PORTLAND HARBOR RI/FS

ROUND 2 MULTIPLATE INVERTEBRATE TISSUE DATA REPORT

APPENDIX A
DATA QUALITY SUMMARY

DRAFT

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Prepared for

The Lower Willamette Group

Prepared by

Integral Consulting Inc.

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LIST OF ACRONYMS

Axys	Axys Analytical Services, Ltd.
CAS	Columbia Analytical Services
DQOs	data quality objectives
EPA	U.S. Environmental Protection Agency
FSR	field sampling report
ICP/AES	inductively coupled plasma/atomic emission spectrometry
ICP/MS	inductively coupled plasma/mass spectrometry
LCS/LCSD	laboratory control sample / laboratory control sample duplicate
MDL	method detection limit
MRL	method reporting limit
MS/MSD	matrix spike / matrix spike duplicate
OPR	ongoing precision and recovery
PARCC	precision, accuracy, representativeness, completeness, comparability
PCB	polychlorinated biphenyl
PCDD/Fs	polychlorinated dibenzo-p-dioxins/furans
QC	quality control
QAPP	quality assurance project plan
RDL	reported detection limit
RI/FS	remedial investigation and feasibility study

1. INTRODUCTION

This report summarizes the data quality of analyses performed on invertebrate multiplate tissue samples collected during Round 2 of the Portland Harbor remedial investigation and feasibility study (RI/FS). Samples were collected September 6-15, 2005. A detailed description of the Round 2 groundwater and sediment sampling is included in the Round 2 Sampling of Invertebrates Using Multiplate Samplers Field Sampling Report (FSR; Windward 2005).

Round 2 invertebrate multiplate tissue samples were analyzed for total solids, polychlorinated dibenzo-p-dioxin/furans (PCDD/Fs), PCDD/F homologs, metals, organochlorine pesticides, polychlorinated biphenyl (PCB) Aroclors, PCB congeners, PCB homologs, lipid content, and percent moisture. The Round 2 invertebrate multiplate tissue samples were analyzed according to the sample preparation and analytical procedures in the Round 2 Quality Assurance Project Plan (QAPP; Integral and Windward 2004), the Round 2 QAPP Addendum 5: Invertebrate Tissue Collection Using Multiplate Samplers (Integral 2005a), and its supplement (Integral 2005b). Deviations from the QAPP are noted in Section 3.3.3 of the main body of this report.

Total solids and metals analyses were conducted by Columbia Analytical Services (CAS; Kelso, WA), and analyses for PCB Aroclors, PCB congeners, PCB homologs, PCDD/Fs, PCDD/F homologs, organochlorine pesticides, lipid content, and percent moisture were completed by Axys Analytical Services Ltd. (Axys; Sidney, B.C., Canada). Round 2 invertebrate multiplate tissue samples were prepared and analyzed by methods detailed in Table A-1.

2. DATA QUALITY AND USABILITY

Data generated in the field and at the laboratories were verified and validated according to the criteria and procedures described in the Round 2 QAPP (Integral and Windward 2004). Data quality and usability were evaluated based on the results of the data validation and the data quality objectives (DQOs) for the Round 2 data. The performance criteria in the QAPP included project analytical goals for precision, accuracy, representativeness, completeness, and comparability (PARCC) of the Round 2 data.

The precision, accuracy, representativeness, and comparability of the data were assessed during data validation, as described in the *Data Validation* section below and in the Round 2 QAPP. Completeness is calculated by comparing the total number of acceptable data (non-rejected data) to the total number of data points generated. Completeness for the Round 2 multiplate tissue data is summarized by parameter group in Table A-2. Completeness was 100% overall, which exceeds the QAPP completeness objective of 95%.

2.1. DATA VALIDATION

Data validation was conducted as required by the Round 2 QAPP (Integral and Windward 2004) and is summarized in Section 3.2 of the main body of this report. The data validation subcontractor for the Round 2 multiplate tissue data was EcoChem, Inc. located in Seattle, WA. Data verification and validation was conducted in accordance with *Guidance on Environmental Data Verification and Validation* (EPA 2002a). Data verification and validation for organic compounds and metals/inorganics was completed according to methods described in the U.S. Environmental Protection Agency's (EPA) guidance for data review (EPA 1996, 1999b, 2002b). As required by the Round 2 QAPP (Integral and Windward 2004), approximately 10 percent of the Round 2 multiplate tissue data were fully validated, and the remaining data were subjected to Level 3 data validation, which includes the evaluation and assessment of the sample results and applicable quality control results reported by the laboratories. The following deliverables were reviewed during Level 3 and full data validation:

- The case narrative discussing analytical problems (if any) and procedures
- Chain-of-custody documentation and laboratory sample receipt logs
- Instrument calibration results
- Method blank results
- Results for laboratory quality control samples required by the referenced method including laboratory control sample/laboratory control sample duplicate (LCS/LCSD) analyses, matrix spike/matrix spike duplicate (MS/MSD) analyses, and surrogate recoveries

- Analytical results for the Round 2 multiplate tissue samples.

In addition to review and assessment of the documentation identified above, full validation included verification of reported concentrations of the results for field samples and quality control (QC) samples, verification of intermediate transcriptions, and review of instrument data, such as mass spectra, to verify analyte identification procedures. The EcoChem data validation reports are provided in Appendix B.

Data qualifiers were assigned during data validation if applicable control limits were not met, in accordance with the EPA data validation guidelines (EPA 1996, 1999b, 2002b) and the quality control requirements included in the referenced methods (EPA 2006). The quality control limits for surrogate spikes, matrix spike/matrix spike, laboratory control samples, and ongoing precision and recovery (OPR) for the laboratories are summarized in Tables A-3 and A-4. The data validation qualifiers and definitions are summarized in Table A-5. Data quality reports and a tabular summary of qualified data generated by EcoChem are included respectively, in Appendix B and Table 4-1 of the main body of this report.

2.2. DATA QUALITY

The EcoChem data validation reports (Appendix B) provide detailed information on the data quality issues and data validation qualifiers for each parameter group for each laboratory data package. A summary of the qualified data by parameter group, with the reasons for qualification, is included in Table A-6.

The discussion below includes a comparison of the reported detection limits to the detection limits specified in the Round 2 QAPP Addendum 5 (Integral 2005a) and its supplement (Integral 2005b), followed by a summary of the qualified data for each parameter group and any limitations to the usability of the data.

2.2.1. Reported Detection Limits

Sample data for Round 2 of the Portland Harbor RI/FS were reported to the method detection limit (MDL) in most cases. Sample-specific detection limits were reported for PCDD/Fs and PCB congeners, as specified in the method protocols (EPA methods 1613B and 1668A; EPA 1994, 1999a). These detection limits are based on the signal-to-noise ratio of the analytical system for each analyte and sample. In several cases, the MDL and method reporting limit (MRL) were elevated at the laboratory or during data validation because matrix interference or the presence of another analyte interfered with the quantification of a given analyte. MDLs and MRLs were also elevated when results were restated as undetected during data validation because of possible sample contamination, as indicated by the presence of target analytes in an associated method blank or equipment blank.

The reported detection limit (RDL) is the collective term for the detection limit or reporting limit used to quantify non-detects, as applicable to each sample and analyte. Table A-7 provides the MDLs included in the Round 2 QAPP Addendum 5 (Integral 2005a) and the minimum and maximum RDL attained by the laboratories for each analyte and sample type.

MDLs and MRLs listed in the Round 2 QAPP Addendum 5 (Integral 2005a) and its supplement (Integral 2005b) were based on inductively coupled plasma/mass spectrometry (ICP/MS) methodology (EPA Method 6020; EPA 2006). Results for aluminum and chromium had higher MDLs and MRLs than stated in QAPP Addendum 5 and its supplement, because they were analyzed by inductively coupled plasma/atomic emission spectrometry (ICP/AES) methodology (EPA Method 6010B; EPA 2006).

2.2.2. Field Quality Control Samples

Quality control samples were prepared in the field and at the laboratories to monitor the bias and precision of the sample collection and analysis procedures. Field QC samples for this study were limited to the collection of one rinse blank for sample processing equipment. Field splits were not collected due to the nature of the multiplate sample devices and the limited mass of invertebrate tissue that was collected from each sampler.

2.2.2.1. Summary of Qualified Data

Selected data not meeting the data quality criteria were qualified as undetected or estimated during validation, in accordance with the QAPP. A summary of the qualified data by parameter group, including the reasons for qualification, is included in Table A-6. Data qualified as undetected are usable for all intended purposes. Data qualified as estimated are usable for all intended purposes, with the knowledge that these data may be less precise or less accurate than unqualified data.

The precision and accuracy of the Round 2 multiplate tissue data was acceptable. The completeness of the Round 2 multiplate tissue data was 100% (see Table A-2). Overall, the data quality was good and will meet program objectives and goals for the RI/FS.

3. REFERENCES

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Integral and Windward. 2004. Portland Harbor RI/FS Round 2 Quality Assurance Project Plan. Prepared for the Lower Willamette Group, Portland, OR. Integral Consulting Inc., Mercer Island, WA.

Windward. 2005. Portland Harbor RI/FS Round 2 Sampling of Invertebrates using Multiplate Samplers Field Sampling Report. Prepared for the Lower Willamette Group, Portland, OR. Windward Environmental LLC, Seattle, WA.

Table A-1. Laboratory Methods for the Round 2 Multiplate Tissue Samples

Analytes	Laboratory	Sample Preparation		Quantitative Analysis	
		Protocol	Procedure	Protocol	Procedure
Total Solids	CAS	CAS SOP	Freeze dry	CAS SOP	Gravimetric
Metals	CAS				
Aluminum, chromium		EPA 3050B	Acid digestion	EPA 6010B	ICP/AES
Aluminum, antimony, arsenic, cadmium, chromium, copper, lead, nickel, selenium, silver, zinc		EPA 3050B	Acid digestion	EPA 6020	ICP/MS
Selenium		EPA 3050B/7742	Acid digestion/hydride generation	EPA 7742	AAS
Lipids	Axys	Axys SOP MLA-013 [a]	Soxhlet extraction	Axys SOP	Gravimetric
Percent Moisture	Axys	--	--	Axys SOP	Oven/Gravimetric
Chlorinated PCDD/Fs [b]	Axys	Axys Method MLA-013 Rev 05	Soxhlet extraction Gel permeation chromatography Florisil® chromatography Carbon celite Layered silver nitrate/acid/base silica 1% deactivated basic alumina	Axys Method MLA-017/EPA 1613B	HRGC/HRMS
PCB Congeners [c]	Axys	Axys Method MLA-013 Rev 05	Soxhlet extraction Gel permeation chromatography Florisil® chromatography Acid/base silica column 1% deactivated basic alumina	Axys Method MLA-010/EPA 1668A	HRGC/HRMS
Organochlorine Pesticides	Axys	Axys Method MLA-013 Rev 05	Soxhlet extraction Gel permeation chromatography Florisil® chromatography	Axys Method MLA-028 Rev 01	HRGC/HRMS

Notes:

[a] PCDD/Fs, PCBs, pesticides, and lipids analyzed from the same extract.

[b] Includes analyses for PCDD/F homologs.

[c] Includes all 209 congeners. Includes analyses for PCB congener homologs and PCB Aroclors.

AAS - atomic absorption spectrometry
CAS - Columbia Analytical Services
EPA - U.S. Environmental Protection Agency
HRGC/HRMS - high resolution gas chromatography/high resolution mass spectrometry
ICP/AES - inductively coupled plasma/atomic emission spectrometry
ICP/MS - inductively coupled plasma/mass spectrometry
PCB - polychlorinated biphenyl
SOP - standard operating procedure

Table A-2. Percent Completeness by Parameter Group.

Analysis	Total # of Data Points [a]	Number of Data Points		Completeness (%)
		Accepted	Rejected	
Conventionals [b]	2	2	0	100
PCDD/F homologs	70	70	0	100
PCDD/Fs	112	112	0	100
Metals	22	22	0	100
Organochlorine Pesticides	196	196	0	100
PCB Aroclors	49	49	0	100
PCB congener homologs	63	63	0	100
PCB congeners	1120	1120	0	100
Multiplate Tissue Sampling Project Total	**1634**	**1634**	**0**	**100**

Notes:

[a] Totals include field replicates and split samples and exclude field blanks.

[b] Includes total solids.

Table A-3. Laboratory Control Limits for Surrogate Recoveries in Round 2 Multiplate Tissue Samples.

Analysis	Surrogate Percent Recovery
PCDD/Fs	
^{13}C-1,2,3,4,6,7,8-Heptachlorodibenzofuran	28 - 143
^{13}C-1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	23 - 140
^{13}C-1,2,3,4,7,8,9-Heptachlorodibenzofuran	26 - 138
^{13}C-1,2,3,4,7,8-Hexachlorodibenzofuran	26 - 152
^{13}C-1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	32 - 141
^{13}C-1,2,3,6,7,8-Hexachlorodibenzofuran	26 - 123
^{13}C-1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	28 - 130
^{13}C-1,2,3,7,8,9-Hexachlorodibenzofuran	29 - 147
^{13}C-1,2,3,7,8-Pentachlorodibenzofuran	24 - 185
^{13}C-1,2,3,7,8-Pentachlorodibenzo-p-dioxin	25 - 181
^{13}C-2,3,4,6,7,8-Hexachlorodibenzofuran	28 - 136
^{13}C-2,3,4,7,8-Pentachlorodibenzofuran	21 - 178
^{13}C-2,3,7,8-Tetrachlorodibenzofuran	24 - 169
^{13}C-2,3,7,8-Tetrachlorodibenzo-p-dioxin	25 - 164
^{13}C-Octachlorodibenzo-p-dioxin	17 - 157
^{37}Cl-2,3,7,8-Tetrachlorodibenzo-p-dioxin	35 - 197
PCB Congeners	
^{13}C-2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	25 - 150
^{13}C-2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	25 - 150
^{13}C-2,2',3,3',4,4',5-Heptachlorobiphenyl	25 - 150
^{13}C-2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl	25 - 150
^{13}C-2,2',3,3',5,5',6,6'-Octachlorobiphenyl	25 - 150
^{13}C-2,2',3,3',5,5',6-Heptachlorobiphenyl	30 - 135
^{13}C-2,2',3,4,4',5,5'-Heptachlorobiphenyl	25 - 150
^{13}C-2,2',3,4',5,6,6'-Heptachlorobiphenyl	25 - 150
^{13}C-2,2',4,4',6,6'-Hexachlorobiphenyl	25 - 150
^{13}C-2,2',4,6,6'-Pentachlorobiphenyl	25 - 150
^{13}C-2,2',6,6'-Tetrachlorobiphenyl	25 - 150
^{13}C-2,2',6-Trichlorobiphenyl	25 - 150
^{13}C-2,2'-Dichlorobiphenyl	25 - 150
^{13}C-2,3,3',4,4',5,5',6-Octachlorobiphenyl	25 - 150
^{13}C-2,3,3',4,4',5,5'-Heptachlorobiphenyl	25 - 150
^{13}C-2,3,3',4,4'-Pentachlorobiphenyl	25 - 150
^{13}C-2,3,3',5,5'-Pentachlorobiphenyl	30 - 135
^{13}C-2,3',4,4',5,5'-Hexachlorobiphenyl	25 - 150
^{13}C-2,3',4,4',5'-Pentachlorobiphenyl	25 - 150
^{13}C-2,3',4,4',5-Pentachlorobiphenyl	25 - 150
^{13}C-2,3,4,4',5-Pentachlorobiphenyl	25 - 150
^{13}C-2,4,4'-Trichlorobiphenyl	30 - 135
^{13}C-2-Chlorobiphenyl	15 - 150
^{13}C-3,3',4,4',5,5'-Hexachlorobiphenyl	25 - 150
^{13}C-3,3',4,4',5-Pentachlorobiphenyl	25 - 150
^{13}C-3,3',4,4'-Tetrachlorobiphenyl	25 - 150
^{13}C-3,4,4',5-Tetrachlorobiphenyl	25 - 150
^{13}C-3,4,4'-Trichlorobiphenyl	25 - 150
^{13}C-4,4'-Dichlorobiphenyl	25 - 150
^{13}C-4-Chlorobiphenyl	15 - 150
PCB156L & 157L	25 - 150

Table A-3. Laboratory Control Limits for Surrogate Recoveries in Round 2 Multiplate Tissue Samples.

Analysis	Surrogate Percent Recovery
Organochlorine Pesticides	
^{13}C-2,4'-DDE	40 - 150
^{13}C-2,4'-DDT	40 - 150
^{13}C-4,4'-DDE	40 - 150
^{13}C-4,4'-DDT	40 - 150
^{13}C-Aldrin	30 - 200
^{13}C-alpha-Endosulfan	30 - 150
^{13}C-beta-Endosulfan	30 - 150
^{13}C-beta-Hexachlorocyclohexane	30 - 150
^{13}C-cis-Nonachlor	40 - 150
^{13}C-delta-Hexachlorocyclohexane	30 - 150
^{13}C-Dieldrin	30 - 150
^{13}C-Endrin	30 - 150
^{13}C-gamma-Hexachlorocyclohexane	30 - 150
^{13}C-Heptachlor	30 - 150
^{13}C-Heptachlor epoxide	30 - 150
^{13}C-Methoxychlor	30 - 150
^{13}C-Oxychlordane	30 - 200
^{13}C-trans-Chlordane	30 - 150
^{13}C-trans-Nonachlor	30 - 150
^{13}C-1,2,3-Trichlorobenzene	20 - 130
^{13}C-Hexachlorobenzene	20 - 150

Table A-4. Laboratory Control Limits for Multiplate Tissue Matrix Spike and Laboratory Control Samples.

Analysis	Matrix Spike Recovery (percent)	Laboratory Control Sample Recovery (percent)
Metals		
Aluminum	-- [a]	18.2 - 31.9
Antimony	-- [a]	--
Arsenic	-- [a]	7.76 - 22.9
Cadmium	-- [a]	15 - 24
Chromium	-- [a]	23.4 - 48.2
Copper	-- [a]	1.74 - 38.6
Lead	-- [a]	0.02 - 0.437
Nickel	-- [a]	1.9 - 27
Selenium	-- [a]	5.26 - 9.05
Silver	-- [a]	0.9 - 1.52
Zinc	-- [a]	20.3 - 107
Conventionals		
Total solids	--	--
Organochlorine Pesticides		
2,4'-DDD	-- [b]	70 - 130
2,4'-DDE	-- [b]	70 - 130
2,4'-DDT	-- [b]	70 - 130
4,4'-DDD	-- [b]	70 - 130
4,4'-DDE	-- [b]	70 - 130
4,4'-DDT	-- [b]	70 - 130
Aldrin	-- [b]	70 - 130
alpha-Endosulfan	-- [b]	70 - 130
alpha-Hexachlorocyclohexane	-- [b]	70 - 130
beta-Endosulfan	-- [b]	70 - 130
beta-Hexachlorocyclohexane	-- [b]	70 - 130
cis-Chlordane	-- [b]	70 - 130
cis-Nonachlor	-- [b]	70 - 130
delta-Hexachlorocyclohexane	-- [b]	60 - 130
Dieldrin	-- [b]	60 - 130
Endosulfan sulfate	-- [b]	70 - 130
Endrin	-- [b]	60 - 130
Endrin aldehyde	-- [b]	50 - 130
Endrin ketone	-- [b]	60 - 130
gamma-Hexachlorocyclohexane	-- [b]	70 - 130
Heptachlor	-- [b]	70 - 130
Heptachlor epoxide	-- [b]	60 - 130
Methoxychlor	-- [b]	60 - 130
Oxychlordane	-- [b]	70 - 130
trans-Chlordane	-- [b]	70 - 130
trans-Nonachlor	-- [b]	70 - 130
Hexachlorobenzene	-- [b]	70 - 130
Hexachlorobutadiene	-- [b]	--
PCDD/F homologs		
Heptachlorodibenzofuran homologs	-- [b]	--
Heptachlorodibenzo-p-dioxin homologs	-- [b]	--
Hexachlorodibenzofuran homologs	-- [b]	--
Hexachlorodibenzo-p-dioxin homologs	-- [b]	--
Octachlorodibenzofuran	-- [b]	63 - 170
Octachlorodibenzo-p-dioxin	-- [b]	78 - 144
Pentachlorodibenzofuran homologs	-- [b]	--

Table A-4. Laboratory Control Limits for Multiplate Tissue Matrix Spike and Laboratory Control Samples.

Analysis	Matrix Spike Recovery (percent)	Laboratory Control Sample Recovery (percent)
Pentachlorodibenzo-p-dioxin homologs	-- [b]	--
Tetrachlorodibenzofuran homologs	-- [b]	--
Tetrachlorodibenzo-p-dioxin homologs	-- [b]	--
PCDD/Fs		
1,2,3,4,6,7,8-Heptachlorodibenzofuran	-- [b]	82 - 122
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	-- [b]	70 - 140
1,2,3,4,7,8,9-Heptachlorodibenzofuran	-- [b]	78 - 138
1,2,3,4,7,8-Hexachlorodibenzofuran	-- [b]	72 - 134
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	-- [b]	70 - 164
1,2,3,6,7,8-Hexachlorodibenzofuran	-- [b]	84 - 130
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	-- [b]	76 - 134
1,2,3,7,8,9-Hexachlorodibenzofuran	-- [b]	78 - 130
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	-- [b]	64 - 162
1,2,3,7,8-Pentachlorodibenzofuran	-- [b]	80 - 134
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	-- [b]	70 - 142
2,3,4,6,7,8-Hexachlorodibenzofuran	-- [b]	70 - 156
2,3,4,7,8-Pentachlorodibenzofuran	-- [b]	68 - 160
2,3,7,8-Tetrachlorodibenzofuran	-- [b]	75 - 158
2,3,7,8-Tetrachlorodibenzo-p-dioxin	-- [b]	67 - 158
PCB homologs		
Dichlorobiphenyl	-- [b]	--
Heptachlorobiphenyl	-- [b]	--
Hexachlorobiphenyl	-- [b]	--
Monochlorobiphenyl	-- [b]	--
Nonachlorobiphenyl	-- [b]	--
Octachlorobiphenyl	-- [b]	--
Pentachlorobiphenyl	-- [b]	--
Tetrachlorobiphenyl	-- [b]	--
Trichlorobiphenyl	-- [b]	--
PCB congeners		
2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	-- [b]	50 - 150
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	-- [b]	50 - 150
2,2',3,3',4,4',5,5'-Octachlorobiphenyl	-- [b]	--
2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl	-- [b]	--
2,2',3,3',4,4',5,6'-Octachlorobiphenyl	-- [b]	--
2,2',3,3',4,4',5,6-Octachlorobiphenyl	-- [b]	--
2,2',3,3',4,4',5-Heptachlorobiphenyl	-- [b]	--
2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl	-- [b]	50 - 150
2,2',3,3',4,5,5'-Heptachlorobiphenyl	-- [b]	--
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	-- [b]	--
2,2',3,3',4,5',6'-Heptachlorobiphenyl	-- [b]	--
2,2',3,3',4,5',6-Heptachlorobiphenyl	-- [b]	--
2,2',3,3',4,5,6'-Heptachlorobiphenyl	-- [b]	--
2,2',3,3',4,5'-Hexachlorobiphenyl	-- [b]	--
2,2',3,3',4,6,6'-Heptachlorobiphenyl	-- [b]	--
2,2',3,3',4,6'-Hexachlorobiphenyl	-- [b]	--
2,2',3,3',4,6-Hexachlorobiphenyl	-- [b]	--
2,2',3,3',4-Pentachlorobiphenyl	-- [b]	--
2,2',3,3',5,5',6,6'-Octachlorobiphenyl	-- [b]	50 - 150
2,2',3,3',5,5',6-Heptachlorobiphenyl	-- [b]	--
2,2',3,3',5,5'-Hexachlorobiphenyl	-- [b]	--

Table A-4. Laboratory Control Limits for Multiplate Tissue Matrix Spike and Laboratory Control Samples.

Analysis	Matrix Spike Recovery (percent)	Laboratory Control Sample Recovery (percent)
2,2',3,3',5,6,6'-Heptachlorobiphenyl	-- [b]	--
2,2',3,3',6,6'-Hexachlorobiphenyl	-- [b]	--
2,2',3,3',6-Pentachlorobiphenyl	-- [b]	--
2,2',3,4,4',5,5',6-Octachlorobiphenyl	-- [b]	--
2,2',3,4,4',5,6,6'-Octachlorobiphenyl	-- [b]	--
2,2',3,4,4',5,6'-Heptachlorobiphenyl	-- [b]	--
2,2',3,4,4',5,6-Heptachlorobiphenyl	-- [b]	--
2,2',3,4,4',5-Hexachlorobiphenyl	-- [b]	--
2,2',3,4,4',6,6'-Heptachlorobiphenyl	-- [b]	--
2,2',3,4',5,5',6-Heptachlorobiphenyl	-- [b]	--
2,2',3,4',5,5'-Hexachlorobiphenyl	-- [b]	--
2,2',3,4,5,5'-Hexachlorobiphenyl	-- [b]	--
2,2',3,4',5,6,6'-Heptachlorobiphenyl	-- [b]	50 - 150
2,2',3,4,5,6,6'-Heptachlorobiphenyl	-- [b]	--
2,2',3,4',5,6'-Hexachlorobiphenyl	-- [b]	--
2,2',3,4,5',6-Hexachlorobiphenyl	-- [b]	--
2,2',3,4,5,6-Hexachlorobiphenyl	-- [b]	--
2,2',3,4',6,6'-Hexachlorobiphenyl	-- [b]	--
2,2',3,4,6,6'-Hexachlorobiphenyl	-- [b]	--
2,2',3,4,6'-Pentachlorobiphenyl	-- [b]	--
2,2',3,4'-Tetrachlorobiphenyl	-- [b]	--
2,2',3,5,5'-Pentachlorobiphenyl	-- [b]	--
2,2',3,5,6,6'-Hexachlorobiphenyl	-- [b]	--
2,2',3,5,6'-Pentachlorobiphenyl	-- [b]	--
2,2',3,5-Tetrachlorobiphenyl	-- [b]	--
2,2',3,6,6'-Pentachlorobiphenyl	-- [b]	--
2,2',3,6'-Tetrachlorobiphenyl	-- [b]	--
2,2',3-Trichlorobiphenyl	-- [b]	--
2,2',4,4',6,6'-Hexachlorobiphenyl	-- [b]	50 - 150
2,2',4,5',6-Pentachlorobiphenyl	-- [b]	--
2,2',4,5-Tetrachlorobiphenyl	-- [b]	--
2,2',4,6,6'-Pentachlorobiphenyl	-- [b]	50 - 150
2,2',4-Trichlorobiphenyl	-- [b]	--
2,2',5,5'-Tetrachlorobiphenyl	-- [b]	--
2,2',6,6'-Tetrachlorobiphenyl	-- [b]	50 - 150
2,2',6-Trichlorobiphenyl	-- [b]	50 - 150
2,2'-Dichlorobiphenyl	-- [b]	50 - 150
2,3,3',4,4',5,5',6-Octachlorobiphenyl	-- [b]	50 - 150
2,3,3',4,4',5,5'-Heptachlorobiphenyl	-- [b]	50 - 150
2,3,3',4,4',5',6-Heptachlorobiphenyl	-- [b]	--
2,3,3',4,4',5,6-Heptachlorobiphenyl	-- [b]	--
2,3,3',4,4',6-Hexachlorobiphenyl	-- [b]	--
2,3,3',4,4'-Pentachlorobiphenyl	-- [b]	50 - 150
2,3,3',4,5,5',6-Heptachlorobiphenyl	-- [b]	--
2,3,3',4',5,5'-Hexachlorobiphenyl	-- [b]	--
2,3,3',4,5,5'-Hexachlorobiphenyl	-- [b]	--
2,3,3',4',5',6-Hexachlorobiphenyl	-- [b]	--
2,3,3',4,5',6-Hexachlorobiphenyl	-- [b]	--
2,3,3',4',5'-Pentachlorobiphenyl	-- [b]	--
2,3,3',4,5-Pentachlorobiphenyl	-- [b]	--
2,3,3',4,6-Pentachlorobiphenyl	-- [b]	--
2,3,3',4'-Tetrachlorobiphenyl	-- [b]	--
2,3,3',4-Tetrachlorobiphenyl	-- [b]	--

Table A-4. Laboratory Control Limits for Multiplate Tissue Matrix Spike and Laboratory Control Samples.

Analysis	Matrix Spike Recovery (percent)	Laboratory Control Sample Recovery (percent)
2,3,3',5,5',6-Hexachlorobiphenyl	-- [b]	--
2,3,3',5,5'-Pentachlorobiphenyl	-- [b]	--
2,3,3',5,6-Pentachlorobiphenyl	-- [b]	--
2,3,3',5'-Tetrachlorobiphenyl	-- [b]	--
2,3,3',5-Tetrachlorobiphenyl	-- [b]	--
2,3',4,4',5,5'-Hexachlorobiphenyl	-- [b]	50 - 150
2,3',4,4',5'-Pentachlorobiphenyl	-- [b]	50 - 150
2,3',4,4',5-Pentachlorobiphenyl	-- [b]	50 - 150
2,3,4,4',5-Pentachlorobiphenyl	-- [b]	50 - 150
2,3',4,4'-Tetrachlorobiphenyl	-- [b]	--
2,3,4,4'-Tetrachlorobiphenyl	-- [b]	--
2,3',4,5,5'-Pentachlorobiphenyl	-- [b]	--
2,3',4,5',6-Pentachlorobiphenyl	-- [b]	--
2,3',4,5'-Tetrachlorobiphenyl	-- [b]	--
2,3',4,5-Tetrachlorobiphenyl	-- [b]	--
2,3,4',5-Tetrachlorobiphenyl	-- [b]	--
2,3,4',6-Tetrachlorobiphenyl	-- [b]	--
2,3',4-Trichlorobiphenyl	-- [b]	--
2,3,4'-Trichlorobiphenyl	-- [b]	--
2,3',5,5'-Tetrachlorobiphenyl	-- [b]	--
2,3',5',6-Tetrachlorobiphenyl	-- [b]	--
2,3',5'-Trichlorobiphenyl	-- [b]	--
2,3,5-Trichlorobiphenyl	-- [b]	--
2,3',6-Trichlorobiphenyl	-- [b]	--
2,3,6-Trichlorobiphenyl	-- [b]	--
2,3'-Dichlorobiphenyl	-- [b]	--
2,3-Dichlorobiphenyl	-- [b]	--
2,4',5-Trichlorobiphenyl	-- [b]	--
2,4',6-Trichlorobiphenyl	-- [b]	--
2,4'-Dichlorobiphenyl	-- [b]	--
2,4-Dichlorobiphenyl	-- [b]	--
2,5-Dichlorobiphenyl	-- [b]	--
2,6-Dichlorobiphenyl	-- [b]	--
2-Chlorobiphenyl	-- [b]	50 - 150
3,3',4,4',5,5'-Hexachlorobiphenyl	-- [b]	50 - 150
3,3',4,4',5-Pentachlorobiphenyl	-- [b]	50 - 150
3,3',4,4'-Tetrachlorobiphenyl	-- [b]	50 - 150
3,3',4,5,5'-Pentachlorobiphenyl	-- [b]	--
3,3',4,5'-Tetrachlorobiphenyl	-- [b]	--
3,3',4,5-Tetrachlorobiphenyl	-- [b]	--
3,3',4-Trichlorobiphenyl	-- [b]	--
3,3',5,5'-Tetrachlorobiphenyl	-- [b]	--
3,3',5-Trichlorobiphenyl	-- [b]	--
3,3'-Dichlorobiphenyl	-- [b]	--
3,4,4',5-Tetrachlorobiphenyl	-- [b]	50 - 150
3,4,4'-Trichlorobiphenyl	-- [b]	50 - 150
3,4',5-Trichlorobiphenyl	-- [b]	--
3,4,5-Trichlorobiphenyl	-- [b]	--
3,5-Dichlorobiphenyl	-- [b]	--
3-Chlorobiphenyl	-- [b]	--
4,4'-Dichlorobiphenyl	-- [b]	50 - 150
4-Chlorobiphenyl	-- [b]	50 - 150

Table A-4. Laboratory Control Limits for Multiplate Tissue Matrix Spike and Laboratory Control Samples.

Analysis	Matrix Spike Recovery (percent)	Laboratory Control Sample Recovery (percent)
PCB012 & 013	-- [b]	--
PCB018 & 030	-- [b]	--
PCB020 & 028	-- [b]	--
PCB021 & 033	-- [b]	--
PCB026 & 029	-- [b]	--
PCB040 & 041 & 071	-- [b]	--
PCB044 & 047 & 065	-- [b]	--
PCB045 & 051	-- [b]	--
PCB049 & 069	-- [b]	--
PCB050 & 053	-- [b]	--
PCB059 & 062 & 075	-- [b]	--
PCB061 & 070 & 074 & 076	-- [b]	--
PCB083 & 099	-- [b]	--
PCB085 & 116 & 117	-- [b]	--
PCB086 & 087 & 097 & 108 & 119 & 125	-- [b]	--
PCB088 & 091	-- [b]	--
PCB090 & 101 & 113	-- [b]	--
PCB093 & 095 & 098 & 100 & 102	-- [b]	--
PCB107 & 124	-- [b]	--
PCB110 & 115	-- [b]	--
PCB128 & 166	-- [b]	--
PCB129 & 138 & 160 & 163	-- [b]	--
PCB134 & 143	-- [b]	--
PCB135 & 151 & 154	-- [b]	--
PCB139 & 140	-- [b]	--
PCB147 & 149	-- [b]	--
PCB153 & 168	-- [b]	--
PCB156 & 157	-- [b]	50 - 150
PCB171 & 173	-- [b]	--
PCB180 & 193	-- [b]	--
PCB183 & 185	-- [b]	--
PCB197 & 200	-- [b]	--
PCB198 & 199	-- [b]	--
Polychlorinated biphenyls	-- [b]	--
PCB Aroclors		
Aroclor 1016	-- [b]	--
Aroclor 1221	-- [b]	--
Aroclor 1232	-- [b]	--
Aroclor 1242	-- [b]	--
Aroclor 1248	-- [b]	--
Aroclor 1254	-- [b]	--
Aroclor 1260	-- [b]	--

Notes:

[a] Insufficient sample to perform a MS/MSD analysis; CAS analyzed an SRM in duplicate for metals.

[b] MS/MSD samples were not analyzed for organics due to insufficient sample size; laboratory control samples and blank spike samples were analyzed.

Table A-5. Data Validation Qualifiers and Definitions.

Data Qualifier	Definition
U	The material was analyzed for, but was not detected. The associated numerical value is the sample quantitation limit.
J	The associated numerical value is an estimated quantity.
NJ	Presumptive evidence of the presence of the material at an estimated quantity.
UJ	The material was analyzed for, but was not detected. The sample quantitation limit is an estimated quantity.
T	The associated numerical value was mathematically derived (e.g., from summing multiple analyte results such as Aroclors, or calculating the average of multiple results for a single analyte). Also indicates all results that are selected for reporting in preference to other available results (e.g., for parameters reported by multiple methods) for the Round 2 data.

Table A-6. Summary of Qualified Data by Parameter Group for Round 2 Multiplate Tissue Samples.

Analyte Group	Number of Samples [a]	Number of Data Points		Total # of Data Points	Detection and Qualification Frequencies (percent)		Reason for Qualification
		Detected	Undetected				
Conventionals	2	2	0	2	100	detected	
					0	undetected	
Metals	2	21	1	22	95	detected	
					5	undetected	
					41	J	Other, ICP %D
PCB Aroclors	7	17	32	49	35	detected	
					65	undetected	
					35	NJ	Other
Organochlorine Pesticides	7	148	48	196	76	detected	
					24	undetected	
					2	J	HT/SP
					4	UJ	Cal-I, Cal-C
					17	U	IAR
PCB Homologs	7	63	0	63	100	detected	
					0	undetected	
PCB congeners	7	974	146	1120	87	detected	
					13	undetected	
					4	U	IAR
PCDD/F Homologs	7	68	2	70	97	detected	
					3	undetected	
PCDD/Fs	7	71	41	112	63	detected	
					37	undetected	
					24	U	LB, IAR

Notes:

[a] Includes replicates and splits, excludes field blanks.

Cal-C - calibration (continuing)
Cal-I - calibration (initial)
HT/SP - holding time/sample preservation
IAR - ion abundance ratio criteria not met
ICP %D - ICP serial dilution % difference
LB - lab blank contamination (e.g., method blank, instrument, etc.)
Other - defined in validation reports

Table A-7. Reported Detection Limits for Round 2 Multiplate Tissue Samples.

Analyte	CAS Number	Units	Round 2 QAPP MDL	Reported Detection Limits		Total # Data Points	# Undetected Results
				Minimum	Maximum		
Metals							
Aluminum	7429-90-5	mg/kg	0.06	0.5	0.5	2	--
Antimony	7440-36-0	mg/kg	0.0016	0.001	0.0011	2	1
Arsenic	7440-38-2	mg/kg	0.006	0.006	0.007	2	--
Cadmium	7440-43-9	mg/kg	0.0012	0.0005	0.0005	2	--
Chromium	7440-47-3	mg/kg	0.1	0.04	0.04	2	--
Copper	7440-50-8	mg/kg	0.018	0.003	0.003	2	--
Lead	7439-92-1	mg/kg	0.0014	0.003	0.003	2	--
Nickel	7440-02-0	mg/kg	0.006	0.013	0.013	2	--
Selenium	7782-49-2	mg/kg	0.2	0.01	0.01	2	--
Silver	7440-22-4	mg/kg	0.0008	0.0003	0.0003	2	--
Zinc	7440-66-6	mg/kg	0.012	0.009	0.009	2	--
Conventionals							
Total solids	TSO	percent	--	--	--	2	--
Organochlorine Pesticides							
2,4'-DDD	53-19-0	µg/kg	--	0.00268	0.0725	7	--
2,4'-DDE	3424-82-6	µg/kg	--	0.0012	0.0126	7	--
2,4'-DDT	789-02-6	µg/kg	--	0.00373	0.0374	7	2
4,4'-DDD	72-54-8	µg/kg	--	0.00306	0.0968	7	--
4,4'-DDE	72-55-9	µg/kg	--	0.00168	0.0157	7	--
4,4'-DDT	50-29-3	µg/kg	--	0.00427	0.043	7	--
Aldrin	309-00-2	µg/kg	--	0.000364	0.0128	7	1
alpha-Endosulfan	959-98-8	µg/kg	--	0.00558	0.137	7	1
alpha-Hexachlorocyclohexane	319-84-6	µg/kg	--	0.00112	0.0178	7	3
beta-Endosulfan	33213-65-9	µg/kg	--	0.00739	0.156	7	4
beta-Hexachlorocyclohexane	319-85-7	µg/kg	--	0.002	0.0268	7	4
cis-Chlordane	5103-71-9	µg/kg	--	0.00185	0.0117	7	--
cis-Nonachlor	5103-73-1	µg/kg	--	0.00198	0.0112	7	--
delta-Hexachlorocyclohexane	319-86-8	µg/kg	--	0.00185	0.0174	7	4
Dieldrin	60-57-1	µg/kg	--	0.00162	0.0132	7	--
Endosulfan sulfate	1031-07-8	µg/kg	--	0.00617	0.067	7	2
Endrin	72-20-8	µg/kg	--	0.00263	0.146	7	2
Endrin aldehyde	7421-93-4	µg/kg	--	0.00551	0.109	7	2
Endrin ketone	53494-70-5	µg/kg	--	0.00324	0.228	7	2
gamma-Hexachlorocyclohexane	58-89-9	µg/kg	--	0.00184	0.0192	7	3
Heptachlor	76-44-8	µg/kg	--	0.000624	0.00606	7	4

Table A-7. Reported Detection Limits for Round 2 Multiplate Tissue Samples.

Analyte	CAS Number	Units	Round 2 QAPP MDL	Reported Detection Limits		Total # Data Points	# Undetected Results
				Minimum	Maximum		
Heptachlor epoxide	1024-57-3	µg/kg	--	0.000623	0.015	7	1
Methoxychlor	72-43-5	µg/kg	--	0.00635	0.109	7	3
Oxychlordane	27304-13-8	µg/kg	--	0.00278	0.0682	7	3
trans-Chlordane	5103-74-2	µg/kg	--	0.00162	0.0103	7	--
trans-Nonachlor	39765-80-5	µg/kg	--	0.00201	0.012	7	--
Hexachlorobenzene	118-74-1	µg/kg	--	0.000136	0.00129	7	--
Hexachlorobutadiene	87-68-3	µg/kg	--	0.006	0.063	7	7
PCB Homologs							
Dichlorobiphenyl	25512-42-9	pg/g	0.24 - 6.68	0.382	3.4	7	--
Heptachlorobiphenyl	28655-71-2	pg/g	0.24 - 6.68	0.763	6.79	7	--
Hexachlorobiphenyl	26601-64-9	pg/g	0.24 - 6.68	0.739	15.9	7	--
Monochlorobiphenyl	27323-18-8	pg/g	0.24 - 6.68	0.0628	0.552	7	--
Nonachlorobiphenyl	53742-07-7	pg/g	0.24 - 6.68	0.0369	0.329	7	--
Octachlorobiphenyl	55722-26-4	pg/g	0.24 - 6.68	0.109	8.22	7	--
Pentachlorobiphenyl	25429-29-2	pg/g	0.24 - 6.68	0.52	4.12	7	--
Tetrachlorobiphenyl	26914-33-0	pg/g	0.24 - 6.68	1.08	9.59	7	--
Trichlorobiphenyl	25323-68-6	pg/g	0.24 - 6.68	0.292	3.57	7	--
PCB congeners							
2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	2051-24-3	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	40186-72-9	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',4,4',5,5'-Octachlorobiphenyl	35694-08-7	pg/g	0.24 - 6.68	0.0969	1.51	7	--
2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl	52663-79-3	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',4,4',5,6'-Octachlorobiphenyl	42740-50-1	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',4,4',5,6-Octachlorobiphenyl	52663-78-2	pg/g	0.24 - 6.68	0.109	1.61	7	--
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl	52663-77-1	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',4,5,5'-Heptachlorobiphenyl	52663-74-8	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	40186-71-8	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',4,5',6'-Heptachlorobiphenyl	52663-70-4	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',4,5',6-Heptachlorobiphenyl	40186-70-7	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',4,5,6'-Heptachlorobiphenyl	38411-25-5	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',4,5'-Hexachlorobiphenyl	52663-66-8	pg/g	0.24 - 6.68	0.339	3.44	7	--
2,2',3,3',4,6,6'-Heptachlorobiphenyl	52663-65-7	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',4,6'-Hexachlorobiphenyl	38380-05-1	pg/g	0.24 - 6.68	0.348	3.2	7	--
2,2',3,3',4,6-Hexachlorobiphenyl	61798-70-7	pg/g	0.24 - 6.68	0.334	3.17	7	--
2,2',3,3',4-Pentachlorobiphenyl	52663-62-4	pg/g	0.24 - 6.68	0.356	79.3	7	1
2,2',3,3',5,5',6,6'-Octachlorobiphenyl	2136-99-4	pg/g	0.24 - 6.68	0.0369	0.329	7	--

Table A-7. Reported Detection Limits for Round 2 Multiplate Tissue Samples.

Analyte	CAS Number	Units	Round 2 QAPP MDL	Reported Detection Limits		Total # Data Points	# Undetected Results
				Minimum	Maximum		
2,2',3,3',5,5',6-Heptachlorobiphenyl	52663-67-9	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',5,5'-Hexachlorobiphenyl	35694-04-3	pg/g	0.24 - 6.68	0.318	3.07	7	--
2,2',3,3',5,6,6'-Heptachlorobiphenyl	52663-64-6	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',6,6'-Hexachlorobiphenyl	38411-22-2	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',6-Pentachlorobiphenyl	52663-60-2	pg/g	0.24 - 6.68	0.339	1	7	--
2,2',3,4,4',5,5',6-Octachlorobiphenyl	52663-76-0	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,4,4',5,6,6'-Octachlorobiphenyl	74472-52-9	pg/g	0.24 - 6.68	0.108	8.22	7	7
2,2',3,4,4',5,6'-Heptachlorobiphenyl	60145-23-5	pg/g	0.24 - 6.68	0.0369	4.02	7	1
2,2',3,4,4',5,6-Heptachlorobiphenyl	74472-47-2	pg/g	0.24 - 6.68	0.0369	4.25	7	1
2,2',3,4,4',5-Hexachlorobiphenyl	35694-06-5	pg/g	0.24 - 6.68	0.307	3.06	7	--
2,2',3,4,4',6,6'-Heptachlorobiphenyl	74472-48-3	pg/g	0.24 - 6.68	0.0369	1.11	7	2
2,2',3,4',5,5',6-Heptachlorobiphenyl	52663-68-0	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,4',5,5'-Hexachlorobiphenyl	51908-16-8	pg/g	0.24 - 6.68	0.275	2.64	7	--
2,2',3,4,5,5'-Hexachlorobiphenyl	52712-04-6	pg/g	0.24 - 6.68	0.301	3.01	7	--
2,2',3,4',5,6,6'-Heptachlorobiphenyl	74487-85-7	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,4,5,6,6'-Heptachlorobiphenyl	74472-49-4	pg/g	0.24 - 6.68	0.0468	2.92	7	6
2,2',3,4',5,6'-Hexachlorobiphenyl	74472-41-6	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,4,5',6-Hexachlorobiphenyl	68194-14-9	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,4,5,6-Hexachlorobiphenyl	41411-61-4	pg/g	0.24 - 6.68	0.403	3.02	7	7
2,2',3,4',6,6'-Hexachlorobiphenyl	68194-08-1	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,4,6,6'-Hexachlorobiphenyl	74472-40-5	pg/g	0.24 - 6.68	0.0384	1.28	7	5
2,2',3,4,6'-Pentachlorobiphenyl	73575-57-2	pg/g	0.24 - 6.68	0.324	1.91	7	1
2,2',3,4'-Tetrachlorobiphenyl	36559-22-5	pg/g	0.24 - 6.68	0.0432	0.67	7	--
2,2',3,5,5'-Pentachlorobiphenyl	52663-61-3	pg/g	0.24 - 6.68	0.31	0.901	7	--
2,2',3,5,6,6'-Hexachlorobiphenyl	68194-09-2	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,5,6'-Pentachlorobiphenyl	73575-55-0	pg/g	0.24 - 6.68	0.326	0.969	7	--
2,2',3,5-Tetrachlorobiphenyl	70362-46-8	pg/g	0.24 - 6.68	0.0473	7.74	7	1
2,2',3,6,6'-Pentachlorobiphenyl	73575-54-9	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,6'-Tetrachlorobiphenyl	41464-47-5	pg/g	0.24 - 6.68	0.0476	0.721	7	--
2,2',3-Trichlorobiphenyl	38444-78-9	pg/g	0.24 - 6.68	0.0426	0.329	7	--
2,2',4,4',6,6'-Hexachlorobiphenyl	33979-03-2	pg/g	0.24 - 6.68	0.0369	1.99	7	2
2,2',4,5',6-Pentachlorobiphenyl	60145-21-3	pg/g	0.24 - 6.68	0.268	0.793	7	--
2,2',4,5-Tetrachlorobiphenyl	70362-47-9	pg/g	0.24 - 6.68	0.0417	0.647	7	--
2,2',4,6,6'-Pentachlorobiphenyl	56558-16-8	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',4-Trichlorobiphenyl	37680-66-3	pg/g	0.24 - 6.68	0.0373	0.329	7	--
2,2',5,5'-Tetrachlorobiphenyl	35693-99-3	pg/g	0.24 - 6.68	0.0382	0.595	7	--
2,2',6,6'-Tetrachlorobiphenyl	15968-05-5	pg/g	0.24 - 6.68	0.038	0.621	7	--
2,2',6-Trichlorobiphenyl	38444-73-4	pg/g	0.24 - 6.68	0.0518	0.446	7	--

Table A-7. Reported Detection Limits for Round 2 Multiplate Tissue Samples.

Analyte	CAS Number	Units	Round 2 QAPP MDL	Reported Detection Limits		Total # Data Points	# Undetected Results
				Minimum	Maximum		
2,2'-Dichlorobiphenyl	13029-08-8	pg/g	0.24 - 6.68	0.225	1.74	7	--
2,3,3',4,4',5,5',6-Octachlorobiphenyl	74472-53-0	pg/g	0.24 - 6.68	0.089	1.33	7	--
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	pg/g	0.33	0.122	18.7	7	1
2,3,3',4,4',5',6-Heptachlorobiphenyl	74472-50-7	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,3,3',4,4',5,6-Heptachlorobiphenyl	41411-64-7	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,3,3',4,4',6-Hexachlorobiphenyl	74472-42-7	pg/g	0.24 - 6.68	0.217	2.11	7	--
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	pg/g	0.36	0.262	1.59	7	--
2,3,3',4,5,5',6-Heptachlorobiphenyl	74472-51-8	pg/g	0.24 - 6.68	0.763	6.79	7	7
2,3,3',4',5,5'-Hexachlorobiphenyl	39635-34-2	pg/g	0.24 - 6.68	0.304	8.47	7	3
2,3,3',4,5,5'-Hexachlorobiphenyl	39635-35-3	pg/g	0.24 - 6.68	0.231	2.4	7	--
2,3,3',4',5',6-Hexachlorobiphenyl	74472-45-0	pg/g	0.24 - 6.68	0.237	2.3	7	--
2,3,3',4,5',6-Hexachlorobiphenyl	74472-43-8	pg/g	0.24 - 6.68	0.404	3.06	7	7
2,3,3',4',5'-Pentachlorobiphenyl	76842-07-4	pg/g	0.24 - 6.68	0.336	10.4	7	2
2,3,3',4,5-Pentachlorobiphenyl	70424-69-0	pg/g	0.24 - 6.68	0.382	3.3	7	6
2,3,3',4,6-Pentachlorobiphenyl	74472-35-8	pg/g	0.24 - 6.68	0.278	1.56	7	--
2,3,3',4'-Tetrachlorobiphenyl	41464-43-1	pg/g	0.24 - 6.68	0.653	1.66	7	--
2,3,3',4-Tetrachlorobiphenyl	74338-24-2	pg/g	0.24 - 6.68	0.985	8.78	7	7
2,3,3',5,5',6-Hexachlorobiphenyl	74472-46-1	pg/g	0.24 - 6.68	0.256	2.52	7	--
2,3,3',5,5'-Pentachlorobiphenyl	39635-32-0	pg/g	0.24 - 6.68	0.237	5.48	7	3
2,3,3',5,6-Pentachlorobiphenyl	74472-36-9	pg/g	0.24 - 6.68	0.339	2.89	7	6
2,3,3',5'-Tetrachlorobiphenyl	41464-49-7	pg/g	0.24 - 6.68	0.617	3.01	7	2
2,3,3',5-Tetrachlorobiphenyl	70424-67-8	pg/g	0.24 - 6.68	0.603	4.21	7	2
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	pg/g	0.29	0.231	2.27	7	--
2,3',4,4',5'-Pentachlorobiphenyl	65510-44-3	pg/g	0.68	0.267	11.7	7	1
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	pg/g	0.40	0.264	1.47	7	--
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	pg/g	0.33	0.256	1.42	7	--
2,3',4,4'-Tetrachlorobiphenyl	32598-10-0	pg/g	0.24 - 6.68	0.597	1.51	7	--
2,3,4,4'-Tetrachlorobiphenyl	33025-41-1	pg/g	0.24 - 6.68	0.652	1.7	7	--
2,3',4,5,5'-Pentachlorobiphenyl	68194-12-7	pg/g	0.24 - 6.68	0.227	0.661	7	--
2,3',4,5',6-Pentachlorobiphenyl	56558-18-0	pg/g	0.24 - 6.68	0.232	1.46	7	1
2,3',4,5'-Tetrachlorobiphenyl	73575-52-7	pg/g	0.24 - 6.68	0.582	1.47	7	--
2,3',4,5-Tetrachlorobiphenyl	73575-53-8	pg/g	0.24 - 6.68	0.534	1.36	7	--
2,3,4',5-Tetrachlorobiphenyl	74472-34-7	pg/g	0.24 - 6.68	0.579	1.49	7	--
2,3,4',6-Tetrachlorobiphenyl	52663-58-8	pg/g	0.24 - 6.68	0.0369	0.472	7	--
2,3',4-Trichlorobiphenyl	55712-37-3	pg/g	0.24 - 6.68	0.157	0.496	7	--
2,3,4'-Trichlorobiphenyl	38444-85-8	pg/g	0.24 - 6.68	0.195	0.61	7	--
2,3',5,5'-Tetrachlorobiphenyl	41464-42-0	pg/g	0.24 - 6.68	0.578	1.55	7	--
2,3',5',6-Tetrachlorobiphenyl	74338-23-1	pg/g	0.24 - 6.68	0.0369	0.869	7	1

Table A-7. Reported Detection Limits for Round 2 Multiplate Tissue Samples.

Analyte	CAS Number	Units	Round 2 QAPP MDL	Reported Detection Limits		Total # Data Points	# Undetected Results
				Minimum	Maximum		
2,3',5'-Trichlorobiphenyl	37680-68-5	pg/g	0.24 - 6.68	0.18	0.545	7	--
2,3,5-Trichlorobiphenyl	55720-44-0	pg/g	0.24 - 6.68	0.182	3.57	7	3
2,3',6-Trichlorobiphenyl	38444-76-7	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,3,6-Trichlorobiphenyl	55702-45-9	pg/g	0.24 - 6.68	0.0369	0.847	7	1
2,3'-Dichlorobiphenyl	25569-80-6	pg/g	0.24 - 6.68	0.128	0.974	7	--
2,3-Dichlorobiphenyl	16605-91-7	pg/g	0.24 - 6.68	0.149	1.13	7	--
2,4',5-Trichlorobiphenyl	16606-02-3	pg/g	0.24 - 6.68	0.166	0.508	7	--
2,4',6-Trichlorobiphenyl	38444-77-8	pg/g	0.24 - 6.68	0.17	0.524	7	--
2,4'-Dichlorobiphenyl	34883-43-7	pg/g	0.24 - 6.68	0.12	0.914	7	--
2,4-Dichlorobiphenyl	33284-50-3	pg/g	0.24 - 6.68	0.136	1.04	7	--
2,5-Dichlorobiphenyl	34883-39-1	pg/g	0.24 - 6.68	0.129	0.979	7	--
2,6-Dichlorobiphenyl	33146-45-1	pg/g	0.24 - 6.68	0.13	0.986	7	--
2-Chlorobiphenyl	2051-60-7	pg/g	0.24 - 6.68	0.058	0.528	7	--
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	pg/g	0.37	0.678	15.9	7	7
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	pg/g	0.45	0.293	6.55	7	2
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	pg/g	0.38	0.622	1.59	7	--
3,3',4,5,5'-Pentachlorobiphenyl	39635-33-1	pg/g	0.24 - 6.68	0.463	4.12	7	6
3,3',4,5'-Tetrachlorobiphenyl	41464-48-6	pg/g	0.24 - 6.68	0.541	1.47	7	--
3,3',4,5-Tetrachlorobiphenyl	70362-49-1	pg/g	0.24 - 6.68	0.786	5.53	7	7
3,3',4-Trichlorobiphenyl	37680-69-6	pg/g	0.24 - 6.68	0.201	4	7	1
3,3',5,5'-Tetrachlorobiphenyl	33284-52-5	pg/g	0.24 - 6.68	1.08	9.59	7	7
3,3',5-Trichlorobiphenyl	38444-87-0	pg/g	0.24 - 6.68	0.263	1.12	7	4
3,3'-Dichlorobiphenyl	2050-67-1	pg/g	0.24 - 6.68	0.139	1.06	7	--
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	pg/g	0.34	1.66	5.14	7	7
3,4,4'-Trichlorobiphenyl	38444-90-5	pg/g	0.24 - 6.68	0.163	0.538	7	--
3,4',5-Trichlorobiphenyl	38444-88-1	pg/g	0.24 - 6.68	0.257	1.59	7	3
3,4,5-Trichlorobiphenyl	53555-66-1	pg/g	0.24 - 6.68	0.306	2.65	7	7
3,5-Dichlorobiphenyl	34883-41-5	pg/g	0.24 - 6.68	0.382	3.4	7	7
3-Chlorobiphenyl	2051-61-8	pg/g	0.24 - 6.68	0.0622	0.502	7	--
4,4'-Dichlorobiphenyl	2050-68-2	pg/g	0.24 - 6.68	0.139	1.05	7	--
4-Chlorobiphenyl	2051-62-9	pg/g	0.24 - 6.68	0.0628	0.552	7	--
PCB012 & 013	PCB012_013	pg/g	0.24 - 6.68	0.141	1.07	7	--
PCB018 & 030	PCB018_030	pg/g	0.24 - 6.68	0.0369	0.329	7	--
PCB020 & 028	PCB020_028	pg/g	0.24 - 6.68	0.175	0.54	7	--
PCB021 & 033	PCB021_033	pg/g	0.24 - 6.68	0.172	0.542	7	--
PCB026 & 029	PCB026_029	pg/g	0.24 - 6.68	0.175	0.543	7	--
PCB040 & 041 & 071	PCB040_041_071	pg/g	0.24 - 6.68	0.0419	0.647	7	--
PCB044 & 047 & 065	PCB044_047_065	pg/g	0.24 - 6.68	0.0372	0.574	7	--

Table A-7. Reported Detection Limits for Round 2 Multiplate Tissue Samples.

Analyte	CAS Number	Units	Round 2 QAPP MDL	Reported Detection Limits		Total # Data Points	# Undetected Results
				Minimum	Maximum		
PCB045 & 051	PCB045_051	pg/g	0.24 - 6.68	0.0416	0.638	7	--
PCB049 & 069	PCB049_069	pg/g	0.24 - 6.68	0.0369	0.549	7	--
PCB050 & 053	PCB050_053	pg/g	0.24 - 6.68	0.04	0.605	7	--
PCB059 & 062 & 075	PCB059_062_075	pg/g	0.24 - 6.68	0.0369	0.476	7	--
PCB061 & 070 & 074 & 076	PCB061_070_074_	pg/g	0.24 - 6.68	0.594	1.51	7	--
PCB083 & 099	PCB083_099	pg/g	0.24 - 6.68	0.313	0.912	7	--
PCB085 & 116 & 117	PCB085_116_117	pg/g	0.24 - 6.68	0.26	0.757	7	--
PCB086 & 087 & 097 & 108 & 119 & 125	PCB086_087_097_	pg/g	0.24 - 6.68	0.265	0.773	7	--
PCB088 & 091	PCB088_091	pg/g	0.24 - 6.68	0.3	0.886	7	--
PCB090 & 101 & 113	PCB090_101_113	pg/g	0.24 - 6.68	0.268	0.779	7	--
PCB093 & 095 & 098 & 100 & 102	PCB093_095_098_	pg/g	0.24 - 6.68	0.29	0.86	7	--
PCB107 & 124	PCB107_124	pg/g	0.24 - 6.68	0.323	1.7	7	--
PCB110 & 115	PCB110_115	pg/g	0.24 - 6.68	0.233	0.678	7	--
PCB128 & 166	PCB128_166	pg/g	0.24 - 6.68	0.276	2.78	7	--
PCB129 & 138 & 160 & 163	PCB129_138_160_	pg/g	0.24 - 6.68	0.275	2.75	7	--
PCB134 & 143	PCB134_143	pg/g	0.24 - 6.68	0.322	3.07	7	--
PCB135 & 151 & 154	PCB135_151_154	pg/g	0.24 - 6.68	0.0369	3.23	7	1
PCB139 & 140	PCB139_140	pg/g	0.24 - 6.68	0.291	2.72	7	--
PCB147 & 149	PCB147_149	pg/g	0.24 - 6.68	0.0562	2.65	7	--
PCB153 & 168	PCB153_168	pg/g	0.24 - 6.68	0.241	2.37	7	--
PCB156 & 157	PCB156_157	pg/g	0.42	0.285	2.98	7	--
PCB171 & 173	PCB171_173	pg/g	0.24 - 6.68	0.0369	0.329	7	--
PCB180 & 193	PCB180_193	pg/g	0.24 - 6.68	0.0369	0.329	7	--
PCB183 & 185	PCB183_185	pg/g	0.24 - 6.68	0.0369	0.329	7	--
PCB197 & 200	PCB197_200	pg/g	0.24 - 6.68	0.0369	0.329	7	--
PCB198 & 199	PCB198_199	pg/g	0.24 - 6.68	0.0369	0.329	7	--
Polychlorinated biphenyls	1336-36-3	pg/g	0.24 - 6.68	--	--	7	--
PCDD/Fs							
Heptachlorodibenzofuran homologs	38998-75-3	pg/g	--	0.0369	0.329	7	--
Heptachlorodibenzo-p-dioxin homologs	37871-00-4	pg/g	--	0.0369	0.329	7	--
Hexachlorodibenzofuran homologs	55684-94-1	pg/g	--	0.0369	0.329	7	--
Hexachlorodibenzo-p-dioxin homologs	34465-46-8	pg/g	--	0.0369	0.329	7	--
Octachlorodibenzofuran	39001-02-0	pg/g	0.41	0.0369	0.329	7	--
Octachlorodibenzo-p-dioxin	3268-87-9	pg/g	0.73	0.0369	0.329	7	--
Pentachlorodibenzofuran homologs	30402-15-4	pg/g	--	0.0369	0.329	7	--
Pentachlorodibenzo-p-dioxin homologs	36088-22-9	pg/g	--	0.0369	0.672	7	2
Tetrachlorodibenzofuran homologs	30402-14-3	pg/g	--	0.0369	0.329	7	--
Tetrachlorodibenzo-p-dioxin homologs	41903-57-5	pg/g	--	0.0369	0.329	7	--

Table A-7. Reported Detection Limits for Round 2 Multiplate Tissue Samples.

Analyte	CAS Number	Units	Round 2 QAPP MDL	Reported Detection Limits		Total # Data Points	# Undetected Results
				Minimum	Maximum		
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	pg/g	0.1	0.0369	0.329	7	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	35822-46-9	pg/g	0.16	0.0369	0.329	7	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	pg/g	0.12	0.038	0.757	7	3
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	pg/g	0.09	0.038	0.625	7	2
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	39227-28-6	pg/g	0.14	0.0369	0.95	7	2
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	pg/g	0.08	0.0369	0.537	7	2
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	57653-85-7	pg/g	0.09	0.0369	0.329	7	--
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	pg/g	0.12	0.0489	0.761	7	7
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	19408-74-3	pg/g	0.08	0.0369	0.555	7	3
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	pg/g	0.12	0.0369	0.779	7	2
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	40321-76-4	pg/g	0.1	0.0369	0.672	7	3
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	pg/g	0.1	0.063	0.331	7	7
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	pg/g	0.09	0.0468	0.329	7	3
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	pg/g	0.03	0.0369	0.341	14	3
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746-01-6	pg/g	0.03	0.0369	0.329	7	4
PCB Aroclors							
Aroclor 1016	12674-11-2	pg/g	0.24 - 6.68	0.532	2.47	7	7
Aroclor 1221	11104-28-2	pg/g	0.24 - 6.68	0.168	1.28	7	7
Aroclor 1232	11141-16-5	pg/g	0.24 - 6.68	0.214	1.88	7	7
Aroclor 1242	53469-21-9	pg/g	0.24 - 6.68	0.591	2.74	7	4
Aroclor 1248	12672-29-6	pg/g	0.24 - 6.68	3.64	9.2	7	3
Aroclor 1254	11097-69-1	pg/g	0.24 - 6.68	2.51	7.3	7	4
Aroclor 1260	11096-82-5	pg/g	0.24 - 6.68	0.185	1.64	7	--

EcoChem, Inc.

Environmental Science and Chemistry

DATA QUALITY EVALUATION

PORTLAND HARBOR RI/FS

BENTHIC INVERTEBRATE MULTIPLATE TISSUES – FALL 2005

Dioxin/Furan Compounds – EPA Method 1613 ver. B
Polychlorinated Biphenyl (PCB) Congeners – EPA Method 1668A
Chlorinated Pesticides - Axys Method MLA-028
Metals – EPA Methods 6010, 6020, 7742

Prepared for:

Integral Consulting
7900 SE 28th Street, Suite 300
Mercer Island, Washington 98040

Integral Project: B01-01-58C

Prepared by:

EcoChem, Inc.
710 Second Avenue, Suite 660
Seattle, Washington 98104

EcoChem Project: C22111-1

May 1, 2006

Approved for Release:

John Mitchell
Sr. Project Manager
EcoChem, Inc.

DATA QUALITY EVALUATION

BASIS OF DATA EVALUATION

The data were validated using guidance and quality control (QC) criteria documented in the analytical methods; *Guidance on Environmental Data Verification and Validation* (EPA 2002c); *Portland Harbor RI/FS, Round 2, Quality Assurance Project Plan* (QAPP) *Addendum 5: Multiplate Tissue Collection;* and *National Functional Guidelines for Organic and/or Inorganic Data Review* (USEPA 1994, 1999 & 2002). Additional guidance for polychlorinated biphenyl (PCB) congener data validation were *Axys Standard Operating Procedure MLA-10, Revision 5; EPA Region 10 SOP for the Validation of Method 1668 Toxic, Dioxin-like PCB Data* (USEPA 1995).

Data qualifier definitions, reason codes, and validation criteria are included as **APPENDIX A**. Data validation reports, which discuss individual findings for each quality control element [by sample delivery group (SDG)], are provided in **APPENDIX B**. Data validation worksheets and communication records are organized by SDG and retained at EcoChem.

PROCESS FOR DATA VALIDATION

All electronic data deliverable files (EDD) were verified by comparing 100% of the field sample results and 10% of the QC sample results to the hardcopy data package (ten percent for PCB congener EDD files).

The Multiplate tissue data received Level III data validation, which included evaluation (as appropriate for each method) of:

- Package completeness
- Sample chain-of-custody and sample preservation
- Analytical holding times
- Blank contamination
- Precision (replicate analyses)
- Accuracy (compound recovery)
- Detection limits
- Instrument performance (initial calibration, continuing calibration, tuning, sensitivity and degradation)

A minimum ten percent (10%) of all Multiplate tissue data packages received full (Level IV) data validation, which includes evaluation of compound identification and quantitation (transcription and calculation checks).

A dual-tier system of primary and secondary reviewers is utilized to ensure technical correctness and QC of the validation process; and all data validation is documented using standardized and controlled validation worksheets and spreadsheets. These worksheets are completed for each SDG, documenting all deficiencies, outliers and subsequent qualifiers.

After qualifiers are entered into the EcoChem database, a second party verifies 100% of the qualifier entry. Interpretive qualifiers are then applied to the field samples and qualified data is exported to the Project Database (Integral).

SUMMARY OF DATA VALIDATION: METALS

Two (2) Multiplate tissue samples were analyzed for metals for the Portland Harbor RI/FS. One rinse proof blank was generated to monitor the sample homogenization process. All metals analyses were completed by Columbia Analytical Services, Kelso, Washington.

The metals data for the Multiplate tissue samples were generally acceptable. A total of nine (9) data points (19% of all Multiplate tissue metals results) were estimated because control limits were exceeded in one or more laboratory QC samples or procedures. These qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose.

The laboratory data were evaluated in terms of completeness, holding times, instrument performance, bias, and precision. The results of the QC procedures used during sample analyses are discussed below.

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were 100% complete for the Multiplate tissue metals analyses.

Holding Times and Sample Preservation

All analytical holding time requirements were met for metals analysis of the Multiplate tissue samples and associated QC samples.

Instrument Performance

Initial and continuing calibrations were completed for all target analytes and met the criteria for frequency of analysis. All initial and continuing calibrations met acceptance criteria.

Method Blank Analyses

Method and instrument blanks are used to evaluate all associated samples, including field blanks. Any remaining positive results in the field blanks are used to evaluate all associated samples.

Method and instrument blanks were analyzed at the appropriate frequency. Various target analytes were detected in the method and/or instrument blanks. A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets. Two antimony results (4.3% of all Multiplate tissue metals results) were qualified as not detected (U) based on blank contamination.

Accuracy

The accuracy of the analytical results is evaluated in the following sections in terms of analytical bias (matrix spike [MS], laboratory control sample [LCS], contract required detection limit [CRDL] standard recovery values, interference check samples [ICS], and serial dilution percent difference [%D] values) and precision (laboratory duplicate analyses).

Matrix Spike Recoveries

There was insufficient tissue sample available to analyze a matrix spike; therefore the laboratory analyzed duplicate standard reference material (SRM) samples. Analysis frequency and recoveries met the criteria for acceptable performance.

Laboratory Control Sample Recoveries

LCS analyses met the criteria for frequency of analysis. The recoveries reported by the laboratory met the criteria for acceptable performance.

Contract Required Detection Limit Standard Analyses

CRDL standards were analyzed at the beginning of each analytical sequence. For recoveries greater than the 130% upper control limit, the associated positive results less than two times the CRDL are estimated (J) to indicate a potential high bias. For recoveries less than the 70% lower control limit, positive results less than twice the CRDL and non-detects are estimated (J/UJ) to indicate a potential low bias. One result for selenium (2.1% of all Multiplate tissue metals results) was qualified as estimated (J) for potential low bias based on CRDL standard recovery outliers.

Interference Check Samples

ICP interference check samples were analyzed at the beginning of each analytical sequence. All ICP interference check sample results were within the acceptance criteria.

Serial Dilution Analyses

Serial dilution analyses were performed at the proper frequency. Serial dilution %D values greater than 10% may indicate the presence of matrix interference, resulting in potential bias. Eight (8) results (17% of all Multiplate tissue metals results) were qualified as estimated (J) based on serial dilution outliers. The qualifiers were applied to copper, lead, silver, and zinc (2 results each).

Precision

Laboratory and field duplicate analyses were not performed. Precision was assessed using duplicate SRM analyses only.

Method Detection Limits and Method Reporting Limits

The laboratory reported non-detects at the MDLs, adjusted for sample size and any dilution factor. The method reporting limit (MRL) for antimony was 0.011 mg/kg for the only non-detected tissue result.

Other Quality Control Samples

QC samples analyzed with the Multiplate tissue study included a homogenization proof blank. The results are discussed in the following sections.

Homogenization Proof Blank

A homogenization proof blank was associated with the Multiplate tissue samples. After qualifiers based on method blank contamination were issued, positive results for six metals remained in this proof blank. Results from the associated tissue samples were above the blank action levels, so no qualifiers were required.

Field Replicate Samples

No field replicate sample pairs were associated with the Multiplate tissue samples.

SUMMARY OF DATA VALIDATION: PESTICIDE COMPOUNDS

Seven (7) Multiplate tissue samples were analyzed for chlorinated pesticide compounds for the Portland Harbor RI/FS. One rinse proof blank was generated to monitor the sample homogenization process. Axys Analytical, Sidney, British Columbia, completed all pesticide analyses.

The pesticide data for the Multiplate tissue samples were generally acceptable. A total of 11 data points (4.9% of all Multiplate tissue pesticide results) were estimated because control limits were exceeded in one or more laboratory quality control QC samples or procedures. These qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose.

The laboratory data were evaluated in terms of completeness, holding times, instrument performance, bias, and precision. The results of the QC procedures used during sample analyses are discussed below.

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were 100% complete for the Multiplate tissue pesticide analyses.

No results were reported for toxaphene, although it was designated as a target analyte for this project. This was noted in previous data quality evaluation reports for earlier phases of this project. No further action was taken.

Holding Times and Sample Preservation

All extraction holding time requirements were met for pesticide analysis of the Multiplate tissue samples and associated QC samples. The analytical holding time of 40 days from the date of extraction was exceeded for re-analysis of Sample LW2-MIT004. The three (3) results reported from this re-analysis (1.3% of all Multiplate tissue pesticide results) were qualified as estimated (J) due to holding time outliers.

Instrument Performance

Calibrations

Initial and continuing calibrations were completed for all reported analytes except hexachlorobutadiene. Results for this analyte were calculated from a ratio of its response to that of another analyte, 1,2,3-trichlorobenzene. This calibration method does not meet project requirements; therefore, all hexachlorobutadiene results and detection limits were estimated (J or UJ). All other calibrations met the criteria for frequency of analysis and all initial calibrations met all acceptance criteria.

The continuing calibration percent difference (%D) values were used to evaluate instrument stability. Hexachlorobutadiene was not included in the continuing calibration checks, so all hexachlorobutadiene results and detection limits were estimated (J or UJ). All other calibrations met the criteria for frequency of analysis and all continuing calibrations met acceptance criteria.

A total of eight (8) hexachlorobutadiene results (3.6% of all Multiplate pesticide results) were qualified as estimated (UJ) based on calibration outliers.

Endrin/DDT Breakdown

Breakdown evaluation mixtures were analyzed at the proper frequency to measure percent breakdown of 4,4'-DDT and endrin. All acceptance criteria were met.

Method Blank Analyses

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times (5X) the concentration detected in the blank. If a contaminant is detected in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U). If the result is also less than the reporting limit, then the result is elevated to the reporting limit. No action is taken if the sample result is greater than the action level, or for non-detected results.

Method blanks are used to evaluate all associated samples.

Method blanks were analyzed at the appropriate frequency. A total of three (3) results (1.3% of all Multiplate tissue pesticide results) were qualified as not detected (U) based on method blank contamination.

Accuracy

The accuracy of the analytical results is evaluated in the following sections in terms of analytical bias (labeled compound and ongoing precision and recovery samples [OPR] recoveries).

Labeled Compound Recoveries

Labeled compounds were added to all field and QC samples. The recoveries reported by the laboratory met the criteria for acceptable performance.

Matrix Spike Recoveries

Matrix and duplicate matrix spike (MS/MSD) analyses were not performed. Accuracy was assessed using the labeled compound and OPR analyses.

Ongoing Precision and Recovery Sample Recoveries

OPR analyses met the criteria for frequency of analysis. The recoveries reported by the laboratory met the criteria for acceptable performance.

Precision

Laboratory and field duplicate analyses were not performed. Precision was assessed using OPR analyses only.

Method Detection Limits and Method Reporting Limits

To meet the project analytical concentration goals (ACG), the laboratory reported non-detects at the detection limits, adjusted for sample size and any dilution factor. These method reporting limits (MRLs) ranged from 0.00185 pg/g to 0.063 pg/g for the non-detected results. The MRLs met project criteria for all analytes except toxaphene, which was not analyzed for the Multiplate tissue samples.

Compound Identification

Several different flags were used by the laboratory to provide information about the reported results. A "K" flag indicates that a peak was detected at the correct retention time for the target analyte; however, the ion abundance ratio criteria were not met. The reported result is an estimated maximum possible concentration value, which is essentially an elevated detection limit. Data flagged "K" by the laboratory were qualified as not detected (U) to make this relationship clear to the data user. Forty (40) data points (18% of all Multiplate tissue pesticide data points) were qualified as not detected because the ion abundance ratio criteria were not met.

Other Quality Control Samples

QC samples analyzed with the Multiplate tissue study included a homogenization proof blank. The results are discussed in the following sections.

Homogenization Proof Blank

A homogenization proof blank was associated with the Multiplate tissue samples. After qualifiers based on method blank contamination and compound identification were issued, no positive results for dioxins or furans were detected in this proof blank.

Field Replicate Samples

No field replicate sample pairs were associated with the Multiplate tissue samples.

SUMMARY OF DATA VALIDATION: PCB CONGENERS

Seven (7) Multiplate tissue samples were analyzed for polychlorinated biphenyl (PCB) congeners for the Portland Harbor RI/FS. One rinse proof blank was generated to monitor the sample homogenization process. Samples were analyzed by Axys Analytical Services, Ltd. Sidney, British Columbia.

The laboratory data were evaluated in terms of completeness, holding times, instrument performance, bias, and precision. The results of the QC procedures used during sample analyses are discussed below.

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were 100% complete for the Multiplate tissue PCB analyses.

Holding Times and Sample Preservation

All extraction and analytical holding time requirements were met for the PCB congener analyses of Multiplate tissue samples and associated QC samples.

Instrument Performance

Initial and continuing calibrations were completed for all target analytes and met the criteria for frequency of analysis. All calibrations met all acceptance criteria.

All other instrument performance criteria were met by the laboratory.

Method Blank Analyses

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times (5X) the concentration detected in the blank. If a contaminant is detected in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U). If the result is also less than the reporting limit, then the result is elevated to the reporting limit. No action is taken if the sample result is greater than the action level, or for non-detected results.

Method blanks are used to evaluate all associated samples.

Method blanks were analyzed at the appropriate frequency. A total of 23 results (1.6% of all Multiplate tissue PCB results) were qualified as not detected (U) based on method blank contamination.

Accuracy

The accuracy of the analytical results is evaluated in the following sections in terms of analytical bias (labeled compound and OPR samples).

Labeled Compound Recoveries

Labeled compounds were added to all field and QC samples. The recoveries reported by the laboratory met the criteria for acceptable performance.

Matrix Spike Recoveries

MS/MSD analyses were not performed. Accuracy was assessed using the labeled compound and OPR analyses.

Ongoing Precision and Recovery Sample Recoveries

OPR analyses met the criteria for frequency of analysis. The recoveries reported by the laboratory met the criteria for acceptable performance.

Precision

Laboratory and field duplicate analyses were not performed. Precision was assessed using OPR analyses only.

Method Detection Limits and Method Reporting Limits

To meet the project analytical concentration goals (ACG), the laboratory reported non-detects at the detection limits, adjusted for sample size and any dilution factor. These method reporting limits (MRLs) range from 0.0369 pg/g to 15.9 pg/g for the non-detected results.

Compound Identification

Different flags were used by the laboratory to provide information about the reported results. A "K" flag indicates that a peak was detected at the correct retention time for the target analyte; however, the ion abundance ratio criteria were not met. The reported result is an estimated maximum possible concentration value, which is essentially an elevated detection limit. Data flagged "K" by the laboratory were qualified as not detected (U) to make this relationship clear to the data user. A total of 83 data points (5.9% of all Multiplate tissue PCB data points) were qualified as not detected because the ion abundance ratio criteria were not met.

No Aroclor patterns were observed in the samples, but the laboratory reported results for Aroclors by summing the concentrations of certain PCB congeners and applying a laboratory-derived correction factor. All 17 positive Aroclor results (1.2% of all Multiplate tissue PCB data points) were qualified (NJ) to indicate that they should be considered as tentatively identified at estimated concentrations.

Other Quality Control Samples

QC samples analyzed with the Multiplate tissue study included a homogenization proof blank. The results are discussed in the following sections.

Homogenization Proof Blank

A homogenization proof blank was associated with the Multiplate tissue samples. After qualifiers based on method blank contamination and compound identification were issued, positive results for PCB congeners remained in this proof blank. Results from the associated tissue samples were above the blank action levels, so no qualifiers were required.

Field Replicate Samples

No field replicate sample pairs were associated with the Multiplate tissue samples.

SUMMARY OF DATA VALIDATION: DIOXIN/FURAN COMPOUNDS

Basis of Data Evaluation

Dioxin/furan data were validated using guidance and quality control (QC) criteria documented in the analytical method (E1613); *Guidance on Environmental Data Verification and Validation* (EPA 2002c); *EPA Region 10 SOP for the Validation of Polychlorinated Dibenzodioxin (PCDD) and Polychlorinated Dibenzofuran (PCDF) Data* (EPA 1996), in addition to the sources listed above.

Summary of Data Validation

Seven (7) Multiplate tissue samples were analyzed for dioxin and furan compounds for the Portland Harbor RI/FS. One rinse proof blank was generated to monitor the sample homogenization process. Axys Analytical, Sidney, British Columbia, completed all dioxin/furan analyses.

The dioxin/furan data for the Multiplate tissue samples were acceptable. No data were estimated or rejected for any reason.

The laboratory data were evaluated in terms of completeness, holding times, instrument performance, bias, and precision. The results of the QC procedures used during sample analyses are discussed below.

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were 100% complete for the Multiplate tissue dioxin/furan analyses.

Holding Times and Sample Preservation

All extraction and analytical holding time requirements were met for the dioxin/furan analyses of the Multiplate tissue samples and associated QC samples.

Instrument Performance

Initial and continuing calibrations were completed for all target analytes and met the criteria for frequency of analysis. All calibrations met all acceptance criteria.

Method Blank Analyses

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times (5X) the concentration detected in the blank. If a contaminant is detected in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U). If the result is also less than the reporting limit, then the result is elevated to the reporting limit. No action is taken if the sample result is greater than the action level, or for non-detected results.

Method blanks are used to evaluate all associated samples.

Method blanks were analyzed at the appropriate frequency. A total of seven results (3.4% of all Multiplate tissue dioxin/furan results) were qualified as not detected (U) based on method blank contamination.

Accuracy

The accuracy of the analytical results is evaluated in the following sections in terms of analytical bias (labeled compound and OPR samples).

Labeled Compound Recoveries

Labeled compounds were added to all field and QC samples. The recoveries reported by the laboratory met the criteria for acceptable performance.

Matrix Spike Recoveries

MS/MSD analyses were not performed. Accuracy was assessed using the labeled compound and OPR analyses.

Ongoing Precision and Recovery Sample Recoveries

OPR analyses met the criteria for frequency of analysis. The recoveries reported by the laboratory met the criteria for acceptable performance.

Precision

Laboratory and field duplicate analyses were not performed. Precision was assessed using OPR analyses only.

Method Detection Limits and Method Reporting Limits

To meet the project analytical concentration goals (ACG), the laboratory reported non-detects at the detection limits, adjusted for sample size and any dilution factor. These method reporting limits (MRLs) range from 0.0489 pg/g to 0.95 pg/g for the non-detected results.

Compound Identification

Flags were used by the laboratory to provide information about the reported results. A "K" flag indicates that a peak was detected at the correct retention time for the target analyte; however, the ion abundance ratio criteria were not met. The reported result is an estimated maximum possible concentration (EMPC) value, which is an elevated detection limit. Data flagged "K" by the laboratory were qualified as not detected (U) to make this relationship clear to the data user. Twenty-two (22) data points (11% of all Multiplate tissue dioxin/furan data points) were qualified as not detected because the ion abundance ratio criteria were not met.

Other Quality Control Samples

QC samples analyzed with the Multiplate tissue study included a homogenization proof blank. The results are discussed in the following sections.

Homogenization Proof Blank

A homogenization proof blank was associated with the Multiplate tissue samples. After qualifiers based on method blank contamination and compound identification were issued, no positive results for dioxins or furans were detected in this proof blank.

Field Replicate Samples

No field replicate sample pairs were associated with the Multiplate tissue samples.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Multiplate Tissue Study
Dioxin/Furan Compounds
Method: EPA 1613B
Axys Analytical Services, Ltd.

This report documents the review of analytical data from the analyses of tissue samples and the associated laboratory and field quality control samples. Axys Analytical Services, Ltd. of Sidney, British Columbia, Canada, analyzed the samples.

SDG	Number of Samples	Validation Level
WG17772	7 TISSUES	FULL
WG17828	1 HOMOGENIZATION PROOF BLANK	COMPLIANCE

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory quality control (QC)results were also verified (10%).

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

	Holding Times and Sample Receipt	1	Matrix Spikes/Matrix Spike Duplicates (MS/MSD)
	Initial Calibration (ICAL)	1	Ongoing Precision and Recovery
	GC/MS Tuning	1	Laboratory Duplicate
	Continuing Calibration (CCAL)	1	Field Duplicates
2	Laboratory Blanks	2	Compound Identification
1	Field Blanks		Reporting Limits (MDL and MRL)
	Labeled Compounds	1	Calculation Verification (full validation only)

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[1] ***Quality control results are discussed below, but no data were qualified.***
[2] ***Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.***

Laboratory Blanks

SDG WG17772: Positive values for OCDD, 2,3,4,6,7,8-HpCDF, and OCDF were reported in the laboratory blank. Action levels of five times the blank concentrations were established and the sample results were compared to this action level. Values less than the action level were qualified as not detected (U-7) at the reported concentration.

SDG WG17828: This SDG consisted of a laboratory preparation blank and a homogenization proof blank. Positive values for 1,2,3,4,6,7,8-HpCDD and OCDD were reported in the laboratory preparation blank. Action levels of five times the blank concentrations were established and the sample results were compared to this action level. Values less than the action level were qualified as not detected (U-7) at the reported concentration. After qualifiers based on the laboratory preparation blank were assigned, no positive values remained in the homogenization proof blank.

Field Blanks

No field blanks were submitted with these SDG.

Matrix Spikes/Matrix Spike Duplicates (MS/MSD)

No MS/MSD sets were performed with these SDGs. Accuracy and precision were assessed using labeled compound recoveries and ongoing precision and recovery samples.

Ongoing Precision and Recovery

SDG WG17828: No ongoing precision and recovery (OPR) was analyzed with this SDG.

Laboratory Duplicate

No laboratory duplicate were reported with these SDGs. Precision was assessed using the ongoing precision and recovery samples.

Field Duplicates

No field duplicates were submitted.

Compound Identification

The laboratory assigned a “K” qualifier to one or more analytes in all samples to indicate the ion ratio criterion were not met. Since the ion abundance ratio is the primary identification criterion for high resolution mass spectroscopy, an outlier indicates that the reported value may be a false positive. These values were qualified as not detected (U-21).

Calculation Verification

SDG WG17772: Full (Level IV) validation was performed on this SDG. No transcription or calculation errors were found.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the labeled compound and OPR percent recovery values. Precision was acceptable as demonstrated by the OPR recovery values.

Data were qualified as not detected due to ion ratio criteria outliers and contamination in the associated blanks.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Multiplate Tissue Study
PCB Congeners by EPA Method 1668
Axys Analytical Services, Ltd.

This report documents the review of analytical data from the analyses of tissue samples and the associated laboratory quality control samples. Samples were analyzed by Axys Analytical Services, Ltd. Sidney, British Columbia, Canada.

SDG	Number of Samples	Validation Level
WG17772	7 TISSUES	FULL
WG17828	1 HOMOGENIZATION PROOF BLANK	COMPLIANCE

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

III. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory quality control (QC) results were also verified (10%). Numerous reporting limits and method detection limits (MDL) did not match between the data packages and EDD files. The laboratory re-submitted all EDD files and replaced several data package pages to resolve the inconsistencies.

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

	Holding Times and Sample Receipt	1	Matrix Spikes/Matrix Spike Duplicates (MS/MSD)
	GC/MS Tuning	1	Ongoing Precision and Recovery
	Initial Calibration (ICAL)	1	Laboratory Duplicate
	Calibration Verification (CVER)	1	Field Duplicates
	Isomer Specificity	2	Compound Identification
2	Laboratory Blanks	1	Calculation Verification (full validation only)
1	Field Blanks	1	Reporting Limits (MDL and MRL)
1	Labeled Compound Recovery		

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[1] ***Quality control results are discussed below, but no data were qualified.***
[2] ***Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.***

Laboratory Blanks

In order to assess the impact of laboratory blank contamination on the reported sample results, action levels at five times the blank concentrations are established. If the concentrations in the associated field samples are less than the action levels, the results are qualified as not detected (U-7). If the result is also less than the reporting limit, the result is elevated to the reporting limit.

SDG WG17772: Positive results for several PCB congeners were reported in the laboratory preparation blank. All sample concentrations were either greater than the established action levels, or the PCB was not detected in the sample. The samples were then compared to the homogenization proof blank from SDG WG17828. Again, all sample concentrations were greater than the established action levels. No qualifies were required.

SDG WG17828: This SDG consisted of one laboratory preparation blank and a homogenization proof blank. Positive results for several PCB congeners were reported in the laboratory preparation blank. After qualifiers based on the laboratory preparation blank were assigned, positive results for 11 congeners remained in the homogenization proof blank. Results from the associated tissue samples were greater than the action levels so no qualifiers were required.

Field Blanks

No field blanks were submitted with these SDGs.

Labeled Compound Recovery

SDG WG17772: The percent recovery (%R) values for the labeled compounds 13C-PCB4 and 13C-PCB19 were less than their lower control limits in the laboratory preparation blank. The %R values for the labeled compounds 13C-PCB1, 13C-PCB4, and 13C-PCB19 were less their lower control limits in the duplicate ongoing precision and recovery (OPR) sample. Qualifiers are not assigned to QC samples.

SDG WG17828: The %R values for the labeled compounds 13C-PCB4 and 13C-PCB19 were less than their lower control limits in the laboratory preparation blank. Qualifiers are not assigned to QC samples.

Matrix Spikes/Matrix Spike Duplicates (MS/MSD)

No MS/MSD sets were performed with these SDGs. Accuracy and precision were assessed using labeled compound recoveries and OPR samples.

Ongoing Precision and Recovery

SDG WG17828: No OPR was analyzed with this SDG.

Laboratory Duplicate

No laboratory duplicate were reported with these SDG. Precision was assessed using the ongoing precision and recovery samples.

Field Duplicates

No field duplicates were submitted with these SDGs.

Compound Identification

The laboratory assigned a "K" qualifier to one or more analytes in all samples to indicate the ion abundance ratio criteria were not met. Since the ion abundance ratio is the primary identification criterion for high resolution mass spectroscopy, an outlier indicates that the reported result may be a false positive; therefore these results were qualified as not detected (U-21).

SDG WG17772: No Aroclor patterns were observed in the samples and the laboratory reported default Aroclor identifications. Additionally, results reported for Aroclors were calculated from the concentrations of PCB congeners using a laboratory-derived correction factor, instead of an Aroclor specific response factor. For these reasons all positive Aroclor results were qualified as estimated and tentatively identified (NJ-14).

Calculation Verification

SDG WG17772: Full (Level IV) validation was performed on this SDG. No transcription or calculation errors were found.

Reporting Limits (MDL and MRL)

SDG WG17828: The laboratory determined sample detection limits by converting the minimum detectable signal to a concentration. The minimum detectable area is determined as three times the height of the detector noise, converted to a peak area using the area/height ratio of the corresponding surrogate peak. These limits are generally supported by regular method detection limit (MDL) studies using low level spikes, following the statistical procedures outlined in the US Code of Federal Regulations (40 CFR Part 136, Appendix B). However, for this SDG, the statistical MDL values exceeded the quoted detection limits by **up to ten times**. The laboratory explained that the sample detection limit is a more realistic measure of sensitivity than the statistical MDL, so this value should be considered the actual detection limit of this analysis. However, when no target analyte is detected, the higher value of the sample detection limit and the MDL is reported as the detection limit.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the labeled compound and OPR percent recovery values. Precision was acceptable as demonstrated by the RPD values for the duplicate OPR analyses.

Data were qualified as not detected based on contamination in the associated blanks and potential false positive results. Aroclor results were also qualified as tentatively identified at estimated concentrations.

All data, as estimated, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Multiplate Tissue Study
Method: MLA013
Axys Analytical Services, Ltd.

This report documents the review of analytical data from the analyses of tissue samples and the associated laboratory and field quality control samples. Axys Analytical Services, Ltd. of Sidney, British Columbia, Canada, analyzed the samples.

SDG	Number of Samples	Validation Level
WG17772	7 TISSUES	FULL
WG17828	1 HOMOGENIZATION PROOF BLANK	COMPLIANCE

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables, with exceptions noted below. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory quality control (QC) results were also verified (10%).

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

- 2 Holding Times and Sample Receipt
- GC/MS Tuning
- 2 Initial Calibration (ICAL)
- 2 Continuing Calibration (CCAL)
- 2 Laboratory Blanks
- Field Blanks
- Labeled Compounds
- 1 Matrix Spikes/Matrix Spike Duplicates (MS/MSD)
- 1 Ongoing Precision & Recovery (OPR)
- 1 Laboratory Duplicates
- 1 Field Duplicates
- DDT/Endrin Breakdown
- 2 Compound Identification
- 1 Reporting Limits (MDL and MRL)
- 1 Calculation Verification (full validation only)

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[1] ***Quality control results are discussed below, but no data were qualified.***
[2] ***Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.***

Holding Times and Sample Receipt

SDG WG17772: Positive results for 2,4'-DDD, 2,4'-DDE and 4,4'-DDD from Sample LW2-MIT004 required re-analysis at dilution to bring them within the calibration range. This re-analysis was

performed 45 days after the date of extraction, which exceeds the 40-day holding time. These results were estimated (J-1).

Initial Calibration (ICAL)

The analyte hexachlorobutadiene was not included in the standards used for the initial calibration. No positive results for this compound were reported in the samples and all reporting limits were estimated (UJ-5A).

Continuing Calibration (CCAL)

The analyte hexachlorobutadiene was not included in the continuing calibration verification standards. This compound was not reported in the samples and all reporting limits were estimated (UJ-5B).

Laboratory Blanks

In order to assess the impact of blank contamination on the reported sample results, action levels at five times the blank concentrations are established. If the concentrations in the associated field samples are less than the action levels, the results are qualified as not detected (U-7).

SDG WG17772: Positive results for hexachlorobenzene, oxychlordane, gamma-chlordane, and alpha-chlordane were reported in the laboratory preparation blank. Results for these analytes were reported in all samples at concentrations greater than the established action levels and no qualifiers were required.

SDG WG17828: This SDG consisted of a laboratory preparation blank and a homogenization proof blank. Positive results for hexachlorobenzene, aldrin, alpha-chlordane, and trans-nonachlor were reported in the one laboratory preparation blank. After qualifiers based on the laboratory preparation blank were assigned no positive results remained in the homogenization proof blank.

Matrix Spikes/Matrix Spike Duplicates (MS/MSD)

No MS/MSD sets were performed with these SDG. Accuracy and precision were assessed using labeled compound recoveries and ongoing precision and recovery samples.

Ongoing Precision & Recovery (OPR)

SDG WG17828: No ongoing precision and recovery (OPR) was analyzed with this SDG.

Laboratory Duplicates

No laboratory duplicate was reported with these SDGs.

Field Duplicates

No field duplicates were submitted with these SDGs.

Compound Identification & Quantitation

The laboratory applies a "K" flag to pesticide results when a peak is detected but does not meet quantitation criteria, and therefore the reported value cannot be considered a positive identification for this analyte, these results are considered potential false positives and qualified as not detected (U-21).

Reporting Limits (MDL and MRL)

Toxaphene is listed as a target analyte in the quality assurance program plan (QAPP) but was not reported by the laboratory.

Calculation Verification

SDG WG17772: Full (Level IV) validation was performed on this SDG. No transcription or calculation errors were found.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the surrogate and OPR, %R values. Precision was acceptable as demonstrated by the RPD values for the duplicate OPR analyses.

Data were qualified as estimated due to a target analyte being omitted from the calibration standards. Data were also qualified as not detected based on contamination in the associated blanks and potential false positive results.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Mutltiplate Tissue Study, Fall 2005
Metals
Columbia Analytical Laboratories—Kelso

This report documents the review of analytical data from the analyses of archived core samples and the associated laboratory and field quality control samples. Columbia Analytical Laboratories, Inc., Kelso, Washington, analyzed the samples.

SDG	Number of Samples	Validation Level
K0506539	2 TISSUE SAMPLES, 1 RINSE BLANK	FULL

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory quality control (QC)results were also verified (10%). No errors were found.

III. TECHNICAL DATA VALIDATION

The QC requirements for review are listed below.

	Holding Times and Sample Preservation	1	Laboratory Duplicates
	Initial Calibration (ICAL)	1	ICP Interference Check Samples
	Calibration Verification (CVER)	2	ICP Serial Dilution
2	CRDL Standard		ICPMS Internal Standards
2	Laboratory Blanks		Field Replicates
	Laboratory Control Samples		Reporting Limits (MDL and MRL)
1	Matrix Spike Samples	1	Calculation Verification (Full validation only)

[1] ***Quality control results are discussed below, but no data were qualified.***
[2] ***Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.***

CRDL Standard

Contract required detection limit (CRDL) standards were analyzed at the beginning of each analytical sequence. The recovery for selenium (45%) was less than the lower control limit of 70%. The selenium result for Sample MIT009 was less than twice the standard concentration and was qualified as estimated (J) to indicate a potential low bias.

Laboratory Blanks

Aluminum, antimony, cadmium, chromium, copper, lead, silver and zinc were detected in the method and/or instrument blanks at levels greater than the method detection limit (MDL). To evaluate the effect on the sample data, action levels of five times the blank concentrations were established. The antimony result for Sample LW2-MITPROOF was less than the action level and was qualified as not detected (U).

A homogenization blank, LW2-MITPROOF, was prepared and analyzed. After qualification for laboratory blank contamination, positive results remained for aluminum, chromium, copper, lead, nickel and zinc. Results for these analytes in the associated samples were greater than the action level of five times the blank concentrations; no qualification of data was necessary.

Matrix Spike Samples

There was insufficient tissue sample to analyze a matrix spike; therefore the laboratory analyzed duplicate standard reference material (SRM) samples. All recoveries were within the control limits of 75% to 125%; laboratory accuracy was acceptable.

Laboratory Duplicates

There was insufficient tissue sample to analyze a replicate aliquot. The results from the analysis of duplicate SRMs were used to evaluate laboratory precision. The relative percent difference (RPD) values were within control limit of 20% for sample results greater than five times the reporting limit (for results less than five times the reporting limit, the absolute difference was less than twice the reporting limit).

ICP Interference Check Samples

The concentration of the interfering element calcium was greater than the level in the interference check samples (ICSA/ICSAB) in Sample MIT001. The ICSA results were carefully evaluated to determine if there was a potential high or low bias caused by iron interference. Calcium does not interfere with the analytes of interest; no further action was taken.

ICP Serial Dilution

For QC sample LW2-MIT001, the serial dilution percent difference (%D) values for copper (14%), lead (18%), silver (14%), and zinc (13%) were greater than the control limit of 10%. All associated results were positive and were estimated (J).

Calculation Verification

Several results were verified by recalculation from the raw data. No calculation or transcription errors were found.

IV. OVERALL ASSESSMENT

As determined by this evaluation, the laboratory followed the specified analytical methods. The duplicate SRM RPD values indicated acceptable precision. Accuracy was also acceptable, as demonstrated by the SRM %R values.

Data were qualified as not detected based on laboratory blank contamination. Data were also qualified as estimated based on CRDL %R and serial dilution %D outliers.

All data, as qualified, are acceptable for use.

EcoChem, Inc.

Environmental Science and Chemistry

APPENDIX A

DATA QUALIFIER DEFINITIONS AND VALIDATION CRITERIA

DATA VALIDATION QUALIFIER CODES
National Functional Guidelines

The following definitions provide brief explanations of the qualifiers assigned to results in the data review process.

U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification".
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents the approximate concentration.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
R	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

The following is an EcoChem qualifier that may also be assigned during the data review process:

DNR	Do not report; a more appropriate result is reported from another analysis or dilution.

DATA QUALIFIER REASON CODES

1	Holding Time/Sample Preservation
2	Chromatographic pattern in sample does not match pattern of calibration standard.
3	Compound Confirmation
4	Tentatively Identified Compound (TIC) (associated with NJ only)
5A	Calibration (initial)
5B	Calibration (continuing)
6	Field Blank Contamination
7	Lab Blank Contamination (e.g., method blank, instrument, etc.)
8	Matrix Spike(MS & MSD) Recoveries
9	Precision (all replicates)
10	Laboratory Control Sample Recoveries
11	A more appropriate result is reported (associated with "R" and "DNR" only)
12	Reference Material
13	Surrogate Spike Recoveries (a.k.a., labeled compounds & recovery standards)
14	Other (define in validation report)
15	GFAA Post Digestion Spike Recoveries
16	ICP Serial Dilution % Difference
17	ICP Interference Check Standard Recovery
18	Trip Blank Contamination
19	Internal Standard Performance (e.g., area, retention time, recovery)
20	Linear Range Exceeded
21	Potential False Positives

Integral - Portland Harbor Site
Compounds Analyzed By HRMS (Methods 1613B or SW846 - 8290)
Phthalates, Polycyclic Aromatic Hydrocarbons (PAH), PCB Congeners and Dioxins/Furans

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Cooler Temperature	Waters/Solids <4°C Tissues <10°C	**EcoChem PJ, see TM-05**	1
Holding Time	Water: 30 days from collection Soil: 30 days from collection Analysis: 40 days from extraction Note: Under CWA, SDWA, and RCRA the HT for H2O is 7 days	J(+)/UJ(-) if ext > 30days J(+)/UJ(-) if analysis > 40 Days **EcoChem PJ, see TM-05**	1
Mass Resolution	>=10,000 resolving power at m/z 304.9824 Exact mass of m/z 380.9760 w/in 5 ppm of theoretical value (380.97410 to 380.97790) . Analyzed prior to ICAL and at the start and end of each 12 hr. shift	R(+/-) if not met	14
Window Defining Mix and Column Performance Mix	Window defining mixture/Isomer specificity std run before ICAL and CCAL Valley < 25% (valley = (x/y)*100%) x = ht. of TCDD y = baseline to bottom of valley For all isomers eluting near 2378-TCDD/TCDF isomers (TCDD only for 8290)	J(+) if valley > 25%	5A (ICAL) 5B (CCAL
Initial Calibration	ICAL: Minimum of five standards %RSD < 20% for native compounds %RSD <30% for labeled compounds (%RSD <35% for labeled compounds under 1613b)	J(+) natives if %RSD > 20%	5A
	Abs. RT of $^{13}C_{12}$-1234-TCDD >25 min on DB5 >15 min on DB-225	**EcoChem PJ, see TM-05**	
	Ion Abundance ratios within QC limits (Table 8 of method 8290) (Table 9 of method 1613B)	**EcoChem PJ, see TM-05**	
	S/N ratio > 10 for all native and labeled compounds in CS1 std.	If <10, elevate Det. Limit or R(-)	

Integral - Portland Harbor Site
Compounds Analyzed By HRMS (Methods 1613B or SW846 - 8290)
Phthalates, Polycyclic Aromatic Hydrocarbons (PAH), PCB Congeners and Dioxins/Furans

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Continuing Calibration	Analyzed at the start and end of each 12 hour shift. %D+/-20% for native compounds %D +/-30% for labeled compounds (Must meet limits in Table 6 for 1613B) (If %Ds in the closing CCAL are w/in 25%/35% the avg RF from the 2 CCAL may be used to calculate sam	J(+)/UJ(-) natives if %D = 30% - 75% R(+/-) if %D > 75%	5B
	Abs. RT of $^{13}C_{12}$-1234-TCDD and $^{13}C12$-123789-HxCDD +/- 15 sec of ICAL.	**EcoChem PJ, see ICAL section of TM-05**	
	RRT of all other compounds must meet table 2 of 1613B.	**EcoChem PJ, see TM-05**	
	Ion Abundance ratios within QC limits (Table 8 of method 8290) (Table 9 of method 1613B)	**EcoChem PJ, see TM-05**	
	S/N ratio > 10	If <10, elevate Det. Limit or R(-)	
Method Blank	One per matrix per batch No positive results	If sample result <5X action level, qualify U at reported value. (<10X for phthalates)	7
Field Blanks	No results > QL	Apply 5X rule; U(+) < action level	6
LCS / OPR	Concentrations must meet limits in Table 6 of method 1613B or lab limits.	J(+) if %R > UCL J(+)/UJ(-) if %R < LCL J(+)/R(-) using PJ if %R <<LCL (< 10%)	10
MS/MSD (recovery)	May not analyze MS/MSD %R should meet lab limits.	Qualify parent only unless other QC indicates systematic problems: J(+) if both %R > UCL J(+)/UJ(-) if both %R < LCL J(+)/R(-) if both %R < 10% **PJ if only one %R outlier**	8

Integral - Portland Harbor Site
Compounds Analyzed By HRMS (Methods 1613B or SW846 - 8290)
Phthalates, Polycyclic Aromatic Hydrocarbons (PAH), PCB Congeners and Dioxins/Furans

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
MS/MSD (RPD)	May not analyze MS/MSD RPD < 20%	J(+) if RPD > CL	9
Lab Duplicate	RPD <25% if present.	J(+) if outside limts	9
Labeled Compounds / Internal Standards	*Method 8290:* %R = 40% - 135% in all samples	J(+)/UJ(-) if %R = 10% - LCL J(+) if %R > UCL J(+)/R(-) if %R < 10%	13
	Method 1613B: %R must meet limits specified inTable 7		
Quantitation/ Identification	SIM ions for analyte, Istd, rec. std. Max w/in 2 sec. S/N >2.5 IA ratios meet limits in Table 9 of 1613B or Table 8 of 8290 RRTs w/in limits in table 2 of 1613B	If RT criteria not met, use PJ (**see TM-05**) If S/N criteria not met, J(+). if unlabelled ion abundance not met, change to EMPC If labelled ion abundance not met, J(+).	21
EMPC (estimated maximum possible concentration)	If quantitation identification criteria are not met, laboratory should report an EMPC value.	If laboratory correctly reported an EMPC value, qualify with U to indicate that the value is a detection limit.	14
Interferences	PCDF interferences from PCDPE	If both detected, change PCDF result to EMPC	14
Second Column Confirmation	All 2378-TCDF hits must be confirmed on a DB-225 (or equiv) column. All QC specs in this table must be met for the confirmation analysis.	Report lower of the two values. If not performed use PJ (**see TM-05**).	3
Field Duplicates	QAPP specified RPD < 50% (sediment & water)	Narrate; do not qualify.	na
Two analyses for one sample	Report only one result per analyte	"DNR" results that should not be used	11

Integral - Portland Harbor Site
Pesticides/PCBs/Herbicides/Phenols by GC/ECD (Based on Organic NFG 1999)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Cooler Temperature	4°C ±2°	J(+)/UJ(-) if greater than 6 deg. C **(EcoChem PJ)**	1
Holding Time	Water: 7 days from collection Soil: 14 days from collection Analysis: 40 days from extraction	J(+)/UJ(-) if ext/analyzed > HT J(+)/R(-) if ext/analyzed > 3X HT **(EcoChem PJ)**	1
Resolution Check	Beginning of ICAL Sequence Within RTW Resolution >90%	Narrate (Use Professional Judgement to qualify)	14
Instrument Performance (Breakdown)	DDT Breakdown: < 20% Endrin Breakdown: <20% Combined Breakdown: <30% Compounds within RTW	J(+) DDT NJ(+) DDD and/or DDE R(-) DDT - If (+) for either DDE or DDD J(+) Endrin NJ(+) EK and/or EA R(-) Endrin - If (+) for either EK or EA	5A
Retention Times	Surrogates: TCX (+/- 0.05); DCB (+/- 0.10) Target compounds: elute before heptachlor epoxide (+/- 0.05) elute after heptachlor epoxide (+/- 0.07)	NJ(+)/R(-) results for analytes with RT shifts **For full DV, use PJ based on examination of raw data**	5B
Initial Calibration	Pesticides: Low=CRQL, Mid=4X, High=16X Multiresponse - one point Calibration %RSD<20% %RSD<30% for surr; two comp. may exceed if <30% Resolution in Mix A and Mix B >90%	J(+)/UJ(-)	5A
Continuing Calibration	Alternating PEM standard and INDA/INDB standards every 12 hours (each preceeded by an inst. Blank) %D < 25% Resolution >90% in IND mixes; 100% for PEM	J(+)/UJ(-) J(+)R(-) if %D > 90% **PJ for resolution**	5B
Method Blank	One per matrix per batch No results > CRQL	U(+) if sample result is < CRQL and < 5X rule (raise sample value to CRQL)	7
		U(+) if sample result is > or equal to CRQL and < 5X rule (at reported sample value)	7
Instrument Blanks	Analyzed at the beginning of every 12 hour sequence No analyte > 1/2 CRQL	Same as Method Blank	7
Field Blanks	No results > QL	Apply 5X rule; U(+) < action level	6

Integral - Portland Harbor Site
Pesticides/PCBs/Herbicides/Phenols by GC/ECD (Based on Organic NFG 1999)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
MS/MSD (recovery)	One set per matrix per batch Method Acceptance Criteria	Qualify parent only unless other QC indicates systematic problems: J(+) if both %R > UCL J(+)/UJ(-) if both %R < LCL J(+)/R(-) if both %R < 10% **PJ if only one %R outlier**	8
MS/MSD (RPD)	One set per matrix per batch Method Acceptance Criteria	J(+) if RPD > CL	9
LCS	One per SDG Method Acceptance Criteria	J(+) if %R > UCL J(+)/UJ(-) if %R < LCL J(+)/R(-) using PJ if %R <<LCL (< 10%)	10
LCS/LCSD *(if required)*	One set per matrix and batch of 20 samples RPD < 35%	J(+) assoc. cmpd. in all samples	9
Surrogates	TCX and DCB added to every sample %R = 30-150%	J(+)/UJ(-) if both %R = 10 - 60% J(+) if both >150% J(+)/R(-) if any %R <10%	13
Quantitation/ Identification	Analyte within RTW on both columns Quantitated using CCV or ICAL CF Lowest value from either column reported %D between columns (25%)	J(+) if RPD = 25-60% (Pest/Aroclor); 40-60% (Herb/Phenol) NJ(+) using PJ if RPD > 60% R(+) using PJ if RPD >90%	3
Two analyses for one sample	Report only one result per analyte	"DNR" results that should not be used to avoid reporting two results for one sample	11
Sample Clean-up	GPC required for soil samples Florisil required for all samples Sulfur is optional Clean-up standard check %R within CLP limits	J(+)/UJ(-) if %R < LCL J(+) if %R > UCL	14
Field Duplicates	QAPP specified RPD < 50% (sediment & water)	Narrate; do not qualify.	na

Integral - Portland Harbor Site
Metals by ICP (Based on Inorganic NFG 1994 & 2002)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Cooler Temperature and Preservation	4°C ±2° Water Only: Nitric Acid to pH < 2 For Dissolved metals, 0.45 um filter preserve after filtration	Professional Judgment J(+)/UJ(-) if preservation requirements are not met	1
Holding Time	180 days	Professional Judgment J(+)/UJ(-)	1
Initial Calibration	Blank + minimum 1 standard once every 24 hours if more than 1 standard r>0.995	Professional Judgment J(+)/UJ(-) if r<0.995 (multi point cal)	5A
Initial Calibration Verification (ICV)	Independent source analyzed immed. after cal. %R within +/- 10% of true value	Professional Judgment J(+)/UJ(-) if %R 75%-89% J(+) if %R = 111-125% R(+) if %R > 125% R(+/-) if %R < 75%	5A
Continuing Cal Verification (CCV)	Every ten samples, immed. Before samples+ and end of run %R within +/- 10% of true value	Professional Judgment J(+)/UJ(-) if %R = 75%-89% J(+) if %R 111-125% R(+) if %R > 125% R(+/-) if %R < 75%	5B
CRI Standard (to check CRDL)	2X CRDL (or 2X IDL if greater) analyzed beginning and end of run (at least 8 hrs) Not required for Al, Ba, Ca, Fe, Mg, Na, K %R = 70%-130% (50%-150% Sb, Pb, Tl)	Professional Judgment R(-),(+)<2XCRDL if %R <50% (< 30% Sb, Pb, Tl) J(+)<2XCRDL, UJ(-) if %R 50-69% (30%-49% Sb, Pb,Tl) J(+) <2X CRDL if %R 130%-180% (150%-200%Sb, Pb, Tl) R(+)<2X CRDL if %R>180%(200% Sb, Pb, Tl)	14

Initial and Continuing Cal Blanks (ICB/CCB)	after each ICV and CCV
	every ten samples and end of run
	blank < +/- IDL
		Action level is 5x abs. value of blk conc.
		For (+) blk value, U(+) values < action level
		For (-) blk value, J(+)/UJ(-) values < action level
			7

Prep Blank	One per matrix per batch
	(not to exceed 20 samples)
		Action level is 5x abs. value of blk conc.
		For (+) blk value, U(+) values < action level
		For (-) blk value, J(+)/UJ(-) values < action level
			7

Interference Check Samples ICSA/ICSAB	Beginning and end of each run or every eight hours ICSAB +/- 20% ICSA < +/- IDL	For samp with Al,Ca,Fe,Mg > ICS levels R(+/-) if %R<50% J(+) if %R >120% J(+)/UJ(-) if %R= 50% to 79% Professional Judgment ICSA	17
Post Digestion Spike	If ICP Matrix Spike is outside 75-125%, spike at twice the sample conc.	No Quals assigned based on this element	

Integral - Portland Harbor Site
Metals by ICP (Based on Inorganic NFG 1994 & 2002)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Matrix Spike	One per matrix per batch 75-125% for samples less than 4 x spike level	J(+) if %R>125% J(+)/UJ(-) if %R <75% J(+)/R(-) if %R<30%	8
Laboratory Duplicate	One per matrix per batch RPD <20% for samples > 5x CRDL Diff <CRDL for samples >CRDL and <5 x CRDL (may use RPD < 35%, Diff < 2X CRDL for solids)	J(+)/UJ(-) if RPD > 20% or diff > CRDL	9
Serial Dilution	5x dilution one per matrix %D <10% for values > 50x IDL	J(+)/UJ(-) if %D >10%	16
Laboratory Control Sample	Waters: One per matrix per batch %R (80-120%)	R(+/-) if %R < 50% J(+)/UJ(-) if %R = 50-79% J(+) if %R >120%	10
	Soils: One per matrix per batch Result within manufacturer's certified acceptance range	J(+)/UJ(-) if < LCL, J(+) if > UCL	10
Field Blanks	No results > QL	Apply 5X rule; U(+) < action level	6
Field Duplicates	QAPP specified RPD < 50% (sediment & water)	Narrate; do not qualify.	na
Instrument Detection Limit	determined every 3 months	Professional Judgment	14
Linear Range	determined yearly samples diluted to fall within range	J(+) values over range	20

Integral - Portland Harbor Site
Metals by ICP-MS (Based on Inorganic NFG 1994 & 2002)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Cooler Temperature and Preservation	4°C ±2° Water Only: Nitric Acid to pH < 2 For Dissolved metals, 0.45 um filter preserve after filtration	Professional Judgment J(+)/UJ(-) if preservation requirements are not met	1
Holding Time	180 days	Professional Judgment J(+)/UJ(-) if holding time exceeded J(+)/R(-) if HT exceeded by 3x	1
Tune	Prior to ICAL Analyzed 5 times wih Std Dev. ≤ 5% mass calibration <0.1 amu from True Value Resolution < 0.9 AMU @ 10% peak height or <0.75 amu @ 5% peak height	Professional Judgment No Tune - R all results criteria not met - J(+)/UJ(-)	5A
Initial Calibration	Mininum Blank+1 Standard every 24 hours	Professional Judgment J(+)/UJ(-) >24 hours J(+)/UJ(-) if r<0.995 (for multi point cal)	5A
Initial Calibration Verification (ICV)	Independent source; analyzed post ICAL and prior to samples +/-10% of the True value	Professional Judgment J(+)/UJ(-) if %R 75%-89% J(+) if %R = 111-125% R(+) if %R > 125% R(+/-) if %R < 75%	5A
Continuing Cal Verification (CCV)	Every 10 samples,post ICV/ICB and end of run +/- 10% of True value	professional judgment J(+)/UJ(-) if %R 75%-89% J(+) if %R = 111-125% R(+) if %R > 125% R(+/-) if %R < 75%	5B
CRDL Standard (CRI)	2X CRDL (or 2X IDL if greater) analyzed beginning and end of run (at least 8 hrs) Not required for Al, Ba, Ca, Fe, Mg, Na, K %R = 70%-130% (50%-150% Co,Mn, Zn)	Professional judgment R(-),(+)<2XCRDL if %R <50% (< 30% Co,Mn, Zn) J(+)<2XCRDL, UJ(-) if %R 50-69% (30%-49% Co,Mn, Zn) J(+) <2X CRDL if %R 130%-180% (150%-200% Co,Mn, Zn) R(+)<2X CRDL if %R>180%(200% Co,Mn, Zn)	14

Initial and Continuing Cal Blanks (ICB/CCB)	after each ICV and CCV every ten samples and end of run blank < +/- IDL	Action level is 5x abs. value of blk conc.
		For (+) blk value, U(+) values < AL
		For (-) blk value, J(+)/UJ(-) values < AL
			7

Prep Blank	One per matrix per batch (not to exceed 20 samples)	Action level is 5x abs. value of blk conc.
		For (+) blk value, U(+) values < AL
		For (-) blk value, J(+)/UJ(-) values < AL
			7

Field Blanks	No results > QL	Apply 5X rule; U(+) < action level	6

Integral - Portland Harbor Site
Metals by ICP-MS (Based on Inorganic NFG 1994 & 2002)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Interference Check Samples ICSA/ICSAB	ICSAB +/- 20% of true value ICSA < +/- IDL	Where Al,Ca,Fe,Mg = ICS levels J(+) if %R >120% J(+)/UJ(-) if %R = 50% to 79% R(+/-) if %R<50% Professional Judgment for ICSA > +/- IDL	17
Post Digestion Spike	If ICP Matrix Spike is outside 75-125% Spike parent sample at 2X the sample conc.	Use Professional Judgment - usually no action	14
Matrix Spike	One per matrix, batch and SDG 75-125% for samples where results do not exceed 4x spike level	J (+) if %R > 125% J(+)/UJ(-) if %R < 75% J(+)/R(-) if %R < 30% UJ(-) if %R = 30-74%	8
Laboratory Duplicate	One per matrix per batch RPD <20% for samples > 5x CRDL Diff<CRDL for samples >CRDL and <5 x CRDL (may use RPD < 35%, Diff < 2X CRDL for solids)	J(+)/UJ(-) associated samples if RPD > 20% or diff > CRDL	9
Laboratory Control Sample	Waters: One per matrix per batch %R (80-120%)	R(+/-) if %R < 50% J(+)/UJ(-) if %R = 50-79% J(+) if %R >120%	10
	Soils: One per matrix per batch result within manufaturer's certified acceptance range	J(+)/UJ(-) if < LCL, J(+) if > UCL	10
Serial Dilution	5x dilution one per matrix (or SDG) %D <10% of the undiluted value for values > 50x IDL	J(+)/UJ(-) if %D >10%	16
Field Duplicates	QAPP specified RPD < 50% (sediment & water)	Narrate; do not qualify.	na
Internal Standards	Every Sample 60%-125% of ICAL IS	J (+)/UJ (-) analytes associated with IS outlier	19
Instrument Detection Limit	Determined every 3 months	Professional Judgment	14
Linear Range	determined yearly samples diluted to fall within range	J(+) values over range	20

Integral - Portland Harbor Site
Mercury by CVAA (Based on Inorganic NFG 1994 & 2002)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Cooler Temperature and Preservation	4°C ±2° Water Only: Nitric Acid to pH < 2 For Dissolved metals, 0.45 um filter preserve after filtration	Professional Judgment J(+)/UJ(-) if preservation requirements are not met	1
Holding Time	28 days from date sampled	Professional Judgment J(+)/UJ(-) if holding time exceeded	1
Initial Calibration	Blank + 4 standards r > 0.995 once every 24 hours	Professional Judgment J(+)/UJ(-) if r<0.995	5A
Initial Calibration Verification (ICV)	Independent source analyzed immediately after cal. %R within +/- 20% of true value	Professional Judgment R(+/-) if %R < 65% R(+) if %R > 135% J(+)/UJ(-) if %R = 65%-79% J(+) if %R = 121-135%	5A
Continuing Cal Verification (CCV)	Every ten samples, immed. following ICV/ICB and end of run %R within +/- 20% of true value	R(+/-) if %R < 65% R(+) if %R > 135% J(+)/UJ(-) if %R = 65%-79% J(+) if %R = 121-135%	5B
CRDL Standard (CRA)	Beginning of run after ICV/ICB CCV/CCB Conc = CRDL 70% - 130%	Professional Judgment R(-),(+)<2XCRDL if %R <50% J(+)<2XCRDL, UJ(-) if %R 50-69% J(+) <2X CRDL if %R 130%-180% R(+)<2X CRDL if %R>180%	14

Initial and Continuing Cal Blanks (ICB/CCB)	After each ICV and CCV
	every ten samples and end of run
	blank < +/- IDL
		Action level is 5x abs. value of blk conc.
		For (+) blk value, U(+) sample values < AL
		For (-) blk value, J(+)/UJ(-) sample values < AL
			7

Prep Blank	One per matrix per batch
	(not to exceed 20 samples)
		Action level is 5x abs. value of blk conc.
		For (+) blk value, U(+) sample values < AL
		For (-) blk value, J(+)/UJ(-) sample values < AL
			7

Matrix Spike	One per matrix per batch 5% frequency 75-125% for samples less than 4x spike level	J(+) if %R > 125% J(+)/UJ(-) if %R < 75% J(+)/R(-) if %R < 30%	8
Laboratory Duplicate	One per matrix per batch RPD <20% for samples > 5x CRDL (+/-)CRDL for samples >CRDL and <5 x CRDL (may use RPD < 35%, Diff < 2X CRDL for solids)	J(+)/UJ(-) if RPD > 20% or diff > CRDL	9

Integral - Portland Harbor Site
Mercury by CVAA (Based on Inorganic NFG 1994 & 2002)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Laboratory Control Sample	Waters: One per matrix per batch %R (80-120%)	R(+/-) if %R < 50%; J(+) if %R >120% J(+)/UJ(-) if %R = 50-79%	10
	Soils: One per matrix per batch Result within manufacturer's certified acceptance range	J(+)/UJ(-) if < LCL, J(+) if > UCL	10
Field Duplicates	No specific QAPP limits Use RPD < 35% (water) or < 50% (soil)	Narrate; do not qualify.	na
Field Duplicates	QAPP specified RPD < 50% (sediment & water)	J(+)/UJ(-) in parent samples only	9

		Location Name	MIT001	MIT002	MIT004	MIT007	MIT009	MIT356	MIT810
		X_Easting	7617663.46	7619698.71	7627123.4	7632689.04	7637538.23	7626430	7637373
		Y_Northing	724684.37	717254.37	705754.61	701833.8	694204.01	704103	694168
		Sample ID	LW2-MIT001	LW2-MIT002	LW2-MIT004	LW2-MIT007	LW2-MIT009	LW2-MIT003/005/006	LW2-MIT008/010
		Sample Date	9/14/2005	9/15/2005	9/12/2005	9/9/2005	9/7/2005	9/10/2005	9/6/2005
Analyte Group	**CAS No**	**Chemical Name**	**Unit**						
Aroclors	12674-11-2	Aroclor 1016	pg/g	0.532 U	0.65 U	1.46 U	2.47 U	0.696 U	0.725 U	1.07 U
Aroclors	11104-28-2	Aroclor 1221	pg/g	0.276 U	0.168 U	0.718 U	1.28 U	0.228 U	0.31 U	0.365 U
Aroclors	11141-16-5	Aroclor 1232	pg/g	0.241 U	0.228 U	0.76 U	1.88 U	0.312 U	0.214 U	0.391 U
Aroclors	53469-21-9	Aroclor 1242	pg/g	0.591 U	0.723 U	3630 NJ	1950 NJ	7450 NJ	0.806 U	1.19 U
Aroclors	12672-29-6	Aroclor 1248	pg/g	25700 NJ	14400 NJ	9.2 U	5.22 U	3.81 U	19900 NJ	16100 NJ
Aroclors	11097-69-1	Aroclor 1254	pg/g	3.74 U	5.46 U	110000 NJ	13500 NJ	21000 NJ	2.67 U	7.29 U
Aroclors	11096-82-5	Aroclor 1260	pg/g	11700 NJ	10800 NJ	376000 NJ	13900 NJ	45300 NJ	14900 NJ	11500 NJ
Aroclors	12767-79-2	Aroclors	pg/g	37400 JT	25200 JT	490000 JT	29400 JT	73800 JT	34800 JT	27600 JT
Conventionals	TSO	Total solids	percent	13.3 T				12.9		
Dioxin_Furan_Homolog	41903-57-5	Tetrachlorodibenzo-p-dioxin homologs	pg/g	4.03	0.974	2.79	1.17	4.11	6.8	5.72
Dioxin_Furan_Homolog	36088-22-9	Pentachlorodibenzo-p-dioxin homologs	pg/g	0.91	0.238	0.175 U	0.672 U	1.39	1.11	1.4
Dioxin_Furan_Homolog	34465-46-8	Hexachlorodibenzo-p-dioxin homologs	pg/g	1.99	2.52	2.78	5.78	7.56	3.16	3.83
Dioxin_Furan_Homolog	37871-00-4	Heptachlorodibenzo-p-dioxin homologs	pg/g	6.34	13.9	9.81	44.4	35.8	10.3	16.8
Dioxin_Furan_Homolog	3268-87-9	Octachlorodibenzo-p-dioxin	pg/g	18.9	53.2	30.1	122	130	32.2	60.3
Dioxin_Furan_Homolog	30402-14-3	Tetrachlorodibenzofuran homologs	pg/g	7.32	4.73	4.84	1.18	5.15	31.7	5.3
Dioxin_Furan_Homolog	30402-15-4	Pentachlorodibenzofuran homologs	pg/g	3.95	2.4	4.58	0.446	4.96	21.2	3.79
Dioxin_Furan_Homolog	55684-94-1	Hexachlorodibenzofuran homologs	pg/g	2.02	2.81	3.22	3.29	6.38	11.9	3.22
Dioxin_Furan_Homolog	38998-75-3	Heptachlorodibenzofuran homologs	pg/g	1.86	3.93	2.31	4.45	8.51	4.32	4
Dioxin_Furan_Homolog	39001-02-0	Octachlorodibenzofuran	pg/g	1.75	3.27	1.77 J	3.29 J	8.66	3.47	3.95
Dioxins_Furans	1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin	pg/g	0.112 J	0.061 U	0.149 U	0.329 U	0.163 U	0.189	0.29
Dioxins_Furans	40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin	pg/g	0.15 J	0.079 J	0.166 U	0.672 U	0.29 U	0.218 J	0.184 J
Dioxins_Furans	39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	pg/g	0.1 J	0.09 J	0.12 U	0.95 U	0.346 J	0.167 J	0.182 J
Dioxins_Furans	57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	pg/g	0.372 J	0.417 J	0.571 J	1.63 J	1.07 J	0.586 J	0.651 J
Dioxins_Furans	19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	pg/g	0.153 J	0.188 J	0.197 J	0.429 U	0.555 U	0.235 J	0.252 U
Dioxins_Furans	35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	pg/g	2.92	6.59	4.74	23.1	16.2	4.64	7.44
Dioxins_Furans	51207-31-9	2,3,7,8-Tetrachlorodibenzofuran	pg/g	0.629	0.397	0.263 U	0.329 U	0.296	11	0.341 U
Dioxins_Furans	57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran	pg/g	0.286 J	0.135 J	0.182 J	0.779 U	0.127 U	6.71	0.11 J
Dioxins_Furans	57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran	pg/g	0.229 U	0.182 U	0.25 J	0.446 J	0.262 U	2.69	0.177 J
Dioxins_Furans	70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran	pg/g	0.288 U	0.26 J	0.429 J	0.625 U	0.282 J	5.2	0.192 J
Dioxins_Furans	57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran	pg/g	0.092 J	0.11 U	0.093 J	0.537 U	0.189 J	1.24	0.11 J
Dioxins_Furans	72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran	pg/g	0.0854 U	0.0879 U	0.198 U	0.761 U	0.127 U	0.108 U	0.0489 U
Dioxins_Furans	60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran	pg/g	0.063 U	0.097 U	0.126 U	0.331 U	0.178 U	0.217 U	0.096 U
Dioxins_Furans	67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran	pg/g	0.545 J	1.34	0.755 J	1.65 J	2.75	1.72	1.36
Dioxins_Furans	55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran	pg/g	0.072 U	0.122 J	0.142 J	0.757 U	0.225 U	0.535 J	0.078 J
Metals	7429-90-5	Aluminum	mg/kg	446				1420		
Metals	7440-36-0	Antimony	mg/kg	0.0011 U				0.0022 J		
Metals	7440-38-2	Arsenic	mg/kg	0.45				0.349		
Metals	7440-43-9	Cadmium	mg/kg	0.0321				0.0366		
Metals	7440-47-3	Chromium	mg/kg	0.64				1.73		
Metals	7440-50-8	Copper	mg/kg	6 J				3.01 J		
Metals	7439-92-1	Lead	mg/kg	0.245 J				1.06 J		
Metals	7440-02-0	Nickel	mg/kg	0.401				1.12		
Metals	7782-49-2	Selenium	mg/kg	0.06				0.04 J		
Metals	7440-22-4	Silver	mg/kg	0.0287 J				0.0235 J		
Metals	7440-66-6	Zinc	mg/kg	12.6 J				24.8 J		
PCB_Congeners	2051-60-7	PCB001	pg/g	26.9	8.94	33.4	24.7	19.6	34.3	28.2
PCB_Congeners	2051-61-8	PCB002	pg/g	1.89	0.872	2.55	3.3 J	1.99	2.77	3.02
PCB_Congeners	2051-62-9	PCB003	pg/g	7.57	3.59	13.7	14.6	9.86	10.7	12.9
PCB_Congeners	13029-08-8	PCB004	pg/g	148	83.4	1290	96.2	207	159	145
PCB_Congeners	16605-91-7	PCB005	pg/g	3.04	0.988	3.32	3.57	3.23	4.63	4.79
PCB_Congeners	25569-80-6	PCB006	pg/g	27.4	14.7	40.5	30.8	79.6	40.3	46.7
PCB_Congeners	33284-50-3	PCB007	pg/g	6.14	3.46	12.8	7.47	9.65	9.48	10.7
PCB_Congeners	34883-43-7	PCB008	pg/g	125	70.1	162	170	259	186	225
PCB_Congeners	34883-39-1	PCB009	pg/g	8.96	4.97	14.2	11.6	15.7	13.7	15.6
PCB_Congeners	33146-45-1	PCB010	pg/g	5.99	3.11	71.2	4.04	6.33	6.82	5.83
PCB_Congeners	2050-67-1	PCB011	pg/g	96.3	40.4	139	97	221	223	220

PCB_Congeners	PCB012_013	PCB012 & 013	pg/g	8.41	10.3	27.9	10.9	24.5	12.3	13.2
PCB_Congeners	34883-41-5	PCB014	pg/g	0.382 U	0.393 U	0.887 U	3.4 U	0.567 U	0.484 U	0.506 U
PCB_Congeners	2050-68-2	PCB015	pg/g	52.1	112	81.8	60.2	156	59.2	75.3
PCB_Congeners	38444-78-9	PCB016	pg/g	53.9	68.7	55.3	33.5	115	73.5	97.4
PCB_Congeners	37680-66-3	PCB017	pg/g	156	127	1440	74.5	346	179	204
PCB_Congeners	PCB018_030	PCB018 & 030	pg/g	181	195	282	90.6	396	236	306
PCB_Congeners	38444-73-4	PCB019	pg/g	171	84.2	5150	88.8	179	167	103
PCB_Congeners	PCB020_028	PCB020 & 028	pg/g	536	755	505	225	948	538	731
PCB_Congeners	PCB021_033	PCB021 & 033	pg/g	88.4	154	220	62.1	352	151	256
PCB_Congeners	38444-85-8	PCB022	pg/g	83.2	129	56.4	42.7	281	124	201
PCB_Congeners	55720-44-0	PCB023	pg/g	0.233 J	0.413 U	1.84	3.57 U	0.675	0.413 U	0.592
PCB_Congeners	55702-45-9	PCB024	pg/g	2.54	3.26	0.847 U	1.83 J	6.11	3.69	3.8
PCB_Congeners	55712-37-3	PCB025	pg/g	37.7	46	243	20	104	48.3	49.4
PCB_Congeners	PCB026_029	PCB026 & 029	pg/g	78.4	92.2	214	31.1	187	90.8	109
PCB_Congeners	38444-76-7	PCB027	pg/g	36.2	35.2	731	16.9	44	33.6	29.7
PCB_Congeners	16606-02-3	PCB031	pg/g	318	534	260	165	881	388	587
PCB_Congeners	38444-77-8	PCB032	pg/g	96.4	101	498	50.7	225	111	129
PCB_Congeners	37680-68-5	PCB034	pg/g	2.94	2.03	5.99	1.14 J	3.9	3.39	3.68
PCB_Congeners	37680-69-6	PCB035	pg/g	4.48	8.63	4.35	4 U	11.2	6.44	7.88
PCB_Congeners	38444-87-0	PCB036	pg/g	1.05 U	0.528 U	0.834 U	1.12 U	1.61	2.52	2.17
PCB_Congeners	38444-90-5	PCB037	pg/g	86.6	164	38.2	30.9	176	76	116
PCB_Congeners	53555-66-1	PCB038	pg/g	0.612 U	0.306 U	0.69 U	2.65 U	0.442 U	0.444 U	0.423 U
PCB_Congeners	38444-88-1	PCB039	pg/g	0.292 U	3.43	4.34	1.59 U	4.2	0.37 U	4.71
PCB_Congeners	PCB040_041_071	PCB040 & 041 & 071	pg/g	481	384	1390	150	509	355	339
PCB_Congeners	36559-22-5	PCB042	pg/g	257	212	296	62.1	236	191	187
PCB_Congeners	70362-46-8	PCB043	pg/g	51	38.1	241	7.74 U	26.1	41.2	35.3
PCB_Congeners	PCB044_047_065	PCB044 & 047 & 065	pg/g	1720	905	26100	1230	2330	1440	1090
PCB_Congeners	PCB045_051	PCB045 & 051	pg/g	257	134	5380	180	439	243	170
PCB_Congeners	41464-47-5	PCB046	pg/g	33	29.6	163	11.1	20.7	28.1	20.1
PCB_Congeners	70362-47-9	PCB048	pg/g	199	146	156	38.8	144	176	170
PCB_Congeners	PCB049_069	PCB049 & 069	pg/g	908	660	5830	583	1400	808	673
PCB_Congeners	PCB050_053	PCB050 & 053	pg/g	268	123	4080	162	243	279	166
PCB_Congeners	35693-99-3	PCB052	pg/g	1550	1310	3850	608	1150	1360	1040
PCB_Congeners	15968-05-5	PCB054	pg/g	56.3	14.9	1900	27.4	35	48.6	23.2
PCB_Congeners	74338-24-2	PCB055	pg/g	0.985 U	1.01 U	2.29 U	8.78 U	1.46 U	1.25 U	1.31 U
PCB_Congeners	41464-43-1	PCB056	pg/g	589	255	81.4	64.8	339	383	368
PCB_Congeners	70424-67-8	PCB057	pg/g	7.1	4.72	99.3	1.74 U	3.77	5.52	4.21 U
PCB_Congeners	41464-49-7	PCB058	pg/g	3.8	3.67	1.95 U	3.01 U	2.87	4.65	3.16
PCB_Congeners	PCB059_062_075	PCB059 & 062 & 075	pg/g	124	78.1	863	44.1	93.6	94.5	79.3
PCB_Congeners	33025-41-1	PCB060	pg/g	327	157	46.9	33.8	155	198	194
PCB_Congeners	PCB061_070_074_	PCB061 & 070 & 074 & 076	pg/g	2060	1490	683	461	1440	1560	1510
PCB_Congeners	74472-34-7	PCB063	pg/g	62.9	37	72.7	16.1	34	50.9	39.3
PCB_Congeners	52663-58-8	PCB064	pg/g	614	446	164	126	411	440	400
PCB_Congeners	32598-10-0	PCB066	pg/g	1590	800	837	293	788	1010	883
PCB_Congeners	73575-53-8	PCB067	pg/g	31.8	24.1	114	9.6	31	30.7	27.3
PCB_Congeners	73575-52-7	PCB068	pg/g	15.9	8.62	268	21.2	19.3	19	12.4
PCB_Congeners	41464-42-0	PCB072	pg/g	19.4	15.5	83.6	15	19	20	12.9
PCB_Congeners	74338-23-1	PCB073	pg/g	26.9	0.869 U	644	26	23.8	24.5	14.1
PCB_Congeners	32598-13-3	PCB077	pg/g	83.9	51.8	20.5	20	57.5	57.5	54.3
PCB_Congeners	70362-49-1	PCB078	pg/g	0.95 U	0.857 U	1.7 U	5.53 U	0.923 U	0.786 U	0.869 U
PCB_Congeners	41464-48-6	PCB079	pg/g	21	13	31.7	8.49	15.3	18.2	14.1
PCB_Congeners	33284-52-5	PCB080	pg/g	1.08 U	1.11 U	2.5 U	9.59 U	1.6 U	1.36 U	1.43 U
PCB_Congeners	70362-50-4	PCB081	pg/g	5.14 U	2.34 U	1.66 U	2.23 U	2.17 U	2.37 U	2.88 U
PCB_Congeners	52663-62-4	PCB082	pg/g	123	163	79.3 U	41.5	129	75.8	87.7
PCB_Congeners	PCB083_099	PCB083 & 099	pg/g	1670	1460	10100	1130	1600	1480	1060
PCB_Congeners	52663-60-2	PCB084	pg/g	344	353	801	98.5	209	286	205
PCB_Congeners	PCB085_116_117	PCB085 & 116 & 117	pg/g	530	408	702	165	254	356	270
PCB_Congeners	PCB086_087_097_	PCB086 & 087 & 097 & 108 & 119 & 125	pg/g	1270	1250	3660	557	1020	984	790
PCB_Congeners	PCB088_091	PCB088 & 091	pg/g	397	303	2990	356	671	404	299
PCB_Congeners	73575-57-2	PCB089	pg/g	12.3	11.7	12.2	1.91 U	8.53	7.81	7.5
PCB_Congeners	PCB090_101_113	PCB090 & 101 & 113	pg/g	2290	2490	14200	1900	2880	2280	1630
PCB_Congeners	52663-61-3	PCB092	pg/g	530	474	4810	386	612	540	361
PCB_Congeners	PCB093_095_098_	PCB093 & 095 & 098 & 100 & 102	pg/g	1760	1550	15400	1080	1740	1810	1170

PCB_Congeners	73575-55-0	PCB094	pg/g	45.9	17.4	1370	35.6	28.1	40.7	21.1
PCB_Congeners	73575-54-9	PCB096	pg/g	24.9	10.7	329	15.2	24	25.8	13.7
PCB_Congeners	60145-21-3	PCB103	pg/g	40.9	23.9	1090	68.9	125	66.9	43.5
PCB_Congeners	56558-16-8	PCB104	pg/g	12	2.68	498	5.05	8.99	11.3	6.02
PCB_Congeners	32598-14-4	PCB105	pg/g	662	603	290	207	359	431	352
PCB_Congeners	70424-69-0	PCB106	pg/g	0.395 U	0.382 U	22.1	3.3 U	0.551 U	0.47 U	0.491 U
PCB_Congeners	PCB107_124	PCB107 & 124	pg/g	84.3	76.9	71.7	28.8	46.8	55.4	41.6
PCB_Congeners	74472-35-8	PCB109	pg/g	174	138	278	95.8	132	134	99
PCB_Congeners	PCB110_115	PCB110 & 115	pg/g	2110	2550	3740	1200	2100	1830	1500
PCB_Congeners	39635-32-0	PCB111	pg/g	3.04	1.42 U	56	5.48 U	8.21	4.12 U	2.76
PCB_Congeners	74472-36-9	PCB112	pg/g	0.339 U	0.495 U	725	2.89 U	0.482 U	0.411 U	0.661 U
PCB_Congeners	74472-37-0	PCB114	pg/g	43.9	32.6	19.4	10.5	21	27.5	21.7
PCB_Congeners	31508-00-6	PCB118	pg/g	1540	1790	2490	800	1120	1160	960
PCB_Congeners	68194-12-7	PCB120	pg/g	11.5	6.82	111	19.2	29.1	16.9	10.7
PCB_Congeners	56558-18-0	PCB121	pg/g	5.25	1.46 U	168	5.68	10.9	7.53	4.8
PCB_Congeners	76842-07-4	PCB122	pg/g	32.8	24.3	1.03 U	10.4 U	16.7	20.6	16.7
PCB_Congeners	65510-44-3	PCB123	pg/g	41.1	28.1	32.2	11.7 U	15.4	24.5	17.7
PCB_Congeners	57465-28-8	PCB126	pg/g	4.2	3.08	6.55 U	2.28 J	4.54	3.83 U	2.87
PCB_Congeners	39635-33-1	PCB127	pg/g	0.463 U	0.477 U	12.4	4.12 U	0.688 U	0.586 U	0.613 U
PCB_Congeners	PCB128_166	PCB128 & 166	pg/g	307	426	1610	236	382	297	235
PCB_Congeners	PCB129_138_160_	PCB129 & 138 & 160 & 163	pg/g	3010	3160	42800	3130	6300	3250	2400
PCB_Congeners	52663-66-8	PCB130	pg/g	152	180	1200	136	264	164	122
PCB_Congeners	61798-70-7	PCB131	pg/g	9.84	23.1	79.3	5.83	22	7.28	8.59
PCB_Congeners	38380-05-1	PCB132	pg/g	636	762	6220	495	1370	702	512
PCB_Congeners	35694-04-3	PCB133	pg/g	70.2	46.5	1100	79.9	146	98.7	60.9
PCB_Congeners	PCB134_143	PCB134 & 143	pg/g	125	112	1620	73.6	193	137	88.6
PCB_Congeners	PCB135_151_154	PCB135 & 151 & 154	pg/g	1190	872	20000	1080	2550	3.23 U	1020
PCB_Congeners	38411-22-2	PCB136	pg/g	296	215	3360	182	370	395	218
PCB_Congeners	35694-06-5	PCB137	pg/g	108	138	446	53.3	67.7	79.9	67.7
PCB_Congeners	PCB139_140	PCB139 & 140	pg/g	47.6	50.2	279	38.4	73.2	52.2	38.2
PCB_Congeners	52712-04-6	PCB141	pg/g	498	498	9970	501	1280	590	436
PCB_Congeners	41411-61-4	PCB142	pg/g	0.611 U	0.649 U	3.02 U	2.71 U	0.64 U	0.434 U	0.403 U
PCB_Congeners	68194-14-9	PCB144	pg/g	107	104	1570	90.4	238	126	85.5
PCB_Congeners	74472-40-5	PCB145	pg/g	1.28 U	0.853	8.67	0.502 U	0.83 U	1.04 U	0.62 U
PCB_Congeners	51908-16-8	PCB146	pg/g	508	435	7310	655	1540	707	483
PCB_Congeners	PCB147_149	PCB147 & 149	pg/g	2230	2000	34600	2180	5200	2800	1900
PCB_Congeners	74472-41-6	PCB148	pg/g	15.5	5.96	331	19.4	43.1	24.9	15.4
PCB_Congeners	68194-08-1	PCB150	pg/g	11.7	4.32	183	14	32.8	19.7	12
PCB_Congeners	68194-09-2	PCB152	pg/g	8.84	3.29	268	7.44	10.5	9.99	5.29
PCB_Congeners	PCB153_168	PCB153 & 168	pg/g	2540	2820	49600	3580	7330	2990	2340
PCB_Congeners	33979-03-2	PCB155	pg/g	3.11	0.649 U	109	1.99 U	3.47	3.61	2.1
PCB_Congeners	PCB156_157	PCB156 & 157	pg/g	238	263	2250	176	299	224	171
PCB_Congeners	74472-42-7	PCB158	pg/g	263	263	2810	196	461	276	201
PCB_Congeners	39635-35-3	PCB159	pg/g	21.3	19.2	555	15.7	66.4	29.3	20.1
PCB_Congeners	74472-43-8	PCB161	pg/g	0.404 U	0.474 U	2.21 U	3.06 U	0.511 U	0.435 U	0.455 U
PCB_Congeners	39635-34-2	PCB162	pg/g	7.26	7.75	46.9	4.75 U	8.47 U	5.27	4.98 U
PCB_Congeners	74472-45-0	PCB164	pg/g	190	174	2570	155	396	219	161
PCB_Congeners	74472-46-1	PCB165	pg/g	4.17	1.55	106	4.35	9.16	6	3.79
PCB_Congeners	52663-72-6	PCB167	pg/g	92.4	102	1050	80.9	145	94.7	70.5
PCB_Congeners	32774-16-6	PCB169	pg/g	0.97 U	0.678 U	15.9 U	2.44 U	3.95 U	2.13 U	1.6 U
PCB_Congeners	35065-30-6	PCB170	pg/g	531	476	17100	667	2030	665	501
PCB_Congeners	PCB171_173	PCB171 & 173	pg/g	186	152	4710	167	608	250	172
PCB_Congeners	52663-74-8	PCB172	pg/g	89.8	88.7	2670	105	321	122	88.4
PCB_Congeners	38411-25-5	PCB174	pg/g	551	493	16300	420	1850	736	539
PCB_Congeners	40186-70-7	PCB175	pg/g	26.6	23.7	700	26.2	78.4	36.8	26
PCB_Congeners	52663-65-7	PCB176	pg/g	78.7	57.6	1740	42.6	172	105	65.5
PCB_Congeners	52663-70-4	PCB177	pg/g	425	313	10500	372	1370	539	389
PCB_Congeners	52663-67-9	PCB178	pg/g	175	129	4160	151	477	251	176
PCB_Congeners	52663-64-6	PCB179	pg/g	323	222	6920	179	632	445	282
PCB_Congeners	PCB180_193	PCB180 & 193	pg/g	1310	1250	43200	1630	5370	1660	1310
PCB_Congeners	74472-47-2	PCB181	pg/g	5.32	4.87	95.5	4.25	9	25.7	4.25 U
PCB_Congeners	60145-23-5	PCB182	pg/g	5.97	4.02 U	94.6	7.17	17.6	8.27	6.73

PCB_Congeners	PCB183_185	PCB183 & 185	pg/g	496	431	14800	489	1670	656	492
PCB_Congeners	74472-48-3	PCB184	pg/g	0.987	0.472 U	7.46	0.45 J	1.28	1.84	1.11 U
PCB_Congeners	74472-49-4	PCB186	pg/g	0.328 U	0.338 U	0.762 U	2.92 U	0.487 U	0.908	0.434 U
PCB_Congeners	52663-68-0	PCB187	pg/g	1010	809	26500	888	3190	1430	1030
PCB_Congeners	74487-85-7	PCB188	pg/g	3.41	1.49	68	3.49	9.96	5.16	3.63
PCB_Congeners	39635-31-9	PCB189	pg/g	16.1	12.6	481	18.7 U	53.3	19	13.5
PCB_Congeners	41411-64-7	PCB190	pg/g	132	91.6	3870	123	492	167	122
PCB_Congeners	74472-50-7	PCB191	pg/g	24	20.3	698	26.5	91	31	23
PCB_Congeners	74472-51-8	PCB192	pg/g	0.763 U	0.785 U	1.77 U	6.79 U	1.13 U	0.966 U	1.01 U
PCB_Congeners	35694-08-7	PCB194	pg/g	127	165	4350	150	629	159	141
PCB_Congeners	52663-78-2	PCB195	pg/g	78.6	67	2230	66.3	315	109	81.6
PCB_Congeners	42740-50-1	PCB196	pg/g	97.6	105	3020	91.5	347	130	100
PCB_Congeners	PCB197_200	PCB197 & 200	pg/g	35.9	31.9	881	18.4	99.1	52.6	36.2
PCB_Congeners	PCB198_199	PCB198 & 199	pg/g	165	252	5060	162	706	237	195
PCB_Congeners	40186-71-8	PCB201	pg/g	34.6	31.2	782	21.2	89.3	50.1	35.3
PCB_Congeners	2136-99-4	PCB202	pg/g	55.2	61.6	1060	38.4	142	78.3	59.8
PCB_Congeners	52663-76-0	PCB203	pg/g	141	151	3830	123	534	192	162
PCB_Congeners	74472-52-9	PCB204	pg/g	0.198 U	0.108 U	1.41 U	8.22 U	1.37 U	0.876 U	0.21 U
PCB_Congeners	74472-53-0	PCB205	pg/g	6.41	8.64	235	8.39	42.7	9.53	8.32
PCB_Congeners	40186-72-9	PCB206	pg/g	36.8	72	527	34.6	116	59.5	58
PCB_Congeners	52663-79-3	PCB207	pg/g	6.97	9.75	100	4.65	16.1	12.4	7.8
PCB_Congeners	52663-77-1	PCB208	pg/g	15	23	98	9.87	26	23.5	22.6
PCB_Congeners	2051-24-3	PCB209	pg/g	13.1	17.3	15.8	11.2	15.6	32.9	29.7
PCB_Congeners	1336-36-3	Polychlorinated biphenyls	pg/g	46500	42200	498000	33100	78700	45600	37100
PCB_Homologs	27323-18-8	Monochlorobiphenyl	pg/g	36.4	13.4	49.6	42.6	31.4	47.9	44.1
PCB_Homologs	25512-42-9	Dichlorobiphenyl	pg/g	481	343	1850	492	982	715	763
PCB_Homologs	25323-68-6	Trichlorobiphenyl	pg/g	1930	2500	9710	935	4260	2230	2940
PCB_Homologs	26914-33-0	Tetrachlorobiphenyl	pg/g	11300	7340	53400	4190	9960	8880	7530
PCB_Homologs	25429-29-2	Pentachlorobiphenyl	pg/g	13800	13800	64100	8210	13200	12100	9000
PCB_Homologs	26601-64-9	Hexachlorobiphenyl	pg/g	12700	12700	192000	13200	28800	13300	10700
PCB_Homologs	28655-71-2	Heptachlorobiphenyl	pg/g	5380	4580	155000	5300	18400	7160	5240
PCB_Homologs	55722-26-4	Octachlorobiphenyl	pg/g	743	873	21400	678	2900	1020	819
PCB_Homologs	53742-07-7	Nonachlorobiphenyl	pg/g	58.8	105	725	49.2	158	95.4	88.4
Pesticides	53-19-0	2,4'-DDD	ug/kg	1.47	0.393	0.328 J	0.214 J	0.136	14.1	0.476
Pesticides	3424-82-6	2,4'-DDE	ug/kg	0.17	0.0736	0.0775	0.0525 J	0.0382 J	1.28	0.117
Pesticides	789-02-6	2,4'-DDT	ug/kg	0.313	0.0532	0.12 J	0.0374 U	0.0172 U	7.54	0.0962
Pesticides	72-54-8	4,4'-DDD	ug/kg	3.08	0.831	0.841 J	0.746	0.646	30.3	1.62
Pesticides	72-55-9	4,4'-DDE	ug/kg	6.42	1.21	3.13	1.96	2.14	29.4	6.07
Pesticides	50-29-3	4,4'-DDT	ug/kg	0.463	0.111	0.236	0.0517 J	0.0502	12.2	0.192
Pesticides	PP_DDT3ISO	Total of 4,4'-DDD, -DDE, -DDT	ug/kg	9.96 T	2.15 T	4.21 JT	2.76 JT	2.84 T	71.9 T	7.88 T
Pesticides	309-00-2	Aldrin	ug/kg	0.0513 J	0.00926 J	0.0231 J	0.0128 U	0.025 J	0.0828	0.0872
Pesticides	319-84-6	alpha-Hexachlorocyclohexane	ug/kg	0.00928 U	0.00446 J	0.011 J	0.0178 U	0.0112 U	0.0195 J	0.0167 J
Pesticides	319-85-7	beta-Hexachlorocyclohexane	ug/kg	0.00457 J	0.00295 U	0.0125 U	0.0268 U	0.00542 J	0.00933 U	0.00794 J
Pesticides	319-86-8	delta-Hexachlorocyclohexane	ug/kg	0.0117 U	0.0121 U	0.004 U	0.013 U	0.0174 U	0.004 U	0.00185 U
Pesticides	58-89-9	gamma-Hexachlorocyclohexane	ug/kg	0.0111 J	0.00458 U	0.0124 J	0.0163 U	0.0129 J	0.0214 J	0.0192 U
Pesticides	5103-71-9	cis-Chlordane	ug/kg	0.373	0.0977	0.216	0.186 J	0.159	0.6	0.451
Pesticides	5103-74-2	trans-Chlordane	ug/kg	0.312	0.0686	0.139	0.114 J	0.127	0.466	0.389
Pesticides	27304-13-8	Oxychlordane	ug/kg	0.0375 J	0.0204 U	0.0573 U	0.0682 U	0.183	0.0614 J	0.132
Pesticides	5103-73-1	cis-Nonachlor	ug/kg	0.163	0.0405 J	0.0954 J	0.0833 J	0.0812 J	0.24	0.181
Pesticides	39765-80-5	trans-Nonachlor	ug/kg	0.452	0.106	0.291	0.256 J	0.302	0.697	0.587
Pesticides	TOTCHLDANE	Total Chlordanes	ug/kg	1.34 JT	0.313 JT	0.741 JT	0.639 JT	0.852 JT	2.06 JT	1.74 T
Pesticides	60-57-1	Dieldrin	ug/kg	0.228	0.098	0.243	0.161	0.178	0.396	0.362
Pesticides	959-98-8	alpha-Endosulfan	ug/kg	0.064	0.02 U	0.045	0.137 U	0.055	0.097 J	0.092 J
Pesticides	33213-65-9	beta-Endosulfan	ug/kg	0.047	0.021	0.046 U	0.156 U	0.04 U	0.098 J	0.058 U
Pesticides	1031-07-8	Endosulfan sulfate	ug/kg	0.14	0.067 U	0.097	0.061 U	0.128	0.296	0.227
Pesticides	72-20-8	Endrin	ug/kg	0.004 U	0.0168 U	0.038 U	0.146 U	0.0243 U	0.007 U	0.008 J
Pesticides	7421-93-4	Endrin aldehyde	ug/kg	0.0123 U	0.0127 U	0.0285 U	0.109 U	0.0183 U	0.0101 U	0.00551 U
Pesticides	53494-70-5	Endrin ketone	ug/kg	0.0256 U	0.0263 U	0.0594 U	0.228 U	0.038 U	0.00324 U	0.00339 U
Pesticides	76-44-8	Heptachlor	ug/kg	0.00497 J	0.00228 U	0.0043 U	0.012 J	0.00605 U	0.00606 U	0.00655 J
Pesticides	1024-57-3	Heptachlor epoxide	ug/kg	0.017	0.006	0.016	0.015 U	0.018	0.024 J	0.025 J
Pesticides	72-43-5	Methoxychlor	ug/kg	0.007 U	0.0126 U	0.0284 U	0.109 U	0.0182 U	0.00635 U	0.012 U
SVOCs	118-74-1	Hexachlorobenzene	ug/kg	0.264	0.12	0.26	0.308	0.235	0.544	0.345
SVOCs	87-68-3	Hexachlorobutadiene	ug/kg	0.006 UJ	0.0066 UJ	0.0137 UJ	0.063 UJ	0.0118 UJ	0.015 UJ	0.0097 UJ

Qualifiers	Description
J	Estimate.
JT	Combined qualifier.
N	Presumptive evidence of a compound.
NJ	Combined qualifier.
NJT	Combined qualifier.
R	Rejected.
T	Value is an average or selected result (see data rules).
U	Not detected at value shown.
UJ	Combined qualifier.
UJT	Combined qualifier.
UT	Combined qualifier.

Table D-1. Invertebrate Taxonomic Results by Multiplate Sampler.

	Number of Organisms																								
	MIT001			MIT002		MIT003			MIT004			MIT005			MIT006			MIT007	MIT008	MIT009			MIT010	
Taxonomical Group	**Replicate 1**	**Replicate 2**	**Replicate 3**	**Replicate 1**	**Replicate 2**	**Replicate 1**	**Replicate 2**	**Replicate 3**	**Replicate 1**	**Replicate 2**	**Replicate 3**	**Replicate 1**	**Replicate 2**	**Replicate 3**	**Replicate 1**	**Replicate 2**	**Replicate 3**	**Replicate 1**	**Replicate 1**	**Replicate 1**	**Replicate 2**	**Replicate 3**	**Replicate 1**	**Replicate 2**
Ephemeroptera																									
Caenis sp.	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stenonema terminatum	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diptera-Chironomidae																									
Ablabesmyia sp.	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	0	1	0	
Chironomidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
Chironomini	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	12	0	0	0	0	1	0	
Chironomus sp.	0	0	0	0	0	1	1	2	1	0	0	2	3	0	0	1	1	0	0	1	1	0	0	0	
Cladotanytarsus sp.	0	1	0	0	0	0	0	0	0	0	0	2	2	1	0	0	0	0	0	0	0	0	0	0	
Cricotopus bicinctus gr.	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cricotopus sp.	6	1	5	6	64	5	4	1	36	56	5	21	8	28	4	6	6	0	6	101	109	25	9	8	
Cryptochironomus sp.	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0	
Demeijerea sp.	0	0	0	0	1	0	0	0	3	2	4	0	0	1	0	1	0	9	2	3	5	0	0	0	
Dicrotendipes sp.	9	4	9	104	254	15	18	14	89	74	51	19	29	43	15	22	25	70	4	32	26	13	12	20	
Glyptotendipes sp.	39	49	54	12	1	6	7	12	17	24	37	6	7	2	22	17	17	175	41	136	113	103	8	7	
Nanocladius sp.	1	0	6	0	1	1	0	5	0	1	0	6	1	3	1	2	2	0	1	1	0	0	0	0	
Orthocladius Complex	1	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0	0	0	
Parachironomus sp.	2	8	2	3	4	3	5	3	3	6	2	0	13	3	5	10	3	13	17	28	26	13	4	8	
Parakiefferiella sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
Paraphaenocladius sp.	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Paratanytarsus sp.	4	3	6	4	2	15	5	2	33	11	28	1	3	7	8	5	8	26	5	3	4	2	3	3	
Phaenopsectra sp.	1	0	0	0	0	0	0	2	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	
Procladius sp.	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	1	1	1	1	
Psectrocladius sp.	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
Stenochironomus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
Tanytarsus sp.	0	1	1	0	1	0	0	0	0	2	1	2	0	0	0	0	0	0	0	0	0	0	1	1	
Thienemanniella sp.	2	2	2	0	0	0	1	0	0	2	0	0	0	3	0	0	0	0	0	0	0	0	0	0	
Trichoptera																									
Hydroptila sp.	1	0	0	0	6	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	1	0	0	0	
Hydroptilidae	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Oecetis sp.	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Orthotrichia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	
Polycentropus sp.	0	1	0	0	1	3	0	1	3	0	1	0	0	1	0	2	0	3	1	0	0	1	0	0	
Gastropoda																									
Gastropoda	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
Bivalvia																									
Bivalvia	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	
Corbicula sp.	1	5	13	0	0	0	3	3	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	
Annelida																									
Aeolosomatidae	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Aulodrilus pigueti	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Aulodrilus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
Chaetogaster sp.	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	
Dero digitata	0	0	5	189	187	2	9	38	127	216	32	5	7	2	2	3	8	378	354	456	735	324	303	90	
Dero furcata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
Lumbriculidae	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Manayunkia speciosa	0	1	0	0	0	1	1	1	0	0	1	0	0	0	0	0	0	0	2	0	0	0	4	3	
Nais barbata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	
Nais pardalis	30	45	55	35	13	27	60	71	7	26	30	128	74	201	66	170	79	27	287	228	0	215	101	128	
Nais variabilis	3	23	15	12	3	5	2	35	4	5	3	42	2	6	6	7	7	5	5	5	2	0	0	1	
Pristina aequiseta	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Pristina leidyi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	
Pristina osborni	0	5	1	0	0	0	2	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	
Slavina appendiculata	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
Stylaria lacustris	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6	0	0	0	
Vejdovskyella sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2	
Acari																									
Acari	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
Frontipoda sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
Hygrobates sp.	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
Lebertia sp.	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Limnesiidae	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Torrenticola sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	

Table D-1. Invertebrate Taxonomic Results by Multiplate Sampler.

	Number of Organisms																						
	MIT001			MIT002		MIT003			MIT004			MIT005			MIT006			MIT007	MIT008	MIT009			MIT010	
Taxonomical Group	**Replicate 1**	**Replicate 2**	**Replicate 3**	**Replicate 1**	**Replicate 2**	**Replicate 1**	**Replicate 2**	**Replicate 3**	**Replicate 1**	**Replicate 2**	**Replicate 3**	**Replicate 1**	**Replicate 2**	**Replicate 3**	**Replicate 1**	**Replicate 2**	**Replicate 3**	**Replicate 1**	**Replicate 1**	**Replicate 1**	**Replicate 2**	**Replicate 3**	**Replicate 1**	**Replicate 2**
Crustacea																								
Anisogammarus sp.	9	4	18	0	0	0	0	0	6	8	6	3	3	6	1	3	1	0	0	2	2	1	2	1
Corophium spinicorne	235	179	355	2	1	7	15	9	14	17	0	5	25	5	68	85	77	7	22	2	0	4	0	12
Ostracoda	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Organisms																								
Hydra sp.	0	0	0	0	0	55	8	333	0	0	0	9	4	44	0	8	0	0	0	0	0	0	0	0
Nematoda	2	2	2	0	0	1	0	0	0	0	0	0	0	0	0	2	0	1	2	0	0	0	1	1
Prostoma sp.	0	2	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Turbellaria	0	1	6	0	0	4	0	4	0	6	0	1	5	0	1	3	0	3	1	0	2	0	12	10

Table D-2. Invertebrate Metrics by Multiplate Sampler

Metrics	MIT001			MIT002		MIT003			MIT004		
	Replicate 1	**Replicate 2**	**Replicate 3**	**Replicate 1**	**Replicate 2**	**Replicate 1**	**Replicate 2**	**Replicate 3**	**Replicate 1**	**Replicate 2**	**Replicate 3**
Abundance Measures											
Corrected Abundance	347.00	341.00	575.00	367.00	542.00	154.00	147.00	538.00	344.00	461.00	202.00
EPT Abundance	2.00	4.00	1.00	0.00	7.00	4.00	0.00	1.00	3.00	2.00	1.00
Dominance Measures											
1st Dominant Taxon	*Corophium spinicorne*	Corophium spinicorne	Corophium spinicorne	Dero digitata	Dicrotendipes sp.	Hydra sp.	Nais pardalis	Hydra sp.	Dero digitata	Dero digitata	Dicrotendipes sp.
1st Dominant Abundance	235.00	179.00	355.00	189.00	254.00	55.00	60.00	333.00	127.00	216.00	51.00
2nd Dominant Taxon	*Glyptotendipes sp.*	Glyptotendipes sp.	Nais pardalis	Dicrotendipes sp.	Dero digitata	Nais pardalis	Dicrotendipes sp.	Nais pardalis	Dicrotendipes sp.	Dicrotendipes sp.	Glyptotendipes sp.
2nd Dominant Abundance	39.00	49.00	55.00	104.00	187.00	27.00	18.00	71.00	89.00	74.00	37.00
3rd Dominant Taxon	Nais pardalis	Nais pardalis	Glyptotendipes sp.	Nais pardalis	Cricotopus sp.	Paratanytarsus sp.	Corophium spinicorne	Dero digitata	Cricotopus sp.	Cricotopus sp.	Dero digitata
3rd Dominant Abundance	30.00	45.00	54.00	35.00	64.00	15.00	15.00	38.00	36.00	56.00	32.00
% 1 Dominant Taxon	67.72	52.49	61.74	51.50	46.86	35.71	40.82	61.90	36.92	46.85	25.25
% 2 Dominant Taxa	78.96	66.86	71.30	79.84	81.37	53.25	53.06	75.09	62.79	62.91	43.56
% 3 Dominant Taxa	87.61	80.06	80.70	89.37	93.17	62.99	63.27	82.16	73.26	75.05	59.41
Richness Measures											
Species Richness	17.00	23.00	28.00	9.00	17.00	19.00	20.00	19.00	14.00	19.00	14.00
EPT Richness	2.00	4.00	1.00	0.00	2.00	2.00	0.00	1.00	1.00	1.00	1.00
Ephemeroptera Richness	0.00	2.00	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
Plecoptera Richness	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trichoptera Richness	2.00	2.00	0.00	0.00	2.00	1.00	0.00	1.00	1.00	1.00	1.00
Chironomidae Richness	9.00	8.00	11.00	5.00	9.00	7.00	8.00	9.00	8.00	11.00	8.00
Oligochaeta Richness	2.00	3.00	7.00	3.00	3.00	3.00	6.00	3.00	3.00	3.00	3.00
Non-Chiro. Non-Olig. Richness	6.00	12.00	10.00	1.00	5.00	9.00	6.00	7.00	3.00	5.00	3.00
Rhyacophila Richness	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Community Composition											
% Ephemeroptera	0.00	0.59	0.17	0.00	0.00	0.65	0.00	0.00	0.00	0.00	0.00
% Plecoptera	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Trichoptera	0.58	0.59	0.00	0.00	1.29	1.95	0.00	0.19	0.87	0.43	0.50
% EPT	0.58	1.17	0.17	0.00	1.29	2.60	0.00	0.19	0.87	0.43	0.50
% Coleoptera	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Diptera	18.73	20.23	15.30	35.15	60.70	29.87	29.25	7.81	53.20	39.05	63.86
% Oligochaeta	9.51	21.41	15.30	64.31	37.45	22.08	51.02	26.77	40.12	53.58	32.18
% Baetidae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Brachycentridae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Chironomidae	18.73	20.23	15.30	35.15	60.70	29.87	29.25	7.81	53.20	39.05	63.86
% Ephemerellidae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Hydropsychidae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Odonata	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Perlidae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Pteronarcyidae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Simuliidae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table D-2. Invertebrate Metrics by Multiplate Sampler

Metrics	MIT001			MIT002		MIT003			MIT004		
	Replicate 1	Replicate 2	Replicate 3	Replicate 1	Replicate 2	Replicate 1	Replicate 2	Replicate 3	Replicate 1	Replicate 2	Replicate 3
Functional Group Composition											
% Filterers	0.29	2.05	2.43	0.00	0.18	1.30	2.72	0.74	0.00	0.43	0.99
% Gatherers	28.82	42.82	32.52	97.82	85.79	49.35	77.55	33.83	83.72	81.13	93.56
% Predators	0.86	1.76	2.09	0.00	0.74	41.56	6.12	63.20	0.87	1.52	0.50
% Scrapers	0.29	0.29	0.17	0.00	0.00	0.00	0.00	0.37	0.00	0.00	0.50
% Shredders	1.73	0.29	1.04	1.63	11.81	3.25	2.72	0.19	10.47	12.15	2.48
% Piercer-Herbivores	0.29	0.29	0.00	0.00	1.11	0.00	0.00	0.00	0.00	0.43	0.00
% Unclassified	67.72	52.49	61.74	0.54	0.37	4.55	10.88	1.67	4.94	4.34	1.98
Filterer Richness	1.00	3.00	2.00	0.00	1.00	2.00	2.00	2.00	0.00	1.00	2.00
Gatherer Richness	10.00	12.00	16.00	7.00	8.00	10.00	13.00	9.00	10.00	11.00	8.00
Predator Richness	2.00	4.00	6.00	0.00	4.00	5.00	2.00	5.00	1.00	2.00	1.00
Scraper Richness	1.00	1.00	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.00
Shredder Richness	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Piercer-Herbivore Richness	1.00	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00	0.00
Unclassified	1.00	1.00	1.00	1.00	2.00	1.00	2.00	1.00	2.00	3.00	1.00
Diversity/Evenness Measures											
Shannon-Weaver H' (log 10)	0.55	0.73	0.69	0.58	0.57	0.93	0.93	0.62	0.79	0.79	0.87
Shannon-Weaver H' (log 2)	1.82	2.43	2.30	1.92	1.88	3.10	3.10	2.07	2.62	2.61	2.88
Shannon-Weaver H' (log e)	1.26	1.69	1.60	1.33	1.30	2.15	2.15	1.44	1.82	1.81	1.99
Margalef's Richness	2.74	3.77	4.25	1.35	2.54	3.57	3.81	2.86	2.23	2.93	2.45
Pielou's J'	0.45	0.54	0.48	0.61	0.46	0.73	0.72	0.49	0.69	0.62	0.76
Simpson's Heterogeneity	0.52	0.68	0.60	0.64	0.65	0.82	0.80	0.59	0.77	0.73	0.84
Biotic Indices											
% Indiv. w/ HBI Value	31.99	45.75	35.65	99.46	99.45	93.51	86.39	97.40	95.06	95.66	97.52
Hilsenhoff Biotic Index	7.46	8.13	7.37	9.08	8.55	6.55	7.95	6.30	8.43	8.69	7.92
% Indiv. w/ MTI Value	8.36	7.62	7.30	31.88	61.62	67.53	29.25	68.40	47.97	34.92	44.06
Metals Tolerance Index	5.10	3.85	4.45	5.08	5.69	3.48	4.40	3.13	5.18	6.04	4.18
% Indiv. w/ FSBI Value	0.29	0.00	0.00	0.00	1.11	0.00	0.00	0.00	0.00	0.43	0.00
Fine Sediment Biotic Index	5.00	-99.00	-99.00	-99.00	5.00	-99.00	-99.00	-99.00	-99.00	5.00	-99.00
FSBI - average	0.29	-99.00	-99.00	-99.00	0.29	-99.00	-99.00	-99.00	-99.00	0.26	-99.00
FSBI - weighted average	5.00	-99.00	-99.00	-99.00	5.00	-99.00	-99.00	-99.00	-99.00	5.00	-99.00
% Indiv. w/ TPM Value	2.88	1.17	1.74	1.63	13.10	3.25	3.40	0.19	10.47	13.45	2.97
Temp. Pref. Metric - average	1.18	0.61	0.86	0.56	0.53	0.26	0.60	0.26	0.36	0.84	0.50
TPM - weighted average	5.20	5.25	5.10	5.00	4.70	5.00	5.40	5.00	5.00	4.87	4.50
Karr BIBI Metrics											
Long-Lived Taxa Richness	1.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00	0.00
Clinger Richness	4.00	6.00	4.00	2.00	5.00	3.00	2.00	3.00	3.00	4.00	4.00
% Clingers	13.54	15.84	10.61	4.90	13.47	9.09	7.48	2.60	16.28	18.22	21.78
Intolerant Taxa Richness	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Tolerant Individuals	30.63	48.72	40.98	64.66	37.85	23.61	59.84	27.48	42.20	56.01	32.99
% Tolerant Taxa	35.29	34.78	42.86	66.67	47.06	36.84	55.00	42.11	57.14	42.11	42.86
Coleoptera Richness	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table D-2. Invertebrate Metrics by Multiplatte Sampler

Metrics	MIT005			MIT006			MIT007	MIT008	MIT009			MIT010	
	Replicate 1	Replicate 2	Replicate 3	Replicate 1	Replicate 2	Replicate 3	Replicate 1	Replicate 1	Replicate 1	Replicate 2	Replicate 3	Replicate 1	Replicate 2
Abundance Measures													
Corrected Abundance	256.00	191.00	367.00	200.00	354.00	237.00	736.00	753.00	1002.00	1034.00	702.00	464.00	302.00
EPT Abundance	0.00	0.00	3.00	0.00	2.00	0.00	5.00	1.00	0.00	1.00	1.00	0.00	0.00
Dominance Measures													
1st Dominant Taxon	Nais pardalis	Nais pardalis	Nais pardalis	Corophium spinicorne	Nais pardalis	Nais pardalis	Dero digitata	Dero digitata	Dero digitata	Dero digitata	Dero digitata	Dero digitata	Nais pardalis
1st Dominant Abundance	128.00	74.00	201.00	68.00	170.00	79.00	378.00	354.00	456.00	735.00	324.00	303.00	128.00
2nd Dominant Taxon	Nais variabilis	Dicrotendipes sp.	Hydra sp.	Nais pardalis	Corophium spinicorne	Corophium spinicorne	Glyptotendipes sp.	Nais pardalis	Nais pardalis	Glyptotendipes sp.	Nais pardalis	Nais pardalis	Dero digitata
2nd Dominant Abundance	42.00	29.00	44.00	66.00	85.00	77.00	175.00	287.00	228.00	113.00	215.00	101.00	90.00
3rd Dominant Taxon	Cricotopus sp.	Corophium spinicorne	Dicrotendipes sp.	Glyptotendipes sp.	Dicrotendipes sp.	Dicrotendipes sp.	Dicrotendipes sp.	Glyptotendipes sp.	Glyptotendipes sp.	Cricotopus sp.	Glyptotendipes sp.	Turbellaria	Dicrotendipes sp.
3rd Dominant Abundance	21.00	25.00	43.00	22.00	22.00	25.00	70.00	41.00	136.00	109.00	103.00	12.00	20.00
% 1 Dominant Taxon	50.00	38.74	54.77	34.00	48.02	33.33	51.36	47.01	45.51	71.08	46.15	65.30	42.38
% 2 Dominant Taxa	66.41	53.93	66.76	67.00	72.03	65.82	75.14	85.13	68.26	82.01	76.78	87.07	72.19
% 3 Dominant Taxa	74.61	67.02	78.47	78.00	78.25	76.37	84.65	90.57	81.84	92.55	91.45	89.66	78.81
Richness Measures													
Species Richness	19.00	18.00	22.00	13.00	23.00	15.00	17.00	18.00	16.00	15.00	11.00	16.00	20.00
EPT Richness	0.00	0.00	2.00	0.00	1.00	0.00	2.00	1.00	0.00	1.00	1.00	0.00	0.00
Ephemeroptera Richness	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Plecoptera Richness	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trichoptera Richness	0.00	0.00	2.00	0.00	1.00	0.00	2.00	1.00	0.00	1.00	1.00	0.00	0.00
Chironomidae Richness	10.00	10.00	11.00	6.00	12.00	8.00	7.00	8.00	9.00	8.00	6.00	9.00	8.00
Oligochaeta Richness	5.00	3.00	5.00	3.00	3.00	3.00	5.00	5.00	5.00	4.00	2.00	2.00	5.00
Non-Chiro. Non-Olig. Richness	4.00	5.00	6.00	4.00	8.00	4.00	5.00	5.00	2.00	3.00	3.00	5.00	7.00
Rhyacophila Richness	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Community Composition													
% Ephemeroptera	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Plecoptera	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Trichoptera	0.00	0.00	0.82	0.00	0.56	0.00	0.68	0.13	0.00	0.10	0.14	0.00	0.00
% EPT	0.00	0.00	0.82	0.00	0.56	0.00	0.68	0.13	0.00	0.10	0.14	0.00	0.00
% Coleoptera	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Diptera	23.83	35.60	25.89	27.50	19.49	26.58	41.71	10.23	30.54	27.56	22.36	8.62	16.23
% Oligochaeta	69.14	43.46	58.04	37.00	50.85	39.66	56.11	86.06	69.06	71.95	76.78	87.07	74.17
% Baetidae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Brachycentridae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Chironomidae	23.83	35.60	25.89	27.50	19.49	26.58	41.71	10.23	30.54	27.56	22.36	8.62	16.23
% Ephemerellidae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Hydropsychidae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Odonata	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Perlidae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Pteronarcyidae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Simuliidae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table D-2. Invertebrate Metrics by Multiplatte Sampler

Metrics	MIT005			MIT006			MIT007	MIT008	MIT009			MIT010	
	Replicate 1	Replicate 2	Replicate 3	Replicate 1	Replicate 2	Replicate 3	Replicate 1	Replicate 1	Replicate 1	Replicate 2	Replicate 3	Replicate 1	Replicate 2
Functional Group Composition													
% Filterers	0.78	1.57	0.00	0.00	0.28	0.42	0.00	0.27	0.00	0.00	0.00	1.29	1.32
% Gatherers	83.98	75.92	77.11	63.00	68.36	63.71	96.33	95.22	89.32	88.59	95.58	93.53	87.42
% Predators	4.69	5.24	12.81	1.00	5.37	0.84	1.22	0.53	0.10	0.29	0.28	3.23	4.64
% Scrapers	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Shredders	8.20	4.19	7.63	2.00	1.69	2.53	0.00	0.80	10.08	10.54	3.56	1.94	2.65
% Piercer-Herbivores	0.00	0.00	0.54	0.00	0.00	0.00	0.27	0.00	0.00	0.10	0.00	0.00	0.00
% Unclassified	1.95	13.09	1.91	34.00	24.29	32.49	2.17	3.19	0.50	0.48	0.57	0.00	3.97
Filterer Richness	1.00	1.00	0.00	0.00	1.00	1.00	0.00	1.00	0.00	0.00	0.00	3.00	2.00
Gatherer Richness	11.00	12.00	14.00	9.00	12.00	10.00	10.00	11.00	12.00	10.00	7.00	8.00	11.00
Predator Richness	4.00	3.00	3.00	2.00	7.00	2.00	4.00	3.00	1.00	2.00	2.00	4.00	5.00
Scraper Richness	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shredder Richness	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Piercer-Herbivore Richness	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	0.00
Unclassified	1.00	1.00	3.00	1.00	2.00	1.00	2.00	2.00	2.00	1.00	1.00	0.00	1.00
Diversity/Evenness Measures													
Shannon-Weaver H' (log 10)	0.77	0.91	0.73	0.75	0.76	0.78	0.66	0.57	0.67	0.45	0.58	0.51	0.76
Shannon-Weaver H' (log 2)	2.57	3.02	2.42	2.49	2.54	2.59	2.20	1.88	2.21	1.51	1.94	1.68	2.52
Shannon-Weaver H' (log e)	1.78	2.09	1.68	1.73	1.76	1.79	1.53	1.30	1.53	1.05	1.34	1.16	1.75
Margalef's Richness	3.25	3.24	3.56	2.26	3.75	2.56	2.42	2.57	2.17	2.02	1.53	2.44	3.33
Pielou's J'	0.61	0.72	0.54	0.67	0.56	0.66	0.54	0.45	0.55	0.39	0.56	0.42	0.58
Simpson's Heterogeneity	0.71	0.80	0.67	0.76	0.70	0.77	0.67	0.63	0.71	0.47	0.67	0.53	0.72
Biotic Indices													
% Indiv. w/ HBI Value	98.05	85.34	98.09	66.00	75.14	66.67	97.83	96.55	99.50	99.52	99.43	98.92	94.70
Hilsenhoff Biotic Index	7.98	7.90	7.42	7.93	7.83	8.02	8.95	8.99	8.86	9.36	8.92	9.17	8.44
% Indiv. w/ MTI Value	25.39	36.13	36.78	17.50	18.08	19.41	16.30	4.91	16.67	16.44	7.83	9.48	17.22
Metals Tolerance Index	5.68	4.84	4.90	4.57	4.48	4.87	4.05	4.62	7.19	7.32	6.40	5.16	5.06
% Indiv. w/ FSBI Value	0.00	0.00	0.54	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00
Fine Sediment Biotic Index	-99.00	-99.00	5.00	-99.00	-99.00	-99.00	-99.00	-99.00	-99.00	5.00	-99.00	-99.00	-99.00
FSBI - average	-99.00	-99.00	0.23	-99.00	-99.00	-99.00	-99.00	-99.00	-99.00	0.33	-99.00	-99.00	-99.00
FSBI - weighted average	-99.00	-99.00	5.00	-99.00	-99.00	-99.00	-99.00	-99.00	-99.00	5.00	-99.00	-99.00	-99.00
% Indiv. w/ TPM Value	8.98	4.19	9.81	2.00	1.98	2.53	0.00	0.93	10.08	10.64	3.56	2.16	2.98
Temp. Pref. Metric - average	0.37	0.28	0.91	0.38	0.43	0.33	-99.00	0.61	0.31	0.47	0.45	0.44	0.35
TPM - weighted average	4.74	5.00	5.08	5.00	5.00	5.00	-99.00	5.14	5.00	4.97	5.00	4.70	4.67
Karr BIBI Metrics													
Long-Lived Taxa Richness	0.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
Clinger Richness	4.00	3.00	5.00	3.00	3.00	2.00	3.00	3.00	2.00	3.00	3.00	3.00	3.00
% Clingers	12.11	8.90	9.26	13.50	7.06	9.70	24.46	6.37	23.65	21.57	18.38	3.88	5.30
Intolerant Taxa Richness	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Tolerant Individuals	70.12	50.92	58.61	56.06	67.67	59.49	56.94	89.13	69.41	72.30	77.22	88.02	77.97
% Tolerant Taxa	42.11	44.44	36.36	46.15	39.13	53.33	41.18	44.44	62.50	60.00	54.55	43.75	45.00
Coleoptera Richness	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table D-3. Daphnid Taxonomic Results by Multiplate Sampler.

	Number of Organisms																							
	MIT001			**MIT002**		**MIT003**			**MIT004**			**MIT005**			**MIT006**			**MIT007**	**MIT008**	**MIT009**			**MIT010**	
Taxonomical Group	**Replicate 1**	**Replicate 2**	**Replicate 3**	**Replicate 1**	**Replicate 2**	**Replicate 1**	**Replicate 2**	**Replicate 3**	**Replicate 1**	**Replicate 2**	**Replicate 3**	**Replicate 1**	**Replicate 2**	**Replicate 3**	**Replicate 1**	**Replicate 2**	**Replicate 3**	**Replicate 1**	**Replicate 1**	**Replicate 1**	**Replicate 2**	**Replicate 3**	**Replicate 1**	**Replicate 2**
Order *Cladocera*																								
Family *Sididae*																								
Sida crystallina	0	1	0	564	717	0	0	0	152	40	79	25	4	0	0	34	16	130	40	152	257	114	10	4
Family *Macrothricidae*																								
Ilyocryptus spinifer [a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	1	0

[a] The taxonomist listed *I. acutifrons* as alternative species.