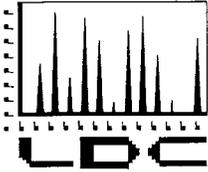


APPENDIX E

PCBs and Dioxin/Furan Congeners Validation Reports



LABORATORY DATA CONSULTANTS, INC.
2701 Loker Ave. West, Suite 220, Carlsbad, CA 92010 Bus: 760-827-1100 Fax: 760-827-1099

King County Environmental Laboratory
322 W. Ewing Street
Seattle WA 98119
ATTN: Mr. Fritz Grothkopp

April 4, 2014

SUBJECT: Lower Duwamish Low Air Deposition, Data Validation

Dear Mr. Grothkopp,

Enclosed is the final validation report for the fractions listed below. This SDG was received on March 12, 2014. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 31470:

<u>SDG #</u>	<u>Fraction</u>
DPWG46571	Dioxins/Dibenzofurans, Polychlorinated Biphenyls as Congeners
DPWG46358	

The data validation was performed under EPA Level III guidelines. The analyses were validated using the following documents, as applicable to each method:

- Lower Duwamish Waterway Bulk Atmospheric Deposition Study Sampling and Analysis Plan, Final August 2011, and addendum April 2013
- EPA Region 10 SOP for the Validation of Polychlorinated Dibenzodioxin, PCDD, and Polychlorinated Dibenzofuran, PCDF, Data, Revision 2.0, January 31, 1996
- EPA Region 10 SOP for the Validation of Method 1668 Toxic, Dioxin-like, PCB Data

Please feel free to contact us if you have any questions.

Sincerely,

Stella S. Cuenco
Operations Manager/Senior Chemist

**Laboratory Data Consultants, Inc.
Data Validation Report**

Project/Site Name: Lower Duwamish Low Air Deposition
Collection Date: April 10 through July 2, 2013
LDC Report Date: March 25, 2014
Matrix: Water
Parameters: Dioxins/Dibenzofurans
Validation Level: EPA Level III
Laboratory: AXYS Analytical Services Ltd.
Sample Delivery Group (SDG): DPWG46571

Sample Identification

L57717-4
L57717-5
L57717-9
L57812-4
L57812-5
L57812-9
L58204-4
L58204-5
L58204-9
L57717-5DUP

Introduction

This data review covers 10 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 1613B for Polychlorinated Dioxins/Dibenzofurans.

This review follows the Lower Duwamish Waterway Bulk Atmospheric Deposition Study Sampling and Analysis Plan (Final August 2011, and addendum April 2013) and EPA Region 10 SOP for the Validation of Polychlorinated Dibenzodioxin (PCDD) and Polychlorinated Dibenzofuran (PCDF) Data (Revision 2.0, January 31, 1996).

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

- U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.
- J Indicates an estimated value.
 - J1 Blank Contamination: Indicates possible high bias and/or false positives.
 - J2 Calibration Range exceeded: Indicates possible low bias.
 - J3 Holding times not met: Indicates low bias for most analytes.
 - J4 Other QC parameters outside control limits: bias not readily determined.
 - J5 Other QC parameters outside control limits. The reported results appear to be biased high. The actual value of target compound in the sample may be lower than the value reported by the laboratory.
 - J6 Other QC parameters outside control limits. The reported results appear to be biased low. The actual value of target compound in the sample may be higher than the value reported by the laboratory.
- R Quality control indicates the data is not usable.
- NJ Presumptive evidence of presence of the compound at an estimated quantity.
- UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.
- A Indicates the finding is based upon technical validation criteria.
- P Indicates the finding is related to a protocol/contractual deviation.
- None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily frequency.

Retention time windows were established for all homologues. The chromatographic resolution between ^{13}C -2,3,7,8-TCDD and ^{13}C -1,2,3,4-TCDD was less than or equal to 25%.

III. Initial Calibration

A five point initial calibration was performed as required by the method.

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 35.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within method and validation criteria.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

All of the continuing calibration results were within the QC limits for unlabeled compounds and labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within method and validation criteria.

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated dioxin/dibenzofuran contaminants were found in the method blanks.

Method blank results flagged "K" by the laboratory as estimated maximum possible concentration (EMPC) were considered not detected.

VI. Matrix Spike/Matrix Spike Duplicates/Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits.

VII. Ongoing Precision & Recovery Samples (OPR)

Ongoing precision and recovery (OPR) samples were reviewed for each matrix as applicable. The percent recoveries (%R) were within the QC limits.

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits.

X. Target Compound Identifications

Raw data were not reviewed for this SDG.

XI. Compound Quantitation

All compound quantitation were within validation criteria with the following exceptions:

Sample	Compound	Flag	A or P
All samples in SDG DPWG46571	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A

Raw data were not reviewed for this SDG.

XII. System Performance

Raw data were not reviewed for this SDG.

XIII. Overall Assessment of Data

The overall assessment of data was acceptable. In the case where more than one result was reported for an individual sample, the least technically acceptable results were rejected as follows:

Sample	Compound	Flag	A or P
L57717-9 L58204-4 L58204-5	2,3,7,8-TCDF (from DB-5)	R	A

Data flags are summarized at the end of this report if data has been qualified.

XIV. Field Duplicates

No field duplicates were identified in this SDG.

XV. Field Blanks

No field blanks were identified in this SDG.

**Lower Duwamish Low Air Deposition
Dioxins/Dibenzofurans - Data Qualification Summary - SDG DPWG46571**

SDG	Sample	Compound	Flag	A or P	Reason
DPWG46571	L57717-4 L57717-5 L57717-9 L57812-4 L57812-5 L57812-9 L58204-4 L58204-5 L58204-9 L57717-5DUP	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A	Compound quantitation and (EMPC)
DPWG46571	L57717-9 L58204-4 L58204-5	2,3,7,8-TCDF (from DB-5)	R	A	Overall assessment of data

**Lower Duwamish Low Air Deposition
Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG DPWG46571**

No Sample Data Qualified in this SDG

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1613B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 4/10/13 → 7/2/13
II.	HRGC/HRMS Instrument performance check	A	
III.	Initial calibration	A	≤ 20/35
IV.	Routine calibration/ICV	A	SC limits
V.	Blanks	A	All results flagged "X" considered ND
VI.	Matrix spike/Matrix spike duplicates /DUP	N/A	client / D=2+10
VII.	Laboratory control samples	A	OPR
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	A	
X.	Target compound identifications	N	
XI.	Compound quantitation/RL/LOQ/LODs	SW	
XII.	System performance	N	
XIII.	Overall assessment of data	SW	
XIV.	Field duplicates	N	
XV.	Field blanks	N	

Note: A = Acceptable ND = No compounds detected D = Duplicate
 N = Not provided/applicable R = Rinsate TB = Trip blank
 SW = See worksheet FB = Field blank EB = Equipment blank

Validated Samples: water

1	L57717-4	11		21		31	
2	L57717-5	12		22		32	
3	L57717-9	13		23		33	
4	L57812-4	14		24		34	
5	L57812-5	15		25		35	
6	L57812-9	16		26		36	
7	L58204-4	17		27		37	
8	L58204-5	18		28		38	
9	L58204-9	19		29		39	
10	L57717-5DUP	20	WG 45234-101	30		40	

Notes: _____

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1613B)

A. 2,3,7,8-TCDD	F. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HxCDF	P. 1,2,3,4,7,8,9-HpCDF	U. Total HpCDD
B. 1,2,3,7,8-PeCDD	G. OCDD	L. 1,2,3,6,7,8-HxCDF	Q. OCDF	V. Total TCDF
C. 1,2,3,4,7,8-HxCDD	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HxCDF	R. Total TCDD	W. Total PeCDF
D. 1,2,3,6,7,8-HxCDD	I. 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HxCDF	S. Total PeCDD	X. Total HxCDF
E. 1,2,3,7,8,9-HxCDD	J. 2,3,4,7,8-PeCDF	O. 1,2,3,4,6,7,8-HpCDF	T. Total HxCDD	Y. Total HpCDF

Notes: _____

**Laboratory Data Consultants, Inc.
Data Validation Report**

Project/Site Name: Lower Duwamish Low Air Deposition
Collection Date: April 10 through July 2, 2013
LDC Report Date: March 25, 2014
Matrix: Water
Parameters: Polychlorinated Biphenyls as Congeners
Validation Level: EPA Level III
Laboratory: AXYS Analytical Services, Ltd.
Sample Delivery Group (SDG): DPWG46358

Sample Identification

L57717-4
L57717-5
L57717-9
L57812-4
L57812-5
L57812-9
L58204-4
L58204-5
L58204-9
L57717-5DUP

Introduction

This data review covers 10 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 1668A for Polychlorinated Biphenyls as Congeners.

This review follows the This review follows the Lower Duwamish Waterway Bulk Atmospheric Deposition Study Sampling and Analysis Plan (Final August 2011, and addendum April 2013) and EPA Region 10 SOP for the Validation of Method 1668 Toxic, Dioxin-like, PCB Data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

- U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.
- J Indicates an estimated value.
 - J1 Blank Contamination: Indicates possible high bias and/or false positives.
 - J2 Calibration Range exceeded: Indicates possible low bias.
 - J3 Holding times not met: Indicates low bias for most analytes.
 - J4 Other QC parameters outside control limits: bias not readily determined.
 - J5 Other QC parameters outside control limits. The reported results appear to be biased high. The actual value of target compound in the sample may be lower than the value reported by the laboratory.
 - J6 Other QC parameters outside control limits. The reported results appear to be biased low. The actual value of target compound in the sample may be higher than the value reported by the laboratory.
- R Quality control indicates the data is not usable.
- NJ Presumptive evidence of presence of the compound at an estimated quantity.
- UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.
- A Indicates the finding is based upon technical validation criteria.
- P Indicates the finding is related to a protocol/contractual deviation.
- None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily frequency.

Retention time windows were established for all congeners. The chromatographic resolution between the congeners PCB-23 and PCB-34 and congeners PCB-182 and PCB-187 was resolved with a valley of less than or equal to 40%.

III. Initial Calibration

A five point initial calibration was performed as required by the method.

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for all compounds.

The ion abundance ratios for all PCBs were within method and validation criteria.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

All of the continuing calibration percent differences (%D) between the initial calibration RRF and the continuing calibration RRF were less than or equal to 30.0% for unlabeled compounds and less than or equal to 50.0% for labeled compounds.

The ion abundance ratios for all PCBs were within method and validation criteria.

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated biphenyls as congeners contaminants were found in the method blanks with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
WG45234-101	10/17/13	PCB 40+41+71 PCB 42 PCB 44+47+65 PCB 48 PCB 49+69 PCB 52 PCB 60 PCB 61+70+74+76 PCB 64 PCB 66 PCB 83+99 PCB 93+95+98+100+102 PCB 110+115 PCB 118 PCB 147+149 PCB 153+168	4.96 pg/L 1.41 pg/L 9.88 pg/L 1.51 pg/L 3.75 pg/L 7.86 pg/L 1.82 pg/L 13.9 pg/L 2.87 pg/L 6.46 pg/L 2.36 pg/L 4.05 pg/L 5.31 pg/L 6.63 pg/L 3.37 pg/L 3.82 pg/L	L57717-4 L57717-5 L57717-9 L57812-4 L57812-5 L57812-9 L58204-4 L58204-5 L58204-9 L57717-5DUP
WG45234-101 W (5x)	10/17/13	PCB 1 PCB 4 PCB 8 PCB 15 PCB 17 PCB 20+28 PCB 21+33 PCB 22 PCB 26+29 PCB 32 PCB 37	3.88 pg/L 11.3 pg/L 11.2 pg/L 12.0 pg/L 5.92 pg/L 16.8 pg/L 10.5 pg/L 6.51 pg/L 3.63 pg/L 4.11 pg/L 9.03 pg/L	L57717-4 L57717-5 L57717-9 L57812-4 L57812-5 L57812-9 L58204-4 L58204-5 L58204-9 L57717-5DUP

Sample concentrations were compared to concentrations detected in the method blanks. The sample concentrations were either not detected or were significantly greater (>5X blank contaminants) than the concentrations found in the associated method blanks with the following exceptions:

Sample	Compound	Reported Concentration	Modified Final Concentration
L57717-4	PCB 1 PCB 4 PCB 8 PCB 15 PCB 17 PCB 20+28 PCB 21+33 PCB 22 PCB 26+29 PCB 32 PCB 37 PCB 44+47+65 PCB 66	7.89 pg/L 15.3 pg/L 35.5 pg/L 27.8 pg/L 17.4 pg/L 55.0 pg/L 34.9 pg/L 24.8 pg/L 9.45 pg/L 12.0 pg/L 21.6 pg/L 47.0 pg/L 31.0 pg/L	7.89U pg/L 15.3U pg/L 35.5U pg/L 27.8U pg/L 17.4U pg/L 55.0U pg/L 34.9U pg/L 24.8U pg/L 9.45U pg/L 12.0U pg/L 21.6U pg/L 47.0U pg/L 31.0U pg/L
L57717-5 (5X)	PCB 1	17.1 pg/L	17.1U pg/L

Sample	Compound	Reported Concentration	Modified Final Concentration
L57717-9	PCB 1 PCB 4 PCB 8 PCB 17 PCB 21+33 PCB 26+29 PCB 32 PCB 37	9.54 pg/L 26.1 pg/L 44.9 pg/L 23.9 pg/L 50.0 pg/L 15.5 pg/L 18.3 pg/L 40.9 pg/L	9.54U pg/L 26.1U pg/L 44.9U pg/L 23.9U pg/L 50.0U pg/L 15.5U pg/L 18.3U pg/L 40.9U pg/L
L57812-9 (5X)	PCB 1	11.3 pg/L	11.3U pg/L
L57717-5DUP (5X)	PCB 1	16.9 pg/L	16.9U pg/L

Method blank results flagged "K" by the laboratory as estimated maximum possible concentration (EMPC) were considered not detected.

VI. Matrix Spike/Matrix Spike Duplicates/Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits with the following exceptions:

DUP ID (Associated Samples)	Compound	RPD (Limits)	Affected Compound	Flag	A or P
L57717-5DUP (L57717-5)	PCB 206 PCB 208	51.4 (≤50) 50.5 (≤50)	PCB 206 PCB 208 Total Nonachloro Biphenyls	J (all detects) J (all detects) J (all detects)	A

VII. Ongoing Precision & Recovery Samples (OPR)

Ongoing precision and recovery (OPR) samples were reviewed for each matrix as applicable. The percent recoveries (%R) were within the QC limits.

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries (%R) were within QC limits with the following exceptions:

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
L58204-9	¹³ C PCB-4	22.1 (25-150)	PCB 4 PCB 5 PCB 6 PCB 7 PCB 8 PCB 9 PCB 10 PCB 11 PCB 12 PCB 13 PCB 14 Total Dichloro Biphenyls	J (all detects) UJ (all non-detects)	P

X. Target Compound Identifications

Raw data were not reviewed for this SDG.

XI. Compound Quantitation

All compound quantitation were within validation criteria with the following exceptions:

Sample	Compound	Flag	A or P
All samples in SDG DPWG46358	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A

Raw data were not reviewed for this SDG.

XII. System Performance

Raw data were not reviewed for this SDG.

XIII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

XIV. Field Duplicates

No field duplicates were identified in this SDG.

XV. Field Blanks

No field blanks were identified in this SDG.

**Lower Duwamish Low Air Deposition
Polychlorinated Biphenyls as Congeners - Data Qualification Summary - SDG
DPWG46358**

SDG	Sample	Compound	Flag	A or P	Reason
DPWG46358	L57717-5	PCB 206 PCB 208 Total Nonachloro Biphenyls	J (all detects) J (all detects) J (all detects)	A	Duplicate sample analysis (RPD)
DPWG46358	L58204-9	PCB 4 PCB 5 PCB 6 PCB 7 PCB 8 PCB 9 PCB 10 PCB 11 PCB 12 PCB 13 PCB 14 Total Dichloro Biphenyls	J (all detects) UJ (all non-detects)	P	Internal standards (%R)
DPWG46358	L57717-4 L57717-5 L57717-9 L57812-4 L57812-5 L57812-9 L58204-4 L58204-5 L58204-9 L57717-5DUP	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A	Compound quantitation (EMPC)

**Lower Duwamish Low Air Deposition
Polychlorinated Biphenyls as Congeners - Laboratory Blank Data Qualification
Summary - SDG DPWG46358**

SDG	Sample	Compound	Modified Final Concentration	A or P
DPWG46358	L57717-4	PCB 1 PCB 4 PCB 8 PCB 15 PCB 17 PCB 20+28 PCB 21+33 PCB 22 PCB 26+29 PCB 32 PCB 37 PCB 44+47+65 PCB 66	7.89U pg/L 15.3U pg/L 35.5U pg/L 27.8U pg/L 17.4U pg/L 55.0U pg/L 34.9U pg/L 24.8U pg/L 9.45U pg/L 12.0U pg/L 21.6U pg/L 47.0U pg/L 31.0U pg/L	A
DPWG46358	L57717-5 (5X)	PCB 1	17.1U pg/L	A

SDG	Sample	Compound	Modified Final Concentration	A or P
DPWG46358	L57717-9	PCB 1 PCB 4 PCB 8 PCB 17 PCB 21+33 PCB 26+29 PCB 32 PCB 37	9.54U pg/L 26.1U pg/L 44.9U pg/L 23.9U pg/L 50.0U pg/L 15.5U pg/L 18.3U pg/L 40.9U pg/L	A
DPWG46358	L57812-9 (5X)	PCB 1	11.3U pg/L	A
DPWG46358	L57717-5DUP (5X)	PCB 1	16.9U pg/L	A

METHOD: HRGC/HRMS Polychlorinated Biphenyls as Congeners (EPA Method 1668A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 4/10/13 → 7/2/13
II.	HRGC/HRMS Instrument performance check	A	
III.	Initial calibration	A	±20
IV.	Routine calibration/ rev	A	±30/50
V.	Blanks	SW	
VI.	Matrix spike/Matrix spike duplicates /DUP	N/SW	client /D=2+10
VII.	Laboratory control samples	A	OPR
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	SW	
X.	Target compound identifications	N	
XI.	Compound quantitation/RL/LOQ/LODs	SW	
XII.	System performance	N	
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	N	
XV.	Field blanks	N	

Note: A = Acceptable ND = No compounds detected D = Duplicate
 N = Not provided/applicable R = Rinsate TB = Trip blank
 SW = See worksheet FB = Field blank EB = Equipment blank

Validated Samples: *water*

1	L57717-4	11		21		31	
2	L57717-5	12		22		32	
3	L57717-9	13		23		33	
4	L57812-4	14		24		34	
5	L57812-5	15		25		35	
6	L57812-9	16		26		36	
7	L58204-4	17		27		37	
8	L58204-5	18		28		38	
9	L58204-9	19		29		39	
10	L57717-5DUP	20	WG 45234-101	30		40	

Notes: _____

VALIDATION FINDINGS WORKSHEET

Blanks

METHOD: HRGC/HRMS PCB Congeners (EPA Method 1668A)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

N A Were all samples associated with a method blank?

Y N A Was a method blank performed for each matrix and whenever a sample extraction was performed?

Y N A Was the method blank contaminated?

Blank extraction date: 10/17/13 **Blank analysis date:** 11/18/13 **Associated samples:** 1-10 Qual U

Conc. units: pg/L

Compound	Blank ID			Sample Identification							
	WG45234-101	WG45234-101 W (5x)	5x	1	2 (5x)	10 (5x)	3	6 (5x)			
PCB 1	--	3.88	19.4	7.89	17.1	16.9	9.54	11.3			
PCB 4	--	11.3	56.5	15.3			26.1				
PCB 8	--	11.2	56.0	35.5			44.9				
PCB 15	--	12.0	60.0	27.8							
PCB 17	--	5.92	29.6	17.4			23.9				
PCB 20+28	--	16.8	84.0	55.0							
PCB 21+33	--	10.5	52.5	34.9			50.0				
PCB 22	--	6.51	32.6	24.8							
PCB 26+29	--	3.63	18.2	9.45			15.5				
PCB 32	--	4.11	20.6	12.0			18.3				
PCB 37	--	9.03	45.2	21.6			40.9				
PCB 40+41+71	4.96	--	24.8								
PCB 42	1.41	--	7.05								
PCB 44+47+65	9.88	--	49.4	47.0							
PCB 48	1.51	--	7.55								
PCB 49+69	3.75	--	18.8								
PCB 52	7.86	--	39.3								
PCB 60	1.82	--	9.10								

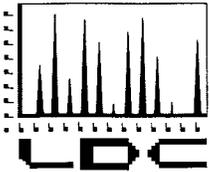
31470A31

2022
92

Compound	Blank ID			Sample Identification							
	WG45234-101	WG45234-101 W (5x)	5x	1	2 (5x)	10 (5x)	3	6 (5x)			
PCB 61+70+74+76	13.9	--	69.5								
PCB 64	2.87	--	14.4								
PCB 66	6.46	--	32.3	31.0							
PCB 83+99	2.36	--	11.8								
PCB 93+95+98+100+102	4.05	--	20.3								
PCB 110+115	5.31	--	26.6								
PCB 118	6.63	--	33.2								
PCB 147+149	3.37	--	16.9								
PCB 153+168	3.82	--	19.1								

*EMPC (flagged "K") considered ND ("U")

All contaminants within five times the method blank concentration were qualified as not detected.



LABORATORY DATA CONSULTANTS, INC.

2701 Loker Ave. West, Suite 220, Carlsbad, CA 92010 Bus: 760-827-1100 Fax: 760-827-1099

King County Environmental Laboratory
322 W. Ewing Street
Seattle WA 98119
ATTN: Mr. Fritz Grothkopp

April 1, 2014

SUBJECT: Lower Duwamish Low Air Deposition, Data Validation

Dear Mr. Grothkopp,

Enclosed are the final validation reports for the fractions listed below. These SDGs were received on March 18, 2014. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 31499:

<u>SDG #</u>	<u>Fraction</u>
DPWG46475	Dioxins/Dibenzofurans, Polychlorinated Biphenyls as Congeners
DPWG46592	
DPWG46757	

The data validation was performed under EPA Level III guidelines. The analyses were validated using the following documents, as applicable to each method:

- Lower Duwamish Waterway Bulk Atmospheric Deposition Study Sampling and Analysis Plan, Final August 2011, and addendum April 2013
- EPA Region 10 SOP for the Validation of Polychlorinated Dibenzodioxin, PCDD, and Polychlorinated Dibenzofuran, PCDF, Data, Revision 2.0, January 31, 1996
- EPA Region 10 SOP for the Validation of Method 1668 Toxic, Dioxin-like, PCB Data

Please feel free to contact us if you have any questions.

Sincerely,

Stella S. Cuenco
Operations Manager/Senior Chemist

**Laboratory Data Consultants, Inc.
Data Validation Report**

Project/Site Name: Lower Duwamish Low Air Deposition
Collection Date: October 30 through November 14, 2013
LDC Report Date: March 25, 2014
Matrix: Water
Parameters: Polychlorinated Biphenyls as Congeners
Validation Level: EPA Level III
Laboratory: AXYS Analytical Services, Ltd.
Sample Delivery Group (SDG): DPWG46475

Sample Identification

L58999-4
L58999-5
L58999-9
L59079-4
L59079-5
L59079-9

Introduction

This data review covers 6 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 1668A for Polychlorinated Biphenyls as Congeners.

This review follows the This review follows the Lower Duwamish Waterway Bulk Atmospheric Deposition Study Sampling and Analysis Plan (Final August 2011, and addendum April 2013) and EPA Region 10 SOP for the Validation of Method 1668 Toxic, Dioxin-like, PCB Data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

- U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.
- J Indicates an estimated value.
 - J1 Blank Contamination: Indicates possible high bias and/or false positives.
 - J2 Calibration Range exceeded: Indicates possible low bias.
 - J3 Holding times not met: Indicates low bias for most analytes.
 - J4 Other QC parameters outside control limits: bias not readily determined.
 - J5 Other QC parameters outside control limits. The reported results appear to be biased high. The actual value of target compound in the sample may be lower than the value reported by the laboratory.
 - J6 Other QC parameters outside control limits. The reported results appear to be biased low. The actual value of target compound in the sample may be higher than the value reported by the laboratory.
- R Quality control indicates the data is not usable.
- NJ Presumptive evidence of presence of the compound at an estimated quantity.
- UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.
- A Indicates the finding is based upon technical validation criteria.
- P Indicates the finding is related to a protocol/contractual deviation.
- None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily frequency.

Retention time windows were established for all congeners. The chromatographic resolution between the congeners PCB-23 and PCB-34 and congeners PCB-182 and PCB-187 was resolved with a valley of less than or equal to 40%.

III. Initial Calibration

A five point initial calibration was performed as required by the method.

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for all compounds.

The ion abundance ratios for all PCBs were within method and validation criteria.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

All of the continuing calibration percent differences (%D) between the initial calibration RRF and the continuing calibration RRF were less than or equal to 30.0% for unlabeled compounds and less than or equal to 50.0% for labeled compounds.

The ion abundance ratios for all PCBs were within method and validation criteria.

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated biphenyls as congeners contaminants were found in the method blanks with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
WB45958-101	12/18/13	PCB 1 (10x) PCB 20+28 PCB 21+33 PCB 22 PCB 31 PCB 37 PCB 44+47+65 PCB 49+69 PCB 52 PCB 56 PCB 64 PCB 66 PCB 83+99 PCB 86+87+97+108+119+125 PCB 90+101+113 PCB 93+95+98+100+102 PCB 110+115 PCB 129+138+160+163 PCB 147+149 PCB 153+168 Total Monochloro Biphenyls Total Trichloro Biphenyls Total Tetrachloro Biphenyls Total Pentachloro Biphenyls Total Hexachloro Biphenyls	10.3 pg/L 5.59 pg/L 2.11 pg/L 1.88 pg/L 3.48 pg/L 1.26 pg/L 7.54 pg/L 2.54 pg/L 6.20 pg/L 1.48 pg/L 1.98 pg/L 2.75 pg/L 2.37 pg/L 2.79 pg/L 4.35 pg/L 5.24 pg/L 4.86 pg/L 2.80 pg/L 3.21 pg/L 3.02 pg/L 10.3 pg/L 14.3 pg/L 22.5 pg/L 19.6 pg/L 9.03 pg/L	All samples in SDG DPWG46475

Sample concentrations were compared to concentrations detected in the method blanks. The sample concentrations were either not detected or were significantly greater (>5X blank contaminants) than the concentrations found in the associated method blanks with the following exceptions:

Sample	Compound	Reported Concentration	Modified Final Concentration
L58999-4 (10X)	PCB 1	24.7 pg/L	24.7U pg/L
L59079-4 (10X)	PCB 1	18.5 pg/L	18.5U pg/L
L59079-5 (10X)	PCB 1	11.2 pg/L	11.2U pg/L

Method blank results flagged "K" by the laboratory as estimated maximum possible concentration (EMPC) were considered not detected.

VI. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VII. Ongoing Precision & Recovery Samples (OPR)

Ongoing precision and recovery (OPR) samples were reviewed for each matrix as applicable. The percent recoveries (%R) were within the QC limits.

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries (%R) were within QC limits with the following exceptions:

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
WG45958-101	¹³ C PCB-104 ¹³ C PCB-155	20.8 (25-150) 19.0 (25-150)	PCB-104 PCB-96 PCB-103 PCB-94 PCB-95 PCB-100 PCB-93 PCB-102 PCB-98 PCB-88 PCB-91 PCB-84 PCB-89 PCB-121 PCB-92 PCB-113 PCB-90 PCB-101 PCB-83 PCB-99 PCB-112 PCB-117 PCB-116 PCB-85 PCB-110 PCB-115 PCB-82 PCB-111 PCB-120 PCB-106 PCB-122 PCB-127 PCB-155 PCB-152 PCB-150 PCB-136 PCB-145 PCB-148 PCB-151 PCB-135 PCB-154 PCB-144 PCB-147 PCB-149 PCB-134 PCB-143 PCB-139 PCB-140 PCB-131 PCB-142 PCB-132 PCB-133 PCB-165 PCB-146 PCB-161 PCB-153	J (all detects) UJ (all non-detects)	P

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
WG45958-101 (continued)			PCB-168 PCB-141 PCB-130 PCB-137 PCB-164 PCB-138 PCB-163 PCB-129 PCB-160 PCB-158 PCB-166 PCB-128 PCB-159 PCB-162 Total Pentachloro Biphenyls Total Hexachloro Biphenyls		

X. Target Compound Identifications

Raw data were not reviewed for this SDG.

XI. Compound Quantitation

All compound quantitation were within validation criteria with the following exceptions:

Sample	Compound	Flag	A or P
All samples in SDG DPWG46475	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A

Raw data were not reviewed for this SDG.

XII. System Performance

Raw data were not reviewed for this SDG.

XIII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

XIV. Field Duplicates

No field duplicates were identified in this SDG.

XV. Field Blanks

No field blanks were identified in this SDG.

**Lower Duwamish Low Air Deposition
 Polychlorinated Biphenyls as Congeners - Data Qualification Summary - SDG
 DPWG46475**

SDG	Sample	Compound	Flag	A or P	Reason
DPWG46475	L58999-4 L58999-5 L58999-9 L59079-4 L59079-5 L59079-9	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A	Compound quantitation (EMPC)

**Lower Duwamish Low Air Deposition
 Polychlorinated Biphenyls as Congeners - Laboratory Blank Data Qualification
 Summary - SDG DPWG46475**

SDG	Sample	Compound	Modified Final Concentration	A or P
DPWG46475	L58999-4 (10X)	PCB 1	24.7U pg/L	A
DPWG46475	L59079-4 (10X)	PCB 1	18.5U pg/L	A
DPWG46475	L59079-5 (10X)	PCB 1	11.2U pg/L	A

LDC #: 31499A31

VALIDATION COMPLETENESS WORKSHEET

Date: 3-20-14

SDG #: DPWG46475

Level III

Page: 1 of 1

Laboratory: AXYS Analytical Services Ltd.

Reviewer: *JA*2nd Reviewer: *JK***METHOD:** HRGC/HRMS Polychlorinated Biphenyls as Congeners (EPA Method 1668A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 10/30/13 → 11/14/13
II.	HRGC/HRMS Instrument performance check	A	
III.	Initial calibration	A	≤ 20
IV.	Routine calibration/ LEV	A	≤ 30/50
V.	Blanks	SW	
VI.	Matrix spike/Matrix spike duplicates	N	client
VII.	Laboratory control samples	A	OPZ
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	SW	
X.	Target compound identifications	N	
XI.	Compound quantitation/RL/LOQ/LODs	SW	
XII.	System performance	N	
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	N	
XV.	Field blanks	N	

Note: A = Acceptable
N = Not provided/applicable
SW = See worksheet

ND = No compounds detected
R = Rinsate
FB = Field blank

D = Duplicate
TB = Trip blank
EB = Equipment blank

Validated Samples: *water*

1	L58999-4	11		21		31	
2	L58999-5	12		22		32	
3	L58999-9	13		23		33	
4	L59079-4	14		24		34	
5	L59079-5	15		25		35	
6	L59079-9	16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20	<i>WF-45958-101</i>	30		40	

Notes: _____

VALIDATION FINDINGS WORKSHEET

Blanks

METHOD: HRGC/HRMS PCB Congeners (EPA Method 1668A)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

~~N~~ ~~N/A~~ Were all samples associated with a method blank?

~~Y~~ ~~N~~ ~~N/A~~ Was a method blank performed for each matrix and whenever a sample extraction was performed?

~~Y~~ ~~N~~ ~~N/A~~ Was the method blank contaminated?

Blank extraction date: 12/18/13 **Blank analysis date:** 01/20/14

Associated samples: All *Qual U*

Conc. units: pg/L

Compound	Blank ID		Sample Identification							
	WG45958-101	5x	1	4	5 (10x)					
PCB 1 (10x dilution)	10.3	51.5	24.7	18.5	11.2					
PCB 20+28	5.59	28.0								
PCB 21+33	2.11	10.6								
PCB 22	1.88	9.40								
PCB 31	3.48	17.4								
PCB 37	1.26	6.30								
PCB 44+47+65	7.54	37.7								
PCB 49+69	2.54	12.7								
PCB 52	6.20	31.0								
PCB 56	1.48	7.40								
PCB 64	1.98	9.90								
PCB 66	2.75	13.8								
PCB 83+99	2.37	11.9								
PCB 86+87+97+108+119+125	2.79	14.0								
PCB 90+101+113	4.35	21.8								
PCB 93+95+98+100+102	5.24	26.2								
PCB 110+115	4.86	24.3								

31499A31

282

Compound	Blank ID		Sample Identification							
	WG45958-101	5x	1	4	5 (10x)					
PCB 129+138+160+163	2.80	14.0								
PCB 147+149	3.21	16.1								
PCB 153+168	3.02	15.1								
Total Monochloro Biphenyls	10.3	51.5								
Total Trichloro Biphenyls	14.3	71.5								
Total Tetrachloro Biphenyls	22.5	112.5								
Total Pentachloro Biphenyls	19.6	98.0								
Total Hexachloro Biphenyls	9.03	45.2								

*EMPC results flagged "K" considered "ND"

All contaminants within five times the method blank concentration were qualified as not detected.

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105

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COMPOUND	Congener Number	GAS NO.	QUANTIFICATION REFERENCE	CO-ELUTIONS	COMPOUND RT	RT Reference	Labelled RT	RRT	RT Window (sec)	RRT Lower Limit	RRT Upper Limit
23'55' - TeCB	72	41464-42-0	54L/81L/77L		28:24:00	81L	34:31:00	0.823	6	0.821	0.824
23'45' - TeCB	68	73575-52-7	54L/81L/77L		28:42:00	81L	34:31:00	0.831	6	0.830	0.833
233'5' - TeCB	57	70424-67-8	54L/81L/77L		29:09:00	81L	34:31:00	0.845	6	0.843	0.846
233'5' - TeCB	58	41464-49-7	54L/81L/77L		29:23:00	81L	34:31:00	0.851	6	0.850	0.853
23'45' - TeCB	67	73575-53-8	54L/81L/77L		29:34:00	81L	34:31:00	0.857	6	0.855	0.858
234'5' - TeCB	63	74472-34-7	54L/81L/77L		29:50:00	81L	34:31:00	0.864	6	0.863	0.866
2345' - TeCB	61	33284-53-6	54L/81L/77L	61 + 70 + 74 + 76	30:11:00	81L	34:31:00	0.874	12	0.872	0.877
23'4'5' - TeCB	70	32598-11-1	54L/81L/77L	61 + 70 + 74 + 76							
2'345' - TeCB	76	70362-48-0	54L/81L/77L	61 + 70 + 74 + 76							
244'5' - TeCB	74	32690-93-0	54L/81L/77L	61 + 70 + 74 + 76							
23'44' - TeCB	66	32598-10-0	54L/81L/77L		30:32:00	81L	34:31:00	0.885	6	0.883	0.886
233'4' - TeCB	55	74338-24-2	54L/81L/77L		30:41:00	81L	34:31:00	0.889	6	0.887	0.890
233'4' - TeCB	56	41464-43-1	54L/81L/77L		31:13:00	81L	34:31:00	0.904	6	0.903	0.906
2344' - TeCB	60	33025-41-1	54L/81L/77L		31:27:00	81L	34:31:00	0.911	6	0.910	0.913
33'55' - TeCB	80	33284-52-5	54L/81L/77L		31:54:00	81L	34:31:00	0.924	6	0.923	0.926
33'45' - TeCB	79	41464-48-6	54L/81L/77L		33:29:00	81L	34:31:00	0.970	6	0.969	0.972
33'45' - TeCB	78	70362-49-1	54L/81L/77L		34:05:00	81L	34:31:00	0.987	6	0.986	0.989
344'5' - TeCB	81	70362-50-4	81L		34:32:00	81L	34:31:00	1.000	-1,3	1.000	1.001
33'44' - TeCB	77	32598-13-3	77L		35:08:00	77L	35:07:00	1.000	-1,3	1.000	1.001
22'466' - PeCB	104	56558-16-8	104L		26:10:00	104L	26:08:00	1.001	-1,3	0.999	1.002
22'366' - PeCB	96	73575-54-9	104L/123L/114L/ 118L/105L		26:32:00	104L	26:08:00	1.015	10	1.012	1.018
22'45'6' - PeCB	103	60145-21-3	104L/123L/114L/ 118L/105L		28:34:00	104L	26:08:00	1.093	6	1.091	1.095
22'356' - PeCB	94	73575-55-0	104L/123L/114L/ 118L/105L		28:48:00	104L	26:08:00	1.102	6	1.100	1.104
22'35'6' - PeCB	95	38379-99-6	104L/123L/114L/ 118L/105L	93 + 95 + 98 + 100 + 102							
22'44'6' - PeCB	100	39485-83-1	104L/123L/114L/ 118L/105L	93 + 95 + 98 + 100 + 102							
22'356' - PeCB	93	73575-56-1	104L/123L/114L/ 118L/105L	93 + 95 + 98 + 100 + 102	29:31:00	104L	26:08:00	1.129	34 *	1.123	1.136
22'456' - PeCB	102	68194-06-9	104L/123L/114L/ 118L/105L	93 + 95 + 98 + 100 + 102							
22'3'46' - PeCB	98	60233-25-2	104L/123L/114L/ 118L/105L	93 + 95 + 98 + 100 + 102							



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COMPOUND	Congener Number	CAS NO.	QUANTIFICATION REFERENCE	CO-ELUTIONS	COMPOUND RT	RT Reference	Labelled RT	RRT	RT Window (sec)	RRT Lower Limit	RRT Upper Limit
22'346 - PeCB	88	55215-17-3	104L/123L/114L/ 118L/105L	88 + 91	30:07:00	104L	26:08:00	1.152	12	1.149	1.156
22'34'6 - PeCB	91	68194-05-8	104L/123L/114L/ 118L/105L	88 + 91							
22'33'6 - PeCB	84	52663-60-2	104L/123L/114L/ 118L/105L		30:23:00	104L	26:08:00	1.163	6	1.161	1.165
22'346' - PeCB	89	73575-57-2	104L/123L/114L/ 118L/105L		30:53:00	104L	26:08:00	1.182	6	1.180	1.184
23'45'6 - PeCB	121	56558-18-0	104L/123L/114L/ 118L/105L		31:20:00	104L	26:08:00	1.199	6	1.197	1.201
22'355' - PeCB	92	52663-61-3	104L/123L/114L/ 118L/105L		31:44:00	123L	37:12:00	0.853	6	0.852	0.854
233'5'6 - PeCB	113	68194-10-5	104L/123L/114L/ 118L/105L	90 + 101 + 113							
22'34'5 - PeCB	90	68194-07-0	104L/123L/114L/ 118L/105L	90 + 101 + 113	32:19:00	123L	37:12:00	0.869	10	0.866	0.871
22'455' - PeCB	101	37680-73-2	104L/123L/114L/ 118L/105L	90 + 101 + 113							
22'33'5 - PeCB	83	60145-20-2	104L/123L/114L/ 118L/105L	83 + 99	32:53:00	123L	37:12:00	0.884	12	0.881	0.887
22'44'5 - PeCB	99	38380-01-7	104L/123L/114L/ 118L/105L	83 + 99							
233'56 - PeCB	112	74472-36-9	104L/123L/114L/ 118L/105L		33:04:00	123L	37:12:00	0.889	6	0.888	0.890
23'44'6 - PeCB											
233'45' - PeCB											
22'345 - PeCB											
22'3'45 - PeCB											
2'3456' - PeCB											
22'345' - PeCB											
234'56 - PeCB	117	68194-11-6	104L/123L/114L/ 118L/105L	85 + 116 + 117							
23456 - PeCB	116	18259-05-7	104L/123L/114L/ 118L/105L	85 + 116 + 117							
22'344' - PeCB	85	65510-45-4	104L/123L/114L/ 118L/105L	85 + 116 + 117	34:12:00	123L	37:12:00	0.919	12	0.917	0.922
233'4'6 - PeCB	110	38380-03-9	104L/123L/114L/ 118L/105L	110 + 115	34:27:00	123L	37:12:00	0.926	10	0.924	0.928

See Tables 6b and 6c for information specific to EPA 1668A or 1668C



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305

31499A31-attachmat

COMPOUND	Congener Number	CAS NO.	QUANTIFICATION REFERENCE	CO-ELUTIONS	COMPOUND RT	RT Reference	Labelled RT	RRT	RT Window (sec)	RRT Lower Limit	RRT Upper Limit
2344'6 - PeCB	115	74472-38-1	104L/123L/114L/ 118L/105L	110 + 115							
22'33'4 - PeCB	82	52663-62-4	104L/123L/114L/ 118L/105L		34:43:00	123L	37:12:00	0.933	6	0.932	0.935
233'55' - PeCB	111	39635-32-0	104L/123L/114L/ 118L/105L		35:10:00	123L	37:12:00	0.945	6	0.944	0.947
23'455' - PeCB	120	68194-12-7	104L/123L/114L/ 118L/105L		35:38:00	123L	37:12:00	0.958	6	0.957	0.959
233'4'5 - PeCB											
2'3455' - PeCB											
233'46 - PeCB											
2'344'5 - PeCB	123	65510-44-3	123L 104L/123L/114L/ 118L/105L		37:13:00	123L	37:12:00	1.000	-1,3	1.000	1.001
233'45 - PeCB	106	70424-69-0	118L/105L		37:21:00	123L	37:12:00	1.004	6	1.003	1.005
23'44'5 - PeCB	118	31508-00-6	118L 104L/123L/114L/ 118L/105L		37:34:00	118L	37:32:00	1.001	-1,3	1.000	1.002
2'33'45 - PeCB	122	76842-07-4	118L/105L		37:55:00	118L	37:32:00	1.010	6	1.009	1.012
2344'5 - PeCB	114	74472-37-0	114L		38:07:00	114L	38:06:00	1.000	-1,3	1.000	1.001
233'44' - PeCB	105	32598-14-4	105L 104L/123L/114L/ 118L/105L		38:48:00	105L	38:46:00	1.001	-1,3	0.999	1.001
33'455' - PeCB	127	39635-33-1	118L/105L		40:21:00	105L	38:46:00	1.041	6	1.040	1.042
33'44'5 - PeCB	126	57465-28-8	126L		42:02:00	126L	42:01:00	1.000	-1,3	1.000	1.001
22'44'66' - HxCB	155	33979-03-2	155L		32:06:00	155L	32:05:00	1.001	-1,3	0.999	1.002
22'3566' - HxCB	152	68194-09-2	155L/156L/157L/ 167L/169L		32:17:00	155L	32:05:00	1.006	6	1.005	1.008
22'34'66' - HxCB	150	68194-08-1	155L/156L/157L/ 167L/169L		32:28:00	155L	32:05:00	1.012	6	1.010	1.014
22'33'66' - HxCB	136	38411-22-2	155L/156L/157L/ 167L/169L		32:51:00	155L	32:05:00	1.024	6	1.022	1.025
22'3466' - HxCB	145	74472-40-5	155L/156L/157L/ 167L/169L		33:10:00	155L	32:05:00	1.034	6	1.032	1.035
22'34'56' - HxCB	148	74472-41-6	155L/156L/157L/ 167L/169L		34:45:00	155L	32:05:00	1.083	6	1.082	1.085
22'355'6 - HxCB	151	52663-63-5	155L/156L/157L/ 167L/169L	135 + 151 + 154							
22'33'56' - HxCB	135	52744-13-5	155L/156L/157L/ 167L/169L	135 + 151 + 154	35:29:00	155L	32:05:00	1.106	22 *	1.103	1.109
22'44'5'6 - HxCB	154	60145-22-4	155L/156L/157L	135 + 151 + 154							

See Tables 6b and 6c for information specific to EPA 1668A or 1668C



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31499A31- attachment

485

COMPOUND	Congener Number	CAS NO.	QUANTIFICATION REFERENCE	CO-ELUTIONS	COMPOUND RT	RT Reference	Labelled RT	RRT	RT Window (sec)	RRT Lower Limit	RRT Upper Limit
22'345'6 - HxCB	144	68194-14-9	167L/169L 155L/156L/157L/ 167L/169L		35:57:00	155L	32:05:00	1.121	6	1.119	1.122
22'34'56 - HxCB	147	68194-13-8	155L/156L/157L/ 167L/169L	147 + 149	36:20:00	155L	32:05:00	1.132	10	1.130	1.135
22'34'5'6 - HxCB	149	38380-04-0	155L/156L/157L/ 167L/169L	147 + 149							
22'33'56 - HxCB	134	52704-70-8	155L/156L/157L/ 167L/169L	134 + 143	36:36:00	155L	32:05:00	1.141	10	1.138	1.143
22'3456' - HxCB	143	68194-15-0	155L/156L/157L/ 167L/169L	134 + 143							
22'344'6 - HxCB	139	56030-56-9	155L/156L/157L/ 167L/169L	139 + 140	36:58:00	155L	32:05:00	1.152	10	1.150	1.155
22'344'6' - HxCB	140	59291-64-4	155L/156L/157L/ 167L/169L	139 + 140							
22'33'46 - HxCB	131	61798-70-7	155L/156L/157L/ 167L/169L		37:11:00	155L	32:05:00	1.159	6	1.157	1.161
22'3456 - HxCB	142	41411-61-4	155L/156L/157L/ 167L/169L		37:20:00	155L	32:05:00	1.164	6	1.162	1.165
22'33'46' - HxCB	132	38380-05-1	155L/156L/157L/ 167L/169L		37:39:00	155L	32:05:00	1.174	10	1.171	1.176
22'33'55' - HxCB	133	35694-04-3	155L/156L/157L/ 167L/169L		38:11:00	155L	32:05:00	1.190	6	1.189	1.192
233'55'6 - HxCB	165	74472-46-1	155L/156L/157L/ 167L/169L		38:37:00	167L	43:57:00	0.879	6	0.878	0.880
22'34'55' - HxCB	146	51908-16-8	155L/156L/157L/ 167L/169L		38:52:00	167L	43:57:00	0.884	6	0.883	0.885
233'45'6 - HxCB	161	74472-43-8	155L/156L/157L/ 167L/169L		39:01:00	167L	43:57:00	0.888	6	0.887	0.889
22'44'55' - HxCB	153	35065-27-1	155L/156L/157L/ 167L/169L	153 + 168	39:32:00	167L	43:57:00	0.900	10	0.898	0.901
23'44'5'6 - HxCB	168	59291-65-5	155L/156L/157L/ 167L/169L	153 + 168							
22'3455' - HxCB	141	52712-04-6	155L/156L/157L/ 167L/169L		39:43:00	167L	43:57:00	0.904	6	0.903	0.905
22'33'45' - HxCB	130	52663-66-8	155L/156L/157L/ 167L/169L		40:08:00	167L	43:57:00	0.913	6	0.912	0.914
22'344'5 - HxCB	137	35694-06-5	155L/156L/157L/ 167L/169L		40:22:00	167L	43:57:00	0.918	6	0.917	0.920



AXYS Analytical Services Ltd.

31499A31-attachment

505

COMPOUND	Congener Number	CAS NO.	QUANTIFICATION REFERENCE	CO-ELUTIONS	COMPOUND RT	RT Reference	Labelled RT	RRT	RT Window (sec)	RRT Lower Limit	RRT Upper Limit
233'4'5'6 - HxCB	164	74472-45-0	155L/156L/157L/ 167L/169L		40:29:00	167L	43:57:00	0.921	6	0.920	0.922
22'344'5' - HxCB	138	35065-28-2	155L/156L/157L/ 167L/169L	129 + 138 + 160 + 163							
233'4'56 - HxCB	163	74472-44-9	155L/156L/157L/ 167L/169L	129 + 138 + 160 + 163							
22'33'45 - HxCB	129	55215-18-4	155L/156L/157L/ 167L/169L	129 + 138 + 160 + 163	40:53:00	167L	43:57:00	0.930	14	0.928	0.933
233'456 - HxCB	160	41411-62-5	155L/156L/157L/ 167L/169L	129 + 138 + 160 + 163							
233'44'6 - HxCB	158	74472-42-7	155L/156L/157L/ 167L/169L		41:13:00	167L	43:57:00	0.938	6	0.937	0.939
2344'56 - HxCB	166	41411-63-6	155L/156L/157L/ 167L/169L	128 + 166							
22'33'44' - HxCB	128	38380-07-3	155L/156L/157L/ 167L/169L	128 + 166	42:08:00	167L	43:57:00	0.959	10	0.957	0.961
233'455' - HxCB	159	39635-35-3	155L/156L/157L/ 167L/169L		43:10:00	167L	43:57:00	0.982	6	0.981	0.983
233'4'55' - HxCB	162	39635-34-2	155L/156L/157L/ 167L/169L		43:28:00	167L	43:57:00	0.989	6	0.988	0.990
23'44'55' - HxCB	167	52663-72-6	167L		43:59:00	167L	43:57:00	1.001	-1,3	1.000	1.001
233'44'5 - HxCB	156	38380-08-4	156L/157L		45:11:00	156L/157L	45:10:00	1.000	6	0.999	1.001
233'44'5' - HxCB	157	69782-90-7	156L/157L	156 + 157							
33'44'55' - HxCB	169	32774-16-6	169L		48:36:00	169L	48:34:00	1.001	-1,3	1.000	1.001
22'34'566' - HpCB	188	74487-85-7	188L		38:06:00	188L	38:04:00	1.001	-1,3	1.000	1.001
22'33'566' - HpCB	179	52663-64-6	188L/189L		38:26:00	188L	38:04:00	1.010	6	1.008	1.011
22'344'66' - HpCB	184	74472-48-3	188L/189L		39:00:00	188L	38:04:00	1.025	6	1.023	1.026
22'33'466' - HpCB	176	52663-65-7	188L/189L		39:22:00	188L	38:04:00	1.034	6	1.033	1.035
22'34566' - HpCB	186	74472-49-4	188L/189L		39:50:00	188L	38:04:00	1.046	6	1.045	1.048
22'33'55'6 - HpCB	178	52663-67-9	188L/189L		41:17:00	188L	38:04:00	1.085	6	1.083	1.086
22'33'45'6 - HpCB	175	40186-70-7	188L/189L		41:57:00	188L	38:04:00	1.102	6	1.101	1.103
22'34'55'6 - HpCB	187	52663-68-0	188L/189L		42:15:00	188L	38:04:00	1.110	6	1.109	1.111
22'344'56' - HpCB	182	60145-23-5	188L/189L		42:27:00	188L	38:04:00	1.115	6	1.114	1.116
22'344'5'6 - HpCB	183	52663-69-1	188L/189L	183 + 185	42:56:00	188L	38:04:00	1.128	6	1.127	1.129
22'3455'6 - HpCB	185	52712-05-7	188L/189L	183 + 185							



**Laboratory Data Consultants, Inc.
Data Validation Report**

Project/Site Name: Lower Duwamish Low Air Deposition
Collection Date: October 30 through November 14, 2013
LDC Report Date: March 25, 2014
Matrix: Water
Parameters: Dioxins/Dibenzofurans
Validation Level: EPA Level III
Laboratory: AXYS Analytical Services Ltd.
Sample Delivery Group (SDG): DPWG46592

Sample Identification

L58999-4
L58999-5
L58999-9
L59079-9

Introduction

This data review covers 4 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 1613B for Polychlorinated Dioxins/Dibenzofurans.

This review follows the Lower Duwamish Waterway Bulk Atmospheric Deposition Study Sampling and Analysis Plan (Final August 2011, and addendum April 2013) and EPA Region 10 SOP for the Validation of Polychlorinated Dibenzodioxin (PCDD) and Polychlorinated Dibenzofuran (PCDF) Data (Revision 2.0, January 31, 1996).

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

- U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.
- J Indicates an estimated value.
 - J1 Blank Contamination: Indicates possible high bias and/or false positives.
 - J2 Calibration Range exceeded: Indicates possible low bias.
 - J3 Holding times not met: Indicates low bias for most analytes.
 - J4 Other QC parameters outside control limits: bias not readily determined.
 - J5 Other QC parameters outside control limits. The reported results appear to be biased high. The actual value of target compound in the sample may be lower than the value reported by the laboratory.
 - J6 Other QC parameters outside control limits. The reported results appear to be biased low. The actual value of target compound in the sample may be higher than the value reported by the laboratory.
- R Quality control indicates the data is not usable.
- NJ Presumptive evidence of presence of the compound at an estimated quantity.
- UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.
- A Indicates the finding is based upon technical validation criteria.
- P Indicates the finding is related to a protocol/contractual deviation.
- None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily frequency.

Retention time windows were established for all homologues. The chromatographic resolution between ¹³C-2,3,7,8-TCDD and ¹³C-1,2,3,4-TCDD was less than or equal to 25%.

III. Initial Calibration

A five point initial calibration was performed as required by the method.

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 35.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within method and validation criteria.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

All of the continuing calibration results were within the QC limits for unlabeled compounds and labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within method and validation criteria.

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated dioxin/dibenzofuran contaminants were found in the method blanks with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
WG45958-101	12/18/13	1,2,3,4,6,7,8-HpCDD OCDD Total Hepta-dioxins Total Tetra-furans	3.13 pg/L 8.58 pg/L 3.13 pg/L 0.523 pg/L	All samples in SDG DPWG46592

Sample concentrations were compared to concentrations detected in the method blanks. The sample concentrations were either not detected or were significantly greater (>5X blank contaminants) than the concentrations found in the associated method blanks.

VI. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VII. Ongoing Precision & Recovery Samples (OPR)

Ongoing precision and recovery (OPR) samples were reviewed for each matrix as applicable. The percent recoveries (%R) were within the QC limits.

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits.

X. Target Compound Identifications

Raw data were not reviewed for this SDG.

XI. Compound Quantitation

All compound quantitation were within validation criteria with the following exceptions:

Sample	Compound	Flag	A or P
All samples in SDG DPWG46592	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A

Raw data were not reviewed for this SDG.

XII. System Performance

Raw data were not reviewed for this SDG.

XIII. Overall Assessment of Data

The overall assessment of data was acceptable. In the case where more than one result was reported for an individual sample, the least technically acceptable results were rejected as follows:

Sample	Compound	Flag	A or P
All samples in SDG DPWG46592	2,3,7,8-TCDF (from DB-5)	R	A

Data flags are summarized at the end of this report if data has been qualified.

XIV. Field Duplicates

No field duplicates were identified in this SDG.

XV. Field Blanks

No field blanks were identified in this SDG.

**Lower Duwamish Low Air Deposition
Dioxins/Dibenzofurans - Data Qualification Summary - SDG DPWG46592**

SDG	Sample	Compound	Flag	A or P	Reason
DPWG46592	L58999-4 L58999-5 L58999-9 L59079-9	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A	Compound quantitation (EMPC)
DPWG46592	L58999-4 L58999-5 L58999-9 L59079-9	2,3,7,8-TCDF (from DB-5)	R	A	Overall assessment of data

**Lower Duwamish Low Air Deposition
Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG DPWG46592**

No Sample Data Qualified in this SDG

LDC #: 31499B21

VALIDATION COMPLETENESS WORKSHEET

Date: 3-20-14

SDG #: DPWG46592

Level III

Page: 1 of 1

Laboratory: AXYS Analytical Services Ltd.

Reviewer: Jm2nd Reviewer: n**METHOD:** HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1613B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 10/30/13 → 11/14/13
II.	HRGC/HRMS Instrument performance check	A	
III.	Initial calibration	A	≤ 20/35
IV.	Routine calibration/ HR	A	QC limits
V.	Blanks	SW	
VI.	Matrix spike/Matrix spike duplicates	N	client
VII.	Laboratory control samples	A	OPR
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	A	
X.	Target compound identifications	N	
XI.	Compound quantitation/RL/LOQ/LODs	SW	
XII.	System performance	N	
XIII.	Overall assessment of data	SW	
XIV.	Field duplicates	N	
XV.	Field blanks	N	

Note: A = Acceptable
N = Not provided/applicable
SW = See worksheet

ND = No compounds detected
R = Rinsate
FB = Field blank

D = Duplicate
TB = Trip blank
EB = Equipment blank

Validated Samples: Water

1	L58999-4	11		21		31	
2	L58999-5	12		22		32	
3	L58999-9	13		23		33	
4	L59079-9	14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20	WG45958-101	30		40	

Notes: _____

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1613B)

A. 2,3,7,8-TCDD	F. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HxCDF	P. 1,2,3,4,7,8,9-HpCDF	U. Total HpCDD
B. 1,2,3,7,8-PeCDD	G. OCDD	L. 1,2,3,6,7,8-HxCDF	Q. OCDF	V. Total TCDF
C. 1,2,3,4,7,8-HxCDD	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HxCDF	R. Total TCDD	W. Total PeCDF
D. 1,2,3,6,7,8-HxCDD	I. 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HxCDF	S. Total PeCDD	X. Total HxCDF
E. 1,2,3,7,8,9-HxCDD	J. 2,3,4,7,8-PeCDF	O. 1,2,3,4,6,7,8-HpCDF	T. Total HxCDD	Y. Total HpCDF

Notes: _____

VALIDATION FINDINGS WORKSHEET

Blanks

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1613B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were all samples associated with a method blank?

Y N N/A Was a method blank performed for each matrix and whenever a sample extraction was performed?

Y N N/A Was the method blank contaminated?

Blank extraction date: 12/18/13 **Blank analysis date:** 01/14/14 **Associated samples:** All

Conc. units: pg/L

Compound	Blank ID	Sample Identification							
	WG45958-101	5x							
F	3.13	15.7							
G	8.58	42.9							
TOTAL HEPTA-DIOXINS	3.13	15.7							
TOTAL TETRA-FURANS	0.523	2.62							

*EMPC results flagged "K" considered "ND"

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
 All contaminants within five times the method blank concentration were qualified as not detected, "U".

**Laboratory Data Consultants, Inc.
Data Validation Report**

Project/Site Name: Lower Duwamish Low Air Deposition
Collection Date: November 14, 2013
LDC Report Date: March 25, 2014
Matrix: Water
Parameters: Dioxins/Dibenzofurans
Validation Level: EPA Level III
Laboratory: AXYS Analytical Services Ltd.
Sample Delivery Group (SDG): DPWG46757

Sample Identification

L59079-4
L59079-5

Introduction

This data review covers 2 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 1613B for Polychlorinated Dioxins/Dibenzofurans.

This review follows the Lower Duwamish Waterway Bulk Atmospheric Deposition Study Sampling and Analysis Plan (Final August 2011, and addendum April 2013) and EPA Region 10 SOP for the Validation of Polychlorinated Dibenzodioxin (PCDD) and Polychlorinated Dibenzofuran (PCDF) Data (Revision 2.0, January 31, 1996).

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

- U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.
- J Indicates an estimated value.
 - J1 Blank Contamination: Indicates possible high bias and/or false positives.
 - J2 Calibration Range exceeded: Indicates possible low bias.
 - J3 Holding times not met: Indicates low bias for most analytes.
 - J4 Other QC parameters outside control limits: bias not readily determined.
 - J5 Other QC parameters outside control limits. The reported results appear to be biased high. The actual value of target compound in the sample may be lower than the value reported by the laboratory.
 - J6 Other QC parameters outside control limits. The reported results appear to be biased low. The actual value of target compound in the sample may be higher than the value reported by the laboratory.
- R Quality control indicates the data is not usable.
- NJ Presumptive evidence of presence of the compound at an estimated quantity.
- UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.
- A Indicates the finding is based upon technical validation criteria.
- P Indicates the finding is related to a protocol/contractual deviation.
- None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily frequency.

Retention time windows were established for all homologues. The chromatographic resolution between ¹³C-2,3,7,8-TCDD and ¹³C-1,2,3,4-TCDD was less than or equal to 25%.

III. Initial Calibration

A five point initial calibration was performed as required by the method.

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 35.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within method and validation criteria.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

All of the continuing calibration results were within the QC limits for unlabeled compounds and labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within method and validation criteria.

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated dioxin/dibenzofuran contaminants were found in the method blanks with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
WG46473-101	2/11/14	OCDD Total Hexa-dioxins	3.31 pg/L 0.696 pg/L	All samples in SDG DPWG46757

Sample concentrations were compared to concentrations detected in the method blanks. The sample concentrations were either not detected or were significantly greater (>5X blank contaminants) than the concentrations found in the associated method blanks.

VI. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VII. Ongoing Precision & Recovery Samples (OPR)

Ongoing precision and recovery (OPR) samples were reviewed for each matrix as applicable. The percent recoveries (%R) were within the QC limits.

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits.

X. Target Compound Identifications

Raw data were not reviewed for this SDG.

XI. Compound Quantitation

All compound quantitation were within validation criteria with the following exceptions:

Sample	Compound	Flag	A or P
All samples in SDG DPWG46757	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A

Raw data were not reviewed for this SDG.

XII. System Performance

Raw data were not reviewed for this SDG.

XIII. Overall Assessment of Data

The overall assessment of data was acceptable. In the case where more than one result was reported for an individual sample, the least technically acceptable results were rejected as follows:

Sample	Compound	Flag	A or P
All samples in SDG DPWG46757	2,3,7,8-TCDF (from DB-5)	R	A

Data flags are summarized at the end of this report if data has been qualified.

XIV. Field Duplicates

No field duplicates were identified in this SDG.

XV. Field Blanks

No field blanks were identified in this SDG.

**Lower Duwamish Low Air Deposition
Dioxins/Dibenzofurans - Data Qualification Summary - SDG DPWG46757**

SDG	Sample	Compound	Flag	A or P	Reason
DPWG46757	L59079-4 L59079-5	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A	Compound quantitation (EMPC)
DPWG46757	L59079-4 L59079-5	2,3,7,8-TCDF (from DB-5)	R	A	Overall assessment of data

**Lower Duwamish Low Air Deposition
Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG
DPWG46757**

No Sample Data Qualified in this SDG

LDC #: 31499C21

VALIDATION COMPLETENESS WORKSHEET

Date: 3-21-14

SDG #: DPWG46757

Level III

Page: 1 of 1

Laboratory: AXYS Analytical Services Ltd.

Reviewer: *[Signature]*

2nd Reviewer: *[Signature]*

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1613B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 11/14/13
II.	HRGC/HRMS Instrument performance check	A	
III.	Initial calibration	A	≤ 20/35
IV.	Routine calibration/ ICV	A	QC limits
V.	Blanks	SW	
VI.	Matrix spike/Matrix spike duplicates	N	client
VII.	Laboratory control samples	A	OPR
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	A	
X.	Target compound identifications	N	
XI.	Compound quantitation/RL/ LOQ/LODs	SW	
XII.	System performance	N	
XIII.	Overall assessment of data	SW	
XIV.	Field duplicates	N	
XV.	Field blanks	N	

Note: A = Acceptable
 N = Not provided/applicable
 SW = See worksheet

ND = No compounds detected
 R = Rinstate
 FB = Field blank

D = Duplicate
 TB = Trip blank
 EB = Equipment blank

Validated Samples: *water*

1	L59079-4	11		21		31	
2	L59079-5	12		22		32	
3		13		23		33	
4		14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20	WG 46473-101	30		40	

Notes: _____

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1613B)

A. 2,3,7,8-TCDD	F. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HxCDF	P. 1,2,3,4,7,8,9-HpCDF	U. Total HpCDD
B. 1,2,3,7,8-PeCDD	G. OCDD	L. 1,2,3,6,7,8-HxCDF	Q. OCDF	V. Total TCDF
C. 1,2,3,4,7,8-HxCDD	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HxCDF	R. Total TCDD	W. Total PeCDF
D. 1,2,3,6,7,8-HxCDD	I. 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HxCDF	S. Total PeCDD	X. Total HxCDF
E. 1,2,3,7,8,9-HxCDD	J. 2,3,4,7,8-PeCDF	O. 1,2,3,4,6,7,8-HpCDF	T. Total HxCDD	Y. Total HpCDF

Notes: _____

VALIDATION FINDINGS WORKSHEET

Blanks

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1613B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

- N N/A Were all samples associated with a method blank?
- N N/A Was a method blank performed for each matrix and whenever a sample extraction was performed?
- N N/A Was the method blank contaminated?

Blank extraction date: 02/11/14 **Blank analysis date:** 02/18/14 **Associated samples:** All

Conc. units: pg/L

Compound	Blank ID	Sample Identification							
	WG46473-101	5x							
G	3.31	16.6							
TOTAL HEXA-DIOXINS	0.696	3.48							

*EMPC results flagged "K" considered "ND"

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
 All contaminants within five times the method blank concentration were qualified as not detected, "U".

