$ as injection standard			
2,3,7,8-TCDF	2,3,7,8-TCDF-$^{13}C_{12}$	2,3,7,8-TCDF-$^{13}C_{12}$	0.999-1.003
2,3,7,8-TCDD	2,3,7,8-TCDD-$^{13}C_{12}$	2,3,7,8-TCDD-$^{13}C_{12}$	0.999-1.002
1,2,3,7,8-PeCDF	1,2,3,7,8-PeCDF-$^{13}C_{12}$	1,2,3,7,8-PeCDF-$^{13}C_{12}$	0.999-1.002
2,3,4,7,8-PeCDF	1,2,3,7,8-PeCDF-$^{13}C_{12}$	2,3,4,7,8-PeCDF-$^{13}C_{12}$	0.999-1.002
1,2,3,7,8-PeCDD	1,2,3,7,8-PeCDD-$^{13}C_{12}$	1,2,3,7,8-PeCDD-$^{13}C_{12}$	0.999-1.002
2,3,7,8-TCDF-$^{13}C_{12}$	1,2,3,4-TCDD-$^{13}C_{12}$	1,2,3,4-TCDD-$^{13}C_{12}$	0.923-1.103
2,3,7,8-TCDD-$^{13}C_{12}$	1,2,3,4-TCDD-$^{13}C_{12}$	1,2,3,4-TCDD-$^{13}C_{12}$	0.976-1.043
2,3,7,8-TCDD-$^{37}Cl_4$	2,3,7,8-TCDD-$^{13}C_{12}$	1,2,3,4-TCDD-$^{13}C_{12}$	0.989-1.052
1,2,3,7,8-PeCDF-$^{13}C_{12}$	1,2,3,4-TCDD-$^{13}C_{12}$	1,2,3,4-TCDD-$^{13}C_{12}$	1.000-1.425
2,3,4,7,8-PeCDF-$^{13}C_{12}$	1,2,3,7,8-PeCDF-$^{13}C_{12}$	1,2,3,4-TCDD-$^{13}C_{12}$	1.011-1.526
1,2,3,7,8-PeCDD-$^{13}C_{12}$	1,2,3,4-TCDD-$^{13}C_{12}$	1,2,3,4-TCDD-$^{13}C_{12}$	1.000-1.567
Compounds using 1,2,3,7,8,9-HxCDD-$^{13}C_{12}$ as injection standard			
1,2,3,4,7,8-HxCDF	1,2,3,6,7,8-HxCDF-$^{13}C_{12}$	1,2,3,4,7,8-HxCDF-$^{13}C_{12}$	0.999-1.001
1,2,3,6,7,8-HxCDF	1,2,3,6,7,8-HxCDF-$^{13}C_{12}$	1,2,3,6,7,8-HxCDF-$^{13}C_{12}$	0.997-1.005
1,2,3,7,8,9-HxCDF	1,2,3,6,7,8-HxCDF-$^{13}C_{12}$	1,2,3,7,8,9-HxCDF-$^{13}C_{12}$	0.999-1.001
2,3,4,6,7,8-HxCDF	2,3,4,6,7,8-HxCDF-$^{13}C_{12}$	2,3,4,6,7,8-HxCDF-$^{13}C_{12}$	0.999-1.001
1,2,3,4,7,8-HxCDD	1,2,3,6,7,8-HxCDD-$^{13}C_{12}$	1,2,3,4,7,8-HxCDD-$^{13}C_{12}$	0.999-1.001
1,2,3,6,7,8-HxCDD	1,2,3,6,7,8-HxCDD-$^{13}C_{12}$	1,2,3,6,7,8-HxCDD-$^{13}C_{12}$	0.998-1.004
1,2,3,7,8,9-HxCDD[a]	1,2,3,6,7,8-HxCDD-$^{13}C_{12}$	[a]	1.000-1.019
1,2,3,4,6,7,8-HpCDF	1,2,3,4,6,7,8-HpCDF-$^{13}C_{12}$	1,2,3,4,6,7,8-HpCDF-$^{13}C_{12}$	0.999-1.001
1,2,3,4,7,8,9-HpCDF	1,2,3,4,6,7,8-HpCDF-$^{13}C_{12}$	1,2,3,4,7,8,9-HpCDF-$^{13}C_{12}$	0.999-1.001
1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-HpCDD-$^{13}C_{12}$	1,2,3,4,6,7,8-HpCDD-$^{13}C_{12}$	0.999-1.001
OCDF	OCDD-$^{13}C_{12}$	OCDD-$^{13}C_{12}$	0.999-1.008
OCDD	OCDD-$^{13}C_{12}$	OCDD-$^{13}C_{12}$	0.999-1.001
1,2,3,4,7,8-HxCDF-$^{13}C_{12}$	1,2,3,6,7,8-HxCDF-$^{13}C_{12}$	1,2,3,7,8,9-HxCDD-$^{13}C_{12}$	0.944-0.970
1,2,3,6,7,8-HxCDF-$^{13}C_{12}$	1,2,3,7,8,9-HxCDD-$^{13}C_{12}$	1,2,3,7,8,9-HxCDD-$^{13}C_{12}$	0.949-0.975
1,2,3,7,8,9-HxCDF-$^{13}C_{12}$	1,2,3,7,8,9-HxCDD-$^{13}C_{12}$	1,2,3,7,8,9-HxCDD-$^{13}C_{12}$	0.977-1.047
2,3,4,6,7,8-HxCDF-$^{13}C_{12}$	1,2,3,7,8,9-HxCDD-$^{13}C_{12}$	1,2,3,7,8,9-HxCDD-$^{13}C_{12}$	0.959-1.021
1,2,3,4,7,8-HxCDD-$^{13}C_{12}$	1,2,3,6,7,8-HxCDD-$^{13}C_{12}$	1,2,3,7,8,9-HxCDD-$^{13}C_{12}$	0.977-1.000
1,2,3,6,7,8-HxCDD-$^{13}C_{12}$	1,2,3,7,8,9-HxCDD-$^{13}C_{12}$	1,2,3,7,8,9-HxCDD-$^{13}C_{12}$	0.981-1.003
1,2,3,4,6,7,8-HpCDF-$^{13}C_{12}$	1,2,3,7,8,9-HxCDD-$^{13}C_{12}$	1,2,3,7,8,9-HxCDD-$^{13}C_{12}$	1.043-1.085
1,2,3,4,7,8,9-HpCDF-$^{13}C_{12}$	1,2,3,4,6,7,8-HpCDF-$^{13}C_{12}$	1,2,3,7,8,9-HxCDD-$^{13}C_{12}$	1.057-1.151
1,2,3,4,6,7,8-HpCDD-$^{13}C_{12}$	1,2,3,7,8,9-HxCDD-$^{13}C_{12}$	1,2,3,7,8,9-HxCDD-$^{13}C_{12}$	1.086-1.110
OCDD-$^{13}C_{12}$	1,2,3,7,8,9-HxCDD-$^{13}C_{12}$	1,2,3,7,8,9-HxCDD-$^{13}C_{12}$	1.032-1.311

[a] For solids/waters via 1612B, 1,2,3,7,8,9-HXCDD is quantified against the average responses of 1,2,3,4,7,8-HxCDD-$^{13}C_{12}$ and 1,2,3,6,7,8-HxCDD-$^{13}C_{12}$ while 1,2,3,6,7,8-HxCDD-$^{13}C_{12}$ is the RT reference.

Table 5: HRMS Instrumental Descriptor Parameters

Descriptor	Exact M/Z	M/Z Type	Elemental Composition	Substance	Type	Theoretical Ion Ratio	Ion Ratio QC Limits Upper	Lower
1	303.9016	M	$^{12}C_{12}\ ^{1}H_4\ ^{35}Cl_4\ ^{16}O$	TCDF	Native	0.77	0.65	0.89
	305.8987	M+2	$^{12}C_{12}\ ^{1}H_4\ ^{35}Cl_3\ ^{37}Cl\ ^{16}O$	TCDF	Native			
	315.9419	M	$^{13}C_{12}\ ^{1}H_4\ ^{35}Cl_4\ ^{16}O$	TCDF	^{13}C	0.77	0.65	0.89
	317.9389	M+2	$^{13}C_{12}\ ^{1}H_4\ ^{35}Cl_3\ ^{37}Cl\ ^{16}O$	TCDF	^{13}C			
	316.9824	Lock	$^{12}C_9\ ^{19}F_{11}$	PFK	Lock			
	319.8965	M	$^{12}C_{12}\ ^{1}H_4\ ^{35}Cl_4\ ^{16}O_2$	TCDD	Native	0.77	0.65	0.89
	321.8936	M+2	$^{12}C_{12}\ ^{1}H_4\ ^{35}Cl_3\ ^{37}Cl\ ^{16}O_2$	TCDD	Native			
	327.8847	M+8	$^{12}C_{12}\ ^{1}H_4\ ^{37}Cl_4\ ^{16}O_2$	TCDD	^{37}Cl			
	331.9368	M	$^{13}C_{12}\ ^{1}H_4\ ^{35}Cl_4\ ^{16}O_2$	TCDD	^{13}C	0.77	0.65	0.89
	333.9339	M+2	$^{13}C_{12}\ ^{1}H_4\ ^{35}Cl_3\ ^{37}Cl\ ^{16}O_2$	TCDD	^{13}C			
	339.8597	M+2	$^{12}C_{12}\ ^{1}H_3\ ^{35}Cl_4\ ^{37}Cl\ ^{16}O$	PeCDF	Native	1.55	1.32	1.78
	341.8568	M+4	$^{12}C_{12}\ ^{1}H_3\ ^{35}Cl_3\ ^{37}Cl_2\ ^{16}O$	PeCDF	Native			
	351.9	M+2	$^{13}C_{12}\ ^{1}H_3\ ^{35}Cl_4\ ^{37}Cl\ ^{16}O$	PeCDF	^{13}C	1.55	1.32	1.78
	353.897	M+4	$^{13}C_{12}\ ^{1}H_3\ ^{35}Cl_3\ ^{37}Cl_2\ ^{16}O$	PeCDF	^{13}C			
	375.8364	M+2	$^{12}C_{12}\ ^{1}H_4\ ^{35}Cl_5\ ^{37}Cl\ ^{16}O$	HxCDPE	Cl-DPE			
	409.7974	M+2	$^{12}C_{12}\ ^{1}H_3\ ^{35}Cl_6\ ^{37}Cl\ ^{16}O$	HpCDPE	Cl-DPE			
2	339.8597	M+2	$^{12}C_{12}\ ^{1}H_3\ ^{35}Cl_4\ ^{37}Cl\ ^{16}O$	PeCDF	Native	1.55	1.32	1.78
	341.8568	M+4	$^{12}C_{12}\ ^{1}H_3\ ^{35}Cl_3\ ^{37}Cl_2\ ^{16}O$	PeCDF	Native			
	351.9	M+2	$^{13}C_{12}\ ^{1}H_3\ ^{35}Cl_4\ ^{37}Cl\ ^{16}O$	PeCDF	^{13}C	1.55	1.32	1.78
	353.897	M+4	$^{13}C_{12}\ ^{1}H_3\ ^{35}Cl_3\ ^{37}Cl_2\ ^{16}O$	PeCDF	^{13}C			
	353.8576	M	$^{12}C_{12}\ ^{1}H_3\ ^{35}Cl_5\ ^{16}O_2$	PeCDD	Native	0.63	0.54	0.72
	355.8546	M+2	$^{12}C_{12}\ ^{1}H_3\ ^{35}Cl_4\ ^{37}Cl\ ^{16}O_2$	PeCDD	Native			
	366.9792	Lock	$^{12}C_{10}\ ^{19}F_{13}$	PFK	Lock			
	365.8978	M	$^{13}C_{12}\ ^{1}H_3\ ^{35}Cl_5\ ^{16}O_2$	PeCDD	^{13}C	0.63	0.54	0.72
	367.8949	M+2	$^{13}C_{12}\ ^{1}H_3\ ^{35}Cl_4\ ^{37}\ Cl\ ^{16}O_2$	PeCDD	^{13}C			
	409.7974	M+2	$^{12}C_{12}\ ^{1}H_3\ ^{35}Cl_6\ ^{37}Cl\ ^{16}O$	HpCDPE	Cl-DPE			
3	373.8207	M+2	$^{12}C_{12}\ ^{1}H_2\ ^{35}Cl_5\ ^{37}Cl\ ^{16}O$	HxCDF	Native	1.24	1.05	1.43
	375.8178	M+4	$^{12}C_{12}\ ^{1}H_2\ ^{35}Cl_4\ ^{37}Cl_2\ ^{16}O$	HxCDF	Native			
	380.976	Lock	$^{12}C_8\ ^{19}F_5$	PFK	Lock			
	383.8639	M	$^{13}C_{12}\ ^{1}H_2\ ^{35}Cl_6\ ^{16}O$	HxCDF	^{13}C	0.51	0.43	0.59
	385.861	M+2	$^{13}C_{12}\ ^{1}H_2\ ^{35}Cl_5\ ^{37}Cl\ ^{16}O$	HxCDF	^{13}C			
	389.8156	M+2	$^{12}C_{12}\ ^{1}H_2\ ^{35}Cl_5\ ^{37}Cl\ ^{16}O_2$	HxCDD	Native	1.24	1.05	1.43
	391.8127	M+4	$^{12}C_{12}\ ^{1}H_2\ ^{35}Cl_4\ ^{37}Cl_2\ ^{16}O_2$	HxCDD	Native			
	401.8559	M+2	$^{13}C_{12}\ ^{1}H_2\ ^{35}Cl_5\ ^{37}Cl\ ^{16}O_2$	HxCDD	^{13}C	1.24	1.05	1.43
	403.853	M+4	$^{13}C_{12}\ ^{1}H_2\ ^{35}Cl_4\ ^{37}Cl_2\ ^{16}O_2$	HxCDD	^{13}C			
	445.7555	M+4	$^{12}C_{12}\ ^{1}H_2\ ^{35}Cl_6\ ^{37}Cl_2\ ^{16}O$	OCDPE	Cl-DPE			
4	409.7789	M+4	$^{12}C_{12}\ ^{1}H\ ^{35}Cl_5\ ^{37}Cl_2\ ^{16}O$	HpCDF	Native	1.88	1.60	2.16
	411.7759	M+6	$^{12}C_{12}\ ^{1}H\ ^{35}Cl_4\ ^{37}Cl_3\ ^{16}O$	HpCDF	Native			
	417.8253	M	$^{13}C_{12}\ ^{1}H\ ^{35}Cl_7\ ^{16}O$	HpCDF	^{13}C	0.44	0.37	0.51
	419.822	M+2	$^{13}C_{12}\ ^{1}H\ ^{35}Cl_6\ ^{37}Cl\ ^{16}O$	HpCDF	^{13}C			
	423.7767	M+2	$^{12}C_{12}\ ^{1}H\ ^{35}Cl_6\ ^{37}Cl\ ^{16}O_2$	HpCDD	Native	1.04	0.88	1.20
	425.7737	M+4	$^{12}C_{12}\ ^{1}H\ ^{35}Cl_5\ ^{37}Cl_2\ ^{16}O_2$	HpCDD	Native			
	430.9728	Lock	$^{12}C_9\ ^{19}F_{17}$	PFK	Lock			
	435.8169	M+2	$^{13}C_{12}\ ^{1}H\ ^{35}Cl_6\ ^{37}Cl\ ^{16}O_2$	HpCDD	^{13}C	1.04	0.88	1.20
	437.814	M+4	$^{13}C_{12}\ ^{1}H\ ^{35}Cl_5\ ^{37}Cl_2\ ^{16}O_2$	HpCDD	^{13}C			
	479.7165	M+4	$^{12}C_{12}\ ^{1}H\ ^{35}Cl_7\ ^{37}Cl_2\ ^{16}O$	NCDPE	Cl-DPE			
5	441.7428	M+2	$^{12}C_{12}\ ^{35}Cl_7\ ^{37}Cl\ ^{16}O$	OCDF	Native	0.89	0.76	1.02
	443.7399	M+4	$^{12}C_{12}\ ^{35}Cl_6\ ^{37}Cl2\ ^{16}O$	OCDF	Native			
	454.9728	Lock	$^{12}C_{11}\ ^{19}F_{17}$	PFK	Lock			
	457.7377	M+2	$^{12}C_{12}\ ^{35}Cl_7\ ^{37}Cl\ ^{16}O_2$	OCDD	Native	0.89	0.76	1.02
	459.7348	M+4	$^{12}C_{12}\ ^{35}Cl_6\ ^{37}Cl_2\ ^{16}O_2$	OCDD	Native			
	469.778	M+2	$^{13}C_{12}\ ^{35}Cl_7\ ^{37}Cl\ ^{16}O_2$	OCDD	^{13}C	0.89	0.76	1.02
	471.775	M+4	$^{13}C_{12}\ ^{35}Cl_6\ ^{37}Cl_2\ ^{16}O_2$	OCDD	^{13}C			
	513.6775	M+4	$^{12}C_{12}\ ^{35}Cl_8\ ^{37}Cl_2\ ^{16}O$	DCDPE	Cl-DPE			

Data Calculations:

a) Analyte Concentrations:

The relative response factor of each target relative to the standard against which it is to be calculated is determined using the area responses of both quantification ions via equation 9.1.
In cases where a native target is calculated against an exact labelled analogue, the quantification will be considered to be by isotope dilution. In other cases, the quantification will be considered to be by internal standard.

$$RRF = \frac{(A1_t + A2_t)\ C_s}{(A1_s + A2_s)\ C_t} \qquad \text{Equ. 9.1}$$

Where,
$A1_t + A2_t$ = The areas of the two quantification ions for the target analyte
$A1_s + A2_s$ = The areas of the two quantification ions for the labelled compound against which the target analyte will be calculated.
C_t = The concentration in the calibration standard of the target analyte.
C_s = The concentration in the calibration standard of the labelled compound against which the target will be calculated.

For all analytes to be quantified and from the initial calibration series of standard injections, a table of RRFs is prepared. The relative standard deviation (%RSD, or the coefficient of variance) is checked to confirm that the appropriate method criteria has been met as listed in Table 3. The average of the five or six levels of standard for each analyte, RRF_{av} is applied for quantification of samples according to Equations 9.2 and 9.3 below.

$$\text{Amount in sample (pg)} = \frac{(A1_n + A2_n)\ Q_l}{(A1_l + A2_l)\ (RRF_{av})} \qquad \text{Equ. 9.2}$$

$$\text{Concentration in sample (pg/g or pg/l)} = \frac{(A1_n + A2_n)\ Q_l}{(A1_l + A2_l)\ (RRF_{av})\ (W_s)} \qquad \text{Equ. 9.3}$$

Where,

Q_l = The amount (pg) of labelled compound added to the sample

W_s = The weight (g) or volume (l) of sample

b) Extraction, Clean-up, and Sampling Standard Recovery Calculation:

The extraction, clean-up, and sampling standard recoveries are determined by Equation 9.4 below.

% Recovery = (Amount in sample)/(Amount added to sample) X 100 Equ. 9.4

c) Estimated Detection Limit

$$EDL = \frac{2.5 \times H_x \times Q_{es}}{H_{es} \times W \times RFF_{av}} \qquad \text{Equ. 9.5}$$

Where,

EDL = estimated detection limit for homologous 2,3,7,8-Substituted PCDD/Fs

H_x = sum of the height of the noise level for each quantification ions for the unlabelled PCDD/Fs.

H_{es} = Sum of the heights of responses of both quantification ions for the labelled extraction standard.

W = weight of volume of sample

RRF_{av} = average relative response factor

Q_{es} = Amount of extraction standard added

Chromatogram Annotation Codes

All manually integrated peaks are expanded and reprinted with the following annotations:

* Analyst Initials	AA
* Date	YYMMDD
* integration code	CC

The Syntax is:	Example:
AAYYMMDDCC	SK111220MB

Code	Mnemonic	Description
MB	Manual Baseline	The peak was manually integrated because the initial baseline was determined incorrectly by the software
MS	Manual Split	The peak was manually integrated because the peak was incorrectly or not split by the software
MJ/MC	Manual Join/Manual Combine	The peak was manually integrated because the peak was split by the software and the peak should be integrated as a single peak
MA	Manual Add	The peak was manually integrated because the signal:noise ratio was judged to be >2.5
MD	Manual Delete	The peak was excluded because the signal:noise ratio was judged to be <2.5
MX	Manual Exclude	The peak was excluded due to an interference
NH	Noise Height	The noise height for detection limit calculation was manually defined, over-riding the software chosen value
MT	Manual Time	The peak retention time was manually chosen

The following explanatory annotation codes may appear on the chromatograms of peaks that have been reviewed:

Code	Mnemonic	Description
+	Detected Peak	A peak was detected at this mass and retention time that was above 2.5:1 signal to noise
<	Below Detection Limit	The signal at this mass and retention time was below 2.5:1 signal to noise
EMPC	Estimated Maximum Possible Concentration	The signal at this mass and retention time is an interference such that the target compound could not be confirmed
X-RT	Not Detected due to Retention Time non-conformance	The signal at this retention time could not be used to positively identify the target compound because of retention time non-conformance (apex of quantification and confirmation ions do not maximize within the same two seconds, or the retention time of the peak does not fall within the expected range with respect to its labeled analogue)
X-LOC	Not Detected due to interference from a higher level of chlorination	The signal at this retention time is attributable to a fragment from a co-eluting compound at a higher level of chlorination, and cannot be used to positively identify the target. The result is expressed as an Estimated Maximum Possible Concentration (EMPC)
X-DPE	Not Detected due to diphenyl ether interference	The signal at this retention time is attributable to interference from a chlorinated diphenyl ether, and cannot be used to positively identify the target. The result is expressed as an Estimated Maximum Possible Concentration (EMPC)
X-IF	Not Detected due to interference	The signal at this retention time is attributable to a co-eluting interference, and cannot be used to positively identify the target. The result is expressed as an Estimated Maximum Possible Concentration (EMPC)

Deviations from the Primary Reference Methods:

The following changes and clarifications apply:

1) The calibration standards as listed in Table 2 are applied appropriately to all of the reference methods listed above. Such an application of one standard calibration series to all of these methods is within the scope of each and every one of the methods. The calibration standard set CS1 through CS5 is consistent with the standards concentration listing in method 1613B Table 4. The CS0 extends the calibration range below what is required by all of the methods. Table 4 defines the use of each of the labelled standards relative to each of the methods.

a. Method 1613B lists a larger suite of labelled extraction standards than does method 8290A. Additional labelled extraction standards have been added into the 8290A analysis to enhance the method and the data quality. These additions to the method constitute performance based enhancements and are within the scope of SW846 Method 8290A.

b. The levels presented in the calibration table of method 8290A are recommended values only. Changes to these concentrations, especially to expand the range, are within the scope of the method. Therefore application of the 1613B calibration standards to method 8290A is compliant with the scope of the method.

c. TO-9A is also a performance based method. It specifically states that different extraction standards and different concentrations of standards from those listed in TO-9A Table 3 is acceptable (see Section 6.8 of reference method).

d. Although OAQPS reference method 23 is not a performance based method, application of the 1613B standards has been defined as within the scope of the method. (see Appendix B)

2) Chlorinated Diphenyl Ether interferences: Both methods 1613B and 8290A indicate that any instrumental response showing the presence of a chlorinated diphenyl ether response and that coelutes with a PCDF represents an interference on that analyte (see Sections 18.3 and 7.8.4.4 respectively). This apparent zero tolerance does not take into account that the response in the diphenyl ether channel may be trivial relative to the corresponding PCDF. For this 'Standard Method', we have defined a chlorinated diphenyl ether interference as the presence of a **significant** response within the chlorinated diphenyl ether channel (rather than zero response) and defined significant as a response equal to or greater than 10% of the peak response in the PCDF channel.

3) When the primary analysis is performed using a DB5MS GC column, 2,3,7,8-TCDF can be resolved to a valley height of 60% from the closest-eluting isomers for this column, providing good quantification of this target without further confirmation. Confirmation of 2,3,7,8-TCDF concentrations above the level of the lowest calibration standard are performed on a second column on a contract basis when requested. Confirmation of additional 2,3,7,8-subtituted PCDD/F isomers is also available when requested.

4) Although not categorically stated in all associated PCDD/F methods, we maintain that each and every individual clean-up procedure is, by definition, performance-based and optional. There is not an expectation within the industry to follow exactly the descriptions of clean-ups in reference methods. Adaptations which meet or exceed the required performance criteria are therefore acceptable within the scope of each reference method. The reference method descriptions are intended as guidelines or templates available to help the laboratory to define effective in-house clean-up methods. The objective within the laboratory is to provide quality clean extracts to the instrument for analysis. Each individual clean-up is part of the laboratory's 'arsenal' in order to achieve this objective.

5) There are differences within the individual reference methods as to the precise spiking protocols for adding extraction standards and native spikes (for LCS, MS and MSD). To ensure consistency within the laboratory between PCDD/F and related methods, the PCDD/F preparative 'Specific Method' requires solids (including stack and ambient sorbants/filters) to be spiked in the soxhlet thimble from a nonane solution and waters are spiked before filtering from an acetone solution. This is consistent with the 8290A approach.

6) Sub-sampling of solids and pre-extraction processing is done in a manner that minimizes potential for cross-contamination. These processes are designed around SW846 protocols rather than 1613B protocols. Solids are sub-sampled directly from the bottle as submitted to the laboratory wherever practical. If the sample is submitted such that homogenization in the bottle is impractical (eg. the bottle is too full or lumps cannot be broken down), then transferring the sample to a tray or another bottle maybe in order.

7) The concentrations of labelled and native spiking solutions are not consistent with those listed in all of the reference methods. These concentrations are prepared at levels convenient and expedient for accurate laboratory processing.

8) With respect to extraction standard recovery limits on non-stack samples analyzed via method 8290A, the limits are based upon the inter-laboratory performance limits defined in method 1613B rather than the relatively arbitrary limits of 35-140% suggested in Section 8.4 of method 8290A.

9) With respect to ions monitored for P5CDD and H7CDF:

a. The 358 ion has a potential for interference from PCB (hexachlorobiphenyls) dependent upon levels of PCBs in the sample and the instrument tuning. Of particular concern is PCB-169 which on a DB5MS column elutes very close to 1,2,3,7,8-P5CDD and which is not removed for the PCDD/F extracts even by carbon clean-up. To eliminate the potential of such interferences from PCB on the 358 mass, we choose to monitor the alternate ion pair of 354 and 356.

b. Similarly, the 408 ion of native H7CDF is prone to problematic interferences arising from 13C12-labeled heptachlorinated biphenyls. To eliminate the potential of such interferences from PCB on the 358 mass, we choose to monitor the alternate ion pair of 410 and 412.

1435 Norjohn Court, Unit 1, Burlington, ON, Canada L7L 0E6

SVOC DATA PACKAGE

SECTION 4: CALIBRATION DATA

Including:

for Multi-Point Calibration(s)

- Multi-Point Calibration Tables
- Individual Quantitation Reports

for Continuing Calibration(s)

- Individual Quantitation Reports

ALS Life Sciences

Calibration Summary Report

Calibration Level	Filename	Run Date
CS-1	7-190724A03	24-Jul-2019 17:20
CS-2	7-190724A02	24-Jul-2019 16:37
CS-3	7-190724A01	24-Jul-2019 15:56
CS-4	7-190724A07	24-Jul-2019 20:08
CS-5	7-190724A06	24-Jul-2019 19:26

Approved: *T.Patterson*
--e-signature--
14-Aug-2019

	Relative Response Factors							CVS
Target Analytes	**CS-1**	**CS-2**	**CS-3**	**CS-4**	**CS-5**	**Mean**	**% RSD**	**% Rec**
2,3,7,8-TCDD	0.987	0.991	1.261	1.155	1.148	1.108	11%	104%
1,2,3,7,8-PeCDD	0.816	0.895	0.923	0.948	0.914	0.899	6%	110%
1,2,3,4,7,8-HxCDD	0.879	0.923	0.965	0.993	0.955	0.943	5%	100%
1,2,3,6,7,8-HxCDD	0.828	0.914	0.940	1.005	0.944	0.926	7%	98%
1,2,3,7,8,9-HxCDD	0.880	0.920	0.956	1.027	0.935	0.944	6%	106%
1,2,3,4,6,7,8-HpCDD	0.836	0.884	0.946	1.000	0.965	0.926	7%	100%
OCDD	0.927	0.937	0.938	1.010	0.962	0.955	4%	98%
2,3,7,8-TCDF	0.783	0.779	0.913	0.904	0.870	0.850	8%	98%
1,2,3,7,8-PeCDF	0.790	0.834	0.864	0.908	0.881	0.855	5%	107%
2,3,4,7,8-PeCDF	0.808	0.917	0.911	0.970	0.941	0.909	7%	95%
1,2,3,4,7,8-HxCDF	0.983	1.056	1.064	1.099	1.083	1.057	4%	100%
1,2,3,6,7,8-HxCDF	0.937	0.964	0.993	1.041	0.984	0.984	4%	106%
2,3,4,6,7,8-HxCDF	0.986	1.034	1.081	1.121	1.086	1.062	5%	99%
1,2,3,7,8,9-HxCDF	0.895	0.926	1.006	1.031	1.002	0.972	6%	108%
1,2,3,4,6,7,8-HpCDF	0.794	0.849	0.888	0.936	0.910	0.875	6%	99%
1,2,3,4,7,8,9-HpCDF	0.850	0.867	0.939	0.944	0.920	0.904	5%	103%
OCDF	1.005	1.081	1.082	1.185	1.137	1.098	6%	104%
Extraction Standards								
13C12-2,3,7,8-TCDD	0.897	0.899	0.909	0.908	0.934	0.909	2%	
13C12-1,2,3,7,8-PeCDD	0.688	0.726	0.725	0.748	0.842	0.746	8%	
13C12-1,2,3,4,7,8-HxCDD	0.910	1.010	0.992	0.986	1.025	0.985	5%	
13C12-1,2,3,6,7,8-HxCDD	1.088	1.109	1.099	1.083	1.094	1.095	1%	
13C12-1,2,3,4,6,7,8-HpCDD	0.775	0.893	0.865	0.815	0.863	0.842	6%	
13C12-OCDD	0.641	0.776	0.766	0.729	0.857	0.754	10%	
13C12-2,3,7,8-TCDF	1.421	1.421	1.462	1.421	1.467	1.438	2%	
13C12-1,2,3,7,8-PeCDF	1.000	1.046	1.047	1.042	1.181	1.063	6%	
13C12-2,3,4,7,8-PeCDF	1.042	1.072	1.091	1.112	1.240	1.111	7%	
13C12-1,2,3,4,7,8-HxCDF	1.109	1.175	1.166	1.124	1.127	1.140	3%	
13C12-1,2,3,6,7,8-HxCDF	1.263	1.385	1.362	1.280	1.303	1.319	4%	
13C12-2,3,4,6,7,8-HxCDF	1.114	1.205	1.159	1.111	1.131	1.144	3%	
13C12-1,2,3,7,8,9-HxCDF	1.029	1.121	1.108	1.085	1.109	1.090	3%	
13C12-1,2,3,4,6,7,8-HpCDF	0.885	1.008	0.957	0.909	0.934	0.939	5%	
13C12-1,2,3,4,7,8,9-HpCDF	0.695	0.808	0.779	0.756	0.800	0.768	6%	
Cleanup Standard								
37Cl4-2,3,7,8-TCDD (Cleanup)	0.967	0.973	1.094	1.039	1.179	1.050	8%	

CVS Indicates a second source Calibration Verification Standard

ALS Life Sciences

Calibration Report

ALS Sample ID **H7-19-CCV-CS1-0017**
Analysis Method EPA TO9A
Analysis Type Calibration

Filename	Inst #	Column	Run Date	Approved:	*T.Patterson*
7-190724A03	HRMS-7	DB5MSUSR826231H	24-Jul-2019 17:20		--e-signature-- 19-Aug-2019

Target Analytes	Ret. Time	Ion Ratio	Concentration ng/mL	Response	RRF
2,3,7,8-TCDD	28.05	0.71	0.50	5.56E+03	1.000
1,2,3,7,8-PeCDD	32.12	1.53	2.50	1.74E+04	0.816
1,2,3,4,7,8-HxCDD	34.16	1.22	2.50	1.57E+04	0.734
1,2,3,6,7,8-HxCDD	34.21	1.30	2.50	1.77E+04	0.828
1,2,3,7,8,9-HxCDD	34.34	1.21	2.50	1.72E+04	0.808
1,2,3,4,6,7,8-HpCDD	35.82	1.01	2.50	1.27E+04	0.836
OCDD	37.32	0.90	5.00	2.33E+04	0.927
2,3,7,8-TCDF	27.13	0.75	0.50	6.88E+03	0.781
1,2,3,7,8-PeCDF	31.18	1.55	2.50	2.45E+04	0.790
2,3,4,7,8-PeCDF	31.89	1.57	2.50	2.61E+04	0.841
1,2,3,4,7,8-HxCDF	33.67	1.13	2.50	2.14E+04	0.863
1,2,3,6,7,8-HxCDF	33.73	1.16	2.50	2.32E+04	0.937
2,3,4,6,7,8-HxCDF	34.06	1.16	2.50	2.15E+04	0.869
1,2,3,7,8,9-HxCDF	34.48	1.23	2.50	1.81E+04	0.729
1,2,3,4,6,7,8-HpCDF	35.27	1.90	2.50	1.38E+04	0.794
1,2,3,4,7,8,9-HpCDF	36.08	1.79	2.50	1.16E+04	0.667
OCDF	37.41	0.89	5.00	2.53E+04	1.005
Field Spike Standards					
37Cl4-2,3,7,8-TCDD	28.06	0.00	0.50	6.00E+03	1.079
13C12-1,2,3,4,7,8-HxCDD	34.15	1.26	100.00	7.13E+05	0.836
13C12-2,3,4,7,8-PeCDF	31.88	1.56	100.00	1.29E+06	1.042
13C12-1,2,3,4,7,8-HxCDF	33.66	0.51	100.00	8.70E+05	0.878
13C12-1,2,3,4,7,8,9-HpCDF	36.07	0.46	100.00	5.45E+05	0.785
Extraction Standards					
13C12-2,3,7,8-TCDD	28.04	0.787	100	1.11E+06	0.897
13C12-1,2,3,7,8-PeCDD	32.1	1.57	100	8.54E+05	0.688
13C12-1,2,3,6,7,8-HxCDD	34.2	1.247	100	8.54E+05	1.088
13C12-1,2,3,4,6,7,8-HpCDD	35.82	1.072	100	6.08E+05	0.775
13C12-OCDD	37.32	0.884	200	1.01E+06	0.641
13C12-2,3,7,8-TCDF	27.11	0.747	100	1.76E+06	1.421
13C12-1,2,3,7,8-PeCDF	31.17	1.601	100	1.24E+06	1
13C12-1,2,3,6,7,8-HxCDF	33.73	0.532	100	9.90E+05	1.263
13C12-1,2,3,4,6,7,8-HpCDF	35.26	0.443	100	6.94E+05	0.885
Cleanup Standard					
13C12-1,2,3,7,8,9-HxCDF	34.48	0.511	100	8.07E+05	1.029
Injection Standards					
13C12-1234-TCDD IS	27.35	0.791	100	1240529.3	12405.293
13C12-123789-HxCDD IS	34.33	1.25	100.00	7.84E+05	7841.906

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Calibration Report

ALS Sample ID **H7-19-CCV-CS2-0017**
Analysis Method EPA TO9A
Analysis Type Calibration

Filename	Inst #	Column	Run Date	Approved:	*T.Patterson*
7-190724A02	HRMS-7	DB5MSUSR826231H	24-Jul-2019 16:37		--e-signature-- 19-Aug-2019

Target Analytes	Ret. Time	Ion Ratio	Concentration ng/mL	Response	RRF
2,3,7,8-TCDD	28.08	0.78	2.00	1.71E+04	0.999
1,2,3,7,8-PeCDD	32.12	1.67	10.00	6.17E+04	0.895
1,2,3,4,7,8-HxCDD	34.15	1.25	10.00	5.75E+04	0.841
1,2,3,6,7,8-HxCDD	34.21	1.27	10.00	6.25E+04	0.914
1,2,3,7,8,9-HxCDD	34.33	1.25	10.00	6.02E+04	0.879
1,2,3,4,6,7,8-HpCDD	35.82	1.03	10.00	4.88E+04	0.884
OCDD	37.32	0.85	20.00	8.97E+04	0.937
2,3,7,8-TCDF	27.16	0.77	2.00	2.13E+04	0.788
1,2,3,7,8-PeCDF	31.19	1.56	10.00	8.29E+04	0.834
2,3,4,7,8-PeCDF	31.89	1.55	10.00	9.34E+04	0.940
1,2,3,4,7,8-HxCDF	33.66	1.21	10.00	7.66E+04	0.896
1,2,3,6,7,8-HxCDF	33.73	1.16	10.00	8.24E+04	0.964
2,3,4,6,7,8-HxCDF	34.06	1.21	10.00	7.69E+04	0.899
1,2,3,7,8,9-HxCDF	34.48	1.23	10.00	6.41E+04	0.749
1,2,3,4,6,7,8-HpCDF	35.27	1.94	10.00	5.29E+04	0.849
1,2,3,4,7,8,9-HpCDF	36.07	1.93	10.00	4.33E+04	0.695
OCDF	37.4	0.88	20.00	1.04E+05	1.081
Field Spike Standards					
37Cl4-2,3,7,8-TCDD	28.08	0.00	2.00	1.85E+04	1.082
13C12-1,2,3,4,7,8-HxCDD	34.15	1.26	100.00	6.23E+05	0.911
13C12-2,3,4,7,8-PeCDF	31.88	1.57	100.00	1.02E+06	1.025
13C12-1,2,3,4,7,8-HxCDF	33.66	0.52	100.00	7.26E+05	0.849
13C12-1,2,3,4,7,8,9-HpCDF	36.07	0.43	100.00	4.99E+05	0.802
Extraction Standards					
13C12-2,3,7,8-TCDD	28.05	0.793	100	8.55E+05	0.899
13C12-1,2,3,7,8-PeCDD	32.1	1.582	100	6.90E+05	0.726
13C12-1,2,3,6,7,8-HxCDD	34.2	1.261	100	6.84E+05	1.109
13C12-1,2,3,4,6,7,8-HpCDD	35.81	1.012	100	5.51E+05	0.893
13C12-OCDD	37.31	0.884	200	9.58E+05	0.776
13C12-2,3,7,8-TCDF	27.13	0.773	100	1.35E+06	1.421
13C12-1,2,3,7,8-PeCDF	31.18	1.481	100	9.94E+05	1.046
13C12-1,2,3,6,7,8-HxCDF	33.73	0.538	100	8.55E+05	1.385
13C12-1,2,3,4,6,7,8-HpCDF	35.26	0.443	100	6.22E+05	1.008
Cleanup Standard					
13C12-1,2,3,7,8,9-HxCDF	34.47	0.512	100	6.92E+05	1.121
Injection Standards					
13C12-1234-TCDD IS	27.38	0.787	100	950730.5	9507.305
13C12-123789-HxCDD IS	34.33	1.27	100.00	6.17E+05	6172.903

ALS Life Sciences

Calibration Report

ALS Sample ID **H7-19-CCV-CS3-0017**
Analysis Method EPA TO9A
Analysis Type Calibration

Filename	Inst #	Column	Run Date	Approved:	*T.Patterson*
7-190724A01	HRMS-7	DB5MSUSR826231H	24-Jul-2019 15:56		--e-signature--
					19-Aug-2019

Target Analytes	Ret. Time	Ion Ratio	Concentration ng/mL	Response	RRF
2,3,7,8-TCDD	28.06	0.76	10.00	1.43E+05	1.261
1,2,3,7,8-PeCDD	32.12	1.66	50.00	4.18E+05	0.923
1,2,3,4,7,8-HxCDD	34.15	1.22	50.00	3.88E+05	0.871
1,2,3,6,7,8-HxCDD	34.21	1.23	50.00	4.19E+05	0.940
1,2,3,7,8,9-HxCDD	34.34	1.19	50.00	4.05E+05	0.909
1,2,3,4,6,7,8-HpCDD	35.82	1.03	50.00	3.32E+05	0.946
OCDD	37.32	0.88	100.00	5.83E+05	0.938
2,3,7,8-TCDF	27.14	0.75	10.00	1.67E+05	0.913
1,2,3,7,8-PeCDF	31.19	1.52	50.00	5.65E+05	0.864
2,3,4,7,8-PeCDF	31.9	1.52	50.00	6.22E+05	0.950
1,2,3,4,7,8-HxCDF	33.67	1.19	50.00	5.03E+05	0.911
1,2,3,6,7,8-HxCDF	33.74	1.16	50.00	5.48E+05	0.993
2,3,4,6,7,8-HxCDF	34.06	1.17	50.00	5.08E+05	0.920
1,2,3,7,8,9-HxCDF	34.48	1.22	50.00	4.52E+05	0.818
1,2,3,4,6,7,8-HpCDF	35.27	1.84	50.00	3.45E+05	0.888
1,2,3,4,7,8,9-HpCDF	36.08	1.81	50.00	2.97E+05	0.764
OCDF	37.41	0.89	100.00	6.72E+05	1.082
Field Spike Standards					
37Cl4-2,3,7,8-TCDD	28.06	0.00	10.00	1.37E+05	1.203
13C12-1,2,3,4,7,8-HxCDD	34.15	1.36	100.00	8.05E+05	0.903
13C12-2,3,4,7,8-PeCDF	31.89	1.55	100.00	1.36E+06	1.043
13C12-1,2,3,4,7,8-HxCDF	33.66	0.51	100.00	9.46E+05	0.856
13C12-1,2,3,4,7,8,9-HpCDF	36.07	0.44	100.00	6.32E+05	0.813
Extraction Standards					
13C12-2,3,7,8-TCDD	28.05	0.804	100	1.14E+06	0.909
13C12-1,2,3,7,8-PeCDD	32.1	1.595	100	9.06E+05	0.725
13C12-1,2,3,6,7,8-HxCDD	34.21	1.191	100	8.91E+05	1.099
13C12-1,2,3,4,6,7,8-HpCDD	35.81	1.046	100	7.02E+05	0.865
13C12-OCDD	37.31	0.905	200	1.24E+06	0.766
13C12-2,3,7,8-TCDF	27.13	0.754	100	1.83E+06	1.462
13C12-1,2,3,7,8-PeCDF	31.18	1.586	100	1.31E+06	1.047
13C12-1,2,3,6,7,8-HxCDF	33.73	0.519	100	1.10E+06	1.362
13C12-1,2,3,4,6,7,8-HpCDF	35.26	0.446	100	7.77E+05	0.957
Cleanup Standard					
13C12-1,2,3,7,8,9-HxCDF	34.47	0.524	100	8.99E+05	1.108
Injection Standards					
13C12-1234-TCDD IS	27.36	0.809	100	1250070.6	12500.706
13C12-123789-HxCDD IS	34.33	1.23	100.00	8.11E+05	8111.065

ALS Life Sciences

Calibration Report

ALS Sample ID **H7-19-CCV-CS4-0017**
Analysis Method EPA TO9A
Analysis Type Calibration

Filename	Inst #	Column	Run Date	Approved:	*T.Patterson*
7-190724A07	HRMS-7	DB5MSUSR826231H	24-Jul-2019 20:08		--e-signature-- 19-Aug-2019

Target Analytes	Ret. Time	Ion Ratio	Concentration ng/mL	Response	RRF
2,3,7,8-TCDD	28.04	0.77	40.00	5.30E+05	1.155
1,2,3,7,8-PeCDD	32.1	1.64	200.00	1.79E+06	0.948
1,2,3,4,7,8-HxCDD	34.15	1.31	200.00	1.73E+06	0.905
1,2,3,6,7,8-HxCDD	34.2	1.17	200.00	1.92E+06	1.005
1,2,3,7,8,9-HxCDD	34.32	1.23	200.00	1.88E+06	0.981
1,2,3,4,6,7,8-HpCDD	35.81	1.03	200.00	1.44E+06	1.000
OCDD	37.31	0.88	400.00	2.60E+06	1.010
2,3,7,8-TCDF	27.11	0.76	40.00	6.49E+05	0.904
1,2,3,7,8-PeCDF	31.17	1.55	200.00	2.39E+06	0.908
2,3,4,7,8-PeCDF	31.88	1.52	200.00	2.73E+06	1.035
1,2,3,4,7,8-HxCDF	33.66	1.18	200.00	2.18E+06	0.965
1,2,3,6,7,8-HxCDF	33.73	1.18	200.00	2.36E+06	1.041
2,3,4,6,7,8-HxCDF	34.05	1.17	200.00	2.20E+06	0.972
1,2,3,7,8,9-HxCDF	34.47	1.17	200.00	1.98E+06	0.874
1,2,3,4,6,7,8-HpCDF	35.26	1.86	200.00	1.50E+06	0.936
1,2,3,4,7,8,9-HpCDF	36.07	1.86	200.00	1.26E+06	0.786
OCDF	37.39	0.89	400.00	3.05E+06	1.185
Field Spike Standards					
37Cl4-2,3,7,8-TCDD	28.04	0.00	40.00	5.26E+05	1.145
13C12-1,2,3,4,7,8-HxCDD	34.14	1.33	100.00	8.71E+05	0.911
13C12-2,3,4,7,8-PeCDF	31.87	1.56	100.00	1.41E+06	1.067
13C12-1,2,3,4,7,8-HxCDF	33.65	0.52	100.00	9.93E+05	0.878
13C12-1,2,3,4,7,8,9-HpCDF	36.05	0.45	100.00	6.68E+05	0.832
Extraction Standards					
13C12-2,3,7,8-TCDD	28.01	0.78	100	1.15E+06	0.908
13C12-1,2,3,7,8-PeCDD	32.09	1.564	100	9.45E+05	0.748
13C12-1,2,3,6,7,8-HxCDD	34.19	1.144	100	9.56E+05	1.083
13C12-1,2,3,4,6,7,8-HpCDD	35.8	1.033	100	7.20E+05	0.815
13C12-OCDD	37.3	0.887	200	1.29E+06	0.729
13C12-2,3,7,8-TCDF	27.1	0.786	100	1.80E+06	1.421
13C12-1,2,3,7,8-PeCDF	31.16	1.571	100	1.32E+06	1.042
13C12-1,2,3,6,7,8-HxCDF	33.71	0.517	100	1.13E+06	1.28
13C12-1,2,3,4,6,7,8-HpCDF	35.24	0.447	100	8.03E+05	0.909
Cleanup Standard					
13C12-1,2,3,7,8,9-HxCDF	34.46	0.525	100	9.58E+05	1.085
Injection Standards					
13C12-1234-TCDD IS	27.34	0.798	100	1264239.9	12642.399
13C12-123789-HxCDD IS	34.32	1.15	100.00	8.83E+05	8834.065

ALS Life Sciences

Calibration Report

ALS Sample ID **H7-19-CCV-CS5-0017**
Analysis Method EPA TO9A
Analysis Type Calibration

Filename	Inst #	Column	Run Date	Approved:	*T.Patterson*
7-190724A06	HRMS-7	DB5MSUSR826231H	24-Jul-2019 19:26		--e-signature-- 19-Aug-2019

Target Analytes	Ret. Time	Ion Ratio	Concentration ng/mL	Response	RRF
2,3,7,8-TCDD	28.04	0.79	200.00	2.33E+06	1.148
1,2,3,7,8-PeCDD	32.1	1.62	1000.00	8.37E+06	0.914
1,2,3,4,7,8-HxCDD	34.15	1.23	1000.00	8.38E+06	0.896
1,2,3,6,7,8-HxCDD	34.2	1.23	1000.00	8.83E+06	0.944
1,2,3,7,8,9-HxCDD	34.32	1.23	1000.00	8.48E+06	0.906
1,2,3,4,6,7,8-HpCDD	35.81	1.03	1000.00	7.13E+06	0.965
OCDD	37.31	0.88	2000.00	1.41E+07	0.962
2,3,7,8-TCDF	27.11	0.76	200.00	2.77E+06	0.870
1,2,3,7,8-PeCDF	31.17	1.54	1000.00	1.13E+07	0.881
2,3,4,7,8-PeCDF	31.88	1.53	1000.00	1.27E+07	0.988
1,2,3,4,7,8-HxCDF	33.66	1.17	1000.00	1.04E+07	0.937
1,2,3,6,7,8-HxCDF	33.73	1.18	1000.00	1.10E+07	0.984
2,3,4,6,7,8-HxCDF	34.05	1.18	1000.00	1.05E+07	0.943
1,2,3,7,8,9-HxCDF	34.47	1.18	1000.00	9.51E+06	0.853
1,2,3,4,6,7,8-HpCDF	35.26	1.84	1000.00	7.27E+06	0.910
1,2,3,4,7,8,9-HpCDF	36.05	1.86	1000.00	6.30E+06	0.788
OCDF	37.39	0.89	2000.00	1.67E+07	1.137
Field Spike Standards					
37Cl4-2,3,7,8-TCDD	28.04	0.00	200.00	2.56E+06	1.262
13C12-1,2,3,4,7,8-HxCDD	34.14	1.25	100.00	8.78E+05	0.938
13C12-2,3,4,7,8-PeCDF	31.87	1.56	100.00	1.35E+06	1.049
13C12-1,2,3,4,7,8-HxCDF	33.65	0.51	100.00	9.65E+05	0.866
13C12-1,2,3,4,7,8,9-HpCDF	36.05	0.44	100.00	6.85E+05	0.856
Extraction Standards					
13C12-2,3,7,8-TCDD	28.02	0.785	100	1.02E+06	0.934
13C12-1,2,3,7,8-PeCDD	32.09	1.602	100	9.15E+05	0.842
13C12-1,2,3,6,7,8-HxCDD	34.19	1.255	100	9.36E+05	1.094
13C12-1,2,3,4,6,7,8-HpCDD	35.8	1.04	100	7.39E+05	0.863
13C12-OCDD	37.3	0.897	200	1.47E+06	0.857
13C12-2,3,7,8-TCDF	27.1	0.758	100	1.59E+06	1.467
13C12-1,2,3,7,8-PeCDF	31.16	1.548	100	1.28E+06	1.181
13C12-1,2,3,6,7,8-HxCDF	33.72	0.501	100	1.11E+06	1.303
13C12-1,2,3,4,6,7,8-HpCDF	35.24	0.445	100	8.00E+05	0.934
Cleanup Standard					
13C12-1,2,3,7,8,9-HxCDF	34.46	0.514	100	9.49E+05	1.109
Injection Standards					
13C12-1234-TCDD IS	27.35	0.788	100	1086981.5	10869.815
13C12-123789-HxCDD IS	34.32	1.24	100.00	8.56E+05	8558.793

ALS Life Sciences

Second Source Calibration Verification Report

Sample Name	**CVS**	Sampling Date	n/a		
ALS Sample ID	1613B-RS1-011	Extraction Date	n/a		Approved:
Analysis Method	EPA 1613B	Sample Size	1	n/a	*S. Kennedy*
Analysis Type	CCV	Percent Moisture	n/a		--e-signature--
Sample Matrix	QC	Split Ratio	1		15-Aug-2019

Run Information	**Run 1**
Filename	7-190724A08
Run Date	24-Jul-19 20:50
Final Volume	20 uL
Dilution Factor	1
Analysis Units	%
Instrument - Column	HRMS-7 DB5MSUSR826231H

Target Analytes	**pg/uL**	**Ret. Time**	**% Rec**	**Limits**	**Flags**
2,3,7,8-TCDD	10	28.09	104.3	78-129	
1,2,3,7,8-PeCDD	50	32.13	109.9	78-130	
1,2,3,4,7,8-HxCDD	50	34.16	100.2	78-128	
1,2,3,6,7,8-HxCDD	50	34.21	97.9	78-128	
1,2,3,7,8,9-HxCDD	50	34.34	105.7	82-122	
1,2,3,4,6,7,8-HpCDD	50	35.82	99.6	86-116	
OCDD	100	37.32	98	79-126	
2,3,7,8-TCDF	10	27.17	97.6	84-120	
1,2,3,7,8-PeCDF	50	31.19	106.6	82-120	
2,3,4,7,8-PeCDF	50	31.90	94.9	82-122	
1,2,3,4,7,8-HxCDF	50	33.67	99.5	90-112	
1,2,3,6,7,8-HxCDF	50	33.74	105.7	88-114	
2,3,4,6,7,8-HxCDF	50	34.06	99.4	88-114	
1,2,3,7,8,9-HxCDF	50	34.48	108.2	90-112	
1,2,3,4,6,7,8-HpCDF	50	35.27	98.8	90-110	
1,2,3,4,7,8,9-HpCDF	50	36.08	103.1	86-116	
OCDF	100	37.41	103.9	63-159	

Extraction Standards	**pg/uL**		**% Rec**	**Limits**
13C12-2,3,7,8-TCDD	100	28.06	99.2	82-121
13C12-1,2,3,7,8-PeCDD	100	32.12	104.3	62-160
13C12-1,2,3,4,7,8-HxCDD	100	34.15	93.2	85-117
13C12-1,2,3,6,7,8-HxCDD	100	34.21	96.9	85-118
13C12-1,2,3,4,6,7,8-HpCDD	100	35.82	96.6	72-138
13C12-OCDD	200	37.32	90.5	48-207
13C12-2,3,7,8-TCDF	100	27.14	99.3	71-140
13C12-1,2,3,7,8-PeCDF	100	31.18	101.8	76-130
13C12-2,3,4,7,8-PeCDF	100	31.89	101	77-130
13C12-1,2,3,4,7,8-HxCDF	100	33.66	94.7	76-131
13C12-1,2,3,6,7,8-HxCDF	100	33.73	93.2	70-143
13C12-2,3,4,6,7,8-HxCDF	100	34.06	95.3	73-137
13C12-1,2,3,7,8,9-HxCDF	100	34.48	92.3	74-135
13C12-1,2,3,4,6,7,8-HpCDF	100	35.27	95.5	78-129
13C12-1,2,3,4,7,8,9-HpCDF	100	36.08	95.4	77-129

Cleanup Standard	**pg/uL**			
37Cl4-2,3,7,8-TCDD (Cleanup)	10	28.09	100.4	31-191

ALS Life Sciences

Continuing Calibration Report

Sample Name	**CCV**	Sampling Date	n/a		
ALS Sample ID	H7-19-CCV-0534	Extraction Date	n/a		Approved:
Analysis Method	EPA TO9A	Sample Size	1	n/a	*T.Patterson*
Analysis Type	CCV	Percent Moisture	n/a		--e-signature--
Sample Matrix	QC	Split Ratio	1		19-Aug-2019

Run Information	**Run 1**
Filename	7-190816A07
Run Date	16-Aug-19 02:13
Final Volume	10 uL
Dilution Factor	1
Analysis Units	%
Instrument - Column	HRMS-7 DB5MSUSR826231H

Target Analytes	**pg/uL**	**Ret. Time**	**% Rec**	**Limits**	**Flags**
2,3,7,8-TCDD	10	28.12	122	75-125	
1,2,3,7,8-PeCDD	50	32.16	114	75-125	
1,2,3,4,7,8-HxCDD	50	34.21	96	75-125	
1,2,3,6,7,8-HxCDD	50	34.26	111	75-125	
1,2,3,7,8,9-HxCDD	50	34.39	99	75-125	
1,2,3,4,6,7,8-HpCDD	50	35.89	110	75-125	
OCDD	100	37.39	110	75-125	
2,3,7,8-TCDF	10	27.20	125	75-125	
1,2,3,7,8-PeCDF	50	31.24	109	75-125	
2,3,4,7,8-PeCDF	50	31.95	125	75-125	
1,2,3,4,7,8-HxCDF	50	33.72	98	75-125	
1,2,3,6,7,8-HxCDF	50	33.79	114	75-125	
2,3,4,6,7,8-HxCDF	50	34.12	108	75-125	
1,2,3,7,8,9-HxCDF	50	34.54	104	75-125	
1,2,3,4,6,7,8-HpCDF	50	35.32	103	75-125	
1,2,3,4,7,8,9-HpCDF	50	36.13	105	75-125	
OCDF	100	37.48	121	70-130	
Field Spike Standards	**pg/uL**		**% Rec**	**Limits**	
37Cl4-2,3,7,8-TCDD	10	28.12	107	75-125	
13C12-1,2,3,4,7,8-HxCDD	100	34.21	86	75-125	
13C12-2,3,4,7,8-PeCDF	100	31.94	110	75-125	
13C12-1,2,3,4,7,8-HxCDF	100	33.71	89	75-125	
13C12-1,2,3,4,7,8,9-HpCDF	100	36.13	95	75-125	
Extraction Standards					
13C12-2,3,7,8-TCDD	100	28.11	105	75-125	
13C12-1,2,3,7,8-PeCDD	100	32.15	105	70-130	
13C12-1,2,3,6,7,8-HxCDD	100	34.26	113	75-125	
13C12-1,2,3,4,6,7,8-HpCDD	100	35.88	122	70-130	
13C12-OCDD	200	37.38	111	70-130	
13C12-2,3,7,8-TCDF	100	27.19	129	70-130	
13C12-1,2,3,7,8-PeCDF	100	31.23	128	70-130	
13C12-1,2,3,6,7,8-HxCDF	100	33.78	119	70-130	
13C12-1,2,3,4,6,7,8-HpCDF	100	35.32	145	70-130	
Cleanup Standard	**pg/uL**				
13C12-1,2,3,7,8,9-HxCDF	100	34.53	110	40-130	

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Continuing Calibration Report

Sample Name	**CCV**	Sampling Date	n/a		
ALS Sample ID	H7-19-CCV-0535	Extraction Date	n/a		Approved:
Analysis Method	EPA TO9A	Sample Size	1	n/a	*T.Patterson*
Analysis Type	CCV	Percent Moisture	n/a		--e-signature--
Sample Matrix	QC	Split Ratio	1		19-Aug-2019

Run Information	**Run 1**
Filename	7-190816A25
Run Date	16-Aug-19 14:59
Final Volume	10 uL
Dilution Factor	1
Analysis Units	%
Instrument - Column	HRMS-7 DB5MSUSR826231H

Target Analytes	**pg/uL**	**Ret. Time**	**% Rec**	**Limits**	**Flags**
2,3,7,8-TCDD	10	28.15	121	75-125	
1,2,3,7,8-PeCDD	50	32.17	110	75-125	
1,2,3,4,7,8-HxCDD	50	34.21	91	75-125	
1,2,3,6,7,8-HxCDD	50	34.26	104	75-125	
1,2,3,7,8,9-HxCDD	50	34.39	95	75-125	
1,2,3,4,6,7,8-HpCDD	50	35.89	113	75-125	
OCDD	100	37.39	108	75-125	
2,3,7,8-TCDF	10	27.23	125	75-125	
1,2,3,7,8-PeCDF	50	31.24	112	75-125	
2,3,4,7,8-PeCDF	50	31.95	114	75-125	
1,2,3,4,7,8-HxCDF	50	33.72	88	75-125	
1,2,3,6,7,8-HxCDF	50	33.79	109	75-125	
2,3,4,6,7,8-HxCDF	50	34.12	111	75-125	
1,2,3,7,8,9-HxCDF	50	34.54	110	75-125	
1,2,3,4,6,7,8-HpCDF	50	35.32	104	75-125	
1,2,3,4,7,8,9-HpCDF	50	36.13	104	75-125	
OCDF	100	37.48	117	70-130	
Field Spike Standards	**pg/uL**		**% Rec**	**Limits**	
37Cl4-2,3,7,8-TCDD	10	28.15	111	75-125	
13C12-1,2,3,4,7,8-HxCDD	100	34.21	84	75-125	
13C12-2,3,4,7,8-PeCDF	100	31.94	100	75-125	
13C12-1,2,3,4,7,8-HxCDF	100	33.71	84	75-125	
13C12-1,2,3,4,7,8,9-HpCDF	100	36.13	95	75-125	
Extraction Standards					
13C12-2,3,7,8-TCDD	100	28.12	96	75-125	
13C12-1,2,3,7,8-PeCDD	100	32.15	96	70-130	
13C12-1,2,3,6,7,8-HxCDD	100	34.25	102	75-125	
13C12-1,2,3,4,6,7,8-HpCDD	100	35.88	104	70-130	
13C12-OCDD	200	37.38	112	70-130	
13C12-2,3,7,8-TCDF	100	27.22	101	70-130	
13C12-1,2,3,7,8-PeCDF	100	31.23	108	70-130	
13C12-1,2,3,6,7,8-HxCDF	100	33.78	109	70-130	
13C12-1,2,3,4,6,7,8-HpCDF	100	35.32	125	70-130	
Cleanup Standard	**pg/uL**				
13C12-1,2,3,7,8,9-HxCDF	100	34.53	108	40-130	

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SVOC DATA PACKAGE

SECTION 5: QC SAMPLE DATA

Including:

- Laboratory Method Blank Analysis Reports
- Laboratory Control Sample Analysis Reports
- Matrix Spike Analysis Reports
- Other QC Sample Analysis Reports (where applicable)

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Laboratory Method Blank Analysis Report

Sample Name	**Method Blank**	Sampling Date	n/a		
ALS Sample ID	WG3116369-1	Extraction Date	12-Aug-19		Approved:
Analysis Method	EPA TO9A	Sample Size	1	Puf	*T.Patterson*
Analysis Type	Blank	Percent Moisture	n/a		--e-signature--
Sample Matrix	MEDIA	Split Ratio	2		19-Aug-2019

Run Information	**Run 1**
Filename	7-190816A11
Run Date	16-Aug-19 05:10
Final Volume	10 uL
Dilution Factor	1
Analysis Units	pg
Instrument - Column	HRMS-7 DB5MSUSR826231H

Target Analytes	**TEF (WHO 2005)**	**Ret. Time**	**Conc. pg**	**EDL pg**	**Flags**	**EMPC pg**	**LQL**
2,3,7,8-TCDD	1	NotFnd	<2.3	2.3	U		10
1,2,3,7,8-PeCDD	1	NotFnd	<1.3	1.3	U		50
1,2,3,4,7,8-HxCDD	0.1	NotFnd	<1.4	1.4	U		50
1,2,3,6,7,8-HxCDD	0.1	NotFnd	<1.3	1.3	U		50
1,2,3,7,8,9-HxCDD	0.1	NotFnd	<1.3	1.3	U		50
1,2,3,4,6,7,8-HpCDD	0.01	NotFnd	<2.3	2.3	U		50
OCDD	0.0003	37.39	<6.2	2.5	M,J,R	6.2	100
2,3,7,8-TCDF	0.1	NotFnd	<1.5	1.5	U		10
1,2,3,7,8-PeCDF	0.03	NotFnd	<1.1	1.1	U		50
2,3,4,7,8-PeCDF	0.3	NotFnd	<0.97	0.97	U		50
1,2,3,4,7,8-HxCDF	0.1	NotFnd	<0.97	0.97	U		50
1,2,3,6,7,8-HxCDF	0.1	NotFnd	<0.90	0.90	U		50
2,3,4,6,7,8-HxCDF	0.1	NotFnd	<0.97	0.97	U		50
1,2,3,7,8,9-HxCDF	0.1	34.54	1.11	1.1	M,J		50
1,2,3,4,6,7,8-HpCDF	0.01	NotFnd	<1.2	1.2	U		50
1,2,3,4,7,8,9-HpCDF	0.01	NotFnd	<1.4	1.4	U		50
OCDF	0.0003	37.49	3.42	2.3	M,J		100
Field Spike Standards			**% Rec**				
37Cl4-2,3,7,8-TCDD			NS				
13C12-1,2,3,4,7,8-HxCDD			NS				
13C12-2,3,4,7,8-PeCDF			NS				
13C12-1,2,3,4,7,8-HxCDF			NS				
13C12-1,2,3,4,7,8,9-HpCDF			NS				
Extraction Standards							
13C12-2,3,7,8-TCDD	4000	28.11	48	40-130			
13C12-1,2,3,7,8-PeCDD	4000	32.15	60	40-130			
13C12-1,2,3,6,7,8-HxCDD	4000	34.26	56	40-130			
13C12-1,2,3,4,6,7,8-HpCDD	4000	35.88	59	25-130			
13C12-OCDD	8000	37.38	48	25-130			
13C12-2,3,7,8-TCDF	4000	27.19	67	40-130			
13C12-1,2,3,7,8-PeCDF	4000	31.23	68	40-130			
13C12-1,2,3,6,7,8-HxCDF	4000	33.79	69	40-130			
13C12-1,2,3,4,6,7,8-HpCDF	4000	35.32	71	25-130			
Cleanup Standard	**pg**						
13C12-1,2,3,7,8,9-HxCDF	4000	34.53	66	40-130			

Homologue Group Totals	**# peaks**	**Conc. pg**	**EDL pg**			
Total-TCDD	0	<2.3	2.3	U		10
Total-PeCDD	0	<1.3	1.3	U		50
Total-HxCDD	0	<1.4	1.4	U		50
Total-HpCDD	0	<2.3	2.3	U		50
Total-TCDF	0	<1.5	1.5	U		10
Total-PeCDF	0	<1.1	1.1	U		50
Total-HxCDF	1	1.11	1.1			50
Total-HpCDF	0	<1.4	1.4	U		50

Toxic Equivalency - (WHO 2005)	**pg**
Lower Bound PCDD/F TEQ (WHO 2005)	0.112
Mid Point PCDD/F TEQ (WHO 2005)	2.52
Upper Bound PCDD/F TEQ (WHO 2005)	4.92

EDL	Indicates the Estimated Detection Limit, based on the measured background noise for this target in this sample.
TEF	Indicates the Toxic Equivalency Factor
TEQ	Indicates the Toxic Equivalency
M	Indicates that a peak has been manually integrated.
U	Indicates that this compound was not detected above the EDL.
J	Indicates that a target analyte was detected below the calibrated range.
R	Indicates that the ion abundance ratio for this compound did not meet the acceptance criterion.
LQL	Lower Quantification Limit, based on the lowest calibration level corrected for sample size, splits and dilutions.
EMPC	Estimated Maximum Possible Concentration – elevated detection limit due to interference or positive id criterion failure
NS	Indicates that this standard was not spiked to sample

ALS Life Sciences

Laboratory Method Blank Analysis Report

Sample Name	**Method Blank**	Sampling Date	n/a		
ALS Sample ID	WG3116369-4	Extraction Date	12-Aug-19		Approved:
Analysis Method	EPA TO9A	Sample Size	1	Puf	*T.Patterson*
Analysis Type	Blank	Percent Moisture	n/a		--e-signature--
Sample Matrix	REAGENT	Split Ratio	2		19-Aug-2019

Run Information	**Run 1**
Filename	7-190816A12
Run Date	16-Aug-19 05:52
Final Volume	10 uL
Dilution Factor	1
Analysis Units	pg
Instrument - Column	HRMS-7 DB5MSUSR826231H

Target Analytes	**TEF (WHO 2005)**	**Ret. Time**	**Conc. pg**	**EDL pg**	**Flags**	**EMPC pg**	**LQL**
2,3,7,8-TCDD	1	NotFnd	<2.0	2.0	U		10
1,2,3,7,8-PeCDD	1	NotFnd	<1.1	1.1	U		50
1,2,3,4,7,8-HxCDD	0.1	NotFnd	<1.5	1.5	U		50
1,2,3,6,7,8-HxCDD	0.1	NotFnd	<1.3	1.3	U		50
1,2,3,7,8,9-HxCDD	0.1	NotFnd	<1.4	1.4	U		50
1,2,3,4,6,7,8-HpCDD	0.01	35.89	<2.1	1.1	M,J,R	2.1	50
OCDD	0.0003	37.40	8.95	1.1	J		100
2,3,7,8-TCDF	0.1	NotFnd	<1.4	1.4	U		10
1,2,3,7,8-PeCDF	0.03	NotFnd	<0.82	0.82	U		50
2,3,4,7,8-PeCDF	0.3	NotFnd	<0.74	0.74	U		50
1,2,3,4,7,8-HxCDF	0.1	NotFnd	<0.79	0.79	U		50
1,2,3,6,7,8-HxCDF	0.1	NotFnd	<0.73	0.73	U		50
2,3,4,6,7,8-HxCDF	0.1	NotFnd	<0.78	0.78	U		50
1,2,3,7,8,9-HxCDF	0.1	34.55	<0.93	0.89	M,J,R	0.93	50
1,2,3,4,6,7,8-HpCDF	0.01	NotFnd	<0.76	0.76	U		50
1,2,3,4,7,8,9-HpCDF	0.01	NotFnd	<0.90	0.90	U		50
OCDF	0.0003	37.49	2.42	1.1	M,J,B		100
Field Spike Standards			**% Rec**				
37Cl4-2,3,7,8-TCDD			NS				
13C12-1,2,3,4,7,8-HxCDD			NS				
13C12-2,3,4,7,8-PeCDF			NS				
13C12-1,2,3,4,7,8-HxCDF			NS				
13C12-1,2,3,4,7,8,9-HpCDF			NS				
Extraction Standards							
13C12-2,3,7,8-TCDD	4000	28.12	52	40-130			
13C12-1,2,3,7,8-PeCDD	4000	32.16	68	40-130			
13C12-1,2,3,6,7,8-HxCDD	4000	34.26	59	40-130			
13C12-1,2,3,4,6,7,8-HpCDD	4000	35.89	67	25-130			
13C12-OCDD	8000	37.39	54	25-130			
13C12-2,3,7,8-TCDF	4000	27.20	67	40-130			
13C12-1,2,3,7,8-PeCDF	4000	31.23	73	40-130			
13C12-1,2,3,6,7,8-HxCDF	4000	33.79	62	40-130			
13C12-1,2,3,4,6,7,8-HpCDF	4000	35.33	74	25-130			
Cleanup Standard	**pg**						
13C12-1,2,3,7,8,9-HxCDF	4000	34.54	70	40-130			

Homologue Group Totals	**# peaks**	**Conc. pg**	**EDL pg**	**Flags**	**LQL**
Total-TCDD	0	<2.0	2.0	U	10
Total-PeCDD	0	<1.1	1.1	U	50
Total-HxCDD	0	<1.5	1.5	U	50
Total-HpCDD	0	<1.1	1.1	U	50
Total-TCDF	0	<1.4	1.4	U	10
Total-PeCDF	0	<0.82	0.82	U	50
Total-HxCDF	0	<0.89	0.89	U	50
Total-HpCDF	0	<0.90	0.90	U	50

Toxic Equivalency - (WHO 2005)	**pg**
Lower Bound PCDD/F TEQ (WHO 2005)	0.00341
Mid Point PCDD/F TEQ (WHO 2005)	2.19
Upper Bound PCDD/F TEQ (WHO 2005)	4.27

EDL	Indicates the Estimated Detection Limit, based on the measured background noise for this target in this sample.
TEF	Indicates the Toxic Equivalency Factor
TEQ	Indicates the Toxic Equivalency
M	Indicates that a peak has been manually integrated.
U	Indicates that this compound was not detected above the EDL.
J	Indicates that a target analyte was detected below the calibrated range.
R	Indicates that the ion abundance ratio for this compound did not meet the acceptance criterion.
B	Indicates that this target was detected in the blank at greater than 10% of the sample concentration.
LQL	Lower Quantification Limit, based on the lowest calibration level corrected for sample size, splits and dilutions.
EMPC	Estimated Maximum Possible Concentration – elevated detection limit due to interference or positive id criterion failure
NS	Indicates that this standard was not spiked to sample

Laboratory Control Sample Analysis Report

Sample Name	**Laboratory Control Sample**	Sampling Date	n/a		
ALS Sample ID	WG3116369-2	Extraction Date	12-Aug-19		Approved:
Analysis Method	EPA TO9A	Sample Size	1	n/a	*T.Patterson*
Analysis Type	LCS	Percent Moisture	n/a		--e-signature--
Sample Matrix	QC	Split Ratio	2		19-Aug-2019

Run Information	**Run 1**
Filename	7-190816A08
Run Date	16-Aug-19 03:04
Final Volume	10 uL
Dilution Factor	1
Analysis Units	%
Instrument - Column	HRMS-7 DB5MSUSR826231H

Target Analytes	**pg**	**Ret. Time**	**% Rec**	**Limits**	**Flags**
2,3,7,8-TCDD	400	28.18	105	70-130	
1,2,3,7,8-PeCDD	2000	32.18	106	70-130	
1,2,3,4,7,8-HxCDD	2000	34.23	102	70-130	
1,2,3,6,7,8-HxCDD	2000	34.28	109	70-130	
1,2,3,7,8,9-HxCDD	2000	34.41	117	70-130	
1,2,3,4,6,7,8-HpCDD	2000	35.90	102	70-130	
OCDD	4000	37.40	97	70-130	
2,3,7,8-TCDF	400	27.26	102	70-130	
1,2,3,7,8-PeCDF	2000	31.26	109	70-130	
2,3,4,7,8-PeCDF	2000	31.97	101	70-130	
1,2,3,4,7,8-HxCDF	2000	33.74	102	70-130	
1,2,3,6,7,8-HxCDF	2000	33.81	115	70-130	
2,3,4,6,7,8-HxCDF	2000	34.13	111	70-130	
1,2,3,7,8,9-HxCDF	2000	34.55	112	70-130	
1,2,3,4,6,7,8-HpCDF	2000	35.34	103	70-130	
1,2,3,4,7,8,9-HpCDF	2000	36.15	101	70-130	
OCDF	4000	37.49	98	70-130	
Field Spike Standards			**% Rec**		
37Cl4-2,3,7,8-TCDD			NS		
13C12-1,2,3,4,7,8-HxCDD			NS		
13C12-2,3,4,7,8-PeCDF			NS		
13C12-1,2,3,4,7,8-HxCDF			NS		
13C12-1,2,3,4,7,8,9-HpCDF			NS		
Extraction Standards					
13C12-2,3,7,8-TCDD	4000	28.17	69	40-130	
13C12-1,2,3,7,8-PeCDD	4000	32.17	93	40-130	
13C12-1,2,3,6,7,8-HxCDD	4000	34.27	77	40-130	
13C12-1,2,3,4,6,7,8-HpCDD	4000	35.89	100	25-130	
13C12-OCDD	8000	37.39	102	25-130	
13C12-2,3,7,8-TCDF	4000	27.25	80	40-130	
13C12-1,2,3,7,8-PeCDF	4000	31.25	97	40-130	
13C12-1,2,3,6,7,8-HxCDF	4000	33.80	82	40-130	
13C12-1,2,3,4,6,7,8-HpCDF	4000	35.33	104	25-130	
Cleanup Standard	**pg**				
13C12-1,2,3,7,8,9-HxCDF	4000	34.54	89	40-130	

NS Indicates that this standard was not spiked to sample

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SVOC DATA PACKAGE

SECTION 6: INTERNAL RECORDS

Including:

- Prep Logs
- Independent calculation checks
- Others as listed below:

Extraction Workup Sheet

Batch ID:	WG3116369
WG3116369	

Analysis:	PUFS - M23/1668A (HR)

Prep Procedure: BU-TM-1110 Overall HR Prep, BU-TP-1101 8270D Prep, BU-TP-2100 PAH Prep Method

Analyst:	Jackson Peggy

Date:	12-Aug-19

SUBSAMPLING

Sample I.D.	Client I.D.	Media Prep L#
WG3116369-1	Method Blank	L2294735-7
WG3116369-2	Laboratory Control Sample	L2294735-8
WG3116369-3	Extraction and Injection STD.	—
WG3116369-4	Method Blank(Reagent)	Empty Thimble
L2310263-1	HEISER-25764410	L2294735-6
L2310263-2	CITY-45764407	L2294735-3
L2310263-3	RES-25764409	L2294735-5

BATCH TRACKING

	Date/Time/Initials
Client Labels Checked:	12-Aug-19 2:00pm JP
Media transfer to soxhlet:	JP
	—
	—
	—
Soxhlet Start Time:	JAZ 12-AUG-19 2:45pm
Soxhlets Reflux Properly:	JAZ
Soxhlet End Time:	13-Aug-19 7:30AM EF
	—
	—
	—
	—
Rotovap Reduction + verify temp:	13-Aug-19 1912
Extract split:	JP 13-Aug-19 AR
Acid Silica Column:	13-AUG-2019 CW
Solvent exchange:	14-AUG-2019 1600 KB
Alumina Column:	14-AUG-2019 1630 KB
Cond Dean Stark Column # DX Micro Vial # PCB	15-AUG-19 1500 KB
	15-AUG-19 1930 KB
Micro/Robo Vial:	14-AUG-2019 1930 KB
Update to LIMS:	14-AUG-19 2100 KB

* see comments 13-Aug-19 AR

Batch ID:	WG3116369

DX Extraction Standard:

Sample I.D.	Volume (ul)	(Checkmark) Spiked
WG3116369-1	40	✓
WG3116369-2	40	✓
WG3116369-3	40	✓
WG3116369-4	40	✓
L2310263-1	40	✓
L2310263-2	40	✓
L2310263-3	40	✓
L2316030-1	40	✓
L2316030-2	40	✓
L2316030-3	40	✓
L2320141-1	40	✓
L2320141-2	40	✓
L2320141-3	40	✓
L2322808-1	40	✓
~~L2322808-2~~	~~40~~	
L2322808-3	40	✓

Syringe ID: 320

Standard: M23-ES#2- ~~035E~~ 035C SP 12-Aug-19

Spike Date: 12-Aug-2019

Spike Witnessing

Chemist's Initials — Chemist: JAZ

Witness's Initials — Witness: SP

JP 12-Aug-19

Witness's Initials — Correct Syringe Obtained: SP

Witness's Initials — Correct Standard Obtained: SP

Witness's Initials — Correct Technique Followed: SP

PCB Extraction Standard:

Sample I.D.	Volume (ul)	(Checkmark) Spiked
WG3116369-1	40	✓
WG3116369-2	40	✓
WG3116369-3	40	✓
WG3116369-4	40	✓
L2310263-1	40	✓
L2310263-2	40	✓
L2310263-3	40	✓
L2316030-1	40	✓
L2316030-2	40	✓
L2316030-3	40	✓
L2320141-1	40	✓
L2320141-2	40	✓
L2320141-3	40	✓
L2322808-1	40	✓
~~L2322808-2~~	~~40~~	
L2322808-3	40	✓

Syringe ID: 118

Standard: 1668A-ES#2-056F

Spike Date: 12-Aug-19

Spike Witnessing

Chemist's Initials — Chemist: JAZ

Witness's Initials — Witness: SP

JP 12-Aug-19

Witness's Initials — Correct Syringe Obtained: SP

Witness's Initials — Correct Standard Obtained: SP

Witness's Initials — Correct Technique Followed: SP

Batch ID:	WG3116369

Batch ID:	WG3116369

DX Native Standard:

Sample I.D.	Volume (ul)	(Checkmark) Spiked
WG3116369-2	40	✓
WG3116369-3	40	✓

Syringe ID: 322
Standard: 1613B-NS#3- 023E
Date & Initials: 12-Aug-2019 JAZ

PCB Native Standard:

Sample I.D.	Volume (ul)	(Checkmark) Spiked
WG3116369-2	40	✓
WG3116369-3	40	✓

Syringe ID: 323
Standard: 1668A-NS#1- 36C
Date & Initials: 12-Aug-2019 JAZ

DX Cleanup Standard:

Sample I.D.	Volume (ul)	(Checkmark) Spiked
WG3116369-1	20	✓
WG3116369-2	20	✓
WG3116369-3	N/A	N/A
WG3116369-4	20	✓
L2310263-1	20	✓
L2310263-2	20	✓
L2310263-3	20	✓
L2316030-1	20	✓
L2316030-2	20	✓
L2316030-3	20	✓
L2320141-1	20	✓
L2320141-2	20	✓
L2320141-3	20	✓
L2322808-1	20	✓
~~L2322808-2~~	~~20~~	
L2322808-3	20	✓

Syringe ID: 357
Standard: M23-CL#1-033B
Date & Initials: 13-AUG-2019 CLL

Chemist's Initials
Correct Syringe Obtained: CLL
Chemist's Initials
Correct Standard Obtained: CLL
Chemist's Initials
Correct Technique Followed: CLL

JP 12-Aug-19

PCB Cleanup Standard:

Sample I.D.	Volume (ul)	(Checkmark) Spiked
WG3116369-1	20	✓
WG3116369-2	20	✓
WG3116369-3	N/A	N/A
WG3116369-4	20	✓
L2310263-1	20	✓
L2310263-2	20	✓
L2310263-3	20	✓
L2316030-1	20	✓
L2316030-2	20	✓
L2316030-3	20	✓
L2320141-1	20	✓
L2320141-2	20	✓
L2320141-3	20	✓
L2322808-1	20	✓
~~L2322808-2~~	~~20~~	
L2322808-3	20	✓

Syringe ID: 378
Standard: 1668A-CL#2-32J
Date & Initials: 13-AUG-2019 CLL

Chemist's Initials
Correct Syringe Obtained: CLL
Chemist's Initials
Correct Standard Obtained: CLL
Chemist's Initials
Correct Technique Followed: CLL

JP 12-Aug-19

Batch ID:	WG3116369

DX Injection Standard:

Sample I.D.	Volume (ul)	Spiked (Checkmark)
WG3116369-1	10	✓
WG3116369-2	10	✓
WG3116369-3	10	✓
WG3116369-4	10	✓
L2310263-1	10	✓
L2310263-2	10	✓
L2310263-3	10	✓
L2316030-1	10	✓
L2316030-2	10	✓
L2316030-3	10	✓
L2320141-1	10	✓
L2320141-2	10	✓
L2320141-3	10	✓
L2322808-1	10	✓
~~L2322808-2~~	~~10~~	
L2322808-3	10	✓

Syringe ID: 335

Standard: 1613B-IS#1- 0765

Date & Initials: 15-AUG-2019 KB

Chemist's Initials

Correct Syringe Obtained: KB

Chemist's Initials

Correct Standard Obtained: KB

Chemist's Initials

Correct Technique Followed: KB

JP 12-Aug-19

PCB Injection Standard:

Sample I.D.	Volume (ul)	Spiked (Checkmark)
WG3116369-1	5	✓
WG3116369-2	5	✓
WG3116369-3	5	✓
WG3116369-4	5	✓
L2310263-1	5	✓
L2310263-2	5	✓
L2310263-3	5	✓
L2316030-1	5	✓
L2316030-2	5	✓
L2316030-3	5	✓
L2320141-1	5	✓
L2320141-2	5	✓
L2320141-3	5	✓
L2322808-1	5	✓
~~L2322808-2~~	~~5~~	
L2322808-3	5	✓

Syringe ID: 260

Standard: 1668A-IS#2- 011A

Date & Initials: 14-AUG-2019 KB

Chemist's Initials

Correct Syringe Obtained: KB

Chemist's Initials

Correct Standard Obtained: KB

Chemist's Initials

Correct Technique Followed: KB

JP 12-Aug-19

Batch ID:	WG3116369

Reagent Lot Numbers:

Reagent	Lot#	Manufacturer
Acetone	104436	
Hexane	104314	
DCM	104596	
Toluene	104369	
Nonane	ORG-WAKONON- 648	
1:1 DCM:HEX	ORG-DH2- 559	
Sodium Sulphate	ORG-SSU- 2116	
Acid Silica	ORG-ASI- 87600	
Neutral Silica	ORG-NSI- 1939	
Alumina	ORG-ALU- 437	
1% Deactivated Silica	ORG-2%DAS- -	
Chromacarb	ORG-CC- 241	

Batch ID:	WG3116369

Procedure:

This batchsheet is a guideline only. Please see test procedure for complete set of instructions.
Extraction:
- For MB and LCS you **must** use blank media - if not available see your Team Lead
- Place the PUF in to a pre-cleaned thimble and transfer to the Soxhlet body.
- Spike with Extraction Standard (plus Native for LCS and ENI).
- Soxhlet extract in DCM for 16 hours (check with team lead or supervisor)
Rotovap:
-Rotovap and reduce to ~5mL.
- Transfer to a calibrated c-tube (marked at 1ml, 2ml) with 3x2ml hexane
- Mix well then quantitatively spilt the extract **1/2 DX/PCB 1/2 Archive**

Batch ID:	WG3116369

DX/PCB:

- Perform Acid Silica column
- Solvent Exchange (reduce to **~50ul**, bulk back up to 1ml Hexane, vortex well.
- Perform Alumina Column:
  - Pre-elute the Alumina Column with 7ml Hexane
  - Place F1 c-tube under the column, then load the sample with 3x1ml Hexane rinses
  - F1 (Archive) 1mL Hexane
  - F2 (DX/PCB) 14mL 1:1 DCM:Hexane

-Split Alumina F2 1/2 PCB 1/2 DX

Micro-Vial:

PCB:

- Blow down to ~1/2ml
- Vortex **very** well.
- Transfer every last drop to a micro-vial (Marked at 20uL with nonane).
- Blow down to the line
- Spike PCB Injection Standard, cap and vortex. **FV=25ul**

DX:
- Solvent Exchange to Hexane (Reduce to Just Dry then bulk back up to 1ml Hexane)
- ChromaCarb: - 4cm of well-packed chroma-carb.
- Pre-elute Carbon with 5ml Hexane
- Transfer with 3x1ml Hexane
- F1 = **10ml** 1:1 DCM:Hexane (Archive)
- After dripping has stopped Invert Column.
- F2 = 14ml Toluene (DX and PCB)
- After the column has stopped dripping reduce the **F2** portion down to ~1/2ml.
- Vortex well, then transfer to a micro-vial without rinses.
- Blow the micro-vial down to just-dry.
- Spike with Injection Standard, Cap the micro-vial, and Vortex. **FV=10ul**

Batch ID:	WG3116369

Comments:

NOTE: Label and Save All Columns including Acid Silica Columns

LZ322808-2 Sample has not arrived yet JP 12-Aug-19

* flask contained ~5mL water after extraction, water was removed with pipette 13-Aug-19 BB

Approval of Deviation from Standard Method

☐ Procedure does deviate from Standard Method. **(Batch Writer):** _____ **Approved (Supervisor/Manager):** _____

. made new W3 could not locate origina. W3 Spike only w DX IS. KB 15-Aug-19

WG3116369			Prep Analyst:		
PUFS - M23/1668A (HR)			Date:		
	Very Good	Meets Method Req	Some Outliers	Very Poor	Comments / Was spl/batch sent for rework? Why?
MB					
LCS					
DUP					
ES rec					

ALS Life Sciences

Sample Calculation Report

CS3 RRF Check

Approved: *T.Patterson* --e-signature-- 19-Aug-2019

RRF = (Response of 2,3,7,8-TCDD / Response of 13C12-2,3,7,8-TCDD) x (Concentration of 13C12-2,3,7,8-TCDD / Concentration of TCDD)

		Calculated Value	Value from TargetLynx
RRF = (**143318.60** / **1136712.10**) x (**100** / **10**) =		**1.26**	**1.26**

Calculation of OCDD amount in L2310263-1

pg = (Response of OCDD / Response of 13C12-OCDD) x (pg of 13C12-OCDD spiked / Mean RRF * Sample Size)

pg = (**466.5** / **522988.9**) x (**8000** / **0.95** * **1.00**) =		**7.47**	**7.47**

Calculation of 13C12-2,3,7,8-TCDD Recovery in L2310263-1

% Recovery = (Response of 13C12-2,3,7,8-TCDD / Response of 13C12-1,2,3,4-TCDD) x (pg of 13C12-1,2,3,4-TCDD spiked * 100 / Mean RRF * Amount Spiked)

% Recovery = (**450065.9** / **706498.9**) x (**2000** / **0.91** * **100** / **2000**) =		**70**	**70 %**

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SVOC DATA PACKAGE

SECTION 7: SHIPPING/RECEIVING DOCUMENTS

Including:

- Airbills
- Chain-of-Custody Records
- Sample Log-in Sheet(s) - where applicable
- Others as listed below:

[For lab use only]

ANALYTICAL REQUEST FORM

L2310263

1. [x] **REGULAR Status**

[ ] **RUSH Status Requested - ADDITIONAL CHARGE**
RESULTS REQUIRED BY _____ DATE
CONTACT ALS PRIOR TO SENDING SAMPLES

2. Date 7/11/19 Purchase Order No. _____

3. Company Name : Floyd|Snider
Address: 601 Union St Suite 600
Seattle WA 98101
Person to Contact: Emily Jones
Telephone (719) 292-2078
Fax Telephone ( )
E-mail Address: emily.jones@floydsnider.com
Billing Address (if different from above)

4. Quote No. Email quote
ALS Project Manager: **Ron McLeod**

5. **Sample Collection**
Sampling Site Background Industrial Areas Phase I
Industrial Process: Background industry
Date of Collection 7/5/19 ~~7/9~~ - 7/11/19
Time Collected 0900
Date of Shipment
Chain of Custody No.:

6. How did you first learn about ALS?
Referred to by SKC / T&B Systems

7. **REQUEST FOR ANALYSES**

Client Sample Number	Matrix*	Sample/Area Volume	ANALYSES REQUESTED - Use method number if known	Units**	Lab Comments
Heiser - 25764410	Lo-Vol PUF tube		PCBs by Method 1668; Dioxins by Method 8290A	1	1
City - 25764407	Lo-Vol PUF tube		PCBs by Method 1668; Dioxins by Method 8290A	1	2
Res - 25764409	Lo-Vol PUF tube		PCBs by Method 1668; Dioxins by Method 8290A	1	3

* Specify: Solid sorbent tube, e.g. Charcoal; Filter type; Impinger solution; Bulk sample; Blood; Urine; Tissue; Soil; Water; Other

** 1. µg/sample 2. mg/m^3 3. ppm 4. % 5. µg/m^3 6. _____ (other) Please indicate one or more units in the column entitled Units**

Comments HOLD FOR BATCH ANALYSIS AFTER REC'E 5 SAMPLE GROUPS

Possible Contamination and/or Chemical Hazards

7. **Chain of Custody (Optional)**

Relinquished by	Emily ~~JMM~~ EMILY JONES	Date/Time	7/15/19 0900
Received by	AARON BURTON	Date/Time	16-JULY-2019 10:40 6.8°C
Relinquished by		Date/Time	
Received by		Date/Time	

1435 Norjohn Court #1 / Burlington, ON Canada, L7L 0E6 **800-356-9135 or 801-266-7700 / FAX: 801-268-9992**
ALS Environmental

Sample Receiving Log

Date/Time Received	Client ID	Number/Description of Containers	Temp. on Receipt*	Condition of Samples, Courier & Tracking Information	Receiver's Initials	Date/Time Login Completed	Submission ID	Sample ID Range
[redacted]								
16-JULY-2019 10:40	Floyd Snider	3 x air samples	6.8°C	Good FedEx 7884 7124 2481	NJ	16-JULY-2019 11:15	L2310263	-1-3

*Temperatures were recorded using:

☑ 'Oakton infraPro' dedicated I.R. gun (serial #97800270)

☐ Other (specify): _____