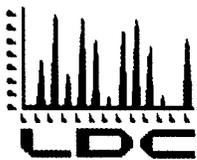


APPENDIX E

PCBs and Dioxin/Furan Congeners Validation Reports



Laboratory Data Consultants, Inc.

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

February 27, 2013

SUBJECT: Lower Duwamish Waterway, Data Validation

Dear Mr. Grothkopp,

Enclosed are the final validation reports for the fractions listed below. These SDGs were received on December 1, 2011. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 26805-1:

<u>SDG #</u>	<u>Fraction</u>
DPWG38006, DPWG38023	Dioxins/Dibenzofurans
DPWG38037, DPWG38047	Polychlorinated Biphenyls as Congeners

The data validation was performed under EPA Level II/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
- EPA Region 10 SOP for the Validation of Polychlorinated Dibenzodioxin(PCDD) and Polychlorinated Dibenzofuran(PCDF) Data, Revision 2.0, January 1996

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 Waterway
Collection Date: August 24, 2011
LDC Report Date: December 21, 2011
Matrix: Water
Parameters: Dioxins/Dibenzofurans
Validation Level: EPA Level III
Laboratory: AXYS Analytical Services Ltd.
Sample Delivery Group (SDG): DPWG38006

Sample Identification

L53760-1
L53760-5
L53760-12

Introduction

This data review covers 3 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 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.

Cooler temperatures for all samples were reported at 9°C upon receipt by the laboratory.

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 all compounds.

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

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration concentrations were within the QC limits.

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

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 (OPR) Samples

Percent recoveries (%R) of the ongoing precision and recovery samples were within 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 and RLs

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

Sample	Compound	Flag	A or P
All samples in SDG DPWG38006	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 DPWG38006	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 Waterway
Dioxins/Dibenzofurans - Data Qualification Summary - SDG DPWG38006**

SDG	Sample	Compound	Flag	A or P	Reason
DPWG38006	L53760-1 L53760-5 L53760-12	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A	Compound quantitation and RLs (EMPC)
DPWG38006	L53760-1 L53760-5 L53760-12	2,3,7,8-TCDF (from DB-5)	R	A	Overall assessment of data

**Lower Duwamish Waterway
Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG DPWG38006**

No Sample Data Qualified in this SDG

LDC #: 26805A21
 SDG #: DPWG38006
 Laboratory: AXYS Analytical Services Ltd.

VALIDATION COMPLETENESS WORKSHEET

Level III

Date: 12/14/11
 Page: 1 of 1
 Reviewer: [Signature]
 2nd Reviewer: [Signature]

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1613³B)

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

cooler temp = 9°C text

	Validation Area		Comments
I.	Technical holding times	Δ	Sampling dates: 8/24/11
II.	HRGC/HRMS Instrument performance check	Δ	
III.	Initial calibration	Δ	% RSD ≤ 20/35
IV.	Routine calibration/EA	Δ	QC limit
V.	Blanks	SW	
VI.	Matrix spike/Matrix spike duplicates	N	client specified
VII.	Laboratory control samples	A	OPR
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	Δ	QC limit
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 *9*

1	L53760-1	11	WG3774-101	21		31
2	L53760-5	12		22		32
3	L53760-12	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		30		40

Notes: _____

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method ~~8290~~) *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 Waterway
Collection Date: August 24, 2011
LDC Report Date: December 22, 2011
Matrix: Wipe
Parameters: Dioxins/Dibenzofurans
Validation Level: EPA Level II
Laboratory: AXYS Analytical Services Ltd.
Sample Delivery Group (SDG): DPWG38023

Sample Identification

L53760-22

Introduction

This data review covers one wipe sample 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 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.

Cooler temperatures for all samples were reported at 9°C upon receipt by the laboratory.

All cooler temperatures met validation criteria.

II. HRGC/HRMS Instrument Performance Check

Instrument performance check data were not reviewed for Level II.

III. Initial Calibration

Initial calibration data were not reviewed for Level II.

IV. Routine Calibration (Continuing)

Routine calibration data were not reviewed for Level II.

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

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 (OPR) Samples

Percent recoveries (%R) of the ongoing precision and recovery samples were within QC limits.

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

Internal standards data were not reviewed for Level II.

X. Target Compound Identifications

Raw data were not reviewed for this SDG.

XI. Compound Quantitation and RLs

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

Sample	Compound	Flag	A or P
All samples in SDG DPWG38023	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 Waterway
Dioxins/Dibenzofurans - Data Qualification Summary - SDG DPWG38023**

SDG	Sample	Compound	Flag	A or P	Reason
DPWG38023	L53760-22	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A	Compound quantitation and RLs (EMPC)

**Lower Duwamish Waterway
Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG DPWG38023**

No Sample Data Qualified in this SDG

LDC #: 26985C21

VALIDATION COMPLETENESS WORKSHEET

Date: 12/14/11

SDG #: DPWG38023

Level II

Page: 1 of 1

Laboratory: AXYS Analytical Services Ltd.

Reviewer: [Signature]

2nd Reviewer: [Signature]

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 16³₁B)

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

cooler temp = 9°C

	Validation Area		Comments
I.	Technical holding times	Δ	Sampling dates: <u>8/24/11</u>
II.	HRGC/HRMS Instrument performance check	N	
III.	Initial calibration	N	
IV.	Routine calibration/ICV	N	
V.	Blanks	<u>SW</u>	
VI.	Matrix spike/Matrix spike duplicates	N	<u>client specified</u>
VII.	Laboratory control samples	A	<u>OPR</u>
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	<u>A</u>	
X.	Target compound identifications	N	
XI.	Compound quantitation/RL/LOQ/LODs	<u>SN</u>	
XII.	System performance	N	
XIII.	Overall assessment of data	<u>A</u>	
XIV.	Field duplicates	<u>N</u>	
XV.	Field blanks	<u>N</u>	

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:

wipe

1†	L53760-22	11	<u>WG 37747-101</u>	21		31	
2		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		30		40	

Notes: _____

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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 Waterway
Collection Date: August 24, 2011
LDC Report Date: May 15, 2012
Matrix: Wipe
Parameters: Polychlorinated Biphenyls as Congeners
Validation Level: EPA Level II
Laboratory: AXYS Analytical Services Ltd.
Sample Delivery Group (SDG): DPWG38037

Sample Identification

L53760-22

Introduction

This data review covers one wipe sample 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 Lower Duwamish Waterway Bulk Atmospheric Deposition Study Sampling and Analysis Plan (Final August 2011) 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.

Cooler temperatures for all samples were reported at 9°C upon receipt by the laboratory.

All cooler temperatures met validation criteria.

II. HRGC/HRMS Instrument Performance Check

Instrument performance check data were not reviewed for Level II.

III. Initial Calibration

Initial calibration data were not reviewed for Level II.

IV. Routine Calibration (Continuing)

Routine calibration data were not reviewed for Level II.

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
WG37747-101	9/26/11	PCB-15	3.90 pg/sample	All samples in SDG DPWG38037
		PCBs 20 + 28	2.63 pg/sample	
		PCBs 21 + 33	0.932 pg/sample	
		PCB-22	1.09 pg/sample	
		PCB-23	1.13 pg/sample	
		PCBs 26 + 29	0.512 pg/sample	
		PCB-32	0.584 pg/sample	
		PCB-34	1.00 pg/sample	
		PCB-37	2.74 pg/sample	
		PCBs 44 + 47 + 65	3.56 pg/sample	
		PCBs 45 + 51	1.09 pg/sample	
		PCB-52	4.42 pg/sample	
		PCB-56	0.617 pg/sample	
		PCBs 61 + 70 + 74 + 76	4.13 pg/sample	
		PCB-66	1.12 pg/sample	
		PCBs 83 + 99	2.78 pg/sample	
		PCB-84	2.18 pg/sample	
		PCBs 86 + 87 + 97 + 108 + 119 + 125	3.62 pg/sample	
		PCBs 88 + 91	0.874 pg/sample	
		PCBs 90 + 101 + 113	4.73 pg/sample	
		PCBs 93 + 95 + 98 + 100 + 102	5.60 pg/sample	
		PCB-105	2.60 pg/sample	
		PCBs 110 + 115	4.26 pg/sample	
		PCB-114	1.68 pg/sample	
		PCB-118	3.62 pg/sample	
		PCBs 135 + 151 + 154	0.735 pg/sample	
		PCBs 147 + 149	2.26 pg/sample	
		PCB-167	1.36 pg/sample	
		PCB-170	1.90 pg/sample	
		PCBs 180 + 193	2.20 pg/sample	
		PCB-202	1.18 pg/sample	
		PCB-209	3.45 pg/sample	
		Total Dichloro Biphenyls	3.90 pg/sample	
		Total Trichloro Biphenyls	10.6 pg/sample	
		Total Tetrachloro Biphenyls	14.9 pg/sample	
		Total Pentachloro Biphenyls	31.9 pg/sample	
		Total Hexachloro Biphenyls	4.36 pg/sample	
		Total Heptachloro Biphenyls	4.10 pg/sample	
		Total Octachloro Biphenyls	1.18 pg/sample	
		Decachloro Biphenyl	3.45 pg/sample	
		Total PCBs	74.5 pg/sample	

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
L53760-22	PCBs 20 + 28	5.39 pg/sample	5.39U pg/sample
	PCBs 44 + 47 + 65	7.18 pg/sample	7.18U pg/sample
	PCB-52	8.62 pg/sample	8.62U pg/sample
	PCB-56	1.44 pg/sample	1.44U pg/sample
	PCBs 61 + 70 + 74 + 76	9.33 pg/sample	9.33U pg/sample
	PCB-66	3.75 pg/sample	3.75U pg/sample
	PCBs 83 + 99	7.31 pg/sample	7.31U pg/sample
	PCBs 86 + 87 + 97 + 108 + 119 + 125	9.81 pg/sample	9.81U pg/sample
	PCBs 88 + 91	1.60 pg/sample	1.60U pg/sample
	PCBs 90 + 101 + 113	11.1 pg/sample	11.1U pg/sample
	PCBs 93 + 95 + 98 + 100 + 102	8.30 pg/sample	8.30U pg/sample
	PCB-105	7.33 pg/sample	7.33U pg/sample
	PCBs 110 + 115	12.0 pg/sample	12.0U pg/sample
	PCB-118	12.2 pg/sample	12.2U pg/sample
	PCB-170	4.11 pg/sample	4.11U pg/sample
	PCBs 180 + 193	8.39 pg/sample	8.39U pg/sample
	PCB-202	0.989 pg/sample	0.989U pg/sample

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) control samples were reviewed for each matrix as applicable. The percent recoveries (%R) and relative percent differences (RPD) were within the QC limits.

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

Internal standards data were not reviewed for Level II.

X. Target Compound Identifications

Raw data were not reviewed for this SDG.

XI. Compound Quantitation and RLs

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

Sample	Compound	Flag	A or P
All samples in SDG DPWG38037	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 Waterway
 Polychlorinated Biphenyls as Congeners - Data Qualification Summary - SDG
 DPWG38037**

SDG	Sample	Compound	Flag	A or P	Reason
DPWG38037	L53760-22	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A	Compound quantitation and RLs (EMPC)

**Lower Duwamish Waterway
 Polychlorinated Biphenyls as Congeners - Laboratory Blank Data Qualification
 Summary - SDG DPWG38037**

SDG	Sample	Compound	Modified Final Concentration	A or P
DPWG38037	L53760-22	PCBs 20 + 28 PCBs 44 + 47 + 65 PCB-52 PCB-56 PCBs 61 + 70 + 74 + 76 PCB-66 PCBs 83 + 99 PCBs 86 + 87 + 97 + 108 + 119 + 125 PCBs 88 + 91 PCBs 90 + 101 + 113 PCBs 93 + 95 + 98 + 100 + 102 PCB-105 PCBs 110 + 115 PCB-118 PCB-170 PCBs 180 + 193 PCB-202	5.39U pg/sample 7.18U pg/sample 8.62U pg/sample 1.44U pg/sample 9.33U pg/sample 3.75U pg/sample 7.31U pg/sample 9.81U pg/sample 1.60U pg/sample 11.1U pg/sample 8.30U pg/sample 7.33U pg/sample 12.0U pg/sample 12.2U pg/sample 4.11U pg/sample 8.39U pg/sample 0.989U pg/sample	A

LDC #: 26405D31

VALIDATION COMPLETENESS WORKSHEET

Date: 12/14/11

SDG #: DPWG38037

Level II

Page: 1 of 1

Laboratory: Analytical Perspectives Services Ltd
IXYS

Reviewer: FJ
2nd Reviewer: K

METHOD: HRGC/HRMS Polychlorinated Biphenyl Congeners (EPA Method 1668B) ^A

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

cooler temp = 9°C

	Validation Area		Comments
I.	Technical holding times	Δ	Sampling dates: 8/24/11
II.	GC/MS Instrument performance check	N	
III.	Initial calibration	N	
IV.	Routine calibration/ICV	N	
V.	Blanks	SW	
VI.	Matrix spike/Matrix spike duplicates	N	
VII.	Laboratory control samples	A	OPR
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	N	
X.	Target compound identifications	N	
XI.	Compound quantitation RL/LOQ/LODs	SW	
XII.	System performance	N	
XIII.	Overall assessment of data	Δ	
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: wipe

1	L53760-22	11	WG 37747-101	21		31	
2		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		30		40	

VALIDATION FINDINGS WORKSHEET

Blanks

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

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? If yes, please see qualification below.

Blank extraction date: 9/26/11 **Blank analysis date:** 10/06/11

Conc. units: pg/sample **Associated samples:** All

Compound	Blank ID	Sample Identification							
	WG37747-101	5x		1					
PCB 15	3.90	19.5							
PCBs 20 + 28	2.63	13.15		5.39U					
PCBs 21 + 33	0.932	4.66							
PCB 22	1.09	5.45							
PCB 23	1.13	5.65							
PCBs 26 + 29	0.512	2.56							
PCB 32	0.584	2.92							
PCB 34	1.00	5							
PCB 37	2.74	13.7							
PCBs 44 + 47 + 65	3.56	17.8		7.18U					
PCBs 45 + 51	1.09	5.45							
PCB 52	4.42	22.1		8.62U					
PCB 56	0.617	3.085		1.44U					
PCBs 61 + 70 + 74 + 76	4.13	20.65		9.33U					
PCB 66	1.12	5.6		3.75U					
PCBs 83 + 99	2.78	13.9		7.31U					
PCB 84	2.18	10.9							
PCBs 86 + 87 + 97 + 108 + 119 + 125	3.62	18.1		9.81U					
PCBs 88 + 91	0.874	4.37		1.60U					
PCBs 90 + 101 + 113	4.73	23.65		11.1U					

Compound	Blank ID	Sample Identification								
	WG37747-101	5x		1						
PCBs 93 + 95 + 98 + 100 + 102	5.60	28		8.30U						
PCB 105	2.60	13		7.33U						
PCBs 110 + 115	4.26	21.3		12.0U						
PCB 114	1.68	8.4								
PCB 118	3.62	18.1		12.2U						
PCBs 135 + 151 + 154	0.735	3.675								
PCBs 147 + 149	2.26	11.3								
PCB 167	1.36	6.8								
PCB 170	1.90	9.5		4.11U						
PCBs 180 + 193	2.20	11		8.39U						
PCB 202	1.18	5.9		0.989U						
PCB 209	3.45	17.25								
Total Dichloro Biphenyls	3.90	19.5								
Total Trichloro Biphenyls	10.6	53								
Total Tetrachloro Biphenyls	14.9	74.5								
Total Pentachloro Biphenyls	31.9	159.5								
Total Hexachloro Biphenyls	4.36	21.8								
Total Heptachloro Biphenyls	4.10	20.5								
Total Octachloro Biphenyls	1.18	5.9								
Decachloro Biphenyls	3.45	17.25								
Total PCBs	74.5	372.5								

ok

MB - EUPC flagged & - qualify U

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 Waterway
Collection Date: August 24, 2011
LDC Report Date: May 15, 2012
Matrix: Water
Parameters: Polychlorinated Biphenyls as Congeners
Validation Level: EPA Level III
Laboratory: AXYS Analytical Services Ltd.
Sample Delivery Group (SDG): DPWG38047

Sample Identification

L53760-1
L53760-5
L53760-12

Introduction

This data review covers 3 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 Lower Duwamish Waterway Bulk Atmospheric Deposition Study Sampling and Analysis Plan (Final August 2011) 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.

Cooler temperatures for all samples were reported at 9°C upon receipt by the laboratory.

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 criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration percent differences (%D) between the initial calibration RRF and the routine 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 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
WG37749-101	9/26/11	PCB-1	2.88 pg/L	All samples in SDG DPWG38047
		PCB-2	1.79 pg/L	
		PCB-3	5.54 pg/L	
		PCB-7	68.8 pg/L	
		PCB-8	2.73 pg/L	
		PCB-11	27.4 pg/L	
		PCB-15	3.32 pg/L	
		PCB-17	0.809 pg/L	
		PCBs 18 + 30	2.54 pg/L	
		PCB-19	0.874 pg/L	
		PCBs 20 + 28	4.74 pg/L	
		PCBs 21 + 33	2.22 pg/L	
		PCB-22	1.54 pg/L	
		PCB-23	0.659 pg/L	
		PCB-31	3.86 pg/L	
		PCB-32	0.917 pg/L	
		PCB-35	0.703 pg/L	
		PCB-37	3.62 pg/L	
		PCBs 40 + 41 + 71	2.70 pg/L	
		PCBs 44 + 47 + 65	5.20 pg/L	
		PCB-52	6.88 pg/L	
		PCB-56	2.97 pg/L	
		PCB-60	0.831 pg/L	
		PCBs 61 + 70 + 74 + 76	7.87 pg/L	
		PCB-64	1.99 pg/L	
		PCB-66	4.54 pg/L	
		PCB-81	2.60 pg/L	
		PCB-84	2.62 pg/L	
		PCBs 86 + 87 + 97 + 108 + 119 + 125	7.54 pg/L	
		PCBs 90 + 101 + 113	7.73 pg/L	
		PCBs 93 + 95 + 98 + 100 + 102	7.81 pg/L	
		PCB-104	0.756 pg/L	
		PCB-105	3.93 pg/L	
		PCBs 110 + 115	9.63 pg/L	
		PCB-114	1.73 pg/L	
		PCB-118	7.59 pg/L	
		PCBs 129 + 138 + 160 + 163	5.95 pg/L	
		PCB-132	2.32 pg/L	
		PCBs 135 + 151 + 154	2.59 pg/L	
		PCB-141	0.903 pg/L	
		PCBs 147 + 149	4.77 pg/L	
		PCBs 153 + 168	4.70 pg/L	
		PCBs 156 + 157	3.82 pg/L	
		PCB-158	0.777 pg/L	
		PCB-170	2.29 pg/L	
		PCBs 180 + 193	2.93 pg/L	
		PCBs 183 + 185	2.04 pg/L	
		PCB-188	1.79 pg/L	
		PCB-208	1.59 pg/L	
		Total Monochloro Biphenyls	10.2 pg/L	
		Total Dichloro Biphenyls	102 pg/L	
		Total Trichloro Biphenyls	22.5 pg/L	
		Total Tetrachloro Biphenyls	35.6 pg/L	
		Total Pentachloro Biphenyls	49.3 pg/L	
		Total Hexachloro Biphenyls	25.8 pg/L	
		Total Heptachloro Biphenyls	9.05 pg/L	
		Total Nonachloro Biphenyls	1.59 pg/L	
		Total PCBs	256 pg/L	

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
L53760-1	PCB-7 PCB-81	11.4 pg/L 4.18 pg/L	11.4U pg/L 4.18U pg/L
L53760-5	PCB-7	98.7 pg/L	98.7U pg/L
L53760-12	PCB-7 PCB-188	145 pg/L 7.66 pg/L	145U pg/L 7.66U 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)

Percent recoveries (%R) of the ongoing precision and recovery samples were within 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
WG37749-101	¹³ C-PCB-1	22.6 (25-150)	PCB-1 PCB-2 Total Monochloro Biphenyls	J (all detects) UJ (all non-detects)	P

X. Target Compound Identifications

Raw data were not reviewed for this SDG.

XI. Compound Quantitation and RLs

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

Sample	Compound	Flag	A or P
All samples in SDG DPWG38047	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 Waterway
 Polychlorinated Biphenyls as Congeners - Data Qualification Summary - SDG
 DPWG38047**

SDG	Sample	Compound	Flag	A or P	Reason
DPWG38047	L53760-1 L53760-5 L53760-12	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A	Compound quantitation and RLs (EMPC)

**Lower Duwamish Waterway
 Polychlorinated Biphenyls as Congeners - Laboratory Blank Data Qualification
 Summary - SDG DPWG38047**

SDG	Sample	Compound	Modified Final Concentration	A or P
DPWG38047	L53760-1	PCB-7 PCB-81	11.4U pg/L 4.18U pg/L	A
DPWG38047	L53760-5	PCB-7	98.7U pg/L	A
DPWG38047	L53760-12	PCB-7 PCB-188	145U pg/L 7.66U pg/L	A

METHOD: HRGC/HRMS Polychlorinated Biphenyl Congeners (EPA Method 1668B)

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

cooler temp = 9°C (text)

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 8/24/11
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	A	% RSD ≤ 20
IV.	Routine calibration/ ICV	A	CV ≤ 30/50
V.	Blanks	SW	
VI.	Matrix spike/Matrix spike duplicates	N	diast
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	SN	
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	L53760-1	11	WG37749-101	21		31	
2	L53760-5	12		22		32	
3	L53760-12	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		30		40	

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?
- 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? If yes, please see qualification below.

Blank extraction date: 9/26/11 Blank analysis date: 10/07/11

Conc. units: pg/L Associated samples:

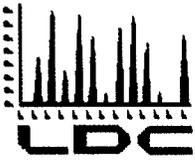
Compound	Blank ID	Sample Identification							
		5x	1	2	3				
	WG37749-101								
PCB 1	2.88	14.4							
PCB 2	1.79	8.95							
PCB 3	5.54	27.7							
PCB 7	68.8	344	11.4/U	98.7/U	145/U				
PCB 8	2.73	13.65							
PCB 11	27.4	137							
PCB 15	3.32	16.6							
PCB 17	0.809	4.045							
PCBs 18 + 30	2.54	12.7							
PCB 19	0.874	4.37							
PCBs 20 + 28	4.74	23.7							
PCBs 21 + 33	2.22	11.1							
PCB 22	1.54	7.7							
PCB 23	0.659	3.295							
PCB 31	3.86	19.3							
PCB 32	0.917	4.585							
PCB 35	0.703	3.515							
PCB 37	3.62	18.1							
PCBs 40 + 41 + 71	2.70	13.5							
PCBs 44 + 47 + 65	5.20	26							
PCB 52	6.88	34.4							

Compound	Blank ID	Sample Identification								
		5x	1	2	3					
	WG37749-101									
PCB 56	2.97	14.85								
PCB 60	0.831	4.155								
PCBs 61 + 70 + 74 +76	7.87	39.35								
PCB 64	1.99	9.95								
PCB 66	4.54	22.7								
PCB 81	2.60	13	4.18/U							
PCB 84	2.62	13.1								
PCBs 86 + 87 + 97 + 108 + 119 + 125	7.54	37.7								
PCBs 90 + 101 + 113	7.73	38.65								
PCBs 93 + 95 + 98 + 100 + 102	7.81	39.05								
PCB 104	0.756	3.78								
PCB 105	3.93	19.65								
PCBs 110 + 115	9.63	48.15								
PCB 114	1.73	8.65								
PCB 118	7.59	37.95								
PCBs 129 + 138 + 160 + 163	5.95	29.75								
PCB 132	2.32	11.6								
PCBs 135 + 151 + 154	2.59	12.95								
PCB 141	0.903	4.515								
PCBs 147 + 149	4.77	23.85								
PCBs 153 + 168	4.70	23.5								
PCBs 156 + 157	3.82	19.1								
PCB 158	0.777	3.885								
PCB 170	2.29	11.45								
PCBs 180 + 193	2.93	14.65								
PCBs 183 + 185	2.04	10.2								
PCB 188	1.79	8.95				7.66/U				

Compound	Blank ID	Sample Identification							
		5x	1	2	3				
	WG37749-101								
PCB 208	1.59	7.95							
Total Monochloro Biphenyls	10.2	51							
Total Dichloro Biphenyls	102	510							
Total Trichloro Biphenyls	22.5	112.5							
Total Tetrachloro Biphenyls	35.6	178							
Total Pentachloro Biphenyls	49.3	246.5							
Total Hexachloro Biphenyls	25.8	129							
Total Heptachloro Biphenyls	9.05	45.25							
Total Nonachloro Biphenyls	1.59	7.95							
Total PCBs	256	1280							

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".

MB EUPC results flagged "K" - qualify U



Laboratory Data Consultants, Inc.

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Fax 760.634.0439

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

February 27, 2013

SUBJECT: LDW Air Deposition, Data Validation

Dear Mr. Grothkopp,

Enclosed are the final validation reports for the fractions listed below. These SDGs were received on September 6, 2012. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 28363-1:

<u>SDG #</u>	<u>Fraction</u>
DPWG38582, DPWG38711	Dioxins/Dibenzofurans
DPWG39582, DPWG39652	Polychlorinated Biphenyls as Congeners

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 Buld Atmospheric Deposition Study Sampling and Analysis Plan, Final August 2011
- EPA Region 10 SOP for the Validation of Polychlorinated Dibenzodioxin (PCDD) and Polychlorinated Dibenzofuran (PCDF) Data, Revision 2.0, January 1996

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 Waterway
Collection Date: September 29 through October 19, 2011
LDC Report Date: September 18, 2012
Matrix: Water
Parameters: Dioxins/Dibenzofurans
Validation Level: EPA Level III
Laboratory: AXYS Analytical Services Ltd.
Sample Delivery Group (SDG): DPWG38582

Sample Identification

L54175-1
L54175-2
L54175-3
L54175-10
L54175-14
L54175-15
L54294-1
L54294-8
L54294-12
L54294-13
L54175-1DUP

Introduction

This data review covers 11 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 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 validation criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine 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 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
WG38263-101	11/16/11	1,2,3,4,6,7,8-HpCDD OCDD Total HpCDD	0.644 pg/L 2.49 pg/L 0.644 pg/L	All samples in SDG DPWG38582

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
L54175-3	OCDD	6.80 pg/L	6.80U 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.

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) control 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 and RLs

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

Sample	Compound	Flag	A or P
All samples in SDG DPWG38582	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
L54175-2	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 Waterway
Dioxins/Dibenzofurans - Data Qualification Summary - SDG DPWG38582**

SDG	Sample	Compound	Flag	A or P	Reason
DPWG38582	L54175-1 L54175-2 L54175-3 L54175-10 L54175-14 L54175-15 L54294-1 L54294-8 L54294-12 L54294-13 L54175-1DUP	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A	Compound quantitation and RLs (EMPC)
DPWG38582	L54175-2	2,3,7,8-TCDF (from DB-5)	R	A	Overall assessment of data

**Lower Duwamish Waterway
Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG DPWG38582**

SDG	Sample	Compound	Modified Final Concentration	A or P
DPWG38582	L54175-3	OCDD	6.80U pg/L	A

LDC #: 28363A21
 SDG #: DPWG38582
 Laboratory: AXYS Analytical Services Ltd.

VALIDATION COMPLETENESS WORKSHEET
 Level III

Date: 9/10/2
 Page: 1 of 1
 Reviewer: [Signature]
 2nd Reviewer: [Signature]

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1618B)

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: <u>9/29-10/19/11</u>
II.	HRGC/HRMS Instrument performance check	A	
III.	Initial calibration	A	<u>20/3570</u>
IV.	Routine calibration/ CV	A	<u>CV & limits</u>
V.	Blanks	W	
VI.	Matrix spike/Matrix spike duplicates <u>DUP</u>	N/A	<u>CS</u>
VII.	Laboratory control samples	A	<u>OPR</u>
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	A	
X.	Target compound identifications	N	
XI.	Compound quantitation/ RL/LOQ/LODs	<u>SN</u>	<u>SNDC</u>
XII.	System performance	N	
XIII.	Overall assessment of data	W	
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:
MU H2O

1	L54175-1	11	L54175-1DUP	21	<u>W438263-10</u>	31
2	L54175-2	12		22		32
3	L54175-3	13		23		33
4	L54175-10	14		24		34
5	L54175-14	15		25		35
6	L54175-15	16		26		36
7	L54294-1	17		27		37
8	L54294-8	18		28		38
9	L54294-12	19		29		39
10	L54294-13	20		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 WOR/UHEET

Blanks

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

Blank extraction date: 11/16/11

Blank analysis date: 11/28/11

Conc. units: pg/L

Associated samples: All qual U

Compound	Blank ID	Sample Identification											
		5X	3										
	WG38263-101	5X	3										
F	0.644	3.22											
G	2.49	12.45	6.80										
U	0.644	3.22											

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

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 Waterway
Collection Date: September 29 through October 19, 2011
LDC Report Date: September 25, 2012
Matrix: Water
Parameters: Polychlorinated Biphenyls as Congeners
Validation Level: EPA Level III
Laboratory: AXYS Analytical Services, Ltd.
Sample Delivery Group (SDG): DPWG38711

Sample Identification

L54175-1
L54175-2
L54175-3
L54175-10
L54175-14
L54175-15
L54294-1
L54294-8
L54294-12
L54294-13
L54175-1DUP

Introduction

This data review covers 11 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 Lower Duwamish Waterway Bulk Atmospheric Deposition Study Sampling and Analysis Plan (Final August 2011) 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 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 criteria.

IV. Routine Calibration

Routine calibration was performed at the required frequencies.

All of the routine calibration percent differences (%D) between the initial calibration RRF and the routine 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 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
WG38263-101	11/16/11	PCB 1	1.73 pg/L	All samples in SDG DPWG38711
		PCB 4	3.40 pg/L	
		PCB 6	1.13 pg/L	
		PCB 7	2.91 pg/L	
		PCB 8	4.74 pg/L	
		PCB 11	43.3 pg/L	
		PCB 15	5.01 pg/L	
		PCB 16	1.96 pg/L	
		PCB 18/30	3.57 pg/L	
		PCB 20/28	8.85 pg/L	
		PCB 21/33	4.64 pg/L	
		PCB 22	3.68 pg/L	
		PCB 25	0.669 pg/L	
		PCB 31	6.97 pg/L	
		PCB 32	1.60 pg/L	
		PCB 37	4.34 pg/L	
		PCB 44/47/65	9.30 pg/L	
		PCB 45/51	2.04 pg/L	
		PCB 52	9.14 pg/L	
		PCB 56	4.02 pg/L	
		PCB 60	1.96 pg/L	
		PCB 61/70/74/76	13.5 pg/L	
		PCB 66	6.35 pg/L	
		PCB 81	2.60 pg/L	
		PCB 83/99	5.40 pg/L	
		PCB 85/116/117	1.77 pg/L	
		PCB 86/87/97/108/119/125	7.62 pg/L	
		PCB 90/101/113	9.49 pg/L	
		PCB 105	6.01 pg/L	
		PCB 118	11.7 pg/L	
		PCB 128/166	2.00 pg/L	
		PCB 129/138/160/163	11.8 pg/L	
		PCB 132	3.64 pg/L	
		PCB 135/151/154	3.45 pg/L	
		PCB 141	2.37 pg/L	
		PCB 146	2.00 pg/L	
		PCB 147/149	10.1 pg/L	
		PCB 153/168	11.3 pg/L	
		PCB 156/157	5.13 pg/L	
		PCB 167	2.28 pg/L	
		PCB 169	8.51 pg/L	
		PCB 180/193	4.91 pg/L	
		PCB 183/185	1.22 pg/L	
		PCB 202	1.76 pg/L	
		PCB 205	2.84 pg/L	
		PCB 206	3.71 pg/L	
		Total Monochlorobiphenyls	5.13 pg/L	
		Total Dichlorobiphenyls	57.1 pg/L	
		Total Trichlorobiphenyls	36.3 pg/L	
		Total Tetrachlorobiphenyls	48.9 pg/L	
		Total Pentachlorobiphenyls	49.6 pg/L	
		Total Hexachlorobiphenyls	62.6 pg/L	
		Total Heptachlorobiphenyls	6.13 pg/L	
		Total Octachlorobiphenyls	4.60 pg/L	
		Total Nonachlorobiphenyls	3.71 pg/L	
		Total PCBs	274 pg/L	

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
L54175-1	PCB 7 PCB 11 PCB 81 PCB 169 PCB 205 Total Monochlorobiphenyls Total Dichlorobiphenyls	4.52 pg/L 130 pg/L 3.16 pg/L 5.32 pg/L 8.78 pg/L 20.6 pg/L 257 pg/L	4.52U pg/L 130U pg/L 3.16U pg/L 5.32U pg/L 8.78U pg/L 20.6U pg/L 257U pg/L
L54175-1DUP	PCB 7 PCB 11 PCB 205 Total Monochlorobiphenyls Total Dichlorobiphenyls	2.92 pg/L 134 pg/L 1.40 pg/L 22.3 pg/L 278 pg/L	2.92U pg/L 134U pg/L 1.40U pg/L 22.3U pg/L 278U pg/L
L54175-2	PCB 7 PCB 11 PCB 20/28 PCB 21/33 PCB 22 PCB 25 PCB 31 PCB 32 PCB 44/47/65 PCB 45/51 PCB 52 PCB 56 PCB 61/70/74/76 PCB 66 PCB 83/99 PCB 85/116/117 PCB 86/87/97/108/119/125 PCB 128/166 PCB 129/138/160/163 PCB 132 PCB 146 PCB 147/149 PCB 153/168	2.67 pg/L 29.2 pg/L 18.8 pg/L 11.6 pg/L 6.84 pg/L 1.47 pg/L 16.5 pg/L 5.47 pg/L 18.0 pg/L 4.34 pg/L 19.6 pg/L 5.39 pg/L 16.1 pg/L 6.15 pg/L 6.77 pg/L 2.78 pg/L 9.66 pg/L 1.38 pg/L 12.1 pg/L 3.54 pg/L 4.08 pg/L 8.42 pg/L 10.4 pg/L	2.67U pg/L 29.2U pg/L 18.8U pg/L 11.6U pg/L 6.84U pg/L 1.47U pg/L 16.5U pg/L 5.47U pg/L 18.0U pg/L 4.34U pg/L 19.6U pg/L 5.39U pg/L 16.1U pg/L 6.15U pg/L 6.77U pg/L 2.78U pg/L 9.66U pg/L 1.38U pg/L 12.1U pg/L 3.54U pg/L 4.08U pg/L 8.42U pg/L 10.4U pg/L

Sample	Compound	Reported Concentration	Modified Final Concentration
L54175-3	PCB 1	2.74 pg/L	2.74U pg/L
	PCB 4	4.21 pg/L	4.21U pg/L
	PCB 8	7.43 pg/L	7.43U pg/L
	PCB 11	23.7 pg/L	23.7U pg/L
	PCB 15	3.88 pg/L	3.88U pg/L
	PCB 16	2.94 pg/L	2.94U pg/L
	PCB 18/30	5.37 pg/L	5.37U pg/L
	PCB 20/28	8.86 pg/L	8.86U pg/L
	PCB 21/33	5.06 pg/L	5.06U pg/L
	PCB 22	3.24 pg/L	3.24U pg/L
	PCB 25	0.620 pg/L	0.620U pg/L
	PCB 31	7.14 pg/L	7.14U pg/L
	PCB 32	1.70 pg/L	1.70U pg/L
	PCB 37	2.66 pg/L	2.66U pg/L
	PCB 44/47/65	8.96 pg/L	8.96U pg/L
	PCB 45/51	1.88 pg/L	1.88U pg/L
	PCB 52	11.8 pg/L	11.8U pg/L
	PCB 56	2.78 pg/L	2.78U pg/L
	PCB 61/70/74/76	14.4 pg/L	14.4U pg/L
	PCB 83/99	9.34 pg/L	9.34U pg/L
	PCB 86/87/97/108/119/125	10.4 pg/L	10.4U pg/L
	PCB 90/101/113	15.7 pg/L	15.7U pg/L
	PCB 105	6.49 pg/L	6.49U pg/L
	PCB 118	16.1 pg/L	16.1U pg/L
	PCB 128/166	1.87 pg/L	1.87U pg/L
	PCB 129/138/160/163	14.1 pg/L	14.1U pg/L
	PCB 141	2.50 pg/L	2.50U pg/L
	PCB 146	3.65 pg/L	3.65U pg/L
	PCB 147/149	7.11 pg/L	7.11U pg/L
	PCB 153/168	21.9 pg/L	21.9U pg/L
	PCB 183/185	5.79 pg/L	5.79U pg/L
	Total Monochlorobiphenyls	6.07 pg/L	6.07U pg/L
Total Dichlorobiphenyls	39.8 pg/L	39.8U pg/L	
Total Trichlorobiphenyls	43.7 pg/L	43.7U pg/L	
Total Tetrachlorobiphenyls	53.4 pg/L	53.4U pg/L	
Total Pentachlorobiphenyls	86.5 pg/L	86.5U pg/L	
Total Hexachlorobiphenyls	53.0 pg/L	53.0U pg/L	
Total Heptachlorobiphenyls	16.8 pg/L	16.8U pg/L	
Total Octachlorobiphenyls	4.86 pg/L	4.86U pg/L	
L54175-10	PCB 7	9.12 pg/L	9.12U pg/L
	PCB 11	64.3 pg/L	64.3U pg/L
L54175-14	PCB 1	8.21 pg/L	8.21U pg/L
	PCB 4	16.6 pg/L	16.6U pg/L
	PCB 7	3.31 pg/L	3.31U pg/L
	PCB 11	112 pg/L	112U pg/L
	PCB 20/28	40.0 pg/L	40.0U pg/L
	PCB 21/33	18.7 pg/L	18.7U pg/L
	PCB 22	13.4 pg/L	13.4U pg/L
	PCB 25	2.55 pg/L	2.55U pg/L
	PCB 31	33.3 pg/L	33.3U pg/L
	PCB 32	7.51 pg/L	7.51U pg/L
	PCB 37	19.7 pg/L	19.7U pg/L
	PCB 45/51	7.24 pg/L	7.24U pg/L
	PCB 56	19.6 pg/L	19.6U pg/L
	PCB 60	8.44 pg/L	8.44U pg/L
	PCB 81	4.29 pg/L	4.29U pg/L
	PCB 167	10.6 pg/L	10.6U pg/L
	PCB 202	7.77 pg/L	7.77U pg/L
PCB 206	16.5 pg/L	16.5U pg/L	
Total Monochlorobiphenyls	23.3 pg/L	23.3U pg/L	
Total Dichlorobiphenyls	202 pg/L	202U pg/L	

Sample	Compound	Reported Concentration	Modified Final Concentration
L54175-15	PCB 1 PCB 7 PCB 11 PCB 15 PCB 25 PCB 37 PCB 44/47/65 PCB 45/51 PCB 56 PCB 60 PCB 66 PCB 167 PCB 205 Total Monochlorobiphenyls Total Dichlorobiphenyls Total Nonachlorobiphenyls	8.18 pg/L 3.76 pg/L 150 pg/L 23.0 pg/L 3.09 pg/L 16.7 pg/L 43.3 pg/L 7.71 pg/L 17.8 pg/L 9.20 pg/L 28.4 pg/L 9.69 pg/L 1.63 pg/L 23.4 pg/L 261 pg/L 6.89 pg/L	8.18U pg/L 3.76U pg/L 150U pg/L 23.0U pg/L 3.09U pg/L 16.7U pg/L 43.3U pg/L 7.71U pg/L 17.8U pg/L 9.20U pg/L 28.4U pg/L 9.69U pg/L 1.63U pg/L 23.4U pg/L 261U pg/L 6.89U pg/L
L54294-1	PCB 1 PCB 7 PCB 11 PCB 15 PCB 20/28 PCB 37 PCB 44/47/65 PCB 45/51 PCB 56 PCB 60 PCB 61/70/74/76 PCB 66 PCB 156/157 PCB 167 PCB 169 PCB 202 PCB 205 PCB 206 Total Monochlorobiphenyls Total Dichlorobiphenyls Total Nonachlorobiphenyls	8.34 pg/L 4.53 pg/L 83.0 pg/L 24.1 pg/L 42.1 pg/L 15.5 pg/L 40.1 pg/L 7.07 pg/L 15.4 pg/L 8.01 pg/L 62.1 pg/L 24.3 pg/L 19.2 pg/L 5.84 pg/L 2.02 pg/L 4.82 pg/L 0.914 pg/L 13.4 pg/L 25.4 pg/L 223 pg/L 13.4 pg/L	8.34U pg/L 4.53U pg/L 83.0U pg/L 24.1U pg/L 42.1U pg/L 15.5U pg/L 40.1U pg/L 7.07U pg/L 15.4U pg/L 8.01U pg/L 62.1U pg/L 24.3U pg/L 19.2U pg/L 5.84U pg/L 2.02U pg/L 4.82U pg/L 0.914U pg/L 13.4U pg/L 25.4U pg/L 223U pg/L 13.4U pg/L
L54294-8	PCB 7 PCB 11 PCB 205	5.73 pg/L 69.4 pg/L 2.36 pg/L	5.73U pg/L 69.4U pg/L 2.36U pg/L

Sample	Compound	Reported Concentration	Modified Final Concentration
L54294-12	PCB 1	6.94 pg/L	6.94U pg/L
	PCB 7	3.81 pg/L	3.81U pg/L
	PCB 11	47.9 pg/L	47.9U pg/L
	PCB 15	17.1 pg/L	17.1U pg/L
	PCB 20/28	29.9 pg/L	29.9U pg/L
	PCB 21/33	17.0 pg/L	17.0U pg/L
	PCB 22	11.0 pg/L	11.0U pg/L
	PCB 25	2.34 pg/L	2.34U pg/L
	PCB 31	25.5 pg/L	25.5U pg/L
	PCB 37	5.65 pg/L	5.65U pg/L
	PCB 44/47/65	26.6 pg/L	26.6U pg/L
	PCB 52	31.1 pg/L	31.1U pg/L
	PCB 56	5.32 pg/L	5.32U pg/L
	PCB 60	2.71 pg/L	2.71U pg/L
	PCB 61/70/74/76	26.0 pg/L	26.0U pg/L
	PCB 66	10.6 pg/L	10.6U pg/L
	PCB 86/87/97/108/119/125	30.4 pg/L	30.4U pg/L
	PCB 90/101/113	38.3 pg/L	38.3U pg/L
	PCB 105	14.3 pg/L	14.3U pg/L
	PCB 118	34.1 pg/L	34.1U pg/L
	PCB 129/138/160/163	45.1 pg/L	45.1U pg/L
	PCB 132	13.3 pg/L	13.3U pg/L
	PCB 135/151/154	14.4 pg/L	14.4U pg/L
	PCB 141	7.88 pg/L	7.88U pg/L
	PCB 146	6.68 pg/L	6.68U pg/L
	PCB 147/149	29.2 pg/L	29.2U pg/L
	PCB 153/168	36.2 pg/L	36.2U pg/L
	PCB 156/157	6.32 pg/L	6.32U pg/L
PCB 206	6.34 pg/L	6.34U pg/L	
Total Monochlorobiphenyls	22.8 pg/L	22.8U pg/L	
Total Dichlorobiphenyls	155 pg/L	155U pg/L	
Total Trichlorobiphenyls	170 pg/L	170U pg/L	
Total Tetrachlorobiphenyls	145 pg/L	145U pg/L	
Total Pentachlorobiphenyls	203 pg/L	203U pg/L	
Total Hexachlorobiphenyls	172 pg/L	172U pg/L	
Total Nonachlorobiphenyls	6.34 pg/L	6.34U pg/L	

Sample	Compound	Reported Concentration	Modified Final Concentration
L54294-13	PCB 1	6.28 pg/L	6.28U pg/L
	PCB 7	5.73 pg/L	5.73U pg/L
	PCB 11	50.4 pg/L	50.4U pg/L
	PCB 15	14.3 pg/L	14.3U pg/L
	PCB 20/28	28.4 pg/L	28.4U pg/L
	PCB 21/33	17.4 pg/L	17.4U pg/L
	PCB 22	12.1 pg/L	12.1U pg/L
	PCB 25	2.40 pg/L	2.40U pg/L
	PCB 31	25.2 pg/L	25.2U pg/L
	PCB 32	7.93 pg/L	7.93U pg/L
	PCB 37	7.13 pg/L	7.13U pg/L
	PCB 44/47/65	28.1 pg/L	28.1U pg/L
	PCB 45/51	6.07 pg/L	6.07U pg/L
	PCB 52	33.7 pg/L	33.7U pg/L
	PCB 56	6.34 pg/L	6.34U pg/L
	PCB 60	3.14 pg/L	3.14U pg/L
	PCB 61/70/74/76	31.7 pg/L	31.7U pg/L
	PCB 66	11.9 pg/L	11.9U pg/L
	PCB 83/99	23.4 pg/L	23.4U pg/L
	PCB 85/116/117	8.68 pg/L	8.68U pg/L
	PCB 86/87/97/108/119/125	36.4 pg/L	36.4U pg/L
	PCB 105	21.8 pg/L	21.8U pg/L
	PCB 118	45.7 pg/L	45.7U pg/L
	PCB 128/166	9.18 pg/L	9.18U pg/L
	PCB 129/138/160/163	56.5 pg/L	56.5U pg/L
	PCB 132	16.8 pg/L	16.8U pg/L
	PCB 141	11.0 pg/L	11.0U pg/L
	PCB 146	9.14 pg/L	9.14U pg/L
	PCB 147/149	35.3 pg/L	35.3U pg/L
	PCB 153/168	45.5 pg/L	45.5U pg/L
	PCB 156/157	8.12 pg/L	8.12U pg/L
	PCB 167	3.10 pg/L	3.10U pg/L
	PCB 202	2.63 pg/L	2.63U pg/L
PCB 206	5.51 pg/L	5.51U pg/L	
Total Monochlorobiphenyls	20.7 pg/L	20.7U pg/L	
Total Dichlorobiphenyls	144 pg/L	144U pg/L	
Total Trichlorobiphenyls	167 pg/L	167U pg/L	
Total Tetrachlorobiphenyls	167 pg/L	167U pg/L	
Total Hexachlorobiphenyls	235 pg/L	235U pg/L	
Total Nonachlorobiphenyls	7.35 pg/L	7.35U 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.

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
L54175-1DUP (L54175-1 L54175-1DUP)	PCB 85/116/117 PCB 107/124 PCB 118 PCB 126 PCB 137 PCB 194 PCB 197/200 PCB 198/199 PCB 201 PCB 203 PCB 205 PCB 206 PCB 208 PCB 209	55.9 (≤50) 56.7 (≤50) 51.4 (≤50) 62.0 (≤50) 54.1 (≤50) 66.4 (≤50) 71.7 (≤50) 75.5 (≤50) 65.0 (≤50) 73.6 (≤50) 145 (≤50) 104 (≤50) 129 (≤50) 105 (≤50)	PCB 85/116/117 PCB 107/124 PCB 118 PCB 126 PCB 137 PCB 194 PCB 197/200 PCB 198/199 PCB 201 PCB 203 PCB 205 PCB 206 PCB 208 PCB 209 Total Pentachlorobiphenyls Total Hexachlorobiphenyls Total Octachlorobiphenyls Total Nonachlorobiphenyls	J (all detects)	A

VII. Ongoing Precision & Recovery Samples (OPR)

Ongoing precision and recovery (OPR) control 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.

X. Target Compound Identifications

Raw data were not reviewed for this SDG.

XI. Compound Quantitation and RLs

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

Sample	Compound	Flag	A or P
All samples in SDG DPWG38711	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 Waterway
 Polychlorinated Biphenyls as Congeners - Data Qualification Summary - SDG
 DPWG38711**

SDG	Sample	Compound	Flag	A or P	Reason
DPWG38711	L54175-1 L54175-1DUP	PCB 85/116/117 PCB 107/124 PCB 118 PCB 126 PCB 137 PCB 194 PCB 197/200 PCB 198/199 PCB 201 PCB 203 PCB 205 PCB 206 PCB 208 PCB 209 Total Pentachlorobiphenyls Total Hexachlorobiphenyls Total Octachlorobiphenyls Total Nonachlorobiphenyls	J (all detects)	A	Duplicate sample analysis (RPD)
DPWG38711	L54175-1 L54175-2 L54175-3 L54175-10 L54175-14 L54175-15 L54294-1 L54294-8 L54294-12 L54294-13 L54175-1DUP	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A	Compound quantitation and RLs (EMPC)

**Lower Duwamish Waterway
 Polychlorinated Biphenyls as Congeners - Laboratory Blank Data Qualification
 Summary - SDG DPWG38711**

SDG	Sample	Compound	Modified Final Concentration	A or P
DPWG38711	L54175-1	PCB 7 PCB 11 PCB 81 PCB 169 PCB 205 Total Monochlorobiphenyls Total Dichlorobiphenyls	4.52U pg/L 130U pg/L 3.16U pg/L 5.32U pg/L 8.78U pg/L 20.6U pg/L 257U pg/L	A
DPWG38711	L54175-1DUP	PCB 7 PCB 11 PCB 205 Total Monochlorobiphenyls Total Dichlorobiphenyls	2.92U pg/L 134U pg/L 1.40U pg/L 22.3U pg/L 278U pg/L	A

SDG	Sample	Compound	Modified Final Concentration	A or P
DPWG38711	L54175-2	PCB 7 PCB 11 PCB 20/28 PCB 21/33 PCB 22 PCB 25 PCB 31 PCB 32 PCB 44/47/65 PCB 45/51 PCB 52 PCB 56 PCB 61/70/74/76 PCB 66 PCB 83/99 PCB 85/116/117 PCB 86/87/97/108/119/125 PCB 128/166 PCB 129/138/160/163 PCB 132 PCB 146 PCB 147/149 PCB 153/168	2.67U pg/L 29.2U pg/L 18.8U pg/L 11.6U pg/L 6.84U pg/L 1.47U pg/L 16.5U pg/L 5.47U pg/L 18.0U pg/L 4.34U pg/L 19.6U pg/L 5.39U pg/L 16.1U pg/L 6.15U pg/L 6.77U pg/L 2.78U pg/L 9.66U pg/L 1.38U pg/L 12.1U pg/L 3.54U pg/L 4.08U pg/L 8.42U pg/L 10.4U pg/L	A
DPWG38711	L54175-3	PCB 1 PCB 4 PCB 8 PCB 11 PCB 15 PCB 16 PCB 18/30 PCB 20/28 PCB 21/33 PCB 22 PCB 25 PCB 31 PCB 32 PCB 37 PCB 44/47/65 PCB 45/51 PCB 52 PCB 56 PCB 61/70/74/76 PCB 83/99 PCB 86/87/97/108/119/125 PCB 90/101/113 PCB 105 PCB 118 PCB 128/166 PCB 129/138/160/163 PCB 141 PCB 146 PCB 147/149 PCB 153/168 PCB 183/185 Total Monochlorobiphenyls Total Dichlorobiphenyls Total Trichlorobiphenyls Total Tetrachlorobiphenyls Total Pentachlorobiphenyls Total Hexachlorobiphenyls Total Heptachlorobiphenyls Total Octachlorobiphenyls	2.74U pg/L 4.21U pg/L 7.43U pg/L 23.7U pg/L 3.88U pg/L 2.94U pg/L 5.37U pg/L 8.86U pg/L 5.06U pg/L 3.24U pg/L 0.620U pg/L 7.14U pg/L 1.70U pg/L 2.66U pg/L 8.96U pg/L 1.88U pg/L 11.8U pg/L 2.78U pg/L 14.4U pg/L 9.34U pg/L 10.4U pg/L 15.7U pg/L 6.49U pg/L 16.1U pg/L 1.87U pg/L 14.1U pg/L 2.50U pg/L 3.65U pg/L 7.11U pg/L 21.9U pg/L 5.79U pg/L 6.07U pg/L 39.8U pg/L 43.7U pg/L 53.4U pg/L 86.5U pg/L 53.0U pg/L 16.8U pg/L 4.86U pg/L	A
DPWG38711	L54175-10	PCB 7 PCB 11	9.12U pg/L 64.3U pg/L	A

SDG	Sample	Compound	Modified Final Concentration	A or P
DPWG38711	L54175-14	PCB 1 PCB 4 PCB 7 PCB 11 PCB 20/28 PCB 21/33 PCB 22 PCB 25 PCB 31 PCB 32 PCB 37 PCB 45/51 PCB 56 PCB 60 PCB 81 PCB 167 PCB 202 PCB 206 Total Monochlorobiphenyls Total Dichlorobiphenyls	8.21U pg/L 16.6U pg/L 3.31U pg/L 112U pg/L 40.0U pg/L 18.7U pg/L 13.4U pg/L 2.55U pg/L 33.3U pg/L 7.51U pg/L 19.7U pg/L 7.24U pg/L 19.6U pg/L 8.44U pg/L 4.29U pg/L 10.6U pg/L 7.77U pg/L 16.5U pg/L 23.3U pg/L 202U pg/L	A
DPWG38711	L54175-15	PCB 1 PCB 7 PCB 11 PCB 15 PCB 25 PCB 37 PCB 44/47/65 PCB 45/51 PCB 56 PCB 60 PCB 66 PCB 167 PCB 205 Total Monochlorobiphenyls Total Dichlorobiphenyls Total Nonachlorobiphenyls	8.18U pg/L 3.76U pg/L 150U pg/L 23.0U pg/L 3.09U pg/L 16.7U pg/L 43.3U pg/L 7.71U pg/L 17.8U pg/L 9.20U pg/L 28.4U pg/L 9.69U pg/L 1.63U pg/L 23.4U pg/L 261U pg/L 6.89U pg/L	A
DPWG38711	L54294-1	PCB 1 PCB 7 PCB 11 PCB 15 PCB 20/28 PCB 37 PCB 44/47/65 PCB 45/51 PCB 56 PCB 60 PCB 61/70/74/76 PCB 66 PCB 156/157 PCB 167 PCB 169 PCB 202 PCB 205 PCB 206 Total Monochlorobiphenyls Total Dichlorobiphenyls Total Nonachlorobiphenyls	8.34U pg/L 4.53U pg/L 83.0U pg/L 24.1U pg/L 42.1U pg/L 15.5U pg/L 40.1U pg/L 7.07U pg/L 15.4U pg/L 8.01U pg/L 62.1U pg/L 24.3U pg/L 19.2U pg/L 5.84U pg/L 2.02U pg/L 4.82U pg/L 0.914U pg/L 13.4U pg/L 25.4U pg/L 223U pg/L 13.4U pg/L	A
DPWG38711	L54294-8	PCB 7 PCB 11 PCB 205	5.73U pg/L 69.4U pg/L 2.36U pg/L	A

SDG	Sample	Compound	Modified Final Concentration	A or P
DPWG38711	L54294-12	PCB 1 PCB 7 PCB 11 PCB 15 PCB 20/28 PCB 21/33 PCB 22 PCB 25 PCB 31 PCB 37 PCB 44/47/65 PCB 52 PCB 56 PCB 60 PCB 61/70/74/76 PCB 66 PCB 86/87/97/108/119/125 PCB 90/101/113 PCB 105 PCB 118 PCB 129/138/160/163 PCB 132 PCB 135/151/154 PCB 141 PCB 146 PCB 147/149 PCB 153/168 PCB 156/157 PCB 206 Total Monochlorobiphenyls Total Dichlorobiphenyls Total Trichlorobiphenyls Total Tetrachlorobiphenyls Total Pentachlorobiphenyls Total Hexachlorobiphenyls Total Nonachlorobiphenyls	6.94U pg/L 3.81U pg/L 47.9U pg/L 17.1U pg/L 29.9U pg/L 17.0U pg/L 11.0U pg/L 2.34U pg/L 25.5U pg/L 5.65U pg/L 26.6U pg/L 31.1U pg/L 5.32U pg/L 2.71U pg/L 26.0U pg/L 10.6U pg/L 30.4U pg/L 38.3U pg/L 14.3U pg/L 34.1U pg/L 45.1U pg/L 13.3U pg/L 14.4U pg/L 7.88U pg/L 6.68U pg/L 29.2U pg/L 36.2U pg/L 6.32U pg/L 6.34U pg/L 22.8U pg/L 155U pg/L 170U pg/L 145U pg/L 203U pg/L 172U pg/L 6.34U pg/L	A

SDG	Sample	Compound	Modified Final Concentration	A or P
DPWG38711	L54294-13	PCB 1 PCB 7 PCB 11 PCB 15 PCB 20/28 PCB 21/33 PCB 22 PCB 25 PCB 31 PCB 32 PCB 37 PCB 44/47/65 PCB 45/51 PCB 52 PCB 56 PCB 60 PCB 61/70/74/76 PCB 66 PCB 83/99 PCB 85/116/117 PCB 86/87/97/108/119/125 PCB 105 PCB 118 PCB 128/166 PCB 129/138/160/163 PCB 132 PCB 141 PCB 146 PCB 147/149 PCB 153/168 PCB 156/157 PCB 167 PCB 202 PCB 206 Total Monochlorobiphenyls Total Dichlorobiphenyls Total Trichlorobiphenyls Total Tetrachlorobiphenyls Total Hexachlorobiphenyls Total Nonachlorobiphenyls	6.28U pg/L 5.73U pg/L 50.4U pg/L 14.3U pg/L 28.4U pg/L 17.4U pg/L 12.1U pg/L 2.40U pg/L 25.2U pg/L 7.93U pg/L 7.13U pg/L 28.1U pg/L 6.07U pg/L 33.7U pg/L 6.34U pg/L 3.14U pg/L 31.7U pg/L 11.9U pg/L 23.4U pg/L 8.68U pg/L 36.4U pg/L 21.8U pg/L 45.7U pg/L 9.18U pg/L 56.5U pg/L 16.8U pg/L 11.0U pg/L 9.14U pg/L 35.3U pg/L 45.5U pg/L 8.12U pg/L 3.10U pg/L 2.63U pg/L 5.51U pg/L 20.7U pg/L 144U pg/L 167U pg/L 167U pg/L 235U pg/L 7.35U pg/L	A

LDC #: 28363C31

VALIDATION COMPLETENESS WORKSHEET

SDG #: DPWG38711

Level III

Laboratory: ~~Analytical Perspectives~~ AXYSDate: 9/10/12Page: 1 of 1Reviewer: g2nd Reviewer: ✓**METHOD:** HRGC/HRMS Polychlorinated Biphenyl 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: <u>9/29-10/19/11</u>
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	A	<u>30/5070 2070</u>
IV.	Routine calibration/ <u>SV</u>	A	<u>30/5070</u>
V.	Blanks	SW	
VI.	Matrix spike/Matrix spike duplicates <u>OWS</u>	N/SW	
VII.	Laboratory control samples	A	<u>OPR</u>
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	A	
X.	Target compound identifications	N	
XI.	Compound quantitation <u>RL/LOQ/LODs</u>	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:

1	L54175-1	11	L54175-1DUP	21	<u>WF38263-101</u>	31	
2	L54175-2	12		22		32	
3	L54175-3	13		23		33	
4	L54175-10	14		24		34	
5	L54175-14	15		25		35	
6	L54175-15	16		26		36	
7	L54294-1	17		27		37	
8	L54294-8	18		28		38	
9	L54294-12	19		29		39	
10	L54294-13	20		30		40	

VALIDATION FINDINGS WORKSHEET

BlanksReviewer: Q2nd Reviewer: L

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

Blank extraction date: 11/16/11 Blank analysis date: 12/2/11

Conc. units: pg/L

Associated samples: All Seds - Qual U

Compound	Blank ID	Sample Identification											
		5X	1	11	2	3	4	5	6	7	8	9	10
	WG38263-101												
PCB 1	1.73	8.65				2.74		8.21	8.18	8.34		6.94	6.28
PCB 4	3.40	17				4.21		16.6					
PCB 6	1.13	5.65											
PCB 7	2.91	14.55	4.52	2.92	2.67		9.12	3.31	3.76	4.53	5.73	3.81	5.73
PCB 8	4.74	23.7				7.43							
PCB 11	43.3	216.5	130	134	29.2	23.7	64.3	112	150	83.0	69.4	47.9	50.4
PCB 15	5.01	25.05				3.88			23.0	24.1		17.1	14.3
PCB 16	1.96	9.8				2.94							
PCB 18/30	3.57	17.85				5.37							
PCB 20/28	8.85	44.25			18.8	8.86		40.0		42.1		29.9	28.4
PCB 21/33	4.64	23.2			11.6	5.06		18.7				17.0	17.4
PCB 22	3.68	18.4			6.84	3.24		13.4				11.0	12.1
PCB 25	0.669	3.345			1.47	0.620		2.55	3.09			2.34	2.40
PCB 31	6.97	34.85			16.5	7.14		33.3				25.5	25.2
PCB 32	1.60	8			5.47	1.70		7.51					7.93
PCB 37	4.34	21.7				2.66		19.7	16.7	15.5		5.65	7.13
PCB 44/47/65	9.30	46.5			18.0	8.96			43.3	40.1		26.6	28.1
PCB 45/51	2.04	10.2			4.34	1.88		7.24	7.71	7.07			6.07
PCB 52	9.14	45.7			19.6	11.8						31.1	33.7
PCB 56	4.02	20.1			5.39	2.78		19.6	17.8	15.4		5.32	6.34
PCB 60	1.96	9.8						8.44	9.20	8.01		2.71	3.14
PCB 61/70/74/76	13.5	67.5			16.1	14.4				62.1		26.0	31.7
PCB 66	6.35	31.75			6.15				28.4	24.3		10.6	11.9

Compound	Blank ID	Sample Identification											
		5X	1	11	2	3	4	5	6	7	8	9	10
	WG38263-101												
PCB 81	2.60	13	3.16					4.29					
PCB 83/99	5.40	27			6.77	9.34							23.4
PCB 85/116/117	1.77	8.85			2.78								8.68
PCB 86/87/97/108/119/125	7.62	38.1			9.66	10.4						30.4	36.4
PCB 90/101/113	9.49	47.45				15.7						38.3	
PCB 105	6.01	30.05				6.49						14.3	21.8
PCB 118	11.7	58.5				16.1						34.1	45.7
PCB 128/166	2.00	10			1.38	1.87							9.18
PCB 129/138/160/163	11.8	59			12.1	14.1						45.1	56.5
PCB 132	3.64	18.2			3.54							13.3	16.8
PCB 135/151/154	3.45	17.25										14.4	
PCB 141	2.37	11.85				2.50						7.88	11.0
PCB 146	2.00	10			4.08	3.65						6.68	9.14
PCB 147/149	10.1	50.5			8.42	7.11						29.2	35.3
PCB 153/168	11.3	56.5			10.4	21.9						36.2	45.5
PCB 156/157	5.13	25.65								19.2		6.32	8.12
PCB 167	2.28	11.4						10.6	9.69	5.84			3.10
PCB 169	8.51	42.55	5.32							2.02			
PCB 180/193	4.91	24.55											
PCB 183/185	1.22	6.1				5.79							
PCB 202	1.76	8.8						7.77		4.82			2.63
PCB 205	2.84	14.2	8.78	1.40					1.63	0.914	2.36		
PCB 206	3.71	18.55						16.5		13.4		6.34	5.51
Total Monochlorobiphenyls	5.13	25.65	20.6	22.3		6.07		23.3	23.4	25.4		22.8	20.7
Total Dichlorobiphenyls	57.1	285.5	257	278		39.8		202	261	223		155	144
Total Trichlorobiphenyls	36.3	181.5				43.7						170	167
Total Tetrachlorobiphenyls	48.9	244.5				53.4						145	167
Total Pentachlorobiphenyls	49.6	248				86.5						203	

Compound	Blank ID	Sample Identification											
		5X	1	11	2	3	4	5	6	7	8	9	10
	WG38263-101												
Total Hexachlorobiphenyls	62.6	313				53.0						172	235
Total Heptachlorobiphenyls	6.13	30.65				16.8							
Total Octachlorobiphenyls	4.60	23				4.86							
Total Nonachlorobiphenyls	3.71	18.55							6.89	13.4		6.34	7.35
Total PCBs	274	1370				304						4030	

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

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".

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

METHOD: HRGC/HRMS Polychlorinated Biphenyls (EPA Method 1668B)

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

Y N N/A Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.

Y N N/A Was a MS/MSD analyzed every 20 samples of each matrix?

Y N N/A Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	Date	MS/MSD ID	Compound	MS %R (Limits)	MSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
		11	PCB 85/116/117	()	()	55.9 (≤ 100)	1, 11	↓ data/A *
			107/124	()	()	56.7 ()		
			118	()	()	51.4 ()		
			126	()	()	62.0 ()		
			137	()	()	54.1 ()		
			194	()	()	66.4 ()		
			197/200	()	()	71.7 ()		
			198/199	()	()	75.5 ()		
			201	()	()	65.0 ()		
			203	()	()	73.6 ()		
			205	()	()	145 ()		
			206	()	()	104 ()		
			208	()	()	129 ()		
			↓ 209	()	()	105 (↓)		
				()	()			
				()	()			* qual total Penta-, Hexa-, Octa-, ↓ Non Nonachlorobiphenyls
				()	()			
				()	()			
				()	()			
				()	()			
				()	()			

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

Project/Site Name: Lower Duwamish Waterway
Collection Date: November 16, 2011 through March 6, 2012
LDC Report Date: September 18, 2012
Matrix: Water
Parameters: Dioxins/Dibenzofurans
Validation Level: EPA Level III
Laboratory: AXYS Analytical Services Ltd.
Sample Delivery Group (SDG): DPWG39582

Sample Identification

L54542-1
L54542-12
L54719-4
L54719-8
L54719-15
L54845-1
L54845-5
L54980-7
L54980-14
L55159-11
L54980-14DUP

Introduction

This data review covers 11 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 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 validation criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine 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 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

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) control 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 and RLs

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

Sample	Compound	Flag	A or P
All samples in SDG DPWG39582	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
L54542-12 L54719-4 L54719-8 L55159-11 L54980-14DUP	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 Waterway
Dioxins/Dibenzofurans - Data Qualification Summary - SDG DPWG39582**

SDG	Sample	Compound	Flag	A or P	Reason
DPWG39582	L54542-1 L54542-12 L54719-4 L54719-8 L54719-15 L54845-1 L54845-5 L54980-7 L54980-14 L55159-11 L54980-14DUP	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A	Compound quantitation and RLs (EMPC)
DPWG39582	L54542-12 L54719-4 L54719-8 L55159-11 L54980-14DUP	2,3,7,8-TCDF (from DB-5)	R	A	Overall assessment of data

**Lower Duwamish Waterway
Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG DPWG39582**

No Sample Data Qualified in this SDG

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 1618B)

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: <u>11/16/11 - 3/6/12</u>
II.	HRGC/HRMS Instrument performance check	A	
III.	Initial calibration	A	<u>20/3570</u>
IV.	Routine calibration/ICV	A	<u>QC limits</u>
V.	Blanks	A	<u>ZMP C - U</u>
VI.	Matrix spike/Matrix spike duplicates <u>104P</u>	N/A	<u>CS</u>
VII.	Laboratory control samples	A	<u>OPR</u>
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	A	
X.	Target compound identifications	N	
XI.	Compound quantitation/RL/LOQ/LODs	N	
XII.	System performance	N	
XIII.	Overall assessment of data	<u>OK</u>	
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:

104 H2O2

1	L54542-1	11	L54980-14DUP	21	<u>N#39373-101</u>	31	
2	L54542-12	12		22		32	
3	L54719-4	13		23		33	
4	L54719-8	14		24		34	
5	L54719-15	15		25		35	
6	L54845-1	16		26		36	
7	L54845-5	17		27		37	
8	L54980-7	18		28		38	
9	L54980-14	19		29		39	
10	L55159-11	20		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 Waterway
Collection Date: November 16, 2011 through March 6, 2012
LDC Report Date: September 25, 2012
Matrix: Water
Parameters: Polychlorinated Biphenyls as Congeners
Validation Level: EPA Level III
Laboratory: AXYS Analytical Services, Ltd.
Sample Delivery Group (SDG): DPWG39652

Sample Identification

L54542-1
L54542-12
L54719-4
L54719-8
L54719-15
L54845-1
L54845-5
L54980-7
L54980-14
L55159-11
L54980-14DUP

Introduction

This data review covers 11 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 Lower Duwamish Waterway Bulk Atmospheric Deposition Study Sampling and Analysis Plan (Final August 2011) 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 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 criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration percent differences (%D) between the initial calibration RRF and the routine 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 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
WG39373-101	3/9/12	PCB-1 PCB-2 PCB-3 PCB-7 PCB-8 PCB-11 PCB-12/13 PCB-15 PCB-18	4.19 pg/L 3.56 pg/L 9.88 pg/L 3.37 pg/L 2.48 pg/L 15.2 pg/L 3.01 pg/L 5.23 pg/L 2.55 pg/L	All samples in SDG DPWG39652

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
WG39373-101 (continued)	3/9/12	PCB-20/28 PCB-21 PCB-31 PCB-44/47/65 PCB-52 PCB-61/70/74/76 PCB-64 PCB-66 PCB-83/99 PCB-90/101/113 PCB-93/95/98/100/102 PCB-105 PCB-110/115 PCB-135/151/154 Total Monochlorobiphenyls Total Dichlorobiphenyls Total Trichlorobiphenyls Total Tetrachlorobiphenyls Total Pentachlorobiphenyls Total Hexachlorobiphenyls Total PCBs	5.74 pg/L 2.56 pg/L 4.73 pg/L 8.01 pg/L 6.47 pg/L 7.07 pg/L 1.57 pg/L 2.33 pg/L 2.39 pg/L 4.70 pg/L 3.94 pg/L 1.62 pg/L 3.83 pg/L 2.22 pg/L 17.6 pg/L 29.3 pg/L 15.6 pg/L 25.5 pg/L 16.5 pg/L 2.22 pg/L 107 pg/L	All samples in SDG DPWG39652

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
L54542-1	PCB-1 PCB-2 PCB-3 PCB-7 PCB-8 (5X) PCB-11 (5X) PCB-18 (5X) PCB-44/47/65 Total Monochlorobiphenyls Total Dichlorobiphenyls	9.95 pg/L 6.61 pg/L 19.5 pg/L 6.65 pg/L 31.2 pg/L 51.2 pg/L 27.3 pg/L 35.1 pg/L 36.1 pg/L 113 pg/L	9.95U pg/L 6.61U pg/L 19.5U pg/L 6.65U pg/L 31.2U pg/L 51.2U pg/L 27.3U pg/L 35.1U pg/L 36.1U pg/L 113U pg/L
L54542-12	PCB-1 PCB-2 PCB-3 PCB-7 PCB-8 (5X) PCB-11 (5X) PCB-18 (5X) Total Monochlorobiphenyls Total Dichlorobiphenyls	10.3 pg/L 8.04 pg/L 19.1 pg/L 4.31 pg/L 29.2 pg/L 83.9 pg/L 28.6 pg/L 37.4 pg/L 137 pg/L	10.3U pg/L 8.04U pg/L 19.1U pg/L 4.31U pg/L 29.2U pg/L 83.9U pg/L 28.6U pg/L 37.4U pg/L 137U pg/L
L54719-4	PCB-1 PCB-2 PCB-3 PCB-7 Total Monochlorobiphenyls	14.9 pg/L 11.2 pg/L 22.4 pg/L 6.59 pg/L 48.5 pg/L	14.9U pg/L 11.2U pg/L 22.4U pg/L 6.59U pg/L 48.5U pg/L

Sample	Compound	Reported Concentration	Modified Final Concentration
L54719-8	PCB-1 PCB-2 PCB-3 PCB-7 PCB-12/13 Total Monochlorobiphenyls	11.9 pg/L 8.79 pg/L 22.8 pg/L 5.61 pg/L 6.44 pg/L 43.5 pg/L	11.9U pg/L 8.79U pg/L 22.8U pg/L 5.61U pg/L 6.44U pg/L 43.5U pg/L
L54719-15	PCB-1 (5X) PCB-2 (5X) PCB-3 PCB-7 PCB-12/13 PCB-18 PCB-83/99 (5X) PCB-90/101/113 (5X) PCB-93/95/98/100/102 (5X) PCB-105 (5X) PCB-110/115 (5X) Total Monochlorobiphenyls Total Dichlorobiphenyls	7.63 pg/L 5.12 pg/L 13.2 pg/L 2.14 pg/L 3.88 pg/L 25.5 pg/L 51.4 pg/L 76.3 pg/L 72.0 pg/L 18.0 pg/L 75.5 pg/L 26.0 pg/L 123 pg/L	7.63U pg/L 5.12U pg/L 13.2U pg/L 2.14U pg/L 3.88U pg/L 25.5U pg/L 51.4U pg/L 76.3U pg/L 72.0U pg/L 18.0U pg/L 75.5U pg/L 26.0U pg/L 123U pg/L
L54845-1	PCB-1 (5X) PCB-2 (5X) PCB-3 PCB-7 PCB-8 (5X) PCB-11 PCB-18 (5X) PCB-20/28 PCB-21 PCB-31 PCB-44/47/65 PCB-52 PCB-61/70/74/76 PCB-64 PCB-66 Total Monochlorobiphenyls Total Dichlorobiphenyls Total Tetrachlorobiphenyls	8.16 pg/L 5.18 pg/L 16.7 pg/L 3.20 pg/L 26.1 pg/L 31.1 pg/L 17.6 pg/L 17.5 pg/L 11.6 pg/L 16.5 pg/L 18.7 pg/L 27.0 pg/L 32.6 pg/L 6.44 pg/L 11.2 pg/L 30.0 pg/L 68.5 pg/L 127 pg/L	8.16U pg/L 5.18U pg/L 16.7U pg/L 3.20U pg/L 26.1U pg/L 31.1U pg/L 17.6U pg/L 17.5U pg/L 11.6U pg/L 16.5U pg/L 18.7U pg/L 27.0U pg/L 32.6U pg/L 6.44U pg/L 11.2U pg/L 30.0U pg/L 68.5U pg/L 127U pg/L
L54845-5	PCB-1 PCB-2 PCB-3 PCB-7 PCB-8 (5X) PCB-11 PCB-15 PCB-18 (5X) Total Monochlorobiphenyls	11.1 pg/L 5.95 pg/L 18.2 pg/L 6.04 pg/L 36.2 pg/L 60.8 pg/L 23.6 pg/L 32.1 pg/L 35.3 pg/L	11.1U pg/L 5.95U pg/L 18.2U pg/L 6.04U pg/L 36.2U pg/L 60.8U pg/L 23.6U pg/L 32.1U pg/L 35.3U pg/L
L54980-7	PCB-1 PCB-2 PCB-3 PCB-7 PCB-11 PCB-12/13 Total Monochlorobiphenyls	12.0 pg/L 6.46 pg/L 17.6 pg/L 6.36 pg/L 73.5 pg/L 10.4 pg/L 36.1 pg/L	12.0U pg/L 6.46U pg/L 17.6U pg/L 6.36U pg/L 73.5U pg/L 10.4U pg/L 36.1U pg/L

Sample	Compound	Reported Concentration	Modified Final Concentration
L54980-14	PCB 1	5.99 pg/L	5.99U pg/L
	PCB 2	4.63 pg/L	4.63U pg/L
	PCB 3	15.1 pg/L	15.1U pg/L
	PCB 7	12.4 pg/L	12.4U pg/L
	PCB 8	11.4 pg/L	11.4U pg/L
	PCB 11	26.8 pg/L	26.8U pg/L
	PCB 15	10.0 pg/L	10.0U pg/L
	PCB 18	10.6 pg/L	10.6U pg/L
	PCB 20/28	11.4 pg/L	11.4U pg/L
	PCB 21	7.27 pg/L	7.27U pg/L
	PCB 31	9.37 pg/L	9.37U pg/L
	PCB 44/47/65	8.96 pg/L	8.96U pg/L
	PCB 52	11.5 pg/L	11.5U pg/L
	PCB 61/70/74/76	9.48 pg/L	9.48U pg/L
	PCB 64	2.95 pg/L	2.95U pg/L
	PCB 66	3.16 pg/L	3.16U pg/L
	PCB 83/99	4.84 pg/L	4.84U pg/L
	PCB 90/101/113	9.29 pg/L	9.29U pg/L
	PCB 93/95/98/100/102	12.9 pg/L	12.9U pg/L
	PCB 105	2.09 pg/L	2.09U pg/L
PCB 110/115	8.73 pg/L	8.73U pg/L	
Total Monochlorobiphenyls	25.7 pg/L	25.7U pg/L	
Total Dichlorobiphenyls	70.9 pg/L	70.9U pg/L	
Total Trichlorobiphenyls	58.7 pg/L	58.7U pg/L	
Total Tetrachlorobiphenyls	41.6 pg/L	41.6U pg/L	
Total Pentachlorobiphenyls	48.2 pg/L	48.2U pg/L	
Total Hexachlorobiphenyls	9.01 pg/L	9.01U pg/L	
L54980-14DUP	PCB 1	5.20 pg/L	5.20U pg/L
	PCB 2	4.76 pg/L	4.76U pg/L
	PCB 3	13.9 pg/L	13.9U pg/L
	PCB 8	11.4 pg/L	11.4U pg/L
	PCB 11	25.3 pg/L	25.3U pg/L
	PCB 15	9.94 pg/L	9.94U pg/L
	PCB 18	6.46 pg/L	6.46U pg/L
	PCB 20/28	9.84 pg/L	9.84U pg/L
	PCB 21	6.37 pg/L	6.37U pg/L
	PCB 31	8.65 pg/L	8.65U pg/L
	PCB 44/47/65	10.4 pg/L	10.4U pg/L
	PCB 52	14.1 pg/L	14.1U pg/L
	PCB 61/70/74/76	8.99 pg/L	8.99U pg/L
	PCB 64	2.49 pg/L	2.49U pg/L
	PCB 66	2.82 pg/L	2.82U pg/L
	PCB 90/101/113	7.30 pg/L	7.30U pg/L
	PCB 93/95/98/100/102	9.47 pg/L	9.47U pg/L
	PCB 105	2.03 pg/L	2.03U pg/L
	PCB 110/115	9.52 pg/L	9.52U pg/L
	Total Monochlorobiphenyls	23.9 pg/L	23.9U pg/L
Total Dichlorobiphenyls	54.8 pg/L	54.8U pg/L	
Total Trichlorobiphenyls	50.4 pg/L	50.4U pg/L	
Total Tetrachlorobiphenyls	52.1 pg/L	52.1U pg/L	
Total Pentachlorobiphenyls	43.9 pg/L	43.9U pg/L	
Total Hexachlorobiphenyls	13.1 pg/L	13.1U pg/L	
L55159-11	PCB-1	7.72 pg/L	7.72U pg/L
	PCB-2	6.56 pg/L	6.56U pg/L
	PCB-3	15.8 pg/L	15.8U pg/L
	PCB-7	6.43 pg/L	6.43U pg/L
	PCB-8 (5X)	27.6 pg/L	27.6U pg/L
	PCB-11	58.4 pg/L	58.4U pg/L
	PCB-15	18.1 pg/L	18.1U pg/L
	PCB-18 (5X)	22.9 pg/L	22.9U pg/L
	PCB-44/47/65	32.5 pg/L	32.5U pg/L
	Total Monochlorobiphenyls	30.1 pg/L	30.1U pg/L
Total Dichlorobiphenyls	128 pg/L	128U 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.

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
L54980-14DUP (L54980-14 L54980-14DUP)	PCB-49/69	52.4 (≤50)	PCB-49/69 Total Tetrachlorobiphenyls	J (all detects) J (all detects)	A

VII. Ongoing Precision & Recovery Samples (OPR)

Ongoing precision and recovery (OPR) control 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.

X. Target Compound Identifications

Raw data were not reviewed for this SDG.

XI. Compound Quantitation and RLs

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

Sample	Compound	Flag	A or P
All samples in SDG DPWG39652	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 Waterway
Polychlorinated Biphenyls as Congeners - Data Qualification Summary - SDG
DPWG39652**

SDG	Sample	Compound	Flag	A or P	Reason
DPWG39652	L54980-14 L54980-14DUP	PCB-49/69 Total Tetrachlorobiphenyls	J (all detects) J (all detects)	A	Duplicate sample analysis (RPD)
DPWG39652	L54542-1 L54542-12 L54719-4 L54719-8 L54719-15 L54845-1 L54845-5 L54980-7 L54980-14 L55159-11 L54980-14DUP	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A	Compound quantitation and RLs (EMPC)

**Lower Duwamish Waterway
Polychlorinated Biphenyls as Congeners - Laboratory Blank Data Qualification
Summary - SDG DPWG39652**

SDG	Sample	Compound	Modified Final Concentration	A or P
DPWG39652	L54542-1	PCB-1 PCB-2 PCB-3 PCB-7 PCB-8 (5X) PCB-11 (5X) PCB-18 (5X) PCB-44/47/65 Total Monochlorobiphenyls Total Dichlorobiphenyls	9.95U pg/L 6.61U pg/L 19.5U pg/L 6.65U pg/L 31.2U pg/L 51.2U pg/L 27.3U pg/L 35.1U pg/L 36.1U pg/L 113U pg/L	A
DPWG39652	L54542-12	PCB-1 PCB-2 PCB-3 PCB-7 PCB-8 (5X) PCB-11 (5X) PCB-18 (5X) Total Monochlorobiphenyls Total Dichlorobiphenyls	10.3U pg/L 8.04U pg/L 19.1U pg/L 4.31U pg/L 29.2U pg/L 83.9U pg/L 28.6U pg/L 37.4U pg/L 137U pg/L	A
DPWG39652	L54719-4	PCB-1 PCB-2 PCB-3 PCB-7 Total Monochlorobiphenyls	14.9U pg/L 11.2U pg/L 22.4U pg/L 6.59U pg/L 48.5U pg/L	A

SDG	Sample	Compound	Modified Final Concentration	A or P
DPWG39652	L54719-8	PCB-1 PCB-2 PCB-3 PCB-7 PCB-12/13 Total Monochlorobiphenyls	11.9U pg/L 8.79U pg/L 22.8U pg/L 5.61U pg/L 6.44U pg/L 43.5U pg/L	A
DPWG39652	L54719-15	PCB-1 (5X) PCB-2 (5X) PCB-3 PCB-7 PCB-12/13 PCB-18 PCB-83/99 (5X) PCB-90/101/113 (5X) PCB-93/95/98/100/102 (5X) PCB-105 (5X) PCB-110/115 (5X) Total Monochlorobiphenyls Total Dichlorobiphenyls	7.63U pg/L 5.12U pg/L 13.2U pg/L 2.14U pg/L 3.88U pg/L 25.5U pg/L 51.4U pg/L 76.3U pg/L 72.0U pg/L 18.0U pg/L 75.5U pg/L 26.0U pg/L 123U pg/L	A
DPWG39652	L54845-1	PCB-1 (5X) PCB-2 (5X) PCB-3 PCB-7 PCB-8 (5X) PCB-11 PCB-18 (5X) PCB-20/28 PCB-21 PCB-31 PCB-44/47/65 PCB-52 PCB-61/70/74/76 PCB-64 PCB-66 Total Monochlorobiphenyls Total Dichlorobiphenyls Total Tetrachlorobiphenyls	8.16U pg/L 5.18U pg/L 16.7U pg/L 3.20U pg/L 26.1U pg/L 31.1U pg/L 17.6U pg/L 17.5U pg/L 11.6U pg/L 16.5U pg/L 18.7U pg/L 27.0U pg/L 32.6U pg/L 6.44U pg/L 11.2U pg/L 30.0U pg/L 68.5U pg/L 127U pg/L	A
DPWG39652	L54845-5	PCB-1 PCB-2 PCB-3 PCB-7 PCB-8 (5X) PCB-11 PCB-15 PCB-18 (5X) Total Monochlorobiphenyls	11.1U pg/L 5.95U pg/L 18.2U pg/L 6.04U pg/L 36.2U pg/L 60.8U pg/L 23.6U pg/L 32.1U pg/L 35.3U pg/L	A
DPWG39652	L54980-7	PCB-1 PCB-2 PCB-3 PCB-7 PCB-11 PCB-12/13 Total Monochlorobiphenyls	12.0U pg/L 6.46U pg/L 17.6U pg/L 6.36U pg/L 73.5U pg/L 10.4U pg/L 36.1U pg/L	A

SDG	Sample	Compound	Modified Final Concentration	A or P
DPWG39652	L54980-14	PCB 1 PCB 2 PCB 3 PCB 7 PCB 8 PCB 11 PCB 15 PCB 18 PCB 20/28 PCB 21 PCB 31 PCB 44/47/65 PCB 52 PCB 61/70/74/76 PCB 64 PCB 66 PCB 83/99 PCB 90/101/113 PCB 93/95/98/100/102 PCB 105 PCB 110/115 Total Monochlorobiphenyls Total Dichlorobiphenyls Total Trichlorobiphenyls Total Tetrachlorobiphenyls Total Pentachlorobiphenyls Total Hexachlorobiphenyls	5.99U pg/L 4.63U pg/L 15.1U pg/L 12.4U pg/L 11.4U pg/L 26.8U pg/L 10.0U pg/L 10.6U pg/L 11.4U pg/L 7.27U pg/L 9.37U pg/L 8.96U pg/L 11.5U pg/L 9.48U pg/L 2.95U pg/L 3.16U pg/L 4.84U pg/L 9.29U pg/L 12.9U pg/L 2.09U pg/L 8.73U pg/L 25.7U pg/L 70.9U pg/L 58.7U pg/L 41.6U pg/L 48.2U pg/L 9.01U pg/L	A
DPWG39652	L54980-14DUP	PCB 1 PCB 2 PCB 3 PCB 8 PCB 11 PCB 15 PCB 18 PCB 20/28 PCB 21 PCB 31 PCB 44/47/65 PCB 52 PCB 61/70/74/76 PCB 64 PCB 66 PCB 90/101/113 PCB 93/95/98/100/102 PCB 105 PCB 110/115 Total Monochlorobiphenyls Total Dichlorobiphenyls Total Trichlorobiphenyls Total Tetrachlorobiphenyls Total Pentachlorobiphenyls Total Hexachlorobiphenyls	5.20U pg/L 4.76U pg/L 13.9U pg/L 11.4U pg/L 25.3U pg/L 9.94U pg/L 6.46U pg/L 9.84U pg/L 6.37U pg/L 8.65U pg/L 10.4U pg/L 14.1U pg/L 8.99U pg/L 2.49U pg/L 2.82U pg/L 7.30U pg/L 9.47U pg/L 2.03U pg/L 9.52U pg/L 23.9U pg/L 54.8U pg/L 50.4U pg/L 52.1U pg/L 43.9U pg/L 13.1U pg/L	A
DPWG39652	L55159-11	PCB-1 PCB-2 PCB-3 PCB-7 PCB-8 (5X) PCB-11 PCB-15 PCB-18 (5X) PCB-44/47/65 Total Monochlorobiphenyls Total Dichlorobiphenyls	7.72U pg/L 6.56U pg/L 15.8U pg/L 6.43U pg/L 27.6U pg/L 58.4U pg/L 18.1U pg/L 22.9U pg/L 32.5U pg/L 30.1U pg/L 128U pg/L	A

METHOD: HRGC/HRMS Polychlorinated Biphenyl 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: <i>11/16/11 - 3/6/12</i>
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	A	<i>20/1</i>
IV.	Routine calibration IX	A	<i>20/20/10</i>
V.	Blanks	<i>W</i>	
VI.	Matrix spike/Matrix spike duplicates <i>/DUP</i>	<i>N/SW</i>	<i>CS</i>
VII.	Laboratory control samples	A	<i>OTR</i>
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	A	
X.	Target compound identifications	N	
XI.	Compound quantitation RL/LOQ/LODs	<i>SW</i>	
XII.	System performance	N	
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	<i>N</i>	
XV.	Field blanks	<i>N</i>	

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:

M+D

1	L54542-1	11	L54980-14DUP	21	<i>WF 393(3-10)</i>	31	
2	L54542-12	12		22		32	
3	L54719-4	13		23		33	
4	L54719-8	14		24		34	
5	L54719-15	15		25		35	
6	L54845-1	16		26		36	
7	L54845-5	17		27		37	
8	L54980-7	18		28		38	
9	L54980-14	19		29		39	
10	L55159-11	20		30		40	

VALIDATION FINDINGS WORKSHEET

Blanks

Reviewer: [Signature]
2nd Reviewer: [Signature]

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

Blank extraction date: 3/9/12

Blank analysis date: 3/23/12

Conc. units: pg/L

Associated samples: All Qual U

Compound	Blank ID	Sample Identification											
		5X	1	2	3	4	5	6	7	8	9	11	10
	WG39373-101												
PCB 1	4.19	20.95	9.95	10.3	14.9	11.9	7.63 (5X)	8.16 (5X)	11.1	12.0	5.99	5.20	7.72
PCB 2	3.56	17.8	6.61	8.04	11.2	8.79	5.12 (5X)	5.18 (5X)	5.95	6.46	4.63	4.76	6.56
PCB 3	9.88	49.4	19.5	19.1	22.4	22.8	13.2	16.7	18.2	17.6	15.1	13.9	15.8
PCB 7	3.37	16.85	6.65	4.31	6.59	5.61	2.14	3.20	6.04	6.36	12.4		6.43
PCB 8	2.48	12.4	31.2 (5X)	29.2 (5X)				26.1 (5X)	36.2 (5X)		11.4	11.4	27.6 (5X)
PCB 11	15.2	76	51.2 (5X)	83.9 (5X)				31.1	60.8	73.5	26.8	25.3	58.4
PCB 12/13	3.01	15.05				6.44	3.88			10.4			
PCB 15	5.23	26.15							23.6		10.0	9.94	18.1
PCB 18	2.55	12.75	27.3 (5X)	28.6 (5X)			25.5 (5X)	17.6 (5X)	32.1 (5X)		10.6	6.46	22.9 (5X)
PCB 20/28	5.74	28.7						17.5			11.4	9.84	
PCB 21	2.56	12.8						11.6			7.27	6.37	
PCB 31	4.73	23.65						16.5			9.37	8.65	
PCB 44/47/65	8.01	40.05	35.1					18.7			8.96	10.4	32.5
PCB 52	6.47	32.35						27.0			11.5	14.1	
PCB 61/70/74/76	7.07	35.35						32.6			9.48	8.99	
PCB 64	1.57	7.85						6.44			2.95	2.49	
PCB 66	2.33	11.65						11.2			3.16	2.82	
PCB 83/99	2.39	11.95					51.4 (5X)				4.84		
PCB 90/101/113	4.70	23.5					76.3 (5X)				9.29	7.30	
PCB 93/95/98/100/102	3.94	19.7					72.0 (5X)				12.9	9.47	
PCB 105	1.62	8.1					18.0 (5X)				2.09	2.03	
PCB 110/115	3.83	19.15					75.5 (5X)				8.73	9.52	
PCB 135/151/154	2.22	11.1											

Compound	Blank ID	Sample Identification											
		5X	1	2	3	4	5	6	7	8	9	11	10
	WG39373-101												
Total Monochlorobiphenyls	17.6	88	36.1	37.4	48.5	43.5	26.0	30.0	35.3	36.1	25.7	23.9	30.1
Total Dichlorobiphenyls	29.3	146.5	113	137			123	68.5			70.9	54.8	128
Total Trichlorobiphenyls	15.6	78									58.7	50.4	
Total Tetrachlorobiphenyls	25.5	127.5						127			41.6	52.1	
Total Pentachlorobiphenyls	16.5	82.5									48.2	43.9	
Total Hexachlorobiphenyls	2.22	11.1									9.01	13.1	
Total PCBs	107	535									257	238	✓

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

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".



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

February 12, 2013

SUBJECT: Lower Duwamish Waterway, Data Validation

Dear Mr. Grothkopp,

Enclosed are the final validation reports for the fractions listed below. These SDGs were received on January 28, 2013. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 29144:

SDG #

Fraction

DPWG41502	DPWG42207	Polychlorinated Biphenyls as Congeners,
DPWG42280	DPWG41395	Dioxins/Dibenzofurans
DPWG41240		

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 in King County Combined Sewer System Sampling and Analysis Plan, Final August 2011
- EPA Region 10 SOP for the Validation of Polychlorinated Dibenzodioxin (PCDD) and Polychlorinated Dibenzofuran (PCDF) Data, Revision 2.0, January 31, 1996

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 Waterway
Collection Date: March 15 through July 19, 2012
LDC Report Date: February 11, 2013
Matrix: Water
Parameters: Polychlorinated Biphenyls as Congeners
Validation Level: EPA Level III
Laboratory: AXYS Analytical Services, Ltd.
Sample Delivery Group (SDG): DPWG41502

Sample Identification

L55316-1
L55316-8
L55530-1
L55530-5
L55530-6
L55530-7
L55793-13
L55963-11
L55963-17
L55963-21
L56076-1
L56076-5
L56076-9
L56076-13
L56076-17
L56076-9DUP

Introduction

This data review covers 16 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 Lower Duwamish Waterway Bulk Atmospheric Deposition Study Sampling and Analysis Plan in King County Combined Sewer System Sampling and Analysis Plan (Final August 2011) 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. Cooler temperatures for samples in this SDG were reported at 5.2°C to 7.2°C upon receipt by the laboratory.

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 criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration percent differences (%D) between the initial calibration RRF and the routine 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 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
WG41271-MB	9/17/12	PCB-1 PCB-2 PCB-3 PCB-11 PCB-26 + 29 PCB-44 + 47 + 65 PCB-61 + 70 + 74 + 76 PCB-64 PCB-66 PCB-85 + 116 + 117 PCB-86 + 87 + 97 + 108 + 119 + 125 PCB-90 + 101 + 113 PCB-93 + 95 + 98 + 100 + 102 PCB-118 PCB-129 + 138 + 160 + 163	5.37 pg/L 4.05 pg/L 5.81 pg/L 14.3 pg/L 1.92 pg/L 9.81 pg/L 9.57 pg/L 1.75 pg/L 5.63 pg/L 2.45 pg/L 6.03 pg/L 8.31 pg/L 6.10 pg/L 8.65 pg/L 6.12 pg/L	All samples in SDG DPWG41502

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
L55316-1	PCB-1 PCB-2 PCB-3 PCB-11 PCB-26 + 29 PCB-44 + 47 + 65 PCB-61 + 70 + 74 + 76 PCB-64 PCB-90 + 101 + 113 PCB-93 + 95 + 98 + 100 + 102 PCB-118	13.0 pg/L 10.8 pg/L 13.0 pg/L 33.1 pg/L 4.66 pg/L 22.9 pg/L 26.7 pg/L 7.71 pg/L 29.5 pg/L 21.2 pg/L 24.3 pg/L	13.0U pg/L 10.8U pg/L 13.0U pg/L 33.1U pg/L 4.66U pg/L 22.9U pg/L 26.7U pg/L 7.71U pg/L 29.5U pg/L 21.2U pg/L 24.3U pg/L
L55316-8	PCB-1 PCB-2 PCB-3 PCB-11 PCB-26 + 29 PCB-44 + 47 + 65 PCB-66 PCB-85 + 116 + 117	10.3 pg/L 9.73 pg/L 11.3 pg/L 28.0 pg/L 4.12 pg/L 24.7 pg/L 19.0 pg/L 9.71 pg/L	10.3U pg/L 9.73U pg/L 11.3U pg/L 28.0U pg/L 4.12U pg/L 24.7U pg/L 19.0U pg/L 9.71U pg/L
L55530-1	PCB-1 PCB-3 PCB-11 PCB-44 + 47 + 65 PCB-61 + 70 + 74 + 76 PCB-64 PCB-66	10.7 pg/L 12.2 pg/L 30.2 pg/L 28.7 pg/L 43.4 pg/L 8.15 pg/L 14.0 pg/L	10.7U pg/L 12.2U pg/L 30.2U pg/L 28.7U pg/L 43.4U pg/L 8.15U pg/L 14.0U pg/L

Sample	Compound	Reported Concentration	Modified Final Concentration
L55530-5	PCB-1 PCB-2 PCB-3 PCB-11 PCB-26 + 29 PCB-61 + 70 + 74 + 76 PCB-66 PCB-85 + 116 + 117 PCB-118	11.1 pg/L 9.50 pg/L 11.3 pg/L 51.9 pg/L 7.72 pg/L 43.0 pg/L 16.0 pg/L 8.51 pg/L 38.4 pg/L	11.1U pg/L 9.50U pg/L 11.3U pg/L 51.9U pg/L 7.72U pg/L 43.0U pg/L 16.0U pg/L 8.51U pg/L 38.4U pg/L
L55530-6	PCB-1 PCB-2 PCB-3 PCB-11 PCB-44 + 47 + 65 PCB-61 + 70 + 74 + 76 PCB-66	11.6 pg/L 9.71 pg/L 12.2 pg/L 45.5 pg/L 24.4 pg/L 43.2 pg/L 15.0 pg/L	11.6U pg/L 9.71U pg/L 12.2U pg/L 45.5U pg/L 24.4U pg/L 43.2U pg/L 15.0U pg/L
L55530-7	PCB-2 PCB-11 PCB-26 + 29 PCB-44 + 47 + 65 PCB-61 + 70 + 74 + 76 PCB-64 PCB-66 PCB-85 + 116 + 117 PCB-90 + 101 + 113 PCB-93 + 95 + 98 + 100 + 102 PCB-118 PCB-129 + 138 + 160 + 163	10.2 pg/L 18.7 pg/L 1.93 pg/L 8.80 pg/L 7.57 pg/L 1.41 pg/L 3.29 pg/L 1.31 pg/L 7.94 pg/L 7.04 pg/L 2.37 pg/L 7.67 pg/L	10.2U pg/L 18.7U pg/L 1.93U pg/L 8.80U pg/L 7.57U pg/L 1.41U pg/L 3.29U pg/L 1.31U pg/L 7.94U pg/L 7.04U pg/L 2.37U pg/L 7.67U pg/L
L55793-13	PCB-1 PCB-2 PCB-3 PCB-11 PCB-44 + 47 + 65 PCB-61 + 70 + 74 + 76 PCB-64 PCB-86 + 87 + 97 + 108 + 119 + 125 PCB-90 + 101 + 113 PCB-93 + 95 + 98 + 100 + 102 PCB-118 PCB-129 + 138 + 160 + 163	10.5 pg/L 8.38 pg/L 12.6 pg/L 16.9 pg/L 12.3 pg/L 27.4 pg/L 3.09 pg/L 18.0 pg/L 27.2 pg/L 13.2 pg/L 22.7 pg/L 17.3 pg/L	10.5U pg/L 8.38U pg/L 12.6U pg/L 16.9U pg/L 12.3U pg/L 27.4U pg/L 3.09U pg/L 18.0U pg/L 27.2U pg/L 13.2U pg/L 22.7U pg/L 17.3U pg/L
L55963-11	PCB-1 PCB-3 PCB-26 + 29 PCB-44 + 47 + 65 PCB-66	25.0 pg/L 27.4 pg/L 7.75 pg/L 42.8 pg/L 22.5 pg/L	25.0U pg/L 27.4U pg/L 7.75U pg/L 42.8U pg/L 22.5U pg/L
L55963-17	PCB-1 PCB-66	23.6 pg/L 24.9 pg/L	23.6U pg/L 24.9U pg/L

Sample	Compound	Reported Concentration	Modified Final Concentration
L55963-21	PCB-2 PCB-3 PCB-11 PCB-44 + 47 + 65 PCB-61 + 70 + 74 + 76 PCB-64 PCB-66 PCB-86 + 87 + 97 + 108 + 119 + 125 PCB-90 + 101 + 113 PCB-93 + 95 + 98 + 100 + 102 PCB-118 PCB-129 + 138 + 160 + 163	9.63 pg/L 13.6 pg/L 28.5 pg/L 19.3 pg/L 21.5 pg/L 4.85 pg/L 6.83 pg/L 15.4 pg/L 22.1 pg/L 23.0 pg/L 16.3 pg/L 22.3 pg/L	9.63U pg/L 13.6U pg/L 28.5U pg/L 19.3U pg/L 21.5U pg/L 4.85U pg/L 6.83U pg/L 15.4U pg/L 22.1U pg/L 23.0U pg/L 16.3U pg/L 22.3U pg/L
L56076-1	PCB-1 PCB-2 PCB-3 PCB-11 PCB-44 + 47 + 65 PCB-66	12.7 pg/L 8.87 pg/L 12.6 pg/L 49.2 pg/L 38.2 pg/L 27.0 pg/L	12.7U pg/L 8.87U pg/L 12.6U pg/L 49.2U pg/L 38.2U pg/L 27.0U pg/L
L56076-5	PCB-1 PCB-2 PCB-3 PCB-11	102 pg/L 9.70 pg/L 16.6 pg/L 53.2 pg/L	102U pg/L 9.70U pg/L 16.6U pg/L 53.2U pg/L
L56076-9	PCB-1 PCB-2 PCB-3 PCB-11 PCB-26 + 29 PCB-44 + 47 + 65 PCB-61 + 70 + 74 + 76 PCB-66 PCB-86 + 87 + 97 + 108 + 119 + 125 PCB-90 + 101 + 113 PCB-93 + 95 + 98 + 100 + 102 PCB-118 PCB-129 + 138 + 160 + 163	11.3 pg/L 10.2 pg/L 12.2 pg/L 30.4 pg/L 2.41 pg/L 8.24 pg/L 15.3 pg/L 5.51 pg/L 14.8 pg/L 21.5 pg/L 14.3 pg/L 18.1 pg/L 28.3 pg/L	11.3U pg/L 10.2U pg/L 12.2U pg/L 30.4U pg/L 2.41U pg/L 8.24U pg/L 15.3U pg/L 5.51U pg/L 14.8U pg/L 21.5U pg/L 14.3U pg/L 18.1U pg/L 28.3U pg/L
L56076-13	PCB-1 PCB-2 PCB-3 PCB-11 PCB-26 + 29 PCB-44 + 47 + 65 PCB-61 + 70 + 74 + 76 PCB-66 PCB-86 + 87 + 97 + 108 + 119 + 125 PCB-90 + 101 + 113 PCB-93 + 95 + 98 + 100 + 102 PCB-118	9.76 pg/L 7.55 pg/L 14.6 pg/L 42.4 pg/L 4.22 pg/L 17.4 pg/L 26.2 pg/L 10.6 pg/L 25.5 pg/L 33.3 pg/L 27.3 pg/L 26.3 pg/L	9.76U pg/L 7.55U pg/L 14.6U pg/L 42.4U pg/L 4.22U pg/L 17.4U pg/L 26.2U pg/L 10.6U pg/L 25.5U pg/L 33.3U pg/L 27.3U pg/L 26.3U pg/L

Sample	Compound	Reported Concentration	Modified Final Concentration
L56076-17	PCB-1	9.92 pg/L	9.92U pg/L
	PCB-2	8.13 pg/L	8.13U pg/L
	PCB-3	12.3 pg/L	12.3U pg/L
	PCB-11	25.3 pg/L	25.3U pg/L
	PCB-44 + 47 + 65	14.4 pg/L	14.4U pg/L
	PCB-61 + 70 + 74 + 76	14.5 pg/L	14.5U pg/L
	PCB-64	3.14 pg/L	3.14U pg/L
	PCB-66	4.57 pg/L	4.57U pg/L
	PCB-85 + 116 + 117	3.72 pg/L	3.72U pg/L
	PCB-86 + 87 + 97 + 108 + 119 + 125	15.9 pg/L	15.9U pg/L
	PCB-90 + 101 + 113	20.9 pg/L	20.9U pg/L
	PCB-118	13.9 pg/L	13.9U pg/L
	PCB-129 + 138 + 160 + 163	15.6 pg/L	15.6U 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.

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) control 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.

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 DPWG41502	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 Waterway
Polychlorinated Biphenyls as Congeners - Data Qualification Summary - SDG
DPWG41502**

SDG	Sample	Compound	Flag	A or P	Reason
DPWG41502	L55316-1 L55316-8 L55530-1 L55530-5 L55530-6 L55530-7 L55793-13 L55963-11 L55963-17 L55963-21 L56076-1 L56076-5 L56076-9 L56076-13 L56076-17	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A	Compound quantitation (EMPC)

**Lower Duwamish Waterway
Polychlorinated Biphenyls as Congeners - Laboratory Blank Data Qualification
Summary - SDG DPWG41502**

SDG	Sample	Compound	Modified Final Concentration	A or P
DPWG41502	L55316-1	PCB-1 PCB-2 PCB-3 PCB-11 PCB-26 + 29 PCB-44 + 47 + 65 PCB-61 + 70 + 74 + 76 PCB-64 PCB-90 + 101 + 113 PCB-93 + 95 + 98 + 100 + 102 PCB-118	13.0U pg/L 10.8U pg/L 13.0U pg/L 33.1U pg/L 4.66U pg/L 22.9U pg/L 26.7U pg/L 7.71U pg/L 29.5U pg/L 21.2U pg/L 24.3U pg/L	A
DPWG41502	L55316-8	PCB-1 PCB-2 PCB-3 PCB-11 PCB-26 + 29 PCB-44 + 47 + 65 PCB-66 PCB-85 + 116 + 117	10.3U pg/L 9.73U pg/L 11.3U pg/L 28.0U pg/L 4.12U pg/L 24.7U pg/L 19.0U pg/L 9.71U pg/L	A
DPWG41502	L55530-1	PCB-1 PCB-3 PCB-11 PCB-44 + 47 + 65 PCB-61 + 70 + 74 + 76 PCB-64 PCB-66	10.7U pg/L 12.2U pg/L 30.2U pg/L 28.7U pg/L 43.4U pg/L 8.15U pg/L 14.0U pg/L	A

SDG	Sample	Compound	Modified Final Concentration	A or P
DPWG41502	L55530-5	PCB-1 PCB-2 PCB-3 PCB-11 PCB-26 + 29 PCB-61 + 70 + 74 + 76 PCB-66 PCB-85 + 116 + 117 PCB-118	11.1U pg/L 9.50U pg/L 11.3U pg/L 51.9U pg/L 7.72U pg/L 43.0U pg/L 16.0U pg/L 8.51U pg/L 38.4U pg/L	A
DPWG41502	L55530-6	PCB-1 PCB-2 PCB-3 PCB-11 PCB-44 + 47 + 65 PCB-61 + 70 + 74 + 76 PCB-66	11.6U pg/L 9.71U pg/L 12.2U pg/L 45.5U pg/L 24.4U pg/L 43.2U pg/L 15.0U pg/L	A
DPWG41502	L55530-7	PCB-2 PCB-11 PCB-26 + 29 PCB-44 + 47 + 65 PCB-61 + 70 + 74 + 76 PCB-64 PCB-66 PCB-85 + 116 + 117 PCB-90 + 101 + 113 PCB-93 + 95 + 98 + 100 + 102 PCB-118 PCB-129 + 138 + 160 + 163	10.2U pg/L 18.7U pg/L 1.93U pg/L 8.80U pg/L 7.57U pg/L 1.41U pg/L 3.29U pg/L 1.31U pg/L 7.94U pg/L 7.04U pg/L 2.37U pg/L 7.67U pg/L	A
DPWG41502	L55793-13	PCB-1 PCB-2 PCB-3 PCB-11 PCB-44 + 47 + 65 PCB-61 + 70 + 74 + 76 PCB-64 PCB-86 + 87 + 97 + 108 + 119 + 125 PCB-90 + 101 + 113 PCB-93 + 95 + 98 + 100 + 102 PCB-118 PCB-129 + 138 + 160 + 163	10.5U pg/L 8.38U pg/L 12.6U pg/L 16.9U pg/L 12.3U pg/L 27.4U pg/L 3.09U pg/L 18.0U pg/L 27.2U pg/L 13.2U pg/L 22.7U pg/L 17.3U pg/L	A
DPWG41502	L55963-11	PCB-1 PCB-3 PCB-26 + 29 PCB-44 + 47 + 65 PCB-66	25.0U pg/L 27.4U pg/L 7.75U pg/L 42.8U pg/L 22.5U pg/L	A
DPWG41502	L55963-17	PCB-1 PCB-66	23.6U pg/L 24.9U pg/L	A

SDG	Sample	Compound	Modified Final Concentration	A or P
DPWG41502	L55963-21	PCB-2 PCB-3 PCB-11 PCB-44 + 47 + 65 PCB-61 + 70 + 74 + 76 PCB-64 PCB-66 PCB-86 + 87 + 97 + 108 + 119 + 125 PCB-90 + 101 + 113 PCB-93 + 95 + 98 + 100 + 102 PCB-118 PCB-129 + 138 + 160 + 163	9.63U pg/L 13.6U pg/L 28.5U pg/L 19.3U pg/L 21.5U pg/L 4.85U pg/L 6.83U pg/L 15.4U pg/L 22.1U pg/L 23.0U pg/L 16.3U pg/L 22.3U pg/L	A
DPWG41502	L56076-1	PCB-1 PCB-2 PCB-3 PCB-11 PCB-44 + 47 + 65 PCB-66	12.7U pg/L 8.87U pg/L 12.6U pg/L 49.2U pg/L 38.2U pg/L 27.0U pg/L	A
DPWG41502	L56076-5	PCB-1 PCB-2 PCB-3 PCB-11	102U pg/L 9.70U pg/L 16.6U pg/L 53.2U pg/L	A
DPWG41502	L56076-9	PCB-1 PCB-2 PCB-3 PCB-11 PCB-26 + 29 PCB-44 + 47 + 65 PCB-61 + 70 + 74 + 76 PCB-66 PCB-86 + 87 + 97 + 108 + 119 + 125 PCB-90 + 101 + 113 PCB-93 + 95 + 98 + 100 + 102 PCB-118 PCB-129 + 138 + 160 + 163	11.3U pg/L 10.2U pg/L 12.2U pg/L 30.4U pg/L 2.41U pg/L 8.24U pg/L 15.3U pg/L 5.51U pg/L 14.8U pg/L 21.5U pg/L 14.3U pg/L 18.1U pg/L 28.3U pg/L	A
DPWG41502	L56076-13	PCB-1 PCB-2 PCB-3 PCB-11 PCB-26 + 29 PCB-44 + 47 + 65 PCB-61 + 70 + 74 + 76 PCB-66 PCB-86 + 87 + 97 + 108 + 119 + 125 PCB-90 + 101 + 113 PCB-93 + 95 + 98 + 100 + 102 PCB-118	9.76U pg/L 7.55U pg/L 14.6U pg/L 42.4U pg/L 4.22U pg/L 17.4U pg/L 26.2U pg/L 10.6U pg/L 25.5U pg/L 33.3U pg/L 27.3U pg/L 26.3U pg/L	A

SDG	Sample	Compound	Modified Final Concentration	A or P
DPWG41502	L56076-17	PCB-1 PCB-2 PCB-3 PCB-11 PCB-44 + 47 + 65 PCB-61 + 70 + 74 + 76 PCB-64 PCB-66 PCB-85 + 116 + 117 PCB-86 + 87 + 97 + 108 + 119 + 125 PCB-90 + 101 + 113 PCB-118 PCB-129 + 138 + 160 + 163	9.92U pg/L 8.13U pg/L 12.3U pg/L 25.3U pg/L 14.4U pg/L 14.5U pg/L 3.14U pg/L 4.57U pg/L 3.72U pg/L 15.9U pg/L 20.9U pg/L 13.9U pg/L 15.6U pg/L	A

METHOD: HRGC/HRMS Polychlorinated Biphenyl 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.

cooling temp 5.2 - 7.2°C

	Validation Area		Comments
I.	Technical holding times	Δ	Sampling dates: 3/15 - 7/19/12
II.	GC/MS Instrument performance check	Δ	
III.	Initial calibration	Δ	% P&D = 20
IV.	Routine calibration/IGV	A	CV = 30/50
V.	Blanks	SW	
VI.	Matrix spike/Matrix spike duplicates /DUP	N/A	client specified
VII.	Laboratory control samples	A	OPR
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	Δ	
X.	Target compound identifications	N	
XI.	Compound quantitation RL/LOQ/LODs	SW	
XII.	System performance	N	
XIII.	Overall assessment of data	Δ	
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:

W&E

1	L55316-1	11	L56076-1	21	WG 41271 - MP3	31	
2	L55316-8	12	L56076-5	22		32	
3	L55530-1	13	L56076-9	23		33	
4	L55530-5	14	L56076-13	24		34	
5	L55530-6	15	L56076-17	25		35	
6	L55530-7	16	L56076-9DUP	26		36	
7	L55793-13	17		27		37	
8	L55963-11	18		28		38	
9	L55963-17	19		29		39	
10	L55963-21	20		30		40	

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".

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: 9/17/12 Blank analysis date: 9/25/12Associated samples: ALLConc. units: pg/L

Compound	Blank ID	Sample Identification								
		5X	1	2	3	4	5	6	7	8
	WG41271-MB									
PCB-1	5.37	26.85	13.0U	10.3U	10.7U	11.1U	11.6U		10.5U	25.0U
PCB-2	4.05	20.25	10.8U	9.73U		9.50U	9.71U	10.2U	8.38U	
PCB-3	5.81	29.05	13.0U	11.3U	12.2U	11.3U	12.2U		12.6U	27.4U
PCB-11	14.3	71.5	33.1U	28.0U	30.2U	51.9U	45.5U	18.7U	16.9U	
PCB-26 + 29	1.92	9.6	4.66U	4.12U		7.72U		1.93U		7.75U
PCB-44 + 47 + 65	9.81	49.05	22.9U	24.7U	28.7U		24.4U	8.80U	12.3U	42.8U
PCB-61 + 70 + 74 + 76	9.57	47.85	26.7U		43.4U	43.0U	43.2U	7.57U	27.4U	
PCB-64	1.75	8.75	7.71U		8.15U			1.41U	3.09U	
PCB-66	5.63	28.15		19.0U	14.0U	16.0U	15.0U	3.29U		22.5U
PCB-85 + 116 + 117	2.45	12.25		9.71U		8.51U		1.31U		
PCB-86 + 87 + 97 + 108 + 119 + 125	6.03	30.15							18.0U	
PCB-90 + 101 + 113	8.31	41.55	29.5U					7.94U	27.2U	
PCB-93 + 95 + 98 + 100 + 102	6.10	30.5	21.2U					7.04U	13.2U	
PCB-118	8.65	43.25	24.3U			38.4U		2.37U	22.7U	
PCB-129 + 138 + 160 + 163	6.12	30.6						7.67U	17.3U	

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".

Blanks**METHOD:** HRGC/HRMS PCBV 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? 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: 9/17/12 Blank analysis date: 9/25/12

Associated samples: ALL

Conc. units: pg/L

Compound	Blank ID	Sample Identification								
		5X	9	10	11	12	13	14	15	
	WG41271-MB									
PCB-1	5.37	26.85	23.6U		12.7U	102U	11.3U	9.76U	9.92U	
PCB-2	4.05	20.25		9.63U	8.87U	9.70U	10.2U	7.55U	8.13U	
PCB-3	5.81	29.05		13.6U	12.6U	16.6U	12.2U	14.6U	12.3U	
PCB-11	14.3	71.5		28.5U	49.2U	53.2U	30.4U	42.4U	25.3U	
PCB-26 + 29	1.92	9.6					2.41U	4.22U		
PCB-44 + 47 + 65	9.81	49.05		19.3U	38.2U		8.24U	17.4U	14.4U	
PCB-61 + 70 + 74 + 76	9.57	47.85		21.5U			15.3U	26.2U	14.5U	
PCB-64	1.75	8.75		4.85U					3.14U	
PCB-66	5.63	28.15	24.9U	6.83U	27.0U		5.51U	10.6U	4.57U	
PCB-85 + 116 + 117	2.45	12.25							3.72U	
PCB-86 + 87 + 97 + 108 + 119 + 125	6.03	30.15		15.4U			14.8U	25.5U	15.9U	
PCB-90 + 101 + 113	8.31	41.55		22.1U			21.5U	33.3U	20.9U	
PCB-93 + 95 + 98 + 100 + 102	6.10	30.5		23.0U			14.3U	27.3U		
PCB-118	8.65	43.25		16.3U			18.1U	26.3U	13.9U	
PCB-129 + 138 + 160 + 163	6.12	30.6		22.3U			28.3U		15.6U	

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 Waterway
Collection Date: August 16 through October 24, 2012
LDC Report Date: February 11, 2013
Matrix: Water
Parameters: Polychlorinated Biphenyls as Congeners
Validation Level: EPA Level III
Laboratory: AXYS Analytical Services, Ltd.
Sample Delivery Group (SDG): DPWG42207

Sample Identification

L56171-5
L56171-9
L56171-13
L56171-17
L56292-1
L56292-5
L56292-9
L56292-15
L56292-19
L56386-1
L56386-5
L56386-9
L56620-1
L56620-5
L56620-5DUP

Introduction

This data review covers 15 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 Lower Duwamish Waterway Bulk Atmospheric Deposition Study Sampling and Analysis Plan in King County Combined Sewer System Sampling and Analysis Plan (Final August 2011) 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. Cooler temperatures for samples in this SDG were reported at 3.1°C to 10.5°C upon receipt by the laboratory.

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 criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration percent differences (%D) between the initial calibration RRF and the routine 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 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
WG41911-MB	11/13/12	PCB-11 PCB-16 PCB-18 + 30 PCB-20 + 28 PCB-21 + 33 PCB-22 PCB-31 PCB-37 PCB-44 + 47 + 65 PCB-45 + 51 PCB-52 PCB-56 PCB-60 PCB-61 + 70 + 74 + 76 PCB-64 PCB-66 PCB-86 + 87 + 97 + 108 + 119 + 125 PCB-147 + 149 PCB -180 + 193	29.6 pg/L 3.63 pg/L 8.32 pg/L 13.0 pg/L 8.08 pg/L 5.27 pg/L 10.5 pg/L 3.60 pg/L 10.3 pg/L 2.61 pg/L 9.51 pg/L 2.82 pg/L 1.80 pg/L 13.1 pg/L 2.86 pg/L 5.67 pg/L 7.00 pg/L 7.58 pg/L 3.03 pg/L	All samples in SDG DPWG42207

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
L56620-1	PCB-11 PCB-18 + 30 PCB-20 + 28 PCB-21 + 33 PCB-22 PCB-31 PCB-37 PCB-52 PCB-56 PCB-60 PCB-61 + 70 + 74 + 76 PCB-64 PCB-66	84.9 pg/L 34.8 pg/L 39.5 pg/L 24.3 pg/L 16.4 pg/L 33.4 pg/L 10.4 pg/L 36.7 pg/L 11.5 pg/L 5.52 pg/L 53.0 pg/L 10.3 pg/L 19.7 pg/L	84.9U pg/L 34.8U pg/L 39.5U pg/L 24.3U pg/L 16.4U pg/L 33.4U pg/L 10.4U pg/L 36.7U pg/L 11.5U pg/L 5.52U pg/L 53.0U pg/L 10.3U pg/L 19.7U pg/L
L56620-5	PCB-11 PCB-16 PCB-18 + 30 PCB-20 + 28 PCB-21 + 33 PCB-22 PCB-31 PCB-37 PCB-52 PCB-56 PCB-60 PCB-61 + 70 + 74 + 76 PCB-64 PCB-66 PCB-147 + 149	50.0 pg/L 12.8 pg/L 28.5 pg/L 23.2 pg/L 15.6 pg/L 11.2 pg/L 20.4 pg/L 5.75 pg/L 21.9 pg/L 4.98 pg/L 3.10 pg/L 25.1 pg/L 6.97 pg/L 11.4 pg/L 23.1 pg/L	50.0U pg/L 12.8U pg/L 28.5U pg/L 23.2U pg/L 15.6U pg/L 11.2U pg/L 20.4U pg/L 5.75U pg/L 21.9U pg/L 4.98U pg/L 3.10U pg/L 25.1U pg/L 6.97U pg/L 11.4U pg/L 23.1U 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.

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) control 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.

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 DPWG42207	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 Waterway
Polychlorinated Biphenyls as Congeners - Data Qualification Summary - SDG
DPWG42207**

SDG	Sample	Compound	Flag	A or P	Reason
DPWG42207	L56171-5 L56171-9 L56171-13 L56171-17 L56292-1 L56292-5 L56292-9 L56292-15 L56292-19 L56386-1 L56386-5 L56386-9 L56620-1 L56620-5	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A	Compound quantitation (EMPC)

**Lower Duwamish Waterway
Polychlorinated Biphenyls as Congeners - Laboratory Blank Data Qualification
Summary - SDG DPWG42207**

SDG	Sample	Compound	Modified Final Concentration	A or P
DPWG42207	L56620-1	PCB-11 PCB-18 + 30 PCB-20 + 28 PCB-21 + 33 PCB-22 PCB-31 PCB-37 PCB-52 PCB-56 PCB-60 PCB-61 + 70 + 74 + 76 PCB-64 PCB-66	84.9U pg/L 34.8U pg/L 39.5U pg/L 24.3U pg/L 16.4U pg/L 33.4U pg/L 10.4U pg/L 36.7U pg/L 11.5U pg/L 5.52U pg/L 53.0U pg/L 10.3U pg/L 19.7U pg/L	A
DPWG42207	L56620-5	PCB-11 PCB-16 PCB-18 + 30 PCB-20 + 28 PCB-21 + 33 PCB-22 PCB-31 PCB-37 PCB-52 PCB-56 PCB-60 PCB-61 + 70 + 74 + 76 PCB-64 PCB-66 PCB-147 + 149	50.0U pg/L 12.8U pg/L 28.5U pg/L 23.2U pg/L 15.6U pg/L 11.2U pg/L 20.4U pg/L 5.75U pg/L 21.9U pg/L 4.98U pg/L 3.10U pg/L 25.1U pg/L 6.97U pg/L 11.4U pg/L 23.1U pg/L	A

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

cooler temp 3.1°C → 10.5°C

	Validation Area		Comments
I.	Technical holding times	Δ	Sampling dates: 8/16 - 10/24/12
II.	GC/MS Instrument performance check	Δ	
III.	Initial calibration	Δ	% RSD ≤ 20
IV.	Routine calibration/CV	A	CV ≤ 30/50
V.	Blanks	SW	
VI.	Matrix spike/Matrix spike duplicates	SW / N / A	client specified
VII.	Laboratory control samples	A	OPR
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	Δ	
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	L56171-5	11	L56386-5	21	WG41911	31	
2	L56171-9	12	L56386-9	22		32	
3	L56171-13	13	L56620-1	23		33	
4	L56171-17	14	L56620-5	24		34	
5	L56292-1	15	L56620-5DUP	25		35	
6	L56292-5	16		26		36	
7	L56292-9	17		27		37	
8	L56292-15	18		28		38	
9	L56292-19	19		29		39	
10	L56386-1	20		30		40	

LDC #: 29144B3

VALIDATION FINDINGS WORKSHEET
Blanks

Page: 1 of 1
Reviewer: [Signature]
2nd Reviewer: [Signature]

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

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: 11/13/12 Blank analysis date: 11/20/12 Associated samples: ALL

Conc. units: pg/L

Compound	Blank ID	Sample Identification							
		5X	13	14					
	WG41911-MB								
PCB-11	29.6	148	84.9U	50.0U					
PCB-16	3.63	18.15		12.8U					
PCB-18 + 30	8.32	41.6	34.8U	28.5U					
PCB-20 + 28	13.0	65	39.5U	23.2U					
PCB-21 + 33	8.08	40.4	24.3U	15.6U					
PCB-22	5.27	26.35	16.4U	11.2U					
PCB-31	10.5	52.5	33.4U	20.4U					
PCB-37	3.60	18	10.4U	5.75U					
PCB-44 + 47 + 65	10.3	51.5							
PCB-45 + 51	2.61	13.05							
PCB-52	9.51	47.55	36.7U	21.9U					
PCB-56	2.82	14.1	11.5U	4.98U					
PCB-60	1.80	9	5.52U	3.10U					
PCB-61 + 70 + 74 + 76	13.1	65.5	53.0U	25.1U					
PCB-64	2.86	14.3	10.3U	6.97U					
PCB-66	5.67	28.35	19.7U	11.4U					
PCB-86 + 87 + 97 + 108 + 119 + 125	7.00	35							
PCB-147 + 149	7.58	37.9		23.1U					
PCB -180 + 193	3.03	15.15							

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

Project/Site Name: Lower Duwamish Waterway
Collection Date: August 16 through October 24, 2012
LDC Report Date: February 11, 2013
Matrix: Water
Parameters: Dioxins/Dibenzofurans
Validation Level: EPA Level III
Laboratory: AXYS Analytical Services Ltd.
Sample Delivery Group (SDG): DPWG42280

Sample Identification

L56171-1
L56171-5
L56171-9
L56171-13
L56171-17
L56292-1
L56292-5
L56292-9
L56292-15
L56292-19
L56386-1
L56386-5
L56386-9
L56620-1
L56620-5
L56620-5DUP

Introduction

This data review covers 16 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 in King County Combined Sewer System Sampling and Analysis Plan (Final August 2011) 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. Cooler temperatures for all samples were reported at 5.2°C to 7.2°C upon receipt by the laboratory.

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 validation criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine 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 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

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) control 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 DPWG42280	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
L56171-1 L56171-5 L56171-9 L56171-13 L56292-1 L56292-5 L56292-9 L56292-15 L56386-1 L56386-5 L56386-9	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 Waterway
Dioxins/Dibenzofurans - Data Qualification Summary - SDG DPWG42280**

SDG	Sample	Compound	Flag	A or P	Reason
DPWG42280	L56171-1 L56171-5 L56171-9 L56171-13 L56171-17 L56292-1 L56292-5 L56292-9 L56292-15 L56292-19 L56386-1 L56386-5 L56386-9 L56620-1 L56620-5	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A	Compound quantitation (EMPC)
DPWG42280	L56171-1 L56171-5 L56171-9 L56171-13 L56292-1 L56292-5 L56292-9 L56292-15 L56386-1 L56386-5 L56386-9	2,3,7,8-TCDF (from DB-5)	R	A	Overall assessment of data

**Lower Duwamish Waterway
Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG DPWG42280**

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.

cooler temp 3.1°C → 10.5°C

	Validation Area		Comments
I.	Technical holding times	Δ	Sampling dates: 8/16 → 10/24/12
II.	HRGC/HRMS Instrument performance check	Δ	
III.	Initial calibration	Δ	% PSD = 20/35
IV.	Routine calibration/lev	Δ	QC limits
V.	Blanks	SW	"EMPC" u
VI.	Matrix spike/Matrix spike duplicates /dup	N/A	client specified
VII.	Laboratory control samples	A	OPR
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	Δ	QC limits
X.	Target compound identifications	N	
XI.	Compound quantitation/RL/LOQ/LODs	N	
XII.	System performance	N	
XIII.	Overall assessment of data	Δ	
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	L56171-1	11	L56386-1	21	WG41911-MB	31	
2	L56171-5	12	L56386-5	22		32	
3	L56171-9	13	L56386-9	23		33	
4	L56171-13	14	L56620-1	24		34	
5	L56171-17	15	L56620-5	25		35	
6	L56292-1	16	L56620-5DUP	26		36	
7	L56292-5	17		27		37	
8	L56292-9	18		28		38	
9	L56292-15	19		29		39	
10	L56292-19	20		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 Waterway
Collection Date: May 2, 2012
LDC Report Date: February 11, 2013
Matrix: Water
Parameters: Dioxins/Dibenzofurans
Validation Level: EPA Level III
Laboratory: AXYS Analytical Services Ltd.
Sample Delivery Group (SDG): DPWG41395

Sample Identification

L55530-7

Introduction

This data review covers one water sample 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 in King County Combined Sewer System Sampling and Analysis Plan (Final August 2011) 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. Cooler temperatures for all samples were reported at 7.2°C upon receipt by the laboratory.

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 validation criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine 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 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
WG41164-MB	9/12/12	1,2,3,4,6,7,8-HpCDD Total HpCDD	0.865 pg/L 0.865 pg/L	All samples in SDG DPWG41395

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.

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) control 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 DPWG41395	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 DPWG41395	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 Waterway
Dioxins/Dibenzofurans - Data Qualification Summary - SDG DPWG41395**

SDG	Sample	Compound	Flag	A or P	Reason
DPWG41395	L55530-7	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A	Compound quantitation (EMPC)
DPWG41395	L55530-7	2,3,7,8-TCDF (from DB-5)	R	A	Overall assessment of data

**Lower Duwamish Waterway
Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG DPWG41395**

No Sample Data Qualified in this SDG

LDC #: 29144D21

VALIDATION COMPLETENESS WORKSHEET

Date: 2/8/13

SDG #: DPWG41395

Level III

Page: 1 of 1

Laboratory: AXYS Analytical Services Ltd.

Reviewer:

2nd Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA Method 161³~~8~~B)

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

cooler temp = 7.2°C

	Validation Area		Comments
I.	Technical holding times	Δ	Sampling dates: 5/2/12
II.	HRGC/HRMS Instrument performance check	Δ	
III.	Initial calibration	Δ	% RSD = 20/35
IV.	Routine calibration/lev	A	QC limit >
V.	Blanks	SW	
VI.	Matrix spike/Matrix spike duplicates	N	client specified
VII.	Laboratory control samples	A	OPR
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	Δ	QC limits
X.	Target compound identifications	N	
XI.	Compound quantitation/RL/LOQ/LODs	N	
XII.	System performance	N	
XIII.	Overall assessment of data	Δ	
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	L55530-7	11	WG41164-MB	21		31	
2		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		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: 9/12/12 Blank analysis date: 9/20/12

Associated samples: All 75X

Conc. units: g/L

Compound	Blank ID	Sample Identification							
	WG41164-MB								
F	0.865								
U	0.865								

Blank extraction date: _____ Blank analysis date: _____

Conc. units: _____ Associated Samples: _____

Compound	Blank ID	Sample Identification							

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 Waterway
Collection Date: March 15 through July 19, 2012
LDC Report Date: February 11, 2013
Matrix: Water
Parameters: Dioxins/Dibenzofurans
Validation Level: EPA Level III
Laboratory: AXYS Analytical Services Ltd.
Sample Delivery Group (SDG): DPWG41240

Sample Identification

L55316-1
L55316-8
L55530-1
L55530-5
L55530-6
L55793-13
L55963-11
L55963-17
L55963-21
L56076-1
L56076-5
L56076-9
L56076-13
L56076-17
L56076-13DUP

Introduction

This data review covers 15 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 in King County Combined Sewer System Sampling and Analysis Plan (Final August 2011) 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. Cooler temperatures for all samples were reported at 5.2°C to 7.2°C upon receipt by the laboratory.

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 validation criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine 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 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
WG40924-MB	8/15/12	OCDD	2.80 pg/L	All samples in SDG DPWG41240

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.

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.

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) control 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 DPWG41240	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
L55316-8 L55530-6 L55963-11 L56076-5	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 Waterway
Dioxins/Dibenzofurans - Data Qualification Summary - SDG DPWG41240**

SDG	Sample	Compound	Flag	A or P	Reason
DPWG41240	L55316-1 L55316-8 L55530-1 L55530-5 L55530-6 L55793-13 L55963-11 L55963-17 L55963-21 L56076-1 L56076-5 L56076-9 L56076-13 L56076-17	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A	Compound quantitation (EMPC)
DPWG41240	L55316-8 L55530-6 L55963-11 L56076-5	2,3,7,8-TCDF (from DB-5)	R	A	Overall assessment of data

**Lower Duwamish Waterway
Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG DPWG41240**

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.

cooler temp 5.2°C - 7.2°C

	Validation Area		Comments
I.	Technical holding times	Δ	Sampling dates: 3/15/12 - 7/19/12
II.	HRGC/HRMS Instrument performance check	Δ	
III.	Initial calibration	Δ	% PSD ≤ 20/35
IV.	Routine calibration/ACV	A	QC limit
V.	Blanks	SW	
VI.	Matrix spike/Matrix spike duplicates /Dup	N / A	client specified
VII.	Laboratory control samples	A	OPR
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	Δ	QC limit
X.	Target compound identifications	N	
XI.	Compound quantitation/RL/LOQ/LODs	N	
XII.	System performance	N	
XIII.	Overall assessment of data	Δ	
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	L55316-1	11	L56076-5	21	WG40924-MB	31	
2	L55316-8	12	L56076-9	22		32	
3	L55530-1	13	L56076-13	23		33	
4	L55530-5	14	L56076-17	24		34	
5	L55530-6	15	L56076-13DUP	25		35	
6	L55793-13	16		26		36	
7	L55963-11	17		27		37	
8	L55963-17	18		28		38	
9	L55963-21	19		29		39	
10	L56076-1	20		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.

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Phone 760.634.0437

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Fax 760.634.0439

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

March 14, 2013

SUBJECT: Lower Duwamish Waterway, Bulk Atmosphere Deposition Study, Data Validation

Dear Mr. Grothkopp,

Enclosed is the final validation report for the fraction listed below. This SDG was received on February 26, 2013. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 29290:

SDG #

Fraction

DPWG42610

Polychlorinated Biphenyls as Congeners

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, August 2011
- EPA Region 10 SOP for the Validation of Polychlorinated Dibenzodioxin (PCDD) and Polychlorinated Dibenzofuran (PCDF) Data, Revision 2.0, January 31, 1996

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 Waterway, Bulk Atmospheric Study

Collection Date: August 16, 2012

LDC Report Date: March 12, 2013

Matrix: Water

Parameters: Polychlorinated Biphenyls as Congeners

Validation Level: EPA Level III

Laboratory: AXYS Analytical Services, Ltd.

Sample Delivery Group (SDG): DPWG42610

Sample Identification

L56171-1

Introduction

This data review covers one water sample 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 Lower Duwamish Waterway Bulk Atmospheric Deposition Study Sampling and Analysis Plan (Final August 2011) 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. Cooler temperatures for all samples were reported at 8.4°C upon receipt by the laboratory.

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 criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration percent differences (%D) between the initial calibration RRF and the routine 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 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
WG42168-101	12/13/12	PCB-1	3.51 pg/L	All samples in SDG DPWG42610
		PCB-2	2.91 pg/L	
		PCB-18+30	1.10 pg/L	
		PCB-20+28	2.26 pg/L	
		PCB-22	0.694 pg/L	
		PCB-26+29	0.405 pg/L	
		PCB-31	1.45 pg/L	
		PCB-37	0.681 pg/L	
		PCB-44+47+65	2.52 pg/L	
		PCB-49+69	0.829 pg/L	
		PCB-52	2.09 pg/L	
		PCB-56	1.05 pg/L	
		PCB-86+87+97+108+119+125	2.63 pg/L	
		PCB-105	1.24 pg/L	
		PCB-110+115	3.58 pg/L	
		PCB-129+138+160+163	3.13 pg/L	
		PCB-135+151+154	1.21 pg/L	
		PCB-153+168	2.47 pg/L	
		Total Monochlorobiphenyls	6.42 pg/L	
		Total Trichlorobiphenyls	6.59 pg/L	
		Total Tetrachlorobiphenyls	6.49 pg/L	
		Total Pentachlorobiphenyls	7.45 pg/L	
		Total Hexachlorobiphenyl	6.81 pg/L	

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.

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) control 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.

X. Target Compound Identifications

Raw data were not reviewed for this SDG.

XI. Compound Quantitation

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

Sample	Compound	Flag	A or P
All samples in SDG DPWG42610	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 Waterway, Bulk Atmospheric Study
 Polychlorinated Biphenyls as Congeners - Data Qualification Summary - SDG
 DPWG42610**

SDG	Sample	Compound	Flag	A or P	Reason
DPWG42610	L56171-1	All TCL compounds flagged "K" by the laboratory as estimated maximum possible concentration.	U	A	Compound quantitation and RLs (EMPC)

**Lower Duwamish Waterway, Bulk Atmospheric Study
 Polychlorinated Biphenyls as Congeners - Laboratory Blank Data Qualification
 Summary - SDG DPWG42610**

No Sample Data Qualified in this SDG

METHOD: HRGC/HRMS Polychlorinated Biphenyl 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	SW	Sampling dates: 8/16/12
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	A	≤ 20
IV.	Routine calibration/ CV	A	30/50%
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/LOD	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	L56171-1	11		21		31	
2	WG42168-101	12		22		32	
3		13		23		33	
4		14		24		34	
5	WG42168-101	15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Blanks

Reviewer: TM

2nd Reviewer: a

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

Blank extraction date: 12/13/12 Blank analysis date: 12/20/12

Conc. units: pg/L

Associated samples: ALL U

Compound	Blank ID	Sample Identification								
		5x	1							
	WG42168-101									
PCB-1	3.51	17.55								
PCB-2	2.91	14.55								
PCB-18+30	1.10	5.5								
PCB-20+28	2.26	11.3								
PCB-22	0.694	3.47								
PCB-26+29	0.405	2.025								
PCB-31	1.45	7.25								
PCB-37	0.681	3.405								
PCB-44+47+65	2.52	12.6								
PCB-49+69	0.829	4.145								
PCB-52	2.09	10.45								
PCB-56	1.05	5.25								
PCB-86+87+97+108+119+125	2.63	13.15								
PCB-105	1.24	6.2								
PCB-110+115	3.58	17.9								
PCB-129+138+160+163	3.13	15.65								
PCB-135+151+154	1.21	6.05								
PCB-153+168	2.47	12.35								
Total Monochlorobiphenyls	6.42	32.1								
Total Trichlorobiphenyls	6.59	32.95								
Total Tetrachlorobiphenyls	6.49	32.45								
Total Pentachlorobiphenyls	7.45	37.25								
Total Hexachlorobiphenyl	6.81	34.05								

EMPC results qualify U

