PORTLAND HARBOR RI/FS

ROUND 3 LAMPREY (*LAMPETRA SP.)* TISSUE DATA REPORT

DRAFT

DRAFT DOCUMENT: DO NOT QUOTE OR CITE
This document is currently under review by US EPA and its federal, state, and tribal partners, and is subject to change in whole or in part

August 24, 2007

Prepared for
The Lower Willamette Group

Prepared by
Integral Consulting Inc.
and
Windward Environmental LLC

IC07-0023

TABLE OF CONTENTS

TABLE OF CONTENTS i
LIST OF FIGURES ii
LIST OF TABLES ii
LIST OF ACRONYMS iii
1.0 INTRODUCTION 1
1.1 Round 3 Sampling Objectives 1
1.2 Report Organization 1
2.0 SAMPLE COLLECTION ACTIVITIES 3
3.0 CHEMICAL ANALYSIS AND DATA MANAGEMENT 4
3.1 Chemical Analyses 4
3.2 Data Validation 4
3.3 Data Quality And Usability 5
3.3.1 Quality Control Samples 6
3.3.2 Summary of Qualified Data 6
3.4 Laboratory Deviations from the QAPP 6
3.4.1 Deviations in Priorities for Analysis 7
3.4.2 Deviations in Laboratory Procedures 7
3.5 Data Management 7
4.0 ROUND 3 RESULTS 10
5.0 REFERENCES 11

Appendix A. Data Quality Summary
Appendix B. Data Validation Report
Appendix C. SCRA Database, Excel Flat File Format (on CD)

LIST OF FIGURES

Figure 3-1. Lamprey Tissue Samples Compositing Scheme and Stations

LIST OF TABLES

Table 2-1. Numbers of lamprey (*Lampetra* sp.) ammocoetes and macropthalmia by sampling station
Table 3-1 Tissue Sample Compositing and Chemical Analyses
Table 3-2 Laboratory Methods for Round 3 Lamprey Tissue Samples
Table 3-3. Data Validation Qualifiers and Definitions
Table 3-4. Percent Completeness by Parameter Group
Table 4-1. Analytical Results for Tissue Samples
Table 4-2. Summary Statistics of Chemical Concentrations for Tissue Samples

LIST OF ACRONYMS

Axys	Axys Analytical Services
CAS	Columbia Analytical Services
CLP	Contract Laboratory Program
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
ERA	ecological risk assessment
EQuIS	Environmental Quality Information System
FSP	field sampling plan
FSR	field sampling report
GC/ECD	gas chromatography/electron capture detection
HHRA	human health risk assessment
HRGC/HRMS	high-resolution gas chromatography/high resolution mass spectrometry
LWG	Lower Willamette Group
NOAA	National Oceanic and Atmospheric Administration
PAHs	polycyclic aromatic hydrocarbons
PARCC	precision, accuracy, representativeness, completeness, comparability
PCBs	polychlorinated biphenyls
PCDD/F	polychlorinated dibenzo-*p*-dioxin/furan
QA	quality assurance
QC	quality control
QAPP	quality assurance project plan
RI/FS	remedial investigation and feasibility study
RM	river mile
SCRA	site characterization and risk assessment
SDG	sample delivery group
SOP	standard operating procedure
SVOCs	semivolatile organic compounds
VOC	volatile organic compound

1.0 INTRODUCTION

Lamprey ammocoetes are the only obligate detritivorous fish present in the Lower Willamette River (LWR). Four species of lamprey may exist in the LWR; and of these, the Pacific lamprey (*Lampetra tridentata*) was selected as the representative species for detritivorous fish (Integral et al. 2004) for the purposes of the ecological risk assessment. As outlined in the *Portland Harbor Remedial Investigation/Feasibility Study Programmatic Work Plan* (Integral et al. 2004), a tissue-residue approach was approved for use in assessing risks to lamprey ammocoetes in the baseline ecological risk assessment.

This Round 3 Lamprey (*Lampetra sp.)* Tissue Data Report summarizes the results from the September 20 through October 16, 2006 collection effort. This field collection effort was designed to collect tissue from lamprey ammocoetes (*Lampetra* sp.) within the Portland Harbor Superfund Study Area (Study Area) for laboratory chemical analysis. A detailed description of the Round 3 collection effort is included in the field sampling report (FSR) (Windward 2006a).

1.1 ROUND 3 SAMPLING OBJECTIVES

The specific objectives of the Portland Harbor lamprey ammocoete tissue sampling and analysis effort were to:

1. Obtain Pacific lamprey ammocoetes from the Study Area for empirical chemical analyses of composited whole-body tissue
2. Measure concentrations of constituents in lamprey ammocoetes from the Study Area for use in evaluating risk from hazardous substances to out-migrating lamprey larvae
3. Determine whether lamprey ammocoetes from the Study Area have elevated concentrations of site-related contaminants compared to upstream reference areas.
4. Collect incidental information on lamprey habitat preference based on catch success.

1.2 REPORT ORGANIZATION

The remaining sections of this document include a summary of the data collection activities (Section 2); details on the laboratory sample analyses, data quality reviews, data management, and laboratory deviations (Section 3); results (Section 4), and references (Section 5).

Supporting information is provided in the following three appendices:

- **Appendix A**: Data Quality Summary
- **Appendix B**: Data Validation Reports
- **Appendix C**: SCRA (site characterization and risk assessment) Database, Excel Flat File Format (on CD)

2.0 SAMPLE COLLECTION ACTIVITIES

This section summarizes the Round 3 lamprey ammocoete collection activities during the September and October 2006 sampling event. Station navigation and positioning, record keeping, and sample handling and storage details are presented in the FSR (Windward 2006a).

Sampling for lamprey ammocoetes (*Lampetra* sp.) was conducted at 25 stations between September 20 and October 16, 2006. These included 21 sampling stations within the Study Area between River Mile (RM) 2 and RM 11 and four locations upstream of the Study Area. Sampling procedures for the collection of ammocoetes followed those detailed in the field sampling plan (FSP) (Windward 2006b). Lamprey ammocoetes and macropthalmia were collected at eight locations and four locations within the Study Area, respectively (Table 2-1). In addition, lamprey ammocoetes and macropthalmia were collected at three and two upstream locations stations, respectively (Table 2-1).

3.0 CHEMICAL ANALYSIS AND DATA MANAGEMENT

The following sections describe the chemical analysis of the lamprey ammocoete tissue samples including any deviations from the analytical methods detailed in the Round 2 QAPP and QAPP Addendum 6 (Integral and Windward 2004, 2005). The data management subsection describes the data validation process from receipt of the laboratory data package to the generation of a final validated electronic data deliverable (EDD). Furthermore, it describes how the SCRA database was compiled into a series of compatible Excel tables, which were then distributed to the SCRA data users. The data validation reports are provided as Appendix B.

3.1 CHEMICAL ANALYSES

The lamprey ammocoete and macropthalmia tissue samples were composited and selected chemical analyses were performed on the composited tissue samples as directed by EPA (EPA 2006, 2007) (Table 3-1 and Figure 3-1). The chemical analyses of the tissue samples were performed by CAS and Axys. The laboratories and methods of analysis for the tissue samples are included in Table 3-2. The tissue samples were analyzed according to the sample preparation and analytical procedures in the Round 2 QAPP and the associated Addendum 6 (Integral and Windward 2004, 2005). Deviations from the Round 2 QAPP and the associated Addendum 6 are noted in Section 3.4 of this report.

3.2 DATA VALIDATION

Due to the small number of R3 lamprey samples, 100% of the data was fully validated using procedures specified in the Round 2 QAPP (Integral and Windward 2004). The data validation subcontractor for the Round 3 lamprey tissue was EcoChem, Inc., located in Seattle, WA.

The inorganic, organic, PCB congener, and PCDD/F data were validated in accordance with guidance specified by the EPA Contract Laboratory Program (CLP) *National Functional Guidelines for Inorganic and Organic Data Review* (EPA 2004, 1999b, 2002b), by EPA Region 10 standard operating procedures (SOPs) for validation of PCB congener data and PCDD/F data (EPA 1995, 1996, 1999a) and by *Guidance on Environmental Data Verification and Validation* (EPA 2002a). Modifications were made to the Functional Guidelines to accommodate quality assurance/quality control (QA/QC) requirements of the non-CLP methods that were used for this project. Data qualifiers were assigned during data validation if applicable control limits were not met, in accordance with the EPA data validation guidelines and the quality control requirements included in the referenced methods. The data validation qualifiers and definitions are summarized in Table 3-3.

The following laboratory deliverables were reviewed during 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 analyses, surrogate recoveries, and other method specific quality control samples (e.g., serial dilutions for inductively coupled plasma analyses).
- Results for field quality control samples (i.e., equipment blanks, field duplicates, and field split samples).
- Analytical results for the tissue samples.

In addition to review and assessment of the documentation identified above, the validation included the verification of calculations of reported concentrations for the field and QC samples, verification of intermediate transcriptions, and review of instrument data such as mass spectra to verify analyte identification procedures.

After completing the data validation activities for each sample type, a data quality report and a tabular summary of qualified data were generated by EcoChem. The EcoChem data quality reports are included in Appendix B. Data qualifiers that were assigned during validation were added to the laboratory EDDs by EcoChem. The revised EDDs and the hard-copy data validation reports were submitted as the project deliverable. The revised EDDs were then incorporated into the project database, as described in Section 3.5.

3.3 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 and Round 2 QAPP Addendum 6 (Integral and Windward 2004, 2005). Data quality and usability were evaluated based on the results of the data validation and the data quality objectives for the Round 3 data. The performance criteria in the QAPP included goals for precision, accuracy, representativeness, completeness, and comparability (PARCC) of the Round 3 data.

The precision, accuracy, representativeness, and comparability of the data were assessed during data validation, as described in the Round 2 QAPP. Completeness is calculated by comparing the total number of acceptable data (nonrejected data) to the total number of data points generated. Completeness for the Round 2 benthic

chemistry data was greater than 99% overall, which exceeds the QAPP completeness objective of 95%. Completeness for the Round 3 lamprey tissue data is summarized by parameter group and matrix in Table 3-4. Completeness ranged from 90.5 to 100% for the various parameter groups.

The validation report (Appendix B) provides detailed information on the data quality issues and data validation qualifiers for each parameter group. Qualified chemistry data for tissue samples are included in Table 4-1. A complete list of qualified results with reason codes is provided in the data validation reports in Appendix B.

3.3.1 Quality Control Samples

Quality control samples were prepared in the laboratories to monitor the bias and precision of the analysis procedures. Duplicate (i.e., split) lamprey ammocoete tissue samples from one station were subsequently created in the analytical laboratory by dividing the composited and homogenized samples for the stations into two jars.

A laboratory homogenization blank was also created at CAS in association with lamprey tissue sample preparation in compliance with the FSP (Windward 2006b).

3.3.2 Summary of Qualified Data

Selected data not meeting the data quality criteria were qualified as undetected, estimated, tentatively identified, or rejected during validation, in accordance with the QAPP. A tabular summary of the results, with the data qualifiers, is included in Tables 4-1. A complete list of qualified results with reason codes is provided in Appendix B. Data qualified as undetected are usable for all intended purposes. Data qualified as estimated or tentatively identified are usable for all intended purposes, with the knowledge that these data may be less precise or less accurate than unqualified data. Rejected data are not usable for any purpose. Concentrations associated with rejected data have been removed from the database, and an “R” qualifier is retained to flag the results that were removed.

3.4 LABORATORY DEVIATIONS FROM THE QAPP

This section discusses laboratory deviations from the Round 2 QAPP and QAPP Addendum 6 (Integral and Windward 2004, 2005). Deviations from the FSP (Windward 2006b) were included in the FSR (Windward 2006a).
The tissue analyses were conducted according to the Round 2 QAPP and the associated Addendum 6 with the exceptions described in this section.

3.4.1 Deviations in Priorities for Analysis

The analysis of all chemicals listed in the FSP (Windward 2006b) and quality assurance project plan (QAPP) (Integral and Windward 2004, 2005) required a minimum of 30 g of ammocoete tissue. Based on agreement with EPA (EPA 2006, 2007), the required sample quantities were generated by compositing the lamprey ammocoete and macropthalmia tissue samples and analyzed as shown in Table 3-1. In cases where less than 30 grams of tissue was obtained for the sample composite, the order of analyses was prioritized as specified in the FSP (Windward 2006b) with the following exceptions:. Mercury was analyzed in samples LW3-LTA-Comp4, LW3-LTA-Comp5-1 and LW3-LTA-Comp5-1 and no analysis for butyltins performed for these samples in accordance to directions from EPA (EPA 2006, 2007).

3.4.2 Deviations in Laboratory Procedures

Insufficient tissue sample mass was available to prepare matrix spike/matrix spike duplicate samples (as specified for organics) or laboratory duplicate samples (as specified for metals) for any of the samples. In place of these QC samples, the laboratories included the analysis of laboratory control samples and laboratory control sample duplicates with the lamprey tissue samples for each method in order to evaluate analytical accuracy and precision.

3.5 DATA MANAGEMENT

Once the laboratories completed their internal QA/QC checks, they exported the analytical data (sample, test, batch, and result information) into comma-delimited text files with data columns arranged in an order that was recognized by the project's Environmental Quality Information System (EQuIS) database. These EDDs were e-mailed to Integral where they were checked for proper EQuIS structure and appended with specific information that was unknown by the labs, such as sampling location, composite information, and field replicate and split information. If any problems were found in the structure of the EDDs, then the laboratory was notified and asked to correct the problem and resubmit the EDD. Each e-mailed EDD transmission, with the original, unaltered EDD attachment, was stored to document and track the laboratories' delivery of electronic data to Integral.

When the EDDs were correct and complete, they were checked electronically by loading them into the temporary section of Integral's LWG project database. In the process of loading, EQuIS checked the EDDs for correct lookup codes (such as for analytes, test methods, and sample matrices); proper relationships for results, tests, batches, and samples (to ensure all results matched with a test, tests with samples,

and sample/test pairs with batches); and that all derived samples (such as replicates, splits, and matrix spikes) had corresponding parent samples.

In addition to these checks, EQuIS also checked “less important” characteristics, such as date and time formats and text field lengths, to ensure consistency throughout the database. Any error prevents the EDD from loading until the error is corrected. If errors were found that were related to the way the laboratory reported the data or constructed the EDD, then the laboratory was notified and asked to correct the problem and resubmit the EDD. If errors were related to Excel automatically formatting date and time fields, for example, then the error was corrected and steps were taken to avoid repeats of the problem (such as changing default settings in the software). Successfully loaded EDDs were saved to document and track the data that were loaded into Integral's LWG project database.

Each verified and accurate EDD was provided to the Round 3 data validation contractor (EcoChem, Seattle, WA) for data review and validation. These EDDs were also stored in a temporary section of the project database, where they could be queried and examined, if desired, until validation was complete. As EcoChem completed validation of the data by sample delivery group (SDG) or small groups of SDGs, the validator qualifiers and reason codes were applied to the data in the temporary section of the database. The validated data were then merged into the permanent project database. During the merging process, all previously performed electronic checks were repeated to ensure nothing was incorrectly modified with the application of the validation results.

Several queries were set up in the permanent project database to translate the data structure to a form compatible with the National Oceanic and Atmospheric Administration’s (NOAA) Query Manager. The data translation included creating station and sample identifiers, converting the sample type code, and changing the date format. The translated data were imported into an Access file provided by NOAA that contained template tables for the Query Manager structure.

Integral’s LWG project database contains all of the data reported by the analytical laboratories. This includes field and lab replicates, lab dilutions, results for the same analyte from multiple analytical methods (SW8270 and SW8270-SIM, for example), and laboratory QA samples such as matrix spikes, surrogates, and method blanks. The data handling rules described in *Guidelines for Data Averaging and Treatment of Non-detected Values for the Round 1 Database* (Kennedy/Jenks et al. 2004) were used to create a data set for the SCRA data users that was simpler: the data set contained only one result per analyte per sample and excluded all of the laboratory QA results. This involved creating a SCRA database that excluded lab QA results, contained only the most appropriate dilution result and analytical method for each analyte, and contained the average of replicates. Excluding the lab QA results was a simple database querying step. Selection of the most appropriate dilution was either done by the reporting laboratory or by the data validator.

Selection of the most appropriate analytical method was described in the guidelines document and was accomplished by flagging the appropriate method in the project database.

The guidelines document described the rules used for averaging data and carrying qualifiers. Because it was the most data manipulation intensive procedure, the data were divided into subgroups and approximately 40% of each subgroup was verified. If any problems were found with the averaging, then 100% of the subgroup was verified and problems were corrected. The preliminary SCRA database was compiled into a series of database-compatible Excel tables and distributed to the SCRA data users.

4.0 ROUND 3 RESULTS

Results for individual samples are presented in Table 4-1. The tissue data generated from this effort will be evaluated in conjunction with Round 1 and 2 tissue data will be reported in the *Baseline Ecological Risk Assessment* in fall/winter 2008. Summary statistics for the tissue samples are compiled in Table 4-2.

5.0 REFERENCES

EPA. 1995. EPA Region 10 SOP For the validation of Method 1668 toxic, dioxin-like, PCB data. Revision 1.0. Environmental Services Division, US Environmental Protection Agency, Region 10, Seattle, WA.

EPA. 1996. EPA Region 10 SOP for the validation of polychlorinated dibenzodioxin (PCDD) and polychlorinated dibenzofuran (PCDF) data. Revision 2.0. Environmental Services Division, US Environmental Protection Agency, Region 10, Seattle, WA.

EPA. 1999a. Method 1668, Revision A: chlorinated biphenyl congeners in water, soil, sediment, and tissue by HRGC/HRMS. EPA-821-R-00-002. US Environmental Protection Agency, Washington, DC.

EPA. 1999b. USEPA contract laboratory program national functional guidelines for organic data review. EPA-540/R-99/008. Office of Emergency and Remedial Response, US Environmental Protection Agency, Washington, DC.

EPA. 2002a. Guidance on environmental data verification and data validation. EPA QA/G-8. EPA/240/R-02/004. Office of Environmental Information, US Environmental Protection Agency, Washington, DC.

EPA. 2002b. USEPA contract laboratory program national functional guidelines for inorganic data review. EPA 540-R-01-008. Office of Emergency and Remedial Response, US Environmental Protection Agency, Washington, DC.

EPA. 2004. USEPA contract laboratory program national functional guidelines for inorganic data review. EPA 540-R-04-004. Office of Emergency and Remedial Response, US Environmental Protection Agency, Washington, DC.

EPA. 2006. E-mail and letter to Lower Willamette Group from C. Humphrey and E. Blischke dated November 27, 2006 regarding Portland Harbor Round 3 sampling for lamprey ammocoete tissue, alternate proposal with attached Excel file. US Environmental Protection Agency Region 10, Oregon Operations Office, Portland, OR.

EPA. 2007. E-mail and letter to Lower Willamette Group from C. Humphrey and E. Blischke dated January 16, 2007 regarding Portland Harbor Round 3 sampling for lamprey ammocoete tissue. Reaffirmation of November 27, 2006 proposed analysis. US Environmental Protection Agency Region 10, Oregon Operations Office, Portland, OR.

Integral, Windward. 2004. Portland Harbor RI/FS: Round 2 quality assurance project plan. Prepared for Lower Willamette Group. Integral Consulting, Inc., Mercer Island, WA and Windward Environmental LLC, Seattle, WA.

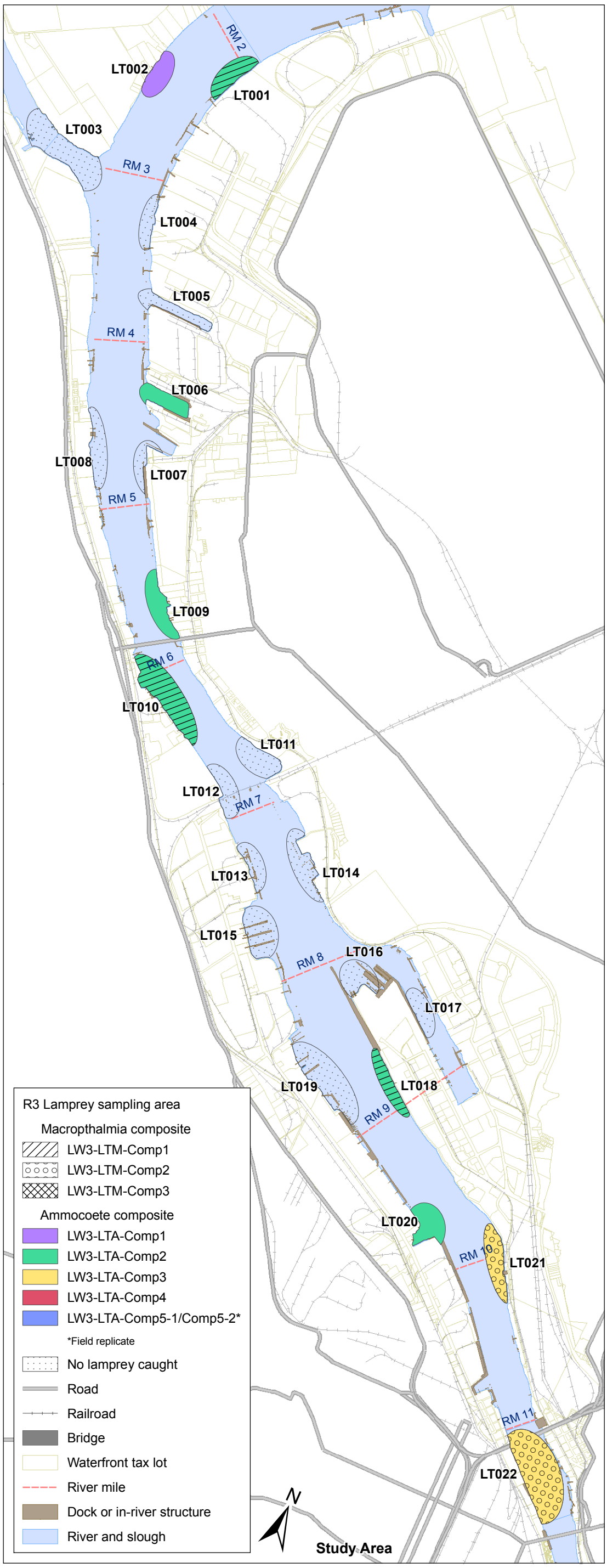
Integral, Windward. 2005. Portland Harbor RI/FS: Round 2 quality assurance project plan addendum 6: sampling of benthic invertebrate tissue. IC-05-0032. Prepared for the Lower Willamette Group. Integral Consulting, Inc., Mercer Island, WA; Windward Environmental, LLC, Seattle, WA.

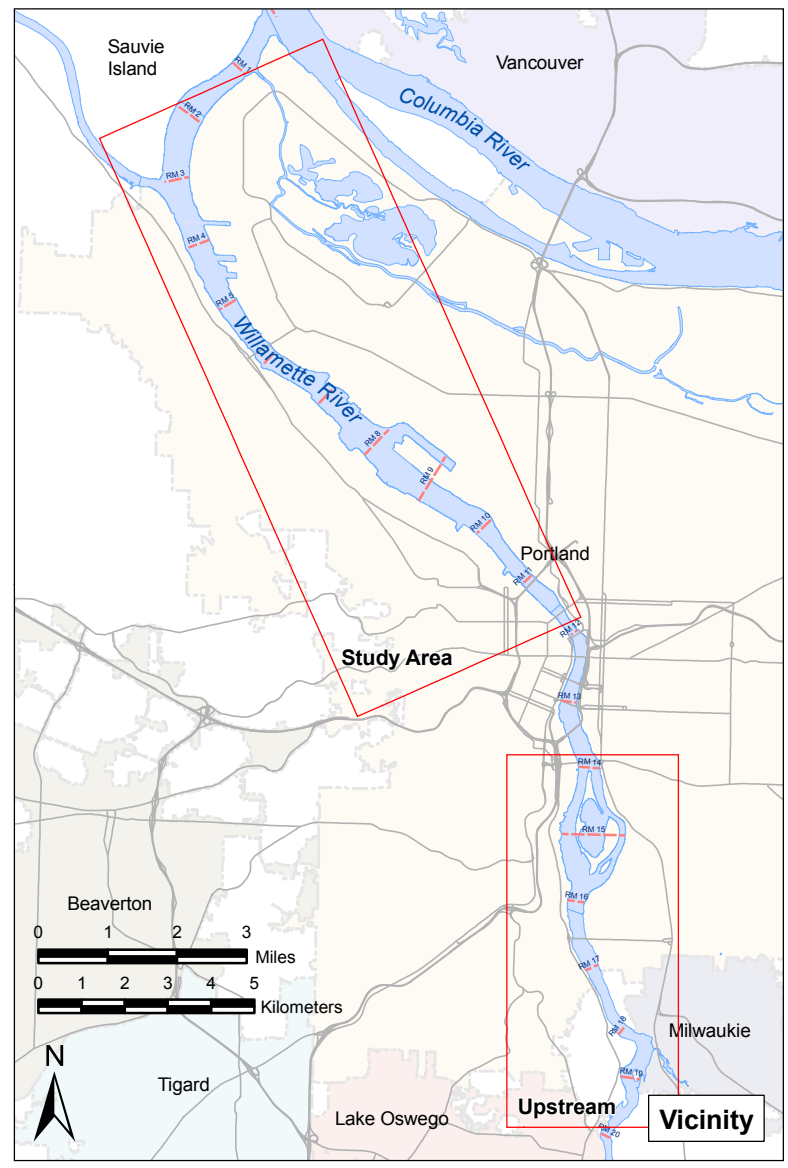
Integral, Windward, Kennedy/Jenks, Anchor, Groundwater Solutions. 2004. Portland Harbor RI/FS programmatic work plan. Prepared for Lower Willamette Group. Integral Consulting, Inc., Mercer Island, WA; Windward Environmental LLC, Seattle, WA; Kennedy/Jenks Consultants, Portland, OR; Anchor Environmental, LLC, Seattle, WA; Groundwater Solutions, Inc., Portland, OR.

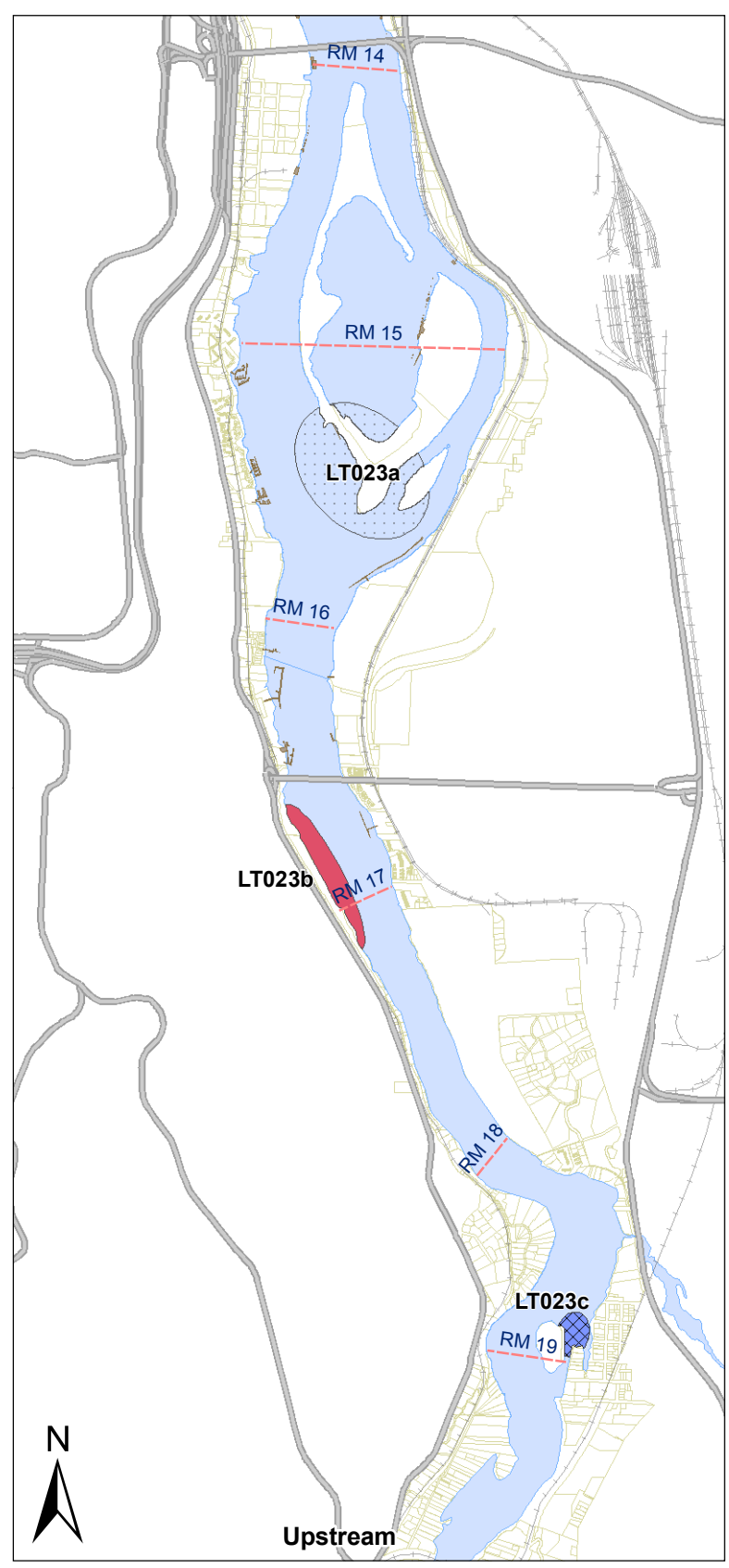
Kennedy/Jenks, Integral, Windward. 2004. Portland Harbor RI/FS technical memorandum: Guidelines for data reporting, data averaging, and treatment of non-detected values for the Round 1 database. Kennedy/Jenks Consultants, Portland, OR; Integral Consulting, Inc., Bellevue, WA; Windward Environmental LLC, Seattle, WA.

Windward. 2006a. Portland Harbor RI/FS Round 3 sampling for lamprey (*Lampetra* sp.) tissue field sampling report. Prepared for the Lower Willamette Group. Windward Environmental LLC, Seattle, WA.

Windward. 2006b. Portland Harbor RI/FS. Field sampling plan: round 3 sampling for lamprey (*Lampetra* sp.) ammocoete tissue. WE-06-0003. Prepared for Lower Willamette Group. Windward Environmental LLC, Seattle, WA.







Wind Ward environmental LLC

0 1,000 2,000 4,000 6,000 Feet

0 250 500 1,000 1,500 Meters

Figure 3-1. Lamprey (*Lampetra* sp.) Tissue Samples Compositing Scheme and Stations

DRAFT - SUBJECT TO REVISION

Prepared by LSM 12/1/06, modified by LSM 7/9/07, map #2980, W:\Projects\01-25-01 Portland Harbor ERA\Data\GIS\Events\Lamprey&Sturgeon

DO NOT QUOTE OR CITE
This document is currently under review by US EPA and its federal, state and tribal partners, and is subject to change in whole or in part.

Table 2-1. Numbers of lamprey (*Lampetra* sp.) ammocoetes and macrophalmia by sampling station.

Sampling Station	No. of Ammocoete Collected	No. of Macrophalmia Collected
LW3-LT001	15	2
LW3-LT002	7	0
LW3-LT006	1	0
LW3-LT009	3	0
LW3-LT010	1	2
LW3-LT018	7	2
LW3-LT020	1	0
LW3-LT021	16	5
LW3-LT022	3	1
LW3-LT023b	49	0
LW3-LT023c	44	9

Table 3-1. Tissue Sample Compositing and Chemical Analyses

Composite ID	Sample ID	Area Description	Analytes
Ammocoetes			
LW3-LTA-Comp1	LW3-LT002	RM 2.5 (South Bank)	PCB Congeners, dioxins and furans, organochlorine pesticides, and lipids
LW3-LTA-Comp2	LW3-LT001	RM 2, OSM	All[1]
	LW3-LT006	Slip 1, Terminal 4	
	LW3-LT009	RM 5.7, Cathedral Park	
	LW3-LT010	RM 6.2, US Moorings	
	LW3-LT018	RM 8.8 Upstream of Port Ship	
	LW3-LT020	RM 9.7, Fireboat Cove	
LW3-LTA-Comp3	LW3-LT021	RM 10.0, Goldendale	PCB Congeners, dioxins and furans, organochlorine pesticides, lipids, metals,
	LW3-LT022	RM 11-11.7	
LW3-LTA-Comp4	LW3-LT023b	RM 16.5-17, Sellwood	All[1] except TBT
LW3-LTA-Comp5-1[2]	LW3-LT023c	RM 18.7, Elk Rock	All[1] except TBT
LW3-LTA-Comp5-2[2]	LW3-LT023c	RM 18.7, Elk Rock	All[1] except TBT
Macropthalmia			
LW3-LTM-Comp1	LW3-LT001	RM 2, OSM	PCB Congeners, dioxins and furans, organochlorine pesticides, lipids, metals, percent moisture, PAHs,
	LW3-LT010	RM 6.2, US Moorings	
	LW3-LT018	RM 8.8 Upstream of Port Ship	
LW3-LTM-Comp2	LW3-LT021	RM 10.0, Goldendale	organochlorine pesticides, lipids, metals, percent moisture, PAHs, mercury
	LW3-LT022	RM 11-11.7	
LW3-LTM-Comp3	LW3-LT023c	RM 18.7, Elk Rock	PCB Congeners, dioxins and furans, organochlorine pesticides, lipids, metals, percent moisture, PAHs, phthalates and SVOCs, mercury

[1]All = PCB congeners, dioxins and furans, organochlorine pesticides, lipids, PAHs, butyltin compounds, phthalates and SVOCs, metals, mercury and percent moisture

[2]Samples LW3-LTA-Comp5-1 and LW3-LTA-Comp5-1 are post-homogenization splits.

Table 3-2. Laboratory Methods for Round 3 Lamprey Tissue Samples.

Analysis	Laboratory	Sample Preparation		Quantitative Analysis	
		Protocol	Procedure	Protocol	Procedure
Percent moisture	CAS	CAS SOP	Freeze dry	CAS SOP	Balance
Metals	CAS				
Aluminum, antimony, arsenic, cadmium, copper, lead, nickel, silver, zinc		EPA 3050B/PSEP	Acid digestion	EPA 6020	ICP/MS
Chromium		EPA 3050B/PSEP	Acid digestion	EPA 6010B	ICP/AES
Selenium		EPA 3050B/PSEP	Acid digestion	EPA 7740	GFAA
Mercury		EPA 7470	Acid digestion/oxidation	EPA 7470	CVAA
Butyltin compounds	CAS	Krone et al. 1988 Krone et al. 1988	Solvent extraction Derivatization	Krone et al. 1988	GC/FPD
Selected SVOCs (includes phenols and phthalate esters)	CAS	EPA 3541 EPA 3640A	Automated Soxhlet extraction Gel permeation chromatography	EPA 8270C-SIM	GC/MS-SIM
Polycyclic aromatic hydrocarbons	CAS	EPA 3541 EPA 3640A EPA 3630C	Automated Soxhlet extraction Gel permeation chromatography Silica gel cleanup	EPA 8270C-SIM	GC/MS-SIM
Lipids	Axys	EPA 3540C[a]	Soxhlet extraction	Axys SOP	Balance
PCB congeners [b]	Axys	EPA 1668A	Soxhlet extraction Gel permeation chromatography Acid/base silica column Florisil® chromatography 1% deactivated basic Alumina	EPA 1668A	HRGC/HRMS
Chlorinated dioxins and furans	Axys	EPA 1613B	Soxhlet extraction Gel permeation chromatography Acid/base silica column Florisil® chromatography Carbon celite Layered silver nitrate/acid/base silica 1% deactivated basic Alumina	EPA 1613B	HRGC/HRMS
Organochlorine Pesticides and selected SVOCs	Axys	Axys SOP	Soxhlet extraction Gel permeation chromatography Acid/base silica column Florisil® chromatography 1% deactivated basic Alumina		HRGC/HRMS

CAS - Columbia Analytical Services
CVAA - cold vapor atomic absorption spectrometry
EPA - U.S. Environmental Protection Agency
GC/ECD - gas chromatography/electron capture detection
GC/FPD - gas chromatography/flame photometric detection
GC/MS - gas chromatography/mass spectrometry
GFAA - graphite furnace atomic absorption spectrometry
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
PSEP - Puget Sound Estuary Program
SIM - selected ion monitoring
SOP - Standard operating procedure
SVOC - semivolatile organic compound

Table 3-3. 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 detection limit.
J	The associated numerical value is an estimated quantity.
R	Rejected.
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 detection limit is an estimated quantity.

Table 3-4. Percent Completeness by Parameter Group.

Analysis	Total # of Data Points[a]	Number of Data Points		Completeness (%)
		Accepted	Rejected	
Conventionals [b]	17	17	0	100
Metals	94	94	0	100
Butyltins	4	4	0	100
SVOCs	63	57	6	90.5
Phenols	25	25	0	100
Phthalates	30	30	0	100
PAHs	119	119	0	100
Organochlorine pesticides	234	234	0	100
PCB congeners	1431	1426	5	99.7
Dioxins/furans	135	135	0	100
Dioxin/furan homologs	90	90	0	100
Round 3 Lamprey Tissue Sampling Project Total	**2242**	**2231**	**11**	**>99**

Notes:
[a] Totals include replicate(split) samples and exclude field blanks.
[b] Lipids, Total Solids.

Table 4-1. Analytical Results for Tissue Samples.

	Location	**LT002**	**LTAC2**	**LTA3M2**	**LT023b**	**LT023c**
	Rivermile	**2.5**	**2.2 - 9.7**	**10.0 - 11.4**	**16.7**	**18.7**
	X_Easting	**7615357**	**7623107**	**7641277**	**7646878**	**7651220**
	Y_Northing	**723680**	**706944.5**	**691777.5**	**660968**	**652624**
	SampleID	**LW3-LTA-Comp1**	**LW3-LTA-Comp2**	**LW3-LTA-Comp3**	**LW3-LTA-Comp4**	**LW3-LTA-Comp5-1**
	Sample Date	**9/21/2006**	**9/20/2006**	**9/29/2006**	**10/3/2006**	**10/4/2006**
	Species	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**
	Tissue	**Ammocoete**	**Ammocoete**	**Ammocoete**	**Ammocoete**	**Ammocoete**
Chemical Name	**Unit**					
Butyltins						
Butyltin ion	µg/kg		0.22 U			
Dibutyltin ion	µg/kg		0.33 U			
Tetrabutyltin	µg/kg		0.83 U			
Tributyltin ion	µg/kg		4.1			
Conventionals						
Lipids	percent	6.91	4.38	3.68	3.14	3.76
Total solids	percent		23.7	24.6	20.9	21.3
Dioxins Furans						
1,2,3,4,6,7,8-Heptachlorodibenzofuran	pg/g	1.25 J	1.5 J	1.31 J	0.693 J	1.02 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	pg/g	7.82	9.78	9.04	5.02	7.18
1,2,3,4,7,8,9-Heptachlorodibenzofuran	pg/g	0.153 U	0.196 U	0.143 U	0.145 U	0.125 U
1,2,3,4,7,8-Hexachlorodibenzofuran	pg/g	0.797 J	1.1 J	0.599 J	0.331 U	0.471 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	pg/g	0.702 J	0.66 J	0.8 J	0.471 J	0.628 J
1,2,3,6,7,8-Hexachlorodibenzofuran	pg/g	0.371 J	0.43 J	0.32 J	0.169 J	0.256 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	pg/g	2.57	2.31	2.55	1.42 J	2.13
1,2,3,7,8,9-Hexachlorodibenzofuran	pg/g	0.13 U	0.117 U	0.109 U	0.105 U	0.0986 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	pg/g	0.857 U	0.642 J	0.787 J	0.402 U	0.654 J
1,2,3,7,8-Pentachlorodibenzofuran	pg/g	0.804 J	0.794 J	0.353 J	0.201 U	0.269 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	pg/g	0.947 J	0.871 J	1 J	0.498 J	0.856 J
2,3,4,6,7,8-Hexachlorodibenzofuran	pg/g	0.246 U	0.376 U	0.302 U	0.177 U	0.262 U
2,3,4,7,8-Pentachlorodibenzofuran	pg/g	0.967 J	0.923 J	0.648 J	0.358 U	0.547 J
2,3,7,8-Tetrachlorodibenzofuran	pg/g	2.37	2.25	1.17	1.06	0.807
2,3,7,8-Tetrachlorodibenzo-p-dioxin	pg/g	0.474	0.434	0.419	0.28 J	0.461
Total Dioxin Furans (calc'd)	pg/g	39 J	51 J	48 J	21 J	31 J
Dioxin TEQ - Birds	pg/g	5.1	4.9	3.6	2.1	2.93
Dioxin TEQ - Fish	pg/g	2.6	2.5	2.4	1.2	2.1
Dioxin TEQ - Mammals	pg/g	2.8	2.7	2.5	1.3	2.2

Table 4-1. Analytical Results for Tissue Samples.

	Location	**LT002**	**LTAC2**	**LTA3M2**	**LT023b**	**LT023c**
	Rivermile	**2.5**	**2.2 - 9.7**	**10.0 - 11.4**	**16.7**	**18.7**
	X_Easting	**7615357**	**7623107**	**7641277**	**7646878**	**7651220**
	Y_Northing	**723680**	**706944.5**	**691777.5**	**660968**	**652624**
	SampleID	**LW3-LTA-Comp1**	**LW3-LTA-Comp2**	**LW3-LTA-Comp3**	**LW3-LTA-Comp4**	**LW3-LTA-Comp5-1**
	Sample Date	**9/21/2006**	**9/20/2006**	**9/29/2006**	**10/3/2006**	**10/4/2006**
	Species	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**
	Tissue	**Ammocoete**	**Ammocoete**	**Ammocoete**	**Ammocoete**	**Ammocoete**
Chemical Name	**Unit**					
Dioxin TEQ - Mammals 2006	pg/g	2.6	2.5	2.4	1.3	2.09
Total TEQ - Birds	pg/g	13	70	11	6.1	7
Total TEQ - Fish	pg/g	2.7	2.9	2.5	1.3	2.2
Total TEQ - Mammals	pg/g	4.2	8.2	4.1	2.2	3.2
Total TEQ - Mammals 2006	pg/g	3.6	6.2	3.5	1.9	2.9
Dioxin Furan Homolog						
Heptachlorodibenzofuran homologs	pg/g	4.34	5.68	4.35	1.97	3.34
Heptachlorodibenzo-p-dioxin homologs	pg/g	9.87	13.9	12.3	6.56	9.5
Hexachlorodibenzofuran homologs	pg/g	10.4	12.2	10.2	4.35	7.91
Hexachlorodibenzo-p-dioxin homologs	pg/g	4.19	5.69	5.8	3.18	5.33
Octachlorodibenzofuran	pg/g	1.62 J	2.62 J	1.8 J	0.861 U	1.26 J
Octachlorodibenzo-p-dioxin	pg/g	18.1	26.8	27.4	9.79	14.2
Pentachlorodibenzofuran homologs	pg/g	9.63	10.9	8.64	4.47	7.08
Pentachlorodibenzo-p-dioxin homologs	pg/g	0.947	1.28	1.3	0.498	1.42
Tetrachlorodibenzofuran homologs	pg/g	9	9.91	7.62	5.87	6.02
Tetrachlorodibenzo-p-dioxin homologs	pg/g	1.05	1.1	1.33	1.02	1.57
Metals						
Aluminum	mg/kg		281	183	222	297
Antimony	mg/kg		0.004 J	0.003 J	0.003 J	0.003 J
Arsenic	mg/kg		0.19	0.15	0.14	0.19
Cadmium	mg/kg		0.005	0.003 J	0.014	0.004 J
Chromium	mg/kg		0.32	0.27	0.26	0.29
Copper	mg/kg		3.64	4.15	4.67	4.8
Lead	mg/kg		0.153	0.0938	0.0827	0.0954
Mercury	mg/kg		0.355		0.259	0.69 J
Nickel	mg/kg		0.292	0.238	0.267	0.268
Selenium	mg/kg		0.37	0.31	0.28	0.31
Silver	mg/kg		0.0352	0.0337	0.0408	0.0358
Zinc	mg/kg		26.5	26.7	28.8	29.1

Table 4-1. Analytical Results for Tissue Samples.

	Location	**LT002**	**LTAC2**	**LTA3M2**	**LT023b**	**LT023c**
	Rivermile	**2.5**	**2.2 - 9.7**	**10.0 - 11.4**	**16.7**	**18.7**
	X_Easting	**7615357**	**7623107**	**7641277**	**7646878**	**7651220**
	Y_Northing	**723680**	**706944.5**	**691777.5**	**660968**	**652624**
	SampleID	**LW3-LTA-Comp1**	**LW3-LTA-Comp2**	**LW3-LTA-Comp3**	**LW3-LTA-Comp4**	**LW3-LTA-Comp5-1**
	Sample Date	**9/21/2006**	**9/20/2006**	**9/29/2006**	**10/3/2006**	**10/4/2006**
	Species	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**
	Tissue	**Ammocoete**	**Ammocoete**	**Ammocoete**	**Ammocoete**	**Ammocoete**
Chemical Name	**Unit**					
PAHs						
2-Methylnaphthalene	µg/kg		3.4		1.8 J	3.6
Acenaphthene	µg/kg		24		0.25 J	0.48 J
Acenaphthylene	µg/kg		3.3		0.6 U	0.6 U
Anthracene	µg/kg		20		1.7	2.2
Benzo(a)anthracene	µg/kg		0.19 U		0.66 U	0.19 U
Benzo(a)pyrene	µg/kg		0.47 J		0.22 U	0.22 U
Benzo(b)fluoranthene	µg/kg		0.7 J		0.2 U	0.2 U
Benzo(g,h,i)perylene	µg/kg		0.5 J		0.2 U	0.2 U
Benzo(k)fluoranthene	µg/kg		0.26 J		0.19 U	0.19 U
Chrysene	µg/kg		0.17 U		0.75 J	0.17 U
Dibenzo(a,h)anthracene	µg/kg		0.28 U		0.28 U	0.28 U
Fluoranthene	µg/kg		85		4.5	8.6
Fluorene	µg/kg		20		0.98 J	2.1
Indeno(1,2,3-cd)pyrene	µg/kg		0.44 J		0.2 U	0.2 U
Naphthalene	µg/kg		3.7		1.7 J	2.8
Phenanthrene	µg/kg		43		2.4	4.6
Pyrene	µg/kg		68		3.6	6.6
Total HPAHs (calc'd)	µg/kg		160 J		9.8 J	16
Total LPAHs (calc'd)	µg/kg		120		9.1 J	16 J
Total PAHs (calc'd)	µg/kg		270 J		19 J	32 J
PCB Congeners						
PCB TEQ - Birds	pg/g	8.36	64.6	7.5	3.91	4.1
PCB TEQ - Fish	pg/g	0.0802	0.379	0.085	0.0489	0.055
PCB TEQ - Mammals	pg/g	1.44	5.48	1.6	0.936	1
PCB TEQ - Mammals 2006	pg/g	1.04	3.72	1.1	0.675	0.81
PCB001	pg/g	6.4 J	30.3 J	4.32 J	2.49 J	2.5 J
PCB002	pg/g	50.9 J	28.1	12.2 J	10.4 J	29.4 J
PCB003	pg/g	4.45	14.2	2.26 J	1.89 J	2.14 UJ

Table 4-1. Analytical Results for Tissue Samples.

	Location	**LT002**	**LTAC2**	**LTA3M2**	**LT023b**	**LT023c**
	Rivermile	**2.5**	**2.2 - 9.7**	**10.0 - 11.4**	**16.7**	**18.7**
	X_Easting	**7615357**	**7623107**	**7641277**	**7646878**	**7651220**
	Y_Northing	**723680**	**706944.5**	**691777.5**	**660968**	**652624**
	SampleID	**LW3-LTA-Comp1**	**LW3-LTA-Comp2**	**LW3-LTA-Comp3**	**LW3-LTA-Comp4**	**LW3-LTA-Comp5-1**
	Sample Date	**9/21/2006**	**9/20/2006**	**9/29/2006**	**10/3/2006**	**10/4/2006**
	Species	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**
	Tissue	**Ammocoete**	**Ammocoete**	**Ammocoete**	**Ammocoete**	**Ammocoete**
Chemical Name	**Unit**					
PCB004	pg/g	227 J	2610	195 J	15.1 J	21.6 J
PCB005	pg/g	1.69 U	3.95 U	0.675 U	0.501 U	0.643 U
PCB006	pg/g	39	192	18.6	5.6	7.83 J
PCB007	pg/g	6.99 U	19.2	3.91	1.17 U	1.62
PCB008	pg/g	154	850	74	25.2	31.3 J
PCB009	pg/g	9.01	26.3	4.48	1.07 U	1.91
PCB010	pg/g	8.68	64.4	6.68	0.472 U	0.61 U
PCB011	pg/g	1460	1010	1270	887	889 J
PCB012 & 013	pg/g	45.3	86.7	37.7	17	22.5 J
PCB014	pg/g	1.1 U	1.17 U	0.616 U	0.586 U	0.607 U
PCB015	pg/g	135	492	67.7	27.2	29.7
PCB016	pg/g	241	450	103	42.2	44.2
PCB017	pg/g	455	2140	466	59	65.5
PCB018 & 030	pg/g	588	1980	295	105	116
PCB019	pg/g	554	4850	822	14.3	17.8
PCB020 & 028	pg/g	1690	8100	1080	367	394
PCB021 & 033	pg/g	577	1260	362	125	114
PCB022	pg/g	462	1580	287	107	112
PCB023	pg/g	1.47	1.35 U	1	0.407 J	0.502 U
PCB024	pg/g	10.6	23.5	5.91	1.63	1.86
PCB025	pg/g	141	543	147	28.8	32.7
PCB026 & 029	pg/g	270	1030	201	60.2	64.2
PCB027	pg/g	104	528	118	9.83	11.7
PCB031	pg/g	1250	4990	829	298	301
PCB032	pg/g	297	2340	261	43.3	49.2
PCB034	pg/g	12.9	64.4	7.19	2.1	3.08
PCB035	pg/g	16.2	36	17.3	11.3	11
PCB036	pg/g	7.07	14.8	10.2	9.42	9.27
PCB037	pg/g	282	1280	180	74.9	72.1

Table 4-1. Analytical Results for Tissue Samples.

	Location	**LT002**	**LTAC2**	**LTA3M2**	**LT023b**	**LT023c**
	Rivermile	**2.5**	**2.2 - 9.7**	**10.0 - 11.4**	**16.7**	**18.7**
	X_Easting	**7615357**	**7623107**	**7641277**	**7646878**	**7651220**
	Y_Northing	**723680**	**706944.5**	**691777.5**	**660968**	**652624**
	SampleID	**LW3-LTA-Comp1**	**LW3-LTA-Comp2**	**LW3-LTA-Comp3**	**LW3-LTA-Comp4**	**LW3-LTA-Comp5-1**
	Sample Date	**9/21/2006**	**9/20/2006**	**9/29/2006**	**10/3/2006**	**10/4/2006**
	Species	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**
	Tissue	**Ammocoete**	**Ammocoete**	**Ammocoete**	**Ammocoete**	**Ammocoete**
Chemical Name	**Unit**					
PCB038	pg/g	1.84 U	12.3 U	2.54 U	0.75 U	1.24 UJ
PCB039	pg/g	17.1	106	13.2	5.24	6.01
PCB040 & 041 & 071	pg/g	1250	10100	1130	311	369
PCB042	pg/g	602	4990	459	164	200
PCB043	pg/g	98.2	750	75.8	27.9	32
PCB044 & 047 & 065	pg/g	3090	22600	4120	689	854
PCB045 & 051	pg/g	677	3720	1210	75.1	96
PCB046	pg/g	125	865	110	22.1	28.6
PCB048	pg/g	421	2980	319	121	138
PCB049 & 069	pg/g	2010	16700	2720	516	630
PCB050 & 053	pg/g	618	4320	1350	61.3	83.5
PCB052	pg/g	3390	27300	4110	935	1160
PCB054	pg/g	155	942	380	1.64	1.92 U
PCB055	pg/g	35	208	1.08 U	0.675 U	1.07 U
PCB056	pg/g	788	8290	592	280	303
PCB057	pg/g	12.6	68.2	12.8	4.17	3.73
PCB058	pg/g	10.1	37.9	1.13 U	3.87	4.39
PCB059 & 062 & 075	pg/g	232	1670	227	61.2	72.8
PCB060	pg/g	375	4530	299	156	164
PCB061 & 070 & 074 & 076	pg/g	3700	37600	3310	1530	1640
PCB063	pg/g	99.4	877	94.2	38.6	42.3
PCB064	pg/g	1060	10800	762	320	393
PCB066	pg/g	1900	23800	1650 J	763 J	854
PCB067	pg/g	62.6	408	63.5	24.6	21.9
PCB068	pg/g	37.4	91.8	60.7	11	12.9
PCB072	pg/g	47.1	188	57.9	16.9	18
PCB073	pg/g	36.2	91.9	98	0.517 U	0.484 U
PCB077	pg/g	138	1140	119	60.4	61.5
PCB078	pg/g	0.899 U	2.63 U	0.999 U	0.625 U	1.03 U

Table 4-1. Analytical Results for Tissue Samples.

	Location	**LT002**	**LTAC2**	**LTA3M2**	**LT023b**	**LT023c**
	Rivermile	**2.5**	**2.2 - 9.7**	**10.0 - 11.4**	**16.7**	**18.7**
	X_Easting	**7615357**	**7623107**	**7641277**	**7646878**	**7651220**
	Y_Northing	**723680**	**706944.5**	**691777.5**	**660968**	**652624**
	SampleID	**LW3-LTA-Comp1**	**LW3-LTA-Comp2**	**LW3-LTA-Comp3**	**LW3-LTA-Comp4**	**LW3-LTA-Comp5-1**
	Sample Date	**9/21/2006**	**9/20/2006**	**9/29/2006**	**10/3/2006**	**10/4/2006**
	Species	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**
	Tissue	**Ammocoete**	**Ammocoete**	**Ammocoete**	**Ammocoete**	**Ammocoete**
Chemical Name	**Unit**					
PCB079	pg/g	31.6	169	41.1	20.1	20.9
PCB080	pg/g	0.804 U	2.36 U	0.918 U	0.574 U	0.949 U
PCB081	pg/g	4.44	39.2	3.88	2.22	2.12
PCB082	pg/g	283	1980	262	139	142
PCB083 & 099	pg/g	2450	12500	2980	1300	1300
PCB084	pg/g	789	4520	843	323	369
PCB085 & 116 & 117	pg/g	615	4030	644	361	392
PCB086 & 087 & 097 & 108 & 119 & 125	pg/g	2150	12400	2510 J	1090 J	1120 J
PCB088 & 091	pg/g	687	3450	1300	244	267
PCB089	pg/g	38.2	381	32.8	15.8	17.2
PCB090 & 101 & 113	pg/g	4440	20900	6580	2110	2200
PCB092	pg/g	913	3620	1290	389	410
PCB093 & 095 & 098 & 100 & 102	pg/g	3420	17000	5940	1240	1350
PCB094	pg/g	67.2	241	195	8.09	8.87
PCB096	pg/g	53.7	277	155	8.11	9.89
PCB103	pg/g	141	446	474	19.6	21.8
PCB104	pg/g	18.2	48.5	68.6	0.357 U	0.719
PCB105	pg/g	826	4670	866	526	499
PCB106	pg/g	0.872 U	1.4 U	1.11 U	0.645 U	0.501 U
PCB107 & 124	pg/g	132	574	119	75.7	73.3
PCB109	pg/g	275	1230	290	151	156
PCB110 & 115	pg/g	3230	14400	3690	1540	1690
PCB111	pg/g	7.89	11.8 U	15.2	2.21	2.4
PCB112	pg/g	0.545 U	2.04 U	0.931 U	0.259 U	0.492 U
PCB114	pg/g	65.7	434	74.6	42.8	39.5
PCB118	pg/g	2740	12600	3130	1750	1660
PCB120	pg/g	28.5	53.6	45	11.6	10.8
PCB121	pg/g	10.7	20.3	40.9	0.98	1.11
PCB122	pg/g	29.4	180	27.2	16.8	15.5

Table 4-1. Analytical Results for Tissue Samples.

	Location	**LT002**	**LTAC2**	**LTA3M2**	**LT023b**	**LT023c**
	Rivermile	**2.5**	**2.2 - 9.7**	**10.0 - 11.4**	**16.7**	**18.7**
	X_Easting	**7615357**	**7623107**	**7641277**	**7646878**	**7651220**
	Y_Northing	**723680**	**706944.5**	**691777.5**	**660968**	**652624**
	SampleID	**LW3-LTA-Comp1**	**LW3-LTA-Comp2**	**LW3-LTA-Comp3**	**LW3-LTA-Comp4**	**LW3-LTA-Comp5-1**
	Sample Date	**9/21/2006**	**9/20/2006**	**9/29/2006**	**10/3/2006**	**10/4/2006**
	Species	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**
	Tissue	**Ammocoete**	**Ammocoete**	**Ammocoete**	**Ammocoete**	**Ammocoete**
Chemical Name	**Unit**					
PCB123	pg/g	48.2	303	52.1	38.8	36.4
PCB126	pg/g	8.68	29.8	9.5	5.68	7
PCB127	pg/g	4.02	9.58	4.62	3.3	3.87
PCB128 & 166	pg/g	331	790	441	231	214
PCB129 & 138 & 160 & 163	pg/g	3580	8260	5730	2010	1940
PCB130	pg/g	239	569	329	146	134
PCB131	pg/g	35.9	120	51.2	20	18.3
PCB132	pg/g	761	1950	1240	334	335
PCB133	pg/g	150	280	289	55.3	53.5
PCB134 & 143	pg/g	209	545	358	89	87.1
PCB135 & 151 & 154	pg/g	1860	4230	3740	646	680
PCB136	pg/g	549	1370	1280	172	178
PCB137	pg/g	136	386	164	105	97.1
PCB139 & 140	pg/g	73.9	196	108	39.7	35.3
PCB141	pg/g	683	1750	1300	297	302
PCB142	pg/g	0.868 U	1.93 U	0.645 U	0.381 U	0.341 U
PCB144	pg/g	227	643	472	95.9	97.4
PCB145	pg/g	1.37	5.4	2.78	0.616 J	0.754 U
PCB146	pg/g	987	2010	1720	442	421
PCB147 & 149	pg/g	3310	7620	6260	1300	1320
PCB148	pg/g	34	53.3	82.2	5.54	5.22
PCB150	pg/g	26	44.9	88.5	3.52	3.41
PCB152	pg/g	11.8	22.7	34.8	1.62	1.41
PCB153 & 168	pg/g	5590	12500	9360	2650	2550
PCB155	pg/g	6.04	7.28	15	2.23	2.82
PCB156 & 157	pg/g	292	777	414	199	179
PCB158	pg/g	324	843	523	196	179
PCB159	pg/g	15.8	31.4	26.4	6.07	5.73
PCB161	pg/g	0.603 U	1.34 U	0.436 U	0.414 U	0.388 U

Table 4-1. Analytical Results for Tissue Samples.

	Location	**LT002**	**LTAC2**	**LTA3M2**	**LT023b**	**LT023c**
	Rivermile	**2.5**	**2.2 - 9.7**	**10.0 - 11.4**	**16.7**	**18.7**
	X_Easting	**7615357**	**7623107**	**7641277**	**7646878**	**7651220**
	Y_Northing	**723680**	**706944.5**	**691777.5**	**660968**	**652624**
	SampleID	**LW3-LTA-Comp1**	**LW3-LTA-Comp2**	**LW3-LTA-Comp3**	**LW3-LTA-Comp4**	**LW3-LTA-Comp5-1**
	Sample Date	**9/21/2006**	**9/20/2006**	**9/29/2006**	**10/3/2006**	**10/4/2006**
	Species	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**
	Tissue	**Ammocoete**	**Ammocoete**	**Ammocoete**	**Ammocoete**	**Ammocoete**
Chemical Name	**Unit**					
PCB162	pg/g	16	32.9	17.4	11.6	10.6
PCB164	pg/g	142	303	214	62.6	60.4
PCB165	pg/g	8	12.2	24.7	1.13	1.32
PCB167	pg/g	144	341	204	96.7	87.7
PCB169	pg/g	2.12 U	2.85 U	2.88 U	1.37 U	1.52 U
PCB170	pg/g	382	859	681	192	199
PCB171 & 173	pg/g	142	325	267	66.5	68.1
PCB172	pg/g	163	332	276	72.6	76
PCB174	pg/g	360	775	631	133	153
PCB175	pg/g	37.1	84.1	70.1	15.6	17
PCB176	pg/g	92.3	209	180	32.4	34.1
PCB177	pg/g	372	751	659	141	149
PCB178	pg/g	281	549	544	112	120
PCB179	pg/g	341	742	677	117	134
PCB180 & 193	pg/g	1690	3510	2980	745	763
PCB181	pg/g	7.02	15.2	8.44	3.85	3.88
PCB182	pg/g	7.43	12.7	12.4	3.23	3.52
PCB183 & 185	pg/g	666	1440	1260	282	292
PCB184	pg/g	2.9	3.14	4.02	3.05	3.24
PCB186	pg/g	0.214 U	0.192 U	0.177 U	0.172 U	0.161 U
PCB187	pg/g	1340	2660	2410	549	596
PCB188	pg/g	6.93	9.78	19.2	1.72	2.07
PCB189	pg/g	23.9	49.7	41.1	12.2	12.2
PCB190	pg/g	127	268	218	59	64.6
PCB191	pg/g	17.1	38.4	33.2	8.46	8.1
PCB192	pg/g	0.429 U	0.384 U	0.355 U	0.345 U	0.323 U
PCB194	pg/g	206	435	346	105	105
PCB195	pg/g	61.7	122	99.9	30.2	30.5
PCB196	pg/g	78.7	159	132	37.6	37.8

Table 4-1. Analytical Results for Tissue Samples.

	Location	**LT002**	**LTAC2**	**LTA3M2**	**LT023b**	**LT023c**
	Rivermile	**2.5**	**2.2 - 9.7**	**10.0 - 11.4**	**16.7**	**18.7**
	X_Easting	**7615357**	**7623107**	**7641277**	**7646878**	**7651220**
	Y_Northing	**723680**	**706944.5**	**691777.5**	**660968**	**652624**
	SampleID	**LW3-LTA-Comp1**	**LW3-LTA-Comp2**	**LW3-LTA-Comp3**	**LW3-LTA-Comp4**	**LW3-LTA-Comp5-1**
	Sample Date	**9/21/2006**	**9/20/2006**	**9/29/2006**	**10/3/2006**	**10/4/2006**
	Species	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**
	Tissue	**Ammocoete**	**Ammocoete**	**Ammocoete**	**Ammocoete**	**Ammocoete**
Chemical Name	**Unit**					
PCB197 & 200	pg/g	29.5	60.1	47	13.4	13.7
PCB198 & 199	pg/g	228	430	349	111	114
PCB201	pg/g	39.6	81.2	66.7	18.1	18.5
PCB202	pg/g	122	201	172	55.7	70.9
PCB203	pg/g	206	407	330	109	106
PCB204	pg/g	2.14 U	0.406 U	0.383 J	0.241 J	0.256 U
PCB205	pg/g	7.2	14.1	11.6	3.72	3.82
PCB206	pg/g	85.1	117	87	45	48.8
PCB207	pg/g	14.1	18.9	15.1	7.89	8.87
PCB208	pg/g	47.6	60.8	45	26.7	31.6
PCB209	pg/g	93.2	93.9	75.8	73.7	90.5
Total PCB Congeners (calc'd)	pg/g	81000 J	400000 J	110000 J	32000 J	34000 J
Pesticides						
2,4'-DDD	µg/kg	6.73	6.7	2.37	1.41	2.29
2,4'-DDE	µg/kg	0.942	1.19	0.473	0.381	0.523
2,4'-DDT	µg/kg	1.21	2.26	0.679	0.558	0.566
4,4'-DDD	µg/kg	31.3	28.3	12.7	9.11	15.5
4,4'-DDE	µg/kg	36.9	35.6	23.5	23	31.7
4,4'-DDT	µg/kg	4.29	3.97	2.61	2.34	2.61
Aldrin	µg/kg	1.82	1.81	0.874	0.65	2.07
alpha-Endosulfan	µg/kg	0.621	0.283	0.23	0.239	0.184 J
alpha-Hexachlorocyclohexane	µg/kg	0.0346 J	0.0213 J	0.016 J	13.5	0.0387 J
beta-Endosulfan	µg/kg	0.249 J	0.196 U	0.132 J	0.116 U	0.179 J
beta-Hexachlorocyclohexane	µg/kg	0.0186 J	0.00974 J	0.0079 J	1.13	0.0268 J
cis-Chlordane	µg/kg	9.37	4.26	3.74	2.33	3.94
cis-Nonachlor	µg/kg	3.4	1.63	1.45	1.2	1.81
delta-Hexachlorocyclohexane	µg/kg	0.00342 U	0.00245 J	0.0018 U	0.0808 J	0.00606 J
Dieldrin	µg/kg	2.58	1.58	0.89	0.698	0.941
Endosulfan sulfate	µg/kg	0.997	0.677	0.353	0.338	0.612

Table 4-1. Analytical Results for Tissue Samples.

	Location	**LT002**	**LTAC2**	**LTA3M2**	**LT023b**	**LT023c**
	Rivermile	**2.5**	**2.2 - 9.7**	**10.0 - 11.4**	**16.7**	**18.7**
	X_Easting	**7615357**	**7623107**	**7641277**	**7646878**	**7651220**
	Y_Northing	**723680**	**706944.5**	**691777.5**	**660968**	**652624**
	SampleID	**LW3-LTA-Comp1**	**LW3-LTA-Comp2**	**LW3-LTA-Comp3**	**LW3-LTA-Comp4**	**LW3-LTA-Comp5-1**
	Sample Date	**9/21/2006**	**9/20/2006**	**9/29/2006**	**10/3/2006**	**10/4/2006**
	Species	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**
	Tissue	**Ammocoete**	**Ammocoete**	**Ammocoete**	**Ammocoete**	**Ammocoete**
Chemical Name	**Unit**					
Endrin	µg/kg	0.029 U	0.0101 J	0.00987 J	0.00784 J	0.00725 U
Endrin aldehyde	µg/kg	0.0574 UJ	0.0444 UJ	0.0479 UJ	0.0462 UJ	0.0435 UJ
Endrin ketone	µg/kg	0.00358 U	0.0444 U	0.0479 U	0.0462 U	0.0435 U
gamma-Hexachlorocyclohexane	µg/kg	0.0297 U	0.0203 U	0.0181 J	0.181 J	0.0175 J
Heptachlor	µg/kg	0.0245 J	0.0163 J	0.011 U	0.00757 J	0.0159 J
Heptachlor epoxide	µg/kg	0.172 J	0.0742 J	0.0466 J	0.0334 J	0.0421 J
Methoxychlor	µg/kg	0.0475 U	0.0223 U	0.0257 U	0.0174 U	0.0294 U
Oxychlordane	µg/kg	0.353 J	0.248 J	0.169 J	0.13 J	0.256 J
Sum DDD (calc'd)	µg/kg	38	35	15.1	10.5	17.8
Sum DDE (calc'd)	µg/kg	37.8	36.8	24	23	32.2
Sum DDT (calc'd)	µg/kg	5.5	6.23	3.29	2.9	3.18
Total Chlordane (calc'd)	µg/kg	29 J	13.6 J	12.5 J	8.7 J	14.1 J
Total DDTs (calc'd)	µg/kg	81.4	78	42.3	37	53.2
Total Endosulfan (calc'd)	µg/kg	1.87 J	1.06	0.72 J	0.635	0.975 J
trans-Chlordane	µg/kg	6.51	3.13	2.85	1.74	2.88
trans-Nonachlor	µg/kg	9.68	4.36	4.33	3.31	5.24
Phenols						
2,4-Dimethylphenol	µg/kg		19 U		19 U	19 U
2-Methylphenol	µg/kg		8.2 U		8.2 U	8.2 U
4-Methylphenol	µg/kg		7.7 U		7.7 U	7.7 U
Pentachlorophenol	µg/kg		30 U		30 U	30 U
Phenol	µg/kg		45 U		45 U	45 U
Phthalates						
Bis(2-ethylhexyl) phthalate	µg/kg		170 J		130 J	120 J
Butylbenzyl phthalate	µg/kg		7.3 U		7.3 U	7.3 U
Dibutyl phthalate	µg/kg		16 U		16 U	16 U
Diethyl phthalate	µg/kg		660 U		200 U	62 U
Dimethyl phthalate	µg/kg		7.7 U		7.7 U	7.7 U
Di-n-octyl phthalate	µg/kg		11 U		11 U	11 U

Table 4-1. Analytical Results for Tissue Samples.

	Location	**LT002**	**LTAC2**	**LTA3M2**	**LT023b**	**LT023c**
	Rivermile	**2.5**	**2.2 - 9.7**	**10.0 - 11.4**	**16.7**	**18.7**
	X_Easting	**7615357**	**7623107**	**7641277**	**7646878**	**7651220**
	Y_Northing	**723680**	**706944.5**	**691777.5**	**660968**	**652624**
	SampleID	**LW3-LTA-Comp1**	**LW3-LTA-Comp2**	**LW3-LTA-Comp3**	**LW3-LTA-Comp4**	**LW3-LTA-Comp5-1**
	Sample Date	**9/21/2006**	**9/20/2006**	**9/29/2006**	**10/3/2006**	**10/4/2006**
	Species	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**
	Tissue	**Ammocoete**	**Ammocoete**	**Ammocoete**	**Ammocoete**	**Ammocoete**
Chemical Name	**Unit**					
SVOCs						
1,2,4-Trichlorobenzene	µg/kg		9.8 U		9.8 U	9.8 U
1,2-Dichlorobenzene	µg/kg		11 U		11 U	11 U
1,3-Dichlorobenzene	µg/kg		11 U		11 U	11 U
1,4-Dichlorobenzene	µg/kg		11 U		11 U	11 U
Benzyl alcohol	µg/kg		22 U		22 U	22 U
Hexachlorobenzene	µg/kg	1.88	1.5	1.25	3.34	2.07
Hexachlorobutadiene	µg/kg	0.0442 UJ	10 U	R	10 U	10 U
Hexachloroethane	µg/kg		20 U		20 U	20 U
N-Nitrosodiphenylamine	µg/kg		6.6 U		6.6 U	6.6 U

Table 4-1. Analytical Results for Tissue Samples.

	Location	**LT023c**	**LTMC1**	**LTA3M2**	**LT023c**
	Rivermile	**18.7**	**2.2 - 8.8**	**10.0 - 11.4**	**18.7**
	X_Easting	**7651220**	**7621455.4**	**7641277**	**7651220**
	Y_Northing	**652624**	**708856.9**	**691777.5**	**652624**
	SampleID	**LW3-LTA-Comp5-2 (FR)**	**LW3-LTM-Comp1**	**LW3-LTM-Comp2**	**LW3-LTM-Comp3**
	Sample Date	**10/4/2006**	**9/20/2006**	**9/29/2006**	**10/4/2006**
	Species	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**
	Tissue	**Ammocoete**	**Macropthalmia**	**Macropthalmia**	**Macropthalmia**
Chemical Name	**Unit**				
Butyltins					
Butyltin ion	µg/kg				
Dibutyltin ion	µg/kg				
Tetrabutyltin	µg/kg				
Tributyltin ion	µg/kg				
Conventionals					
Lipids	percent	3.9	9.84	9.83	10
Total solids	percent	23	29.6	29.4	26
Dioxins Furans					
1,2,3,4,6,7,8-Heptachlorodibenzofuran	pg/g	1.09 U	1.61	1.81	1.4
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	pg/g	6.68	10.3	11	9.16
1,2,3,4,7,8,9-Heptachlorodibenzofuran	pg/g	0.1 U	0.239 U	0.281 U	0.18 U
1,2,3,4,7,8-Hexachlorodibenzofuran	pg/g	0.463 J	1.44	1.17 J	0.796 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	pg/g	0.507 J	0.997 J	1.17 J	0.951 J
1,2,3,6,7,8-Hexachlorodibenzofuran	pg/g	0.259 J	0.63 J	0.575 J	0.392 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	pg/g	1.97	3.93	4.19	3.23
1,2,3,7,8,9-Hexachlorodibenzofuran	pg/g	0.0956 U	0.112 U	0.09 UJ	0.0966 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	pg/g	0.606 J	1.14 J	1.31 J	0.98 J
1,2,3,7,8-Pentachlorodibenzofuran	pg/g	0.252 J	1.45	0.694 J	0.515 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	pg/g	0.735 J	1.56	1.87	1.33 J
2,3,4,6,7,8-Hexachlorodibenzofuran	pg/g	0.275 U	0.446 U	0.492 U	0.306 U
2,3,4,7,8-Pentachlorodibenzofuran	pg/g	0.462 U	1.43	1.09 J	0.85 J
2,3,7,8-Tetrachlorodibenzofuran	pg/g	0.731	4.06	1.71	1.18
2,3,7,8-Tetrachlorodibenzo-p-dioxin	pg/g	0.389	0.729	0.819	0.64
Total Dioxin Furans (calc'd)	pg/g	28 J	40 J	39 J	31 J
Dioxin TEQ - Birds	pg/g	2.3	8.4	6	4.4
Dioxin TEQ - Fish	pg/g	1.7	4.1	4.2	3.2
Dioxin TEQ - Mammals	pg/g	1.8	4.4	4.4	3.3

Table 4-1. Analytical Results for Tissue Samples.

	Location	**LT023c**	**LTMC1**	**LTA3M2**	**LT023c**
	Rivermile	**18.7**	**2.2 - 8.8**	**10.0 - 11.4**	**18.7**
	X_Easting	**7651220**	**7621455.4**	**7641277**	**7651220**
	Y_Northing	**652624**	**708856.9**	**691777.5**	**652624**
	SampleID	**LW3-LTA-Comp5-2 (FR)**	**LW3-LTM-Comp1**	**LW3-LTM-Comp2**	**LW3-LTM-Comp3**
	Sample Date	**10/4/2006**	**9/20/2006**	**9/29/2006**	**10/4/2006**
	Species	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**
	Tissue	**Ammocoete**	**Macropthalmia**	**Macropthalmia**	**Macropthalmia**
Chemical Name	**Unit**				
Dioxin TEQ - Mammals 2006	pg/g	1.7	4.1	4.2	3.1
Total TEQ - Birds	pg/g	5.9	64	18	11
Total TEQ - Fish	pg/g	1.7	4.4	4.4	3.2
Total TEQ - Mammals	pg/g	2.7	9.5	7	4.6
Total TEQ - Mammals 2006	pg/g	2.5	7.7	6	4.1
Dioxin Furan Homolog					
Heptachlorodibenzofuran homologs	pg/g	2.3	5.76	6.39	5.02
Heptachlorodibenzo-p-dioxin homologs	pg/g	9.33	10.5	11.5	9.45
Hexachlorodibenzofuran homologs	pg/g	7.44	16.1	16.7	12.1
Hexachlorodibenzo-p-dioxin homologs	pg/g	4.99	6.46	7.2	6
Octachlorodibenzofuran	pg/g	1.05 J	0.735 U	0.666 U	0.629 U
Octachlorodibenzo-p-dioxin	pg/g	12.9	10.4	10.6	8.77
Pentachlorodibenzofuran homologs	pg/g	7.05	12.2	12.4	10.6
Pentachlorodibenzo-p-dioxin homologs	pg/g	1.22	1.73	1.87	1.33
Tetrachlorodibenzofuran homologs	pg/g	5.77	12	9.12	8.3
Tetrachlorodibenzo-p-dioxin homologs	pg/g	1.65	1.08	0.999	1.4
Metals					
Aluminum	mg/kg	231	2.3	3.6	3.4
Antimony	mg/kg	0.003 J	0.003 J	0.002 U	0.002 U
Arsenic	mg/kg	0.16	0.08 J	0.05 J	0.08 J
Cadmium	mg/kg	0.003 J	0.002 J	0.002 J	0.002 U
Chromium	mg/kg	0.3	0.27	0.13 J	0.1 U
Copper	mg/kg	3.92	6.2	3.08	4.33
Lead	mg/kg	0.0847	0.0492	0.0331	0.0303
Mercury	mg/kg	0.347 J		0.217	0.902
Nickel	mg/kg	0.268	0.18	0.129	0.096
Selenium	mg/kg	0.31	0.31	0.27	0.31
Silver	mg/kg	0.03	0.0311	0.0215	0.0354
Zinc	mg/kg	25.8	25.3	19	26.4

Table 4-1. Analytical Results for Tissue Samples.

	Location	**LT023c**	**LTMC1**	**LTA3M2**	**LT023c**
	Rivermile	**18.7**	**2.2 - 8.8**	**10.0 - 11.4**	**18.7**
	X_Easting	**7651220**	**7621455.4**	**7641277**	**7651220**
	Y_Northing	**652624**	**708856.9**	**691777.5**	**652624**
	SampleID	**LW3-LTA-Comp5-2 (FR)**	**LW3-LTM-Comp1**	**LW3-LTM-Comp2**	**LW3-LTM-Comp3**
	Sample Date	**10/4/2006**	**9/20/2006**	**9/29/2006**	**10/4/2006**
	Species	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**
	Tissue	**Ammocoete**	**Macropthalmia**	**Macropthalmia**	**Macropthalmia**
Chemical Name	**Unit**				
PAHs					
2-Methylnaphthalene	µg/kg	4.6	1.8 J	2.5	6.1
Acenaphthene	µg/kg	0.71 J	21	2	0.83 J
Acenaphthylene	µg/kg	0.59 U	3.9	2.6	1.8
Anthracene	µg/kg	2.6	40	12	6
Benzo(a)anthracene	µg/kg	0.75 U	0.8 U	1 U	0.92 U
Benzo(a)pyrene	µg/kg	0.22 U	0.22 U	0.22 U	0.22 U
Benzo(b)fluoranthene	µg/kg	1.7	0.25 J	0.2 U	0.2 U
Benzo(g,h,i)perylene	µg/kg	0.29 J	0.2 U	0.2 U	0.2 U
Benzo(k)fluoranthene	µg/kg	0.46 J	0.19 U	0.19 U	0.19 U
Chrysene	µg/kg	0.17 U	0.27 J	0.24 J	0.25 J
Dibenzo(a,h)anthracene	µg/kg	0.28 U	0.28 U	0.28 U	0.28 U
Fluoranthene	µg/kg	10	35	4.8	3.6
Fluorene	µg/kg	2.8	20	4.1	3.1
Indeno(1,2,3-cd)pyrene	µg/kg	0.32 J	0.22 J	0.2 U	0.2 U
Naphthalene	µg/kg	3.4	2.6	3.2	3.6
Phenanthrene	µg/kg	6.3	96	14	6.6
Pyrene	µg/kg	7.8	20	2.8	2
Total HPAHs (calc'd)	µg/kg	21 J	57 J	9 J	7 J
Total LPAHs (calc'd)	µg/kg	21 J	190 J	40	28 J
Total PAHs (calc'd)	µg/kg	42 J	240 J	49 J	35 J
PCB Congeners					
PCB TEQ - Birds	pg/g	3.6	55	12	6.3
PCB TEQ - Fish	pg/g	0.048	0.34	0.13	0.071
PCB TEQ - Mammals	pg/g	0.93	5.1	2.6	1.3
PCB TEQ - Mammals 2006	pg/g	0.71	3.6	1.8	0.99
PCB001	pg/g	R	29.3	6.74	R
PCB002	pg/g	R	28.6	27.5	35.4 J
PCB003	pg/g	R	20.4	4.52	4.37 J

Table 4-1. Analytical Results for Tissue Samples.

	Location	**LT023c**	**LTMC1**	**LTA3M2**	**LT023c**
	Rivermile	**18.7**	**2.2 - 8.8**	**10.0 - 11.4**	**18.7**
	X_Easting	**7651220**	**7621455.4**	**7641277**	**7651220**
	Y_Northing	**652624**	**708856.9**	**691777.5**	**652624**
	SampleID	**LW3-LTA-Comp5-2 (FR)**	**LW3-LTM-Comp1**	**LW3-LTM-Comp2**	**LW3-LTM-Comp3**
	Sample Date	**10/4/2006**	**9/20/2006**	**9/29/2006**	**10/4/2006**
	Species	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**
	Tissue	**Ammocoete**	**Macropthalmia**	**Macropthalmia**	**Macropthalmia**
Chemical Name	**Unit**				
PCB004	pg/g	R	948	691	64.4 J
PCB005	pg/g	0.939 UJ	7.89	3.73	1.04
PCB006	pg/g	4.4 UJ	247	77.6	20.8
PCB007	pg/g	0.877 UJ	31.3	16.5	3.45
PCB008	pg/g	20.3 J	876	308	85.5
PCB009	pg/g	1.09 J	51.3	21.2	4.89
PCB010	pg/g	0.891 UJ	34.4	23.2	1.6
PCB011	pg/g	576 J	2550	2640	3280
PCB012 & 013	pg/g	0.882 UJ	113	72.2	56.6
PCB014	pg/g	0.887 UJ	2.62	1.96	1.76
PCB015	pg/g	27.9 U	665	218	78.8
PCB016	pg/g	40.1 J	945	400	121
PCB017	pg/g	57.8 J	2600	3250	179
PCB018 & 030	pg/g	106 J	3080	1410	312
PCB019	pg/g	18.9 J	2200	6030	54
PCB020 & 028	pg/g	380 J	11400	3050	909
PCB021 & 033	pg/g	111 J	1770	1080	263
PCB022	pg/g	111 J	2300	793	271
PCB023	pg/g	0.423 UJ	3.93	3.01	0.947 U
PCB024	pg/g	1.99 J	44.8	17.4	5.77
PCB025	pg/g	31.2 J	711	660	72.7
PCB026 & 029	pg/g	61.6 J	1430	751	154
PCB027	pg/g	11.3 J	622	929	31.4
PCB031	pg/g	288 J	6340	2350	720
PCB032	pg/g	46.8 J	2410	1480	125
PCB034	pg/g	2.51 J	73.3	20.9	6.31
PCB035	pg/g	10.9 UJ	40.2	27.1	21.7
PCB036	pg/g	7.82 J	12.4	15.6	18.3
PCB037	pg/g	70.3	1500	428	158

Table 4-1. Analytical Results for Tissue Samples.

	Location	**LT023c**	**LTMC1**	**LTA3M2**	**LT023c**
	Rivermile	**18.7**	**2.2 - 8.8**	**10.0 - 11.4**	**18.7**
	X_Easting	**7651220**	**7621455.4**	**7641277**	**7651220**
	Y_Northing	**652624**	**708856.9**	**691777.5**	**652624**
	SampleID	**LW3-LTA-Comp5-2 (FR)**	**LW3-LTM-Comp1**	**LW3-LTM-Comp2**	**LW3-LTM-Comp3**
	Sample Date	**10/4/2006**	**9/20/2006**	**9/29/2006**	**10/4/2006**
	Species	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**
	Tissue	**Ammocoete**	**Macropthalmia**	**Macropthalmia**	**Macropthalmia**
Chemical Name	**Unit**				
PCB038	pg/g	0.771 UJ	14.7	5.94	1.68 U
PCB039	pg/g	5.78 J	110	28.8	10.4
PCB040 & 041 & 071	pg/g	352	11200	3670	701
PCB042	pg/g	188	4900	1110	366
PCB043	pg/g	31.7	750	181	54.1
PCB044 & 047 & 065	pg/g	796	23500	15500	1560
PCB045 & 051	pg/g	86	4900	6640	205
PCB046	pg/g	25.8	1150	593	62.2
PCB048	pg/g	127	2920	745	246
PCB049 & 069	pg/g	579	14900	10700	1090
PCB050 & 053	pg/g	73.4	4720	10600	172
PCB052	pg/g	1090	26000	17000	2120
PCB054	pg/g	1.51	655	2820	5.84
PCB055	pg/g	0.961 U	171	1.42 U	20.8
PCB056	pg/g	291	8320	1070	496
PCB057	pg/g	4.32 U	62.4	28.7	5.5
PCB058	pg/g	4.73	44.6	1.37 U	5.45
PCB059 & 062 & 075	pg/g	67.4	1670	659	126
PCB060	pg/g	152	3680	498	242
PCB061 & 070 & 074 & 076	pg/g	1620	28000	5890	2520
PCB063	pg/g	39.4	652	166	61.3
PCB064	pg/g	369	9880	1630	696
PCB066	pg/g	829	18300	2920	1230
PCB067	pg/g	22	359	107	34.5
PCB068	pg/g	10.4	121	136	15.8
PCB072	pg/g	16.6	181	121	25.3
PCB073	pg/g	0.47 U	103	463	6.6
PCB077	pg/g	55.3	968	197	99.7
PCB078	pg/g	0.923 U	1.74 U	1.37 U	0.621 U

Table 4-1. Analytical Results for Tissue Samples.

	Location	**LT023c**	**LTMC1**	**LTA3M2**	**LT023c**
	Rivermile	**18.7**	**2.2 - 8.8**	**10.0 - 11.4**	**18.7**
	X_Easting	**7651220**	**7621455.4**	**7641277**	**7651220**
	Y_Northing	**652624**	**708856.9**	**691777.5**	**652624**
	SampleID	**LW3-LTA-Comp5-2 (FR)**	**LW3-LTM-Comp1**	**LW3-LTM-Comp2**	**LW3-LTM-Comp3**
	Sample Date	**10/4/2006**	**9/20/2006**	**9/29/2006**	**10/4/2006**
	Species	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**
	Tissue	**Ammocoete**	**Macropthalmia**	**Macropthalmia**	**Macropthalmia**
Chemical Name	**Unit**				
PCB079	pg/g	22.7	155	62	25
PCB080	pg/g	0.85 U	1.56 U	1.23 U	0.556 U
PCB081	pg/g	2.37 U	32.9	6.11	3.03
PCB082	pg/g	139	1970	546	230
PCB083 & 099	pg/g	1170	10400	5880	1770
PCB084	pg/g	336	4520	2110	587
PCB085 & 116 & 117	pg/g	355	3270	1250	538
PCB086 & 087 & 097 & 108 & 119 & 125	pg/g	1040 J	11600	5230	1660
PCB088 & 091	pg/g	241	3160	3810	392
PCB089	pg/g	15.7	333	73.8	27
PCB090 & 101 & 113	pg/g	1970	18200	14900	2980
PCB092	pg/g	376	3220	2850	555
PCB093 & 095 & 098 & 100 & 102	pg/g	1220	16900	16900	2050
PCB094	pg/g	8.33	290	697	14.4
PCB096	pg/g	8.48	318	618	15.3
PCB103	pg/g	20.2	520	1430	29
PCB104	pg/g	0.603 U	64.7	231	0.787
PCB105	pg/g	465	4330	1540	711
PCB106	pg/g	0.892 U	2.65 U	2.18 U	2.11 U
PCB107 & 124	pg/g	67.3	501	215	103
PCB109	pg/g	142	1030	518	206
PCB110 & 115	pg/g	1610	15500	9140	2660
PCB111	pg/g	1.92	17.2	30.5	2.73
PCB112	pg/g	0.602 U	1.88 U	0.893 U	0.522 U
PCB114	pg/g	36	326	121	52.3
PCB118	pg/g	1520	9990	4940	2200
PCB120	pg/g	9.64	60.9	84.3	13.6
PCB121	pg/g	1.18	30.5	111	1.48
PCB122	pg/g	15.6	178	50.3	24

Table 4-1. Analytical Results for Tissue Samples.

	Location	**LT023c**	**LTMC1**	**LTA3M2**	**LT023c**
	Rivermile	**18.7**	**2.2 - 8.8**	**10.0 - 11.4**	**18.7**
	X_Easting	**7651220**	**7621455.4**	**7641277**	**7651220**
	Y_Northing	**652624**	**708856.9**	**691777.5**	**652624**
	SampleID	**LW3-LTA-Comp5-2 (FR)**	**LW3-LTM-Comp1**	**LW3-LTM-Comp2**	**LW3-LTM-Comp3**
	Sample Date	**10/4/2006**	**9/20/2006**	**9/29/2006**	**10/4/2006**
	Species	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**
	Tissue	**Ammocoete**	**Macropthalmia**	**Macropthalmia**	**Macropthalmia**
Chemical Name	**Unit**				
PCB123	pg/g	34.5	243	85.7	53.8
PCB126	pg/g	6.11	29.2	14.4	8.51
PCB127	pg/g	3.69	10.7	8.31	4.05 U
PCB128 & 166	pg/g	206	878	853	306
PCB129 & 138 & 160 & 163	pg/g	1820	8840	11500	2700
PCB130	pg/g	124	586	592	185
PCB131	pg/g	16.6	122	104	26.8
PCB132	pg/g	323	2370	2890	519
PCB133	pg/g	50.1	320	537	67.6
PCB134 & 143	pg/g	81.6	596	746	127
PCB135 & 151 & 154	pg/g	645	4690	7760	902
PCB136	pg/g	167	1620	2950	248
PCB137	pg/g	89.1	363	266	121
PCB139 & 140	pg/g	32.1	193	204	47.5
PCB141	pg/g	290	1870	2640	418
PCB142	pg/g	0.61 U	4.36	1.98 U	0.477 U
PCB144	pg/g	87.4	620	910	121
PCB145	pg/g	0.654	5.08	3.67	0.966
PCB146	pg/g	404	2100	3040	537
PCB147 & 149	pg/g	1220	8750	14800	1910
PCB148	pg/g	5.73	74.8	171	5.54
PCB150	pg/g	2.9	75.3	206	4.34
PCB152	pg/g	1.46	34.2	89.6	2.15
PCB153 & 168	pg/g	2400	11900	17400	3330
PCB155	pg/g	2.56	13.9	31	3.16
PCB156 & 157	pg/g	164	780	712	233
PCB158	pg/g	170	868	987	244
PCB159	pg/g	6.19	37.4	59.1	9.48
PCB161	pg/g	0.426 U	0.896 U	1.37 U	0.379 U

Table 4-1. Analytical Results for Tissue Samples.

	Location	**LT023c**	**LTMC1**	**LTA3M2**	**LT023c**
	Rivermile	**18.7**	**2.2 - 8.8**	**10.0 - 11.4**	**18.7**
	X_Easting	**7651220**	**7621455.4**	**7641277**	**7651220**
	Y_Northing	**652624**	**708856.9**	**691777.5**	**652624**
	SampleID	**LW3-LTA-Comp5-2 (FR)**	**LW3-LTM-Comp1**	**LW3-LTM-Comp2**	**LW3-LTM-Comp3**
	Sample Date	**10/4/2006**	**9/20/2006**	**9/29/2006**	**10/4/2006**
	Species	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**
	Tissue	**Ammocoete**	**Macropthalmia**	**Macropthalmia**	**Macropthalmia**
Chemical Name	**Unit**				
PCB162	pg/g	9.51	32.5	28.4	13.5
PCB164	pg/g	61.8	416	557	108
PCB165	pg/g	1.43	19.1	56.4	1.52
PCB167	pg/g	80	337	340	113
PCB169	pg/g	1.5 U	3.18 U	3.94 U	1.86 U
PCB170	pg/g	199	877	1400	257
PCB171 & 173	pg/g	63.6	329	528	89.8
PCB172	pg/g	69	321	509	94.9
PCB174	pg/g	152	941	1490	226
PCB175	pg/g	15.9	81.4	134	20.8
PCB176	pg/g	33.2	217	365	47
PCB177	pg/g	148	787	1310	210
PCB178	pg/g	116	578	981	155
PCB179	pg/g	126	822	1400	187
PCB180 & 193	pg/g	727	3350	5440	943
PCB181	pg/g	3.79	13.7	15	5.04
PCB182	pg/g	3.87	15.4	21.6	4.13
PCB183 & 185	pg/g	274	1370	2300	361
PCB184	pg/g	3.19	4.37	6.36	4.4
PCB186	pg/g	0.157 U	0.16 U	0.168 U	0.158 U
PCB187	pg/g	569	2720	4530	783
PCB188	pg/g	1.92 U	17.8	37.5	2.25
PCB189	pg/g	10.7	45.4	67.5	13.8
PCB190	pg/g	63.9	266	418	79.8
PCB191	pg/g	8.56	40.7	65	10.9
PCB192	pg/g	0.313 U	0.32 U	0.329 U	0.316 U
PCB194	pg/g	100	395	616	119
PCB195	pg/g	30.2	119	183	36.8
PCB196	pg/g	36.1	164	243	44.9

Table 4-1. Analytical Results for Tissue Samples.

	Location	**LT023c**	**LTMC1**	**LTA3M2**	**LT023c**
	Rivermile	**18.7**	**2.2 - 8.8**	**10.0 - 11.4**	**18.7**
	X_Easting	**7651220**	**7621455.4**	**7641277**	**7651220**
	Y_Northing	**652624**	**708856.9**	**691777.5**	**652624**
	SampleID	**LW3-LTA-Comp5-2 (FR)**	**LW3-LTM-Comp1**	**LW3-LTM-Comp2**	**LW3-LTM-Comp3**
	Sample Date	**10/4/2006**	**9/20/2006**	**9/29/2006**	**10/4/2006**
	Species	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**
	Tissue	**Ammocoete**	**Macropthalmia**	**Macropthalmia**	**Macropthalmia**
Chemical Name	**Unit**				
PCB197 & 200	pg/g	13.3	62.2	91.6	18.2
PCB198 & 199	pg/g	112	477	645	149
PCB201	pg/g	17.5	79.2	118	23.1
PCB202	pg/g	64.5	224	291	76.4
PCB203	pg/g	103	401	572	133
PCB204	pg/g	0.266 J	0.459 J	0.521 J	0.308 J
PCB205	pg/g	3.49	13.3	20.1	4.3
PCB206	pg/g	47.3	123	132	54.3
PCB207	pg/g	8.32	20	23.6	9.81
PCB208	pg/g	30.2	64.7	65	34.3
PCB209	pg/g	82.5	89.9	94.6	99.8
Total PCB Congeners (calc'd)	pg/g	31000 J	380000 J	280000 J	53000 J
Pesticides					
2,4'-DDD	µg/kg	2.27	14.1	5.76	4.14
2,4'-DDE	µg/kg	0.479	1.38	0.878	0.748
2,4'-DDT	µg/kg	0.574	2.79	1.48	1.22
4,4'-DDD	µg/kg	14.5	54.7	29.3	25
4,4'-DDE	µg/kg	28.8	39.6	38.1	39.9
4,4'-DDT	µg/kg	2.48	8.65	6.48	6.12
Aldrin	µg/kg	1.99	1.6	1.81	2.72
alpha-Endosulfan	µg/kg	0.167 J	1.11	1.19	1.09
alpha-Hexachlorocyclohexane	µg/kg	0.0285 J	0.0447 U	0.0467 J	0.064 J
beta-Endosulfan	µg/kg	0.186 U	0.403	0.431	0.483
beta-Hexachlorocyclohexane	µg/kg	0.0227 J	0.0257 J	0.023 J	0.0386 J
cis-Chlordane	µg/kg	3.99	7.59	9.24	8.43
cis-Nonachlor	µg/kg	1.63	2.25	2.81	2.61
delta-Hexachlorocyclohexane	µg/kg	0.00249 J	0.00316 J	0.00318 J	0.00392 J
Dieldrin	µg/kg	1.03	6.38	5.47	5.36
Endosulfan sulfate	µg/kg	0.699	1.31	1.06	1.22

Table 4-1. Analytical Results for Tissue Samples.

	Location	**LT023c**	**LTMC1**	**LTA3M2**	**LT023c**
	Rivermile	**18.7**	**2.2 - 8.8**	**10.0 - 11.4**	**18.7**
	X_Easting	**7651220**	**7621455.4**	**7641277**	**7651220**
	Y_Northing	**652624**	**708856.9**	**691777.5**	**652624**
	SampleID	**LW3-LTA-Comp5-2 (FR)**	**LW3-LTM-Comp1**	**LW3-LTM-Comp2**	**LW3-LTM-Comp3**
	Sample Date	**10/4/2006**	**9/20/2006**	**9/29/2006**	**10/4/2006**
	Species	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**
	Tissue	**Ammocoete**	**Macropthalmia**	**Macropthalmia**	**Macropthalmia**
Chemical Name	**Unit**				
Endrin	µg/kg	0.00463 U	0.0416 U	0.0376 J	0.019 J
Endrin aldehyde	µg/kg	0.0422 UJ	0.0428 UJ	0.0444 UJ	0.0426 UJ
Endrin ketone	µg/kg	0.0422 U	0.0428 U	0.00382 J	0.0426 U
gamma-Hexachlorocyclohexane	µg/kg	0.0106 U	0.0643 J	0.0696 J	0.0569 J
Heptachlor	µg/kg	0.0114 U	0.0446 J	0.049 J	0.0379 J
Heptachlor epoxide	µg/kg	0.0386 J	0.326	0.272	0.242
Methoxychlor	µg/kg	0.0307 U	0.129 J	0.238	0.111 J
Oxychlordane	µg/kg	0.259 J	0.616	0.615	0.776
Sum DDD (calc'd)	µg/kg	16.8	68.8	35.1	29
Sum DDE (calc'd)	µg/kg	29.3	41	39	40.6
Sum DDT (calc'd)	µg/kg	3.05	11.4	7.96	7.34
Total Chlordane (calc'd)	µg/kg	13.4 J	22.6	27.1	25.2
Total DDTs (calc'd)	µg/kg	49.1	121	82	77
Total Endosulfan (calc'd)	µg/kg	0.959 J	2.82	2.68	2.79
trans-Chlordane	µg/kg	2.77	5.55	6.83	5.49
trans-Nonachlor	µg/kg	4.78	6.58	7.59	7.88
Phenols					
2,4-Dimethylphenol	µg/kg	19 U			19 U
2-Methylphenol	µg/kg	8.2 U			8.2 U
4-Methylphenol	µg/kg	7.7 U			7.7 U
Pentachlorophenol	µg/kg	30 U			38 J
Phenol	µg/kg	45 U			45 U
Phthalates					
Bis(2-ethylhexyl) phthalate	µg/kg	140 J			160 J
Butylbenzyl phthalate	µg/kg	7.3 U			7.3 U
Dibutyl phthalate	µg/kg	16 U			16 U
Diethyl phthalate	µg/kg	510 U			990 U
Dimethyl phthalate	µg/kg	7.7 U			7.7 U
Di-n-octyl phthalate	µg/kg	11 U			11 U

DRAFT DOCUMENT: DO NOT QUOTE OR CITE
This document is currently under review by US EPA and its federal,
state, and tribal partners, and is subject to change in whole or in part

Table 4-1. Analytical Results for Tissue Samples.

	Location	**LT023c**	**LTMC1**	**LTA3M2**	**LT023c**
	Rivermile	**18.7**	**2.2 - 8.8**	**10.0 - 11.4**	**18.7**
	X_Easting	**7651220**	**7621455.4**	**7641277**	**7651220**
	Y_Northing	**652624**	**708856.9**	**691777.5**	**652624**
	SampleID	**LW3-LTA-Comp5-2 (FR)**	**LW3-LTM-Comp1**	**LW3-LTM-Comp2**	**LW3-LTM-Comp3**
	Sample Date	**10/4/2006**	**9/20/2006**	**9/29/2006**	**10/4/2006**
	Species	**Lamprey**	**Lamprey**	**Lamprey**	**Lamprey**
	Tissue	**Ammocoete**	**Macropthalmia**	**Macropthalmia**	**Macropthalmia**
Chemical Name	**Unit**				
SVOCs					
1,2,4-Trichlorobenzene	µg/kg	9.8 U			9.8 U
1,2-Dichlorobenzene	µg/kg	11 U			11 U
1,3-Dichlorobenzene	µg/kg	11 U			11 U
1,4-Dichlorobenzene	µg/kg	11 U			11 U
Benzyl alcohol	µg/kg	22 U			22 U
Hexachlorobenzene	µg/kg	1.92	3.75	4.62	6.02
Hexachlorobutadiene	µg/kg	0.0198 UJ	0.0962 J	R	10 U
Hexachloroethane	µg/kg	20 U			20 U
N-Nitrosodiphenylamine	µg/kg	6.6 U			6.6 U

Table 4-2. Summary Statistics of Chemical Concentrations for Tissue Samples.

					Detected Concentrations				Nondetected Concentrations	
Chemical	**Units**	**N**	**N Detected**	**% Detected**	**Minimum**	**Maximum**	**Mean Detected Value**	**Mean Detected Value or Half RL**	**Minimum RL**	**Maximum RL**
Lamprey Ammocoete										
Butyltins										
Butyltin ion	µg/kg	1	0	0				0.11	0.22 U	0.22 U
Dibutyltin ion	µg/kg	1	0	0				0.17	0.33 U	0.33 U
Tetrabutyltin	µg/kg	1	0	0				0.42	0.83 U	0.83 U
Tributyltin ion	µg/kg	1	1	100	4.1	4.1	4.1	4.1		
Conventionals										
Lipids	percent	6	6	100	3.14	6.91	4.3	4.3		
Total solids	percent	5	5	100	20.9	24.6	23	23		
Dioxins Furans										
1,2,3,4,6,7,8-Heptachlorodibenzofuran	pg/g	6	5	83	0.693 J	1.5 J	1.2	1.1	1.09 U	1.09 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	pg/g	6	6	100	5.02	9.78	7.59	7.59		
1,2,3,4,7,8,9-Heptachlorodibenzofuran	pg/g	6	0	0				0.072	0.1 U	0.196 U
1,2,3,4,7,8-Hexachlorodibenzofuran	pg/g	6	5	83	0.463 J	1.1 J	0.69	0.6	0.331 U	0.331 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	pg/g	6	6	100	0.471 J	0.8 J	0.63	0.63		
1,2,3,6,7,8-Hexachlorodibenzofuran	pg/g	6	6	100	0.169 J	0.43 J	0.3	0.3		
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	pg/g	6	6	100	1.42 J	2.57	2.16	2.16		
1,2,3,7,8,9-Hexachlorodibenzofuran	pg/g	6	0	0				0.055	0.0956 U	0.13 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	pg/g	6	4	67	0.606 J	0.787 J	0.672	0.553	0.402 U	0.857 U
1,2,3,7,8-Pentachlorodibenzofuran	pg/g	6	5	83	0.252 J	0.804 J	0.494	0.429	0.201 U	0.201 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	pg/g	6	6	100	0.498 J	1 J	0.82	0.82		
2,3,4,6,7,8-Hexachlorodibenzofuran	pg/g	6	0	0				0.137	0.177 U	0.376 U
2,3,4,7,8-Pentachlorodibenzofuran	pg/g	6	4	67	0.547 J	0.967 J	0.771	0.583	0.358 U	0.462 U
2,3,7,8-Tetrachlorodibenzofuran	pg/g	6	6	100	0.731	2.37	1.4	1.4		
2,3,7,8-Tetrachlorodibenzo-p-dioxin	pg/g	6	6	100	0.28 J	0.474	0.41	0.41		
Total Dioxin Furans (calc'd)	pg/g	6	6	100	21 J	51 J	36	36		
Dioxin TEQ - Birds	pg/g	6	6	100	2.1	5.1	3.5	3.5		
Dioxin TEQ - Fish	pg/g	6	6	100	1.2	2.6	2.1	2.1		
Dioxin TEQ - Mammals	pg/g	6	6	100	1.3	2.8	2.2	2.2		
Dioxin TEQ - Mammals 2006	pg/g	6	6	100	1.3	2.6	2.1	2.1		
Total TEQ - Birds	pg/g	6	6	100	5.9	70	19	19		
Total TEQ - Fish	pg/g	6	6	100	1.3	2.9	2.2	2.2		
Total TEQ - Mammals	pg/g	6	6	100	2.2	8.2	4.1	4.1		
Total TEQ - Mammals 2006	pg/g	6	6	100	1.9	6.2	3.4	3.4		
Dioxin Furan Homologs										
Heptachlorodibenzofuran homologs	pg/g	6	6	100	1.97	5.68	3.7	3.7		

Table 4-2. Summary Statistics of Chemical Concentrations for Tissue Samples.

					Detected Concentrations				Nondetected Concentrations	
Chemical	**Units**	**N**	**N Detected**	**% Detected**	**Minimum**	**Maximum**	**Mean Detected Value**	**Mean Detected Value or Half RL**	**Minimum RL**	**Maximum RL**
Heptachlorodibenzo-p-dioxin homologs	pg/g	6	6	100	6.56	13.9	10	10		
Hexachlorodibenzofuran homologs	pg/g	6	6	100	4.35	12.2	8.75	8.75		
Hexachlorodibenzo-p-dioxin homologs	pg/g	6	6	100	3.18	5.8	4.9	4.9		
Octachlorodibenzofuran	pg/g	6	5	83	1.05 J	2.62 J	1.7	1.5	0.861 U	0.861 U
Octachlorodibenzo-p-dioxin	pg/g	6	6	100	9.79	27.4	18.2	18.2		
Pentachlorodibenzofuran homologs	pg/g	6	6	100	4.47	10.9	7.96	7.96		
Pentachlorodibenzo-p-dioxin homologs	pg/g	6	6	100	0.498	1.42	1.1	1.1		
Tetrachlorodibenzofuran homologs	pg/g	6	6	100	5.77	9.91	7.4	7.4		
Tetrachlorodibenzo-p-dioxin homologs	pg/g	6	6	100	1.02	1.65	1.3	1.3		
Metals										
Aluminum	mg/kg	5	5	100	183	297	243	243		
Antimony	mg/kg	5	5	100	0.003 J	0.004 J	0.0032	0.0032		
Arsenic	mg/kg	5	5	100	0.14	0.19	0.17	0.17		
Cadmium	mg/kg	5	5	100	0.003 J	0.014	0.0058	0.0058		
Chromium	mg/kg	5	5	100	0.26	0.32	0.29	0.29		
Copper	mg/kg	5	5	100	3.64	4.8	4.2	4.2		
Lead	mg/kg	5	5	100	0.0827	0.153	0.102	0.102		
Mercury	mg/kg	4	4	100	0.259	0.69 J	0.41	0.41		
Nickel	mg/kg	5	5	100	0.238	0.292	0.267	0.267		
Selenium	mg/kg	5	5	100	0.28	0.37	0.32	0.32		
Silver	mg/kg	5	5	100	0.03	0.0408	0.035	0.035		
Zinc	mg/kg	5	5	100	25.8	29.1	27.4	27.4		
PAHs										
2-Methylnaphthalene	µg/kg	4	4	100	1.8 J	4.6	3.4	3.4		
Acenaphthene	µg/kg	4	4	100	0.25 J	24	6.4	6.4		
Acenaphthylene	µg/kg	4	1	25	3.3	3.3	3.3	1	0.59 U	0.6 U
Anthracene	µg/kg	4	4	100	1.7	20	6.6	6.6		
Benzo(a)anthracene	µg/kg	4	0	0				0.22	0.19 U	0.75 U
Benzo(a)pyrene	µg/kg	4	1	25	0.47 J	0.47 J	0.47	0.2	0.22 U	0.22 U
Benzo(b)fluoranthene	µg/kg	4	2	50	0.7 J	1.7	1.2	0.65	0.2 U	0.2 U
Benzo(g,h,i)perylene	µg/kg	4	2	50	0.29 J	0.5 J	0.4	0.25	0.2 U	0.2 U
Benzo(k)fluoranthene	µg/kg	4	2	50	0.26 J	0.46 J	0.36	0.23	0.19 U	0.19 U
Chrysene	µg/kg	4	1	25	0.75 J	0.75 J	0.75	0.25	0.17 U	0.17 U
Dibenzo(a,h)anthracene	µg/kg	4	0	0				0.14	0.28 U	0.28 U
Fluoranthene	µg/kg	4	4	100	4.5	85	27	27		
Fluorene	µg/kg	4	4	100	0.98 J	20	6.5	6.5		
Indeno(1,2,3-cd)pyrene	µg/kg	4	2	50	0.32 J	0.44 J	0.38	0.24	0.2 U	0.2 U

Table 4-2. Summary Statistics of Chemical Concentrations for Tissue Samples.

					Detected Concentrations				Nondetected Concentrations	
Chemical	**Units**	**N**	**N Detected**	**% Detected**	**Minimum**	**Maximum**	**Mean Detected Value**	**Mean Detected Value or Half RL**	**Minimum RL**	**Maximum RL**
Naphthalene	µg/kg	4	4	100	1.7 J	3.7	2.9	2.9		
Phenanthrene	µg/kg	4	4	100	2.4	43	14	14		
Pyrene	µg/kg	4	4	100	3.6	68	22	22		
Total HPAHs (calc'd)	µg/kg	4	4	100	9.8 J	160 J	52	52		
Total LPAHs (calc'd)	µg/kg	4	4	100	9.1 J	120	42	42		
Total PAHs (calc'd)	µg/kg	4	4	100	19 J	270 J	91	91		
PCB Congeners										
PCB TEQ - Birds	pg/g	6	6	100	3.6	64.6	15	15		
PCB TEQ - Fish	pg/g	6	6	100	0.048	0.379	0.12	0.12		
PCB TEQ - Mammals	pg/g	6	6	100	0.93	5.48	1.9	1.9		
PCB TEQ - Mammals 2006	pg/g	6	6	100	0.675	3.72	1.3	1.3		
PCB001	pg/g	6	5	83	2.49 J	30.3 J	10	10		
PCB002	pg/g	6	5	83	10.4 J	50.9 J	26.2	26.2		
PCB003	pg/g	6	4	67	1.89 J	14.2	10	4.99	2.14 UJ	2.14 UJ
PCB004	pg/g	6	5	83	15.1 J	2610	1000	1000		
PCB005	pg/g	6	0	0				0.7	0.501 U	3.95 U
PCB006	pg/g	6	5	83	5.6	192	53	44	4.4 UJ	4.4 UJ
PCB007	pg/g	6	3	50	1.62	19.2	8.24	4.87	0.877 UJ	6.99 U
PCB008	pg/g	6	6	100	20.3 J	850	190	190		
PCB009	pg/g	6	5	83	1.09 J	26.3	8.56	7.22	1.07 U	1.07 U
PCB010	pg/g	6	3	50	6.68	64.4	27	13	0.472 U	0.891 UJ
PCB011	pg/g	6	6	100	576 J	1460	1020	1020		
PCB012 & 013	pg/g	6	5	83	17	86.7	42	35	0.882 UJ	0.882 UJ
PCB014	pg/g	6	0	0				0.41	0.586 U	1.17 U
PCB015	pg/g	6	5	83	27.2	492	150	128	27.9 U	27.9 U
PCB016	pg/g	6	6	100	40.1 J	450	150	150		
PCB017	pg/g	6	6	100	57.8 J	2140	540	540		
PCB018 & 030	pg/g	6	6	100	105	1980	532	532		
PCB019	pg/g	6	6	100	14.3	4850	1050	1050		
PCB020 & 028	pg/g	6	6	100	367	8100	2000	2000		
PCB021 & 033	pg/g	6	6	100	111 J	1260	425	425		
PCB022	pg/g	6	6	100	107	1580	443	443		
PCB023	pg/g	6	3	50	0.407 J	1.47	0.96	0.67	0.423 UJ	1.35 U
PCB024	pg/g	6	6	100	1.63	23.5	7.58	7.58		
PCB025	pg/g	6	6	100	28.8	543	154	154		
PCB026 & 029	pg/g	6	6	100	60.2	1030	280	280		
PCB027	pg/g	6	6	100	9.83	528	130	130		
PCB031	pg/g	6	6	100	288 J	4990	1330	1330		

Table 4-2. Summary Statistics of Chemical Concentrations for Tissue Samples.

					Detected Concentrations				Nondetected Concentrations	
Chemical	**Units**	**N**	**N Detected**	**% Detected**	**Minimum**	**Maximum**	**Mean Detected Value**	**Mean Detected Value or Half RL**	**Minimum RL**	**Maximum RL**
PCB032	pg/g	6	6	100	43.3	2340	506	506		
PCB034	pg/g	6	6	100	2.1	64.4	15	15		
PCB035	pg/g	6	5	83	11	36	18	16	10.9 UJ	10.9 UJ
PCB036	pg/g	6	6	100	7.07	14.8	9.76	9.76		
PCB037	pg/g	6	6	100	70.3	1280	330	330		
PCB038	pg/g	6	0	0				1.6	0.75 U	12.3 U
PCB039	pg/g	6	6	100	5.24	106	25.6	25.6		
PCB040 & 041 & 071	pg/g	6	6	100	311	10100	2250	2250		
PCB042	pg/g	6	6	100	164	4990	1100	1100		
PCB043	pg/g	6	6	100	27.9	750	170	170		
PCB044 & 047 & 065	pg/g	6	6	100	689	22600	5360	5360		
PCB045 & 051	pg/g	6	6	100	75.1	3720	980	980		
PCB046	pg/g	6	6	100	22.1	865	200	200		
PCB048	pg/g	6	6	100	121	2980	684	684		
PCB049 & 069	pg/g	6	6	100	516	16700	3900	3900		
PCB050 & 053	pg/g	6	6	100	61.3	4320	1080	1080		
PCB052	pg/g	6	6	100	935	27300	6330	6330		
PCB054	pg/g	6	5	83	1.51	942	300	250	1.92 U	1.92 U
PCB055	pg/g	6	2	33	35	208	120	41	0.675 U	1.08 U
PCB056	pg/g	6	6	100	280	8290	1800	1800		
PCB057	pg/g	6	5	83	3.73	68.2	20.3	17.3	4.32 U	4.32 U
PCB058	pg/g	6	5	83	3.87	37.9	12.2	10.3	1.13 U	1.13 U
PCB059 & 062 & 075	pg/g	6	6	100	61.2	1670	388	388		
PCB060	pg/g	6	6	100	152	4530	946	946		
PCB061 & 070 & 074 & 076	pg/g	6	6	100	1530	37600	8200	8200		
PCB063	pg/g	6	6	100	38.6	877	198	198		
PCB064	pg/g	6	6	100	320	10800	2300	2300		
PCB066	pg/g	6	6	100	763 J	23800	5000	5000		
PCB067	pg/g	6	6	100	21.9	408	100	100		
PCB068	pg/g	6	6	100	10.4	91.8	37	37		
PCB072	pg/g	6	6	100	16.6	188	57	57		
PCB073	pg/g	6	3	50	36.2	98	75	38	0.47 U	0.517 U
PCB077	pg/g	6	6	100	55.3	1140	262	262		
PCB078	pg/g	6	0	0				0.592	0.625 U	2.63 U
PCB079	pg/g	6	6	100	20.1	169	50.9	50.9		
PCB080	pg/g	6	0	0				0.54	0.574 U	2.36 U
PCB081	pg/g	6	5	83	2.12	39.2	10.4	8.84	2.37 U	2.37 U
PCB082	pg/g	6	6	100	139	1980	491	491		

Table 4-2. Summary Statistics of Chemical Concentrations for Tissue Samples.

					Detected Concentrations				Nondetected Concentrations	
Chemical	**Units**	**N**	**N Detected**	**% Detected**	**Minimum**	**Maximum**	**Mean Detected Value**	**Mean Detected Value or Half RL**	**Minimum RL**	**Maximum RL**
PCB083 & 099	pg/g	6	6	100	1170	12500	3600	3600		
PCB084	pg/g	6	6	100	323	4520	1200	1200		
PCB085 & 116 & 117	pg/g	6	6	100	355	4030	1070	1070		
PCB086 & 087 & 097 & 108 & 119 & 125	pg/g	6	6	100	1040 J	12400	3390	3390		
PCB088 & 091	pg/g	6	6	100	241	3450	1000	1000		
PCB089	pg/g	6	6	100	15.7	381	83.5	83.5		
PCB090 & 101 & 113	pg/g	6	6	100	1970	20900	6400	6400		
PCB092	pg/g	6	6	100	376	3620	1200	1200		
PCB093 & 095 & 098 & 100 & 102	pg/g	6	6	100	1220	17000	5000	5000		
PCB094	pg/g	6	6	100	8.09	241	88.1	88.1		
PCB096	pg/g	6	6	100	8.11	277	85.4	85.4		
PCB103	pg/g	6	6	100	19.6	474	187	187		
PCB104	pg/g	6	4	67	0.719	68.6	34	22.7	0.357 U	0.603 U
PCB105	pg/g	6	6	100	465	4670	1310	1310		
PCB106	pg/g	6	0	0				0.45	0.501 U	1.4 U
PCB107 & 124	pg/g	6	6	100	67.3	574	174	174		
PCB109	pg/g	6	6	100	142	1230	370	370		
PCB110 & 115	pg/g	6	6	100	1540	14400	4360	4360		
PCB111	pg/g	6	5	83	1.92	15.2	5.9	5.9	11.8 U	11.8 U
PCB112	pg/g	6	0	0				0.406	0.259 U	2.04 U
PCB114	pg/g	6	6	100	36	434	120	120		
PCB118	pg/g	6	6	100	1520	12600	3900	3900		
PCB120	pg/g	6	6	100	9.64	53.6	27	27		
PCB121	pg/g	6	6	100	0.98	40.9	13	13		
PCB122	pg/g	6	6	100	15.5	180	47	47		
PCB123	pg/g	6	6	100	34.5	303	85.5	85.5		
PCB126	pg/g	6	6	100	5.68	29.8	11	11		
PCB127	pg/g	6	6	100	3.3	9.58	4.8	4.8		
PCB128 & 166	pg/g	6	6	100	206	790	370	370		
PCB129 & 138 & 160 & 163	pg/g	6	6	100	1820	8260	3890	3890		
PCB130	pg/g	6	6	100	124	569	257	257		
PCB131	pg/g	6	6	100	16.6	120	44	44		
PCB132	pg/g	6	6	100	323	1950	824	824		
PCB133	pg/g	6	6	100	50.1	289	150	150		
PCB134 & 143	pg/g	6	6	100	81.6	545	230	230		
PCB135 & 151 & 154	pg/g	6	6	100	645	4230	2000	2000		
PCB136	pg/g	6	6	100	167	1370	619	619		
PCB137	pg/g	6	6	100	89.1	386	163	163		

Table 4-2. Summary Statistics of Chemical Concentrations for Tissue Samples.

					Detected Concentrations				Nondetected Concentrations	
Chemical	**Units**	**N**	**N Detected**	**% Detected**	**Minimum**	**Maximum**	**Mean Detected Value**	**Mean Detected Value or Half RL**	**Minimum RL**	**Maximum RL**
PCB139 & 140	pg/g	6	6	100	32.1	196	80.8	80.8		
PCB141	pg/g	6	6	100	290	1750	770	770		
PCB142	pg/g	6	0	0				0.4	0.341 U	1.93 U
PCB144	pg/g	6	6	100	87.4	643	270	270		
PCB145	pg/g	6	5	83	0.616 J	5.4	2.2	1.9	0.754 U	0.754 U
PCB146	pg/g	6	6	100	404	2010	997	997		
PCB147 & 149	pg/g	6	6	100	1220	7620	3500	3500		
PCB148	pg/g	6	6	100	5.22	82.2	31	31		
PCB150	pg/g	6	6	100	2.9	88.5	28	28		
PCB152	pg/g	6	6	100	1.41	34.8	12.3	12.3		
PCB153 & 168	pg/g	6	6	100	2400	12500	5800	5800		
PCB155	pg/g	6	6	100	2.23	15	6	6		
PCB156 & 157	pg/g	6	6	100	164	777	338	338		
PCB158	pg/g	6	6	100	170	843	370	370		
PCB159	pg/g	6	6	100	5.73	31.4	15.3	15.3		
PCB161	pg/g	6	0	0				0.301	0.388 U	1.34 U
PCB162	pg/g	6	6	100	9.51	32.9	16	16		
PCB164	pg/g	6	6	100	60.4	303	141	141		
PCB165	pg/g	6	6	100	1.13	24.7	8.1	8.1		
PCB167	pg/g	6	6	100	80	341	160	160		
PCB169	pg/g	6	0	0				1	1.37 U	2.88 U
PCB170	pg/g	6	6	100	192	859	419	419		
PCB171 & 173	pg/g	6	6	100	63.6	325	155	155		
PCB172	pg/g	6	6	100	69	332	160	160		
PCB174	pg/g	6	6	100	133	775	370	370		
PCB175	pg/g	6	6	100	15.6	84.1	40	40		
PCB176	pg/g	6	6	100	32.4	209	97	97		
PCB177	pg/g	6	6	100	141	751	370	370		
PCB178	pg/g	6	6	100	112	549	290	290		
PCB179	pg/g	6	6	100	117	742	356	356		
PCB180 & 193	pg/g	6	6	100	727	3510	1740	1740		
PCB181	pg/g	6	6	100	3.79	15.2	7.03	7.03		
PCB182	pg/g	6	6	100	3.23	12.7	7.19	7.19		
PCB183 & 185	pg/g	6	6	100	274	1440	702	702		
PCB184	pg/g	6	6	100	2.9	4.02	3.3	3.3		
PCB186	pg/g	6	0	0				0.0894	0.157 U	0.214 U
PCB187	pg/g	6	6	100	549	2660	1350	1350		
PCB188	pg/g	6	5	83	1.72	19.2	7.94	6.78	1.92 U	1.92 U

Table 4-2. Summary Statistics of Chemical Concentrations for Tissue Samples.

					Detected Concentrations				Nondetected Concentrations	
Chemical	**Units**	**N**	**N Detected**	**% Detected**	**Minimum**	**Maximum**	**Mean Detected Value**	**Mean Detected Value or Half RL**	**Minimum RL**	**Maximum RL**
PCB189	pg/g	6	6	100	10.7	49.7	25	25		
PCB190	pg/g	6	6	100	59	268	130	130		
PCB191	pg/g	6	6	100	8.1	38.4	19	19		
PCB192	pg/g	6	0	0				0.179	0.313 U	0.429 U
PCB194	pg/g	6	6	100	100	435	220	220		
PCB195	pg/g	6	6	100	30.2	122	62.4	62.4		
PCB196	pg/g	6	6	100	36.1	159	80.2	80.2		
PCB197 & 200	pg/g	6	6	100	13.3	60.1	30	30		
PCB198 & 199	pg/g	6	6	100	111	430	220	220		
PCB201	pg/g	6	6	100	17.5	81.2	40.3	40.3		
PCB202	pg/g	6	6	100	55.7	201	114	114		
PCB203	pg/g	6	6	100	103	407	210	210		
PCB204	pg/g	6	3	50	0.241 J	0.383 J	0.297	0.382	0.256 U	2.14 U
PCB205	pg/g	6	6	100	3.49	14.1	7.3	7.3		
PCB206	pg/g	6	6	100	45	117	72	72		
PCB207	pg/g	6	6	100	7.89	18.9	12.2	12.2		
PCB208	pg/g	6	6	100	26.7	60.8	40	40		
PCB209	pg/g	6	6	100	73.7	93.9	84.9	84.9		
Total PCB Congeners (calc'd)	pg/g	6	6	100	31000 J	400000 J	110000	110000		
Pesticides										
2,4'-DDD	µg/kg	6	6	100	1.41	6.73	3.6	3.6		
2,4'-DDE	µg/kg	6	6	100	0.381	1.19	0.665	0.665		
2,4'-DDT	µg/kg	6	6	100	0.558	2.26	0.975	0.975		
4,4'-DDD	µg/kg	6	6	100	9.11	31.3	18.6	18.6		
4,4'-DDE	µg/kg	6	6	100	23	36.9	30	30		
4,4'-DDT	µg/kg	6	6	100	2.34	4.29	3.05	3.05		
Aldrin	µg/kg	6	6	100	0.65	2.07	1.5	1.5		
alpha-Endosulfan	µg/kg	6	6	100	0.167 J	0.621	0.29	0.29		
alpha-Hexachlorocyclohexane	µg/kg	6	6	100	0.016 J	13.5	2.3	2.3		
beta-Endosulfan	µg/kg	6	3	50	0.132 J	0.249 J	0.187	0.135	0.116 U	0.196 U
beta-Hexachlorocyclohexane	µg/kg	6	6	100	0.0079 J	1.13	0.2	0.2		
cis-Chlordane	µg/kg	6	6	100	2.33	9.37	4.61	4.61		
cis-Nonachlor	µg/kg	6	6	100	1.2	3.4	1.9	1.9		
delta-Hexachlorocyclohexane	µg/kg	6	4	67	0.00245 J	0.0808 J	0.023	0.016	0.0018 U	0.00342 U
Dieldrin	µg/kg	6	6	100	0.698	2.58	1.3	1.3		
Endosulfan sulfate	µg/kg	6	6	100	0.338	0.997	0.613	0.613		
Endrin	µg/kg	6	3	50	0.00784 J	0.0101 J	0.0093	0.008	0.00463 U	0.029 U
Endrin aldehyde	µg/kg	6	0	0				0.0235	0.0422 UJ	0.0574 UJ

Table 4-2. Summary Statistics of Chemical Concentrations for Tissue Samples.

					Detected Concentrations				Nondetected Concentrations	
Chemical	**Units**	**N**	**N Detected**	**% Detected**	**Minimum**	**Maximum**	**Mean Detected Value**	**Mean Detected Value or Half RL**	**Minimum RL**	**Maximum RL**
Endrin ketone	µg/kg	6	0	0				0.019	0.00358 U	0.0479 U
gamma-Hexachlorocyclohexane	µg/kg	6	3	50	0.0175 J	0.181 J	0.0722	0.0412	0.0106 U	0.0297 U
Heptachlor	µg/kg	6	4	67	0.00757 J	0.0245 J	0.016	0.013	0.011 U	0.0114 U
Heptachlor epoxide	µg/kg	6	6	100	0.0334 J	0.172 J	0.0678	0.0678		
Methoxychlor	µg/kg	6	0	0				0.0144	0.0174 U	0.0475 U
Oxychlordane	µg/kg	6	6	100	0.13 J	0.353 J	0.24	0.24		
Sum DDD (calc'd)	µg/kg	6	6	100	10.5	38	22	22		
Sum DDE (calc'd)	µg/kg	6	6	100	23	37.8	31	31		
Sum DDT (calc'd)	µg/kg	6	6	100	2.9	6.23	4.03	4.03		
Total Chlordane (calc'd)	µg/kg	6	6	100	8.7 J	29 J	15	15		
Total DDTs (calc'd)	µg/kg	6	6	100	37	81.4	57	57		
Total Endosulfan (calc'd)	µg/kg	6	6	100	0.635	1.87 J	1	1		
trans-Chlordane	µg/kg	6	6	100	1.74	6.51	3.31	3.31		
trans-Nonachlor	µg/kg	6	6	100	3.31	9.68	5.28	5.28		
Phenols										
2,4-Dimethylphenol	µg/kg	4	0	0				9.5	19 U	19 U
2-Methylphenol	µg/kg	4	0	0				4.1	8.2 U	8.2 U
4-Methylphenol	µg/kg	4	0	0				3.9	7.7 U	7.7 U
Pentachlorophenol	µg/kg	4	0	0				15	30 U	30 U
Phenol	µg/kg	4	0	0				23	45 U	45 U
Phthalates										
Bis(2-ethylhexyl) phthalate	µg/kg	4	4	100	120 J	170 J	140	140		
Butylbenzyl phthalate	µg/kg	4	0	0				3.7	7.3 U	7.3 U
Dibutyl phthalate	µg/kg	4	0	0				8	16 U	16 U
Diethyl phthalate	µg/kg	4	0	0				180	62 U	660 U
Dimethyl phthalate	µg/kg	4	0	0				3.9	7.7 U	7.7 U
Di-n-octyl phthalate	µg/kg	4	0	0				5.5	11 U	11 U
SVOCs										
1,2,4-Trichlorobenzene	µg/kg	4	0	0				4.9	9.8 U	9.8 U
1,2-Dichlorobenzene	µg/kg	4	0	0				5.5	11 U	11 U
1,3-Dichlorobenzene	µg/kg	4	0	0				5.5	11 U	11 U
1,4-Dichlorobenzene	µg/kg	4	0	0				5.5	11 U	11 U
Benzyl alcohol	µg/kg	4	0	0				11	22 U	22 U
Hexachlorobenzene	µg/kg	6	6	100	1.25	3.34	2	2		
Hexachlorobutadiene	µg/kg	6	0	0				3	0.0198 UJ	10 U
Hexachloroethane	µg/kg	4	0	0				10	20 U	20 U
N-Nitrosodiphenylamine	µg/kg	4	0	0				3.3	6.6 U	6.6 U

Table 4-2. Summary Statistics of Chemical Concentrations for Tissue Samples.

					Detected Concentrations				Nondetected Concentrations	
Chemical	**Units**	**N**	**N Detected**	**% Detected**	**Minimum**	**Maximum**	**Mean Detected Value**	**Mean Detected Value or Half RL**	**Minimum RL**	**Maximum RL**
Lamprey Macropthalmia										
Conventionals										
Lipids	percent	3	3	100	9.83	10	9.9	9.9		
Total solids	percent	3	3	100	26	29.6	28	28		
Dioxins Furans										
1,2,3,4,6,7,8-Heptachlorodibenzofuran	pg/g	3	3	100	1.4	1.81	1.6	1.6		
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	pg/g	3	3	100	9.16	11	10	10		
1,2,3,4,7,8,9-Heptachlorodibenzofuran	pg/g	3	0	0				0.12	0.18 U	0.281 U
1,2,3,4,7,8-Hexachlorodibenzofuran	pg/g	3	3	100	0.796 J	1.44	1.14	1.14		
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	pg/g	3	3	100	0.951 J	1.17 J	1.04	1.04		
1,2,3,6,7,8-Hexachlorodibenzofuran	pg/g	3	3	100	0.392 J	0.63 J	0.53	0.53		
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	pg/g	3	3	100	3.23	4.19	3.78	3.78		
1,2,3,7,8,9-Hexachlorodibenzofuran	pg/g	3	0	0				0.05	0.09 UJ	0.112 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	pg/g	3	3	100	0.98 J	1.31 J	1.1	1.1		
1,2,3,7,8-Pentachlorodibenzofuran	pg/g	3	3	100	0.515 J	1.45	0.886	0.886		
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	pg/g	3	3	100	1.33 J	1.87	1.59	1.59		
2,3,4,6,7,8-Hexachlorodibenzofuran	pg/g	3	0	0				0.207	0.306 U	0.492 U
2,3,4,7,8-Pentachlorodibenzofuran	pg/g	3	3	100	0.85 J	1.43	1.1	1.1		
2,3,7,8-Tetrachlorodibenzofuran	pg/g	3	3	100	1.18	4.06	2.32	2.32		
2,3,7,8-Tetrachlorodibenzo-p-dioxin	pg/g	3	3	100	0.64	0.819	0.73	0.73		
Total Dioxin Furans (calc'd)	pg/g	3	3	100	31 J	40 J	37	37		
Dioxin TEQ - Birds	pg/g	3	3	100	4.4	8.4	6.3	6.3		
Dioxin TEQ - Fish	pg/g	3	3	100	3.2	4.2	3.8	3.8		
Dioxin TEQ - Mammals	pg/g	3	3	100	3.3	4.4	4	4		
Dioxin TEQ - Mammals 2006	pg/g	3	3	100	3.1	4.2	3.8	3.8		
Total TEQ - Birds	pg/g	3	3	100	11	64	31	31		
Total TEQ - Fish	pg/g	3	3	100	3.2	4.4	4	4		
Total TEQ - Mammals	pg/g	3	3	100	4.6	9.5	7	7		
Total TEQ - Mammals 2006	pg/g	3	3	100	4.1	7.7	5.9	5.9		
Dioxin Furan Homologs										
Heptachlorodibenzofuran homologs	pg/g	3	3	100	5.02	6.39	5.72	5.72		
Heptachlorodibenzo-p-dioxin homologs	pg/g	3	3	100	9.45	11.5	10.5	10.5		
Hexachlorodibenzofuran homologs	pg/g	3	3	100	12.1	16.7	15	15		
Hexachlorodibenzo-p-dioxin homologs	pg/g	3	3	100	6	7.2	6.6	6.6		
Octachlorodibenzofuran	pg/g	3	0	0				0.338	0.629 U	0.735 U
Octachlorodibenzo-p-dioxin	pg/g	3	3	100	8.77	10.6	9.92	9.92		
Pentachlorodibenzofuran homologs	pg/g	3	3	100	10.6	12.4	11.7	11.7		

Table 4-2. Summary Statistics of Chemical Concentrations for Tissue Samples.

					Detected Concentrations				Nondetected Concentrations	
Chemical	**Units**	**N**	**N Detected**	**% Detected**	**Minimum**	**Maximum**	**Mean Detected Value**	**Mean Detected Value or Half RL**	**Minimum RL**	**Maximum RL**
Pentachlorodibenzo-p-dioxin homologs	pg/g	3	3	100	1.33	1.87	1.64	1.64		
Tetrachlorodibenzofuran homologs	pg/g	3	3	100	8.3	12	9.8	9.8		
Tetrachlorodibenzo-p-dioxin homologs	pg/g	3	3	100	0.999	1.4	1.2	1.2		
Metals										
Aluminum	mg/kg	3	3	100	2.3	3.6	3.1	3.1		
Antimony	mg/kg	3	1	33	0.003 J	0.003 J	0.003	0.0017	0.002 U	0.002 U
Arsenic	mg/kg	3	3	100	0.05 J	0.08 J	0.07	0.07		
Cadmium	mg/kg	3	2	67	0.002 J	0.002 J	0.002	0.0017	0.002 U	0.002 U
Chromium	mg/kg	3	2	67	0.13 J	0.27	0.2	0.15	0.1 U	0.1 U
Copper	mg/kg	3	3	100	3.08	6.2	4.5	4.5		
Lead	mg/kg	3	3	100	0.0303	0.0492	0.0375	0.0375		
Mercury	mg/kg	2	2	100	0.217	0.902	0.56	0.56		
Nickel	mg/kg	3	3	100	0.096	0.18	0.14	0.14		
Selenium	mg/kg	3	3	100	0.27	0.31	0.3	0.3		
Silver	mg/kg	3	3	100	0.0215	0.0354	0.0293	0.0293		
Zinc	mg/kg	3	3	100	19	26.4	24	24		
PAHs										
2-Methylnaphthalene	µg/kg	3	3	100	1.8 J	6.1	3.5	3.5		
Acenaphthene	µg/kg	3	3	100	0.83 J	21	7.9	7.9		
Acenaphthylene	µg/kg	3	3	100	1.8	3.9	2.8	2.8		
Anthracene	µg/kg	3	3	100	6	40	19	19		
Benzo(a)anthracene	µg/kg	3	0	0				0.45	0.8 U	1 U
Benzo(a)pyrene	µg/kg	3	0	0				0.11	0.22 U	0.22 U
Benzo(b)fluoranthene	µg/kg	3	1	33	0.25 J	0.25 J	0.25	0.15	0.2 U	0.2 U
Benzo(g,h,i)perylene	µg/kg	3	0	0				0.1	0.2 U	0.2 U
Benzo(k)fluoranthene	µg/kg	3	0	0				0.095	0.19 U	0.19 U
Chrysene	µg/kg	3	3	100	0.24 J	0.27 J	0.25	0.25		
Dibenzo(a,h)anthracene	µg/kg	3	0	0				0.14	0.28 U	0.28 U
Fluoranthene	µg/kg	3	3	100	3.6	35	14	14		
Fluorene	µg/kg	3	3	100	3.1	20	9.1	9.1		
Indeno(1,2,3-cd)pyrene	µg/kg	3	1	33	0.22 J	0.22 J	0.22	0.14	0.2 U	0.2 U
Naphthalene	µg/kg	3	3	100	2.6	3.6	3.1	3.1		
Phenanthrene	µg/kg	3	3	100	6.6	96	39	39		
Pyrene	µg/kg	3	3	100	2	20	8.3	8.3		
Total HPAHs (calc'd)	µg/kg	3	3	100	7 J	57 J	24	24		
Total LPAHs (calc'd)	µg/kg	3	3	100	28 J	190 J	86	86		
Total PAHs (calc'd)	µg/kg	3	3	100	35 J	240 J	110	110		

Table 4-2. Summary Statistics of Chemical Concentrations for Tissue Samples.

					Detected Concentrations				Nondetected Concentrations	
Chemical	**Units**	**N**	**N Detected**	**% Detected**	**Minimum**	**Maximum**	**Mean Detected Value**	**Mean Detected Value or Half RL**	**Minimum RL**	**Maximum RL**
PCB Congeners										
PCB TEQ - Birds	pg/g	3	3	100	6.3	55	24	24		
PCB TEQ - Fish	pg/g	3	3	100	0.071	0.34	0.18	0.18		
PCB TEQ - Mammals	pg/g	3	3	100	1.3	5.1	3	3		
PCB TEQ - Mammals 2006	pg/g	3	3	100	0.99	3.6	2.1	2.1		
PCB001	pg/g	3	2	67	6.74	29.3	18	18		
PCB002	pg/g	3	3	100	27.5	35.4 J	30.5	30.5		
PCB003	pg/g	3	3	100	4.37 J	20.4	9.76	9.76		
PCB004	pg/g	3	3	100	64.4 J	948	568	568		
PCB005	pg/g	3	3	100	1.04	7.89	4.22	4.22		
PCB006	pg/g	3	3	100	20.8	247	115	115		
PCB007	pg/g	3	3	100	3.45	31.3	17.1	17.1		
PCB008	pg/g	3	3	100	85.5	876	423	423		
PCB009	pg/g	3	3	100	4.89	51.3	25.8	25.8		
PCB010	pg/g	3	3	100	1.6	34.4	20	20		
PCB011	pg/g	3	3	100	2550	3280	2820	2820		
PCB012 & 013	pg/g	3	3	100	56.6	113	80.6	80.6		
PCB014	pg/g	3	3	100	1.76	2.62	2.11	2.11		
PCB015	pg/g	3	3	100	78.8	665	321	321		
PCB016	pg/g	3	3	100	121	945	490	490		
PCB017	pg/g	3	3	100	179	3250	2000	2000		
PCB018 & 030	pg/g	3	3	100	312	3080	1600	1600		
PCB019	pg/g	3	3	100	54	6030	2800	2800		
PCB020 & 028	pg/g	3	3	100	909	11400	5120	5120		
PCB021 & 033	pg/g	3	3	100	263	1770	1040	1040		
PCB022	pg/g	3	3	100	271	2300	1100	1100		
PCB023	pg/g	3	2	67	3.01	3.93	3.47	2.47	0.947 U	0.947 U
PCB024	pg/g	3	3	100	5.77	44.8	22.7	22.7		
PCB025	pg/g	3	3	100	72.7	711	480	480		
PCB026 & 029	pg/g	3	3	100	154	1430	778	778		
PCB027	pg/g	3	3	100	31.4	929	527	527		
PCB031	pg/g	3	3	100	720	6340	3100	3100		
PCB032	pg/g	3	3	100	125	2410	1340	1340		
PCB034	pg/g	3	3	100	6.31	73.3	33.5	33.5		
PCB035	pg/g	3	3	100	21.7	40.2	29.7	29.7		
PCB036	pg/g	3	3	100	12.4	18.3	15.4	15.4		
PCB037	pg/g	3	3	100	158	1500	700	700		
PCB038	pg/g	3	2	67	5.94	14.7	10.3	7.16	1.68 U	1.68 U

Table 4-2. Summary Statistics of Chemical Concentrations for Tissue Samples.

					Detected Concentrations				Nondetected Concentrations	
Chemical	**Units**	**N**	**N Detected**	**% Detected**	**Minimum**	**Maximum**	**Mean Detected Value**	**Mean Detected Value or Half RL**	**Minimum RL**	**Maximum RL**
PCB039	pg/g	3	3	100	10.4	110	50	50		
PCB040 & 041 & 071	pg/g	3	3	100	701	11200	5190	5190		
PCB042	pg/g	3	3	100	366	4900	2100	2100		
PCB043	pg/g	3	3	100	54.1	750	330	330		
PCB044 & 047 & 065	pg/g	3	3	100	1560	23500	13500	13500		
PCB045 & 051	pg/g	3	3	100	205	6640	3900	3900		
PCB046	pg/g	3	3	100	62.2	1150	602	602		
PCB048	pg/g	3	3	100	246	2920	1300	1300		
PCB049 & 069	pg/g	3	3	100	1090	14900	8900	8900		
PCB050 & 053	pg/g	3	3	100	172	10600	5160	5160		
PCB052	pg/g	3	3	100	2120	26000	15000	15000		
PCB054	pg/g	3	3	100	5.84	2820	1160	1160		
PCB055	pg/g	3	2	67	20.8	171	95.9	64.2	1.42 U	1.42 U
PCB056	pg/g	3	3	100	496	8320	3300	3300		
PCB057	pg/g	3	3	100	5.5	62.4	32	32		
PCB058	pg/g	3	2	67	5.45	44.6	25	16.9	1.37 U	1.37 U
PCB059 & 062 & 075	pg/g	3	3	100	126	1670	818	818		
PCB060	pg/g	3	3	100	242	3680	1470	1470		
PCB061 & 070 & 074 & 076	pg/g	3	3	100	2520	28000	12000	12000		
PCB063	pg/g	3	3	100	61.3	652	293	293		
PCB064	pg/g	3	3	100	696	9880	4070	4070		
PCB066	pg/g	3	3	100	1230	18300	7480	7480		
PCB067	pg/g	3	3	100	34.5	359	167	167		
PCB068	pg/g	3	3	100	15.8	136	90.9	90.9		
PCB072	pg/g	3	3	100	25.3	181	109	109		
PCB073	pg/g	3	3	100	6.6	463	190	190		
PCB077	pg/g	3	3	100	99.7	968	422	422		
PCB078	pg/g	3	0	0				0.622	0.621 U	1.74 U
PCB079	pg/g	3	3	100	25	155	81	81		
PCB080	pg/g	3	0	0				0.558	0.556 U	1.56 U
PCB081	pg/g	3	3	100	3.03	32.9	14	14		
PCB082	pg/g	3	3	100	230	1970	920	920		
PCB083 & 099	pg/g	3	3	100	1770	10400	6020	6020		
PCB084	pg/g	3	3	100	587	4520	2410	2410		
PCB085 & 116 & 117	pg/g	3	3	100	538	3270	1690	1690		
PCB086 & 087 & 097 & 108 & 119 & 125	pg/g	3	3	100	1660	11600	6160	6160		
PCB088 & 091	pg/g	3	3	100	392	3810	2450	2450		
PCB089	pg/g	3	3	100	27	333	140	140		

Table 4-2. Summary Statistics of Chemical Concentrations for Tissue Samples.

					Detected Concentrations				Nondetected Concentrations	
Chemical	**Units**	**N**	**N Detected**	**% Detected**	**Minimum**	**Maximum**	**Mean Detected Value**	**Mean Detected Value or Half RL**	**Minimum RL**	**Maximum RL**
PCB090 & 101 & 113	pg/g	3	3	100	2980	18200	12000	12000		
PCB092	pg/g	3	3	100	555	3220	2210	2210		
PCB093 & 095 & 098 & 100 & 102	pg/g	3	3	100	2050	16900	12000	12000		
PCB094	pg/g	3	3	100	14.4	697	330	330		
PCB096	pg/g	3	3	100	15.3	618	317	317		
PCB103	pg/g	3	3	100	29	1430	660	660		
PCB104	pg/g	3	3	100	0.787	231	98.8	98.8		
PCB105	pg/g	3	3	100	711	4330	2190	2190		
PCB106	pg/g	3	0	0				1.16	2.11 U	2.65 U
PCB107 & 124	pg/g	3	3	100	103	501	273	273		
PCB109	pg/g	3	3	100	206	1030	585	585		
PCB110 & 115	pg/g	3	3	100	2660	15500	9100	9100		
PCB111	pg/g	3	3	100	2.73	30.5	16.8	16.8		
PCB112	pg/g	3	0	0				0.549	0.522 U	1.88 U
PCB114	pg/g	3	3	100	52.3	326	166	166		
PCB118	pg/g	3	3	100	2200	9990	5700	5700		
PCB120	pg/g	3	3	100	13.6	84.3	52.9	52.9		
PCB121	pg/g	3	3	100	1.48	111	47.7	47.7		
PCB122	pg/g	3	3	100	24	178	84	84		
PCB123	pg/g	3	3	100	53.8	243	128	128		
PCB126	pg/g	3	3	100	8.51	29.2	17.4	17.4		
PCB127	pg/g	3	2	67	8.31	10.7	9.51	7.01	4.05 U	4.05 U
PCB128 & 166	pg/g	3	3	100	306	878	679	679		
PCB129 & 138 & 160 & 163	pg/g	3	3	100	2700	11500	7700	7700		
PCB130	pg/g	3	3	100	185	592	454	454		
PCB131	pg/g	3	3	100	26.8	122	84.3	84.3		
PCB132	pg/g	3	3	100	519	2890	1930	1930		
PCB133	pg/g	3	3	100	67.6	537	310	310		
PCB134 & 143	pg/g	3	3	100	127	746	490	490		
PCB135 & 151 & 154	pg/g	3	3	100	902	7760	4450	4450		
PCB136	pg/g	3	3	100	248	2950	1610	1610		
PCB137	pg/g	3	3	100	121	363	250	250		
PCB139 & 140	pg/g	3	3	100	47.5	204	148	148		
PCB141	pg/g	3	3	100	418	2640	1640	1640		
PCB142	pg/g	3	1	33	4.36	4.36	4.36	1.86	0.477 U	1.98 U
PCB144	pg/g	3	3	100	121	910	550	550		
PCB145	pg/g	3	3	100	0.966	5.08	3.24	3.24		
PCB146	pg/g	3	3	100	537	3040	1900	1900		

Table 4-2. Summary Statistics of Chemical Concentrations for Tissue Samples.

					Detected Concentrations				Nondetected Concentrations	
Chemical	**Units**	**N**	**N Detected**	**% Detected**	**Minimum**	**Maximum**	**Mean Detected Value**	**Mean Detected Value or Half RL**	**Minimum RL**	**Maximum RL**
PCB147 & 149	pg/g	3	3	100	1910	14800	8490	8490		
PCB148	pg/g	3	3	100	5.54	171	83.8	83.8		
PCB150	pg/g	3	3	100	4.34	206	95.2	95.2		
PCB152	pg/g	3	3	100	2.15	89.6	42	42		
PCB153 & 168	pg/g	3	3	100	3330	17400	10900	10900		
PCB155	pg/g	3	3	100	3.16	31	16	16		
PCB156 & 157	pg/g	3	3	100	233	780	580	580		
PCB158	pg/g	3	3	100	244	987	700	700		
PCB159	pg/g	3	3	100	9.48	59.1	35.3	35.3		
PCB161	pg/g	3	0	0				0.441	0.379 U	1.37 U
PCB162	pg/g	3	3	100	13.5	32.5	24.8	24.8		
PCB164	pg/g	3	3	100	108	557	360	360		
PCB165	pg/g	3	3	100	1.52	56.4	25.7	25.7		
PCB167	pg/g	3	3	100	113	340	260	260		
PCB169	pg/g	3	0	0				1.5	1.86 U	3.94 U
PCB170	pg/g	3	3	100	257	1400	840	840		
PCB171 & 173	pg/g	3	3	100	89.8	528	316	316		
PCB172	pg/g	3	3	100	94.9	509	308	308		
PCB174	pg/g	3	3	100	226	1490	886	886		
PCB175	pg/g	3	3	100	20.8	134	78.7	78.7		
PCB176	pg/g	3	3	100	47	365	210	210		
PCB177	pg/g	3	3	100	210	1310	770	770		
PCB178	pg/g	3	3	100	155	981	571	571		
PCB179	pg/g	3	3	100	187	1400	800	800		
PCB180 & 193	pg/g	3	3	100	943	5440	3240	3240		
PCB181	pg/g	3	3	100	5.04	15	11	11		
PCB182	pg/g	3	3	100	4.13	21.6	13.7	13.7		
PCB183 & 185	pg/g	3	3	100	361	2300	1300	1300		
PCB184	pg/g	3	3	100	4.37	6.36	5	5		
PCB186	pg/g	3	0	0				0.081	0.158 U	0.168 U
PCB187	pg/g	3	3	100	783	4530	2680	2680		
PCB188	pg/g	3	3	100	2.25	37.5	19.2	19.2		
PCB189	pg/g	3	3	100	13.8	67.5	42.2	42.2		
PCB190	pg/g	3	3	100	79.8	418	255	255		
PCB191	pg/g	3	3	100	10.9	65	39	39		
PCB192	pg/g	3	0	0				0.16	0.316 U	0.329 U
PCB194	pg/g	3	3	100	119	616	377	377		
PCB195	pg/g	3	3	100	36.8	183	113	113		

Table 4-2. Summary Statistics of Chemical Concentrations for Tissue Samples.

					Detected Concentrations				Nondetected Concentrations	
Chemical	**Units**	**N**	**N Detected**	**% Detected**	**Minimum**	**Maximum**	**Mean Detected Value**	**Mean Detected Value or Half RL**	**Minimum RL**	**Maximum RL**
PCB196	pg/g	3	3	100	44.9	243	151	151		
PCB197 & 200	pg/g	3	3	100	18.2	91.6	57.3	57.3		
PCB198 & 199	pg/g	3	3	100	149	645	424	424		
PCB201	pg/g	3	3	100	23.1	118	73.4	73.4		
PCB202	pg/g	3	3	100	76.4	291	197	197		
PCB203	pg/g	3	3	100	133	572	369	369		
PCB204	pg/g	3	3	100	0.308 J	0.521 J	0.429	0.429		
PCB205	pg/g	3	3	100	4.3	20.1	13	13		
PCB206	pg/g	3	3	100	54.3	132	103	103		
PCB207	pg/g	3	3	100	9.81	23.6	18	18		
PCB208	pg/g	3	3	100	34.3	65	55	55		
PCB209	pg/g	3	3	100	89.9	99.8	94.8	94.8		
Total PCB Congeners (calc'd)	pg/g	3	3	100	53000 J	380000 J	240000	240000		
Pesticides										
2,4'-DDD	µg/kg	3	3	100	4.14	14.1	8	8		
2,4'-DDE	µg/kg	3	3	100	0.748	1.38	1	1		
2,4'-DDT	µg/kg	3	3	100	1.22	2.79	1.83	1.83		
4,4'-DDD	µg/kg	3	3	100	25	54.7	36	36		
4,4'-DDE	µg/kg	3	3	100	38.1	39.9	39.2	39.2		
4,4'-DDT	µg/kg	3	3	100	6.12	8.65	7.08	7.08		
Aldrin	µg/kg	3	3	100	1.6	2.72	2	2		
alpha-Endosulfan	µg/kg	3	3	100	1.09	1.19	1.13	1.13		
alpha-Hexachlorocyclohexane	µg/kg	3	2	67	0.0467 J	0.064 J	0.055	0.044	0.0447 U	0.0447 U
beta-Endosulfan	µg/kg	3	3	100	0.403	0.483	0.439	0.439		
beta-Hexachlorocyclohexane	µg/kg	3	3	100	0.023 J	0.0386 J	0.029	0.029		
cis-Chlordane	µg/kg	3	3	100	7.59	9.24	8.42	8.42		
cis-Nonachlor	µg/kg	3	3	100	2.25	2.81	2.56	2.56		
delta-Hexachlorocyclohexane	µg/kg	3	3	100	0.00316 J	0.00392 J	0.00342	0.00342		
Dieldrin	µg/kg	3	3	100	5.36	6.38	5.74	5.74		
Endosulfan sulfate	µg/kg	3	3	100	1.06	1.31	1.2	1.2		
Endrin	µg/kg	3	2	67	0.019 J	0.0376 J	0.028	0.026	0.0416 U	0.0416 U
Endrin aldehyde	µg/kg	3	0	0				0.0216	0.0426 UJ	0.0444 UJ
Endrin ketone	µg/kg	3	1	33	0.00382 J	0.00382 J	0.00382	0.0155	0.0426 U	0.0428 U
gamma-Hexachlorocyclohexane	µg/kg	3	3	100	0.0569 J	0.0696 J	0.0636	0.0636		
Heptachlor	µg/kg	3	3	100	0.0379 J	0.049 J	0.044	0.044		
Heptachlor epoxide	µg/kg	3	3	100	0.242	0.326	0.28	0.28		
Methoxychlor	µg/kg	3	3	100	0.111 J	0.238	0.159	0.159		
Oxychlordane	µg/kg	3	3	100	0.615	0.776	0.669	0.669		

Table 4-2. Summary Statistics of Chemical Concentrations for Tissue Samples.

					Detected Concentrations				Nondetected Concentrations	
Chemical	**Units**	**N**	**N Detected**	**% Detected**	**Minimum**	**Maximum**	**Mean Detected Value**	**Mean Detected Value or Half RL**	**Minimum RL**	**Maximum RL**
Sum DDD (calc'd)	µg/kg	3	3	100	29	68.8	44	44		
Sum DDE (calc'd)	µg/kg	3	3	100	39	41	40.2	40.2		
Sum DDT (calc'd)	µg/kg	3	3	100	7.34	11.4	8.9	8.9		
Total Chlordane (calc'd)	µg/kg	3	3	100	22.6	27.1	25	25		
Total DDTs (calc'd)	µg/kg	3	3	100	77	121	93	93		
Total Endosulfan (calc'd)	µg/kg	3	3	100	2.68	2.82	2.76	2.76		
trans-Chlordane	µg/kg	3	3	100	5.49	6.83	5.96	5.96		
trans-Nonachlor	µg/kg	3	3	100	6.58	7.88	7.35	7.35		
Phenols										
2,4-Dimethylphenol	µg/kg	1	0	0				9.5	19 U	19 U
2-Methylphenol	µg/kg	1	0	0				4.1	8.2 U	8.2 U
4-Methylphenol	µg/kg	1	0	0				3.9	7.7 U	7.7 U
Pentachlorophenol	µg/kg	1	1	100	38 J	38 J	38	38		
Phenol	µg/kg	1	0	0				23	45 U	45 U
Phthalates										
Bis(2-ethylhexyl) phthalate	µg/kg	1	1	100	160 J	160 J	160	160		
Butylbenzyl phthalate	µg/kg	1	0	0				3.7	7.3 U	7.3 U
Dibutyl phthalate	µg/kg	1	0	0				8	16 U	16 U
Diethyl phthalate	µg/kg	1	0	0				500	990 U	990 U
Dimethyl phthalate	µg/kg	1	0	0				3.9	7.7 U	7.7 U
Di-n-octyl phthalate	µg/kg	1	0	0				5.5	11 U	11 U
SVOCs										
1,2,4-Trichlorobenzene	µg/kg	1	0	0				4.9	9.8 U	9.8 U
1,2-Dichlorobenzene	µg/kg	1	0	0				5.5	11 U	11 U
1,3-Dichlorobenzene	µg/kg	1	0	0				5.5	11 U	11 U
1,4-Dichlorobenzene	µg/kg	1	0	0				5.5	11 U	11 U
Benzyl alcohol	µg/kg	1	0	0				11	22 U	22 U
Hexachlorobenzene	µg/kg	3	3	100	3.75	6.02	4.8	4.8		
Hexachlorobutadiene	µg/kg	3	1	33	0.0962 J	0.0962 J	0.1	2.6	10 U	10 U
Hexachloroethane	µg/kg	1	0	0				10	20 U	20 U
N-Nitrosodiphenylamine	µg/kg	1	0	0				3.3	6.6 U	6.6 U

Appendix A. Data Quality Summary

PORTLAND HARBOR RI/FS

DATA QUALITY SUMMARY

FOR THE

ROUND 3 LAMPREY (*LAMPETRA* SP.) TISSUE DATA REPORT

DRAFT

DRAFT DOCUMENT: DO NOT QUOTE OR CITE
This document is currently under review by US EPA and its federal

August 24, 2007

Prepared for

The Lower Willamette Group

Prepared by

Integral Consulting Inc.

TABLE OF CONTENTS

LIST OF TABLES i
LIST OF ACRONYMS ii
1. INTRODUCTION 1
2. DATA QUALITY AND USABILITY 2
2.1. Data Validation 2
2.2. Data Quality 3
2.2.1. Reported Detection Limits 3
2.2.2. Homogenization Quality Control Samples 4
2.2.3. Laboratory Quality Control Samples 5
2.2.4. Summary of Qualified Data 5
3. REFERENCES 6

LIST OF TABLES

Table A-1. Laboratory Methods for Round 3 Lamprey Tissue Samples
Table A-2. Percent Completeness by Parameter Group
Table A-3. Control Limits for Surrogate Recovery
Table A-4. Control Limits for Laboratory Control Samples
Table A-5. Data Validation Qualifiers and Definitions
Table A-6. Summary of Qualified Data by Parameter Group
Table A-7. Expected and Reported Detection Limits
Table A-8. Results for Homogenization Split Samples

DRAFT DOCUMENT: DO NOT QUOTE OR CITE
This document is currently under review by US EPA and its federal

LIST OF ACRONYMS

CAS	Columbia Analytical Services
CLP	Contract Laboratory
DQOs	data quality objectives
EPA	U.S. Environmental Protection Agency
FSP	field sampling plan
FSR	field sampling report
GC/ECD	gas chromatography/electron capture detection
HRGC/HRMS	high resolution gas chromatography/ high resolution 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
PAHs	polycyclic aromatic hydrocarbons
PARCC	precision, accuracy, representativeness, completeness, comparability
PCB	polychlorinated biphenyl
PCDD/Fs	polychlorinated dibenzo-p-dioxins/furans
PSEP	Puget Sound Estuary Program
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
RDL	reported detection limit
RI/FS	remedial investigation and feasibility study
RPD	relative percent difference
SOP	standard operating procedures
STL	Severn Trent Laboratories
SVOCs	semivolatile organic compounds
VOCs	volatile organic compounds

DRAFT DOCUMENT: DO NOT QUOTE OR CITE
This document is currently under review by US EPA and its federal

1. INTRODUCTION

This Round 3 Lamprey (*Lampetra sp.)* Tissue Data Report summarizes the results for lamprey ammocoete and macropthalmia samples collected from September 20 through October 16, 2006. A detailed description of the Round 3 collection effort is included in the field sampling report (FSR) (Windward 2006a). Samples were composited and analyses selected as described in Section 3.1 in the main body of this report.

Chemical analyses of the lamprey tissue samples were performed by two laboratories: Columbia Analytical Services, Inc. of Kelso, Washington (CAS), and Axys Analytical Services, Ltd. of Sidney, BC, Canada (Axys). CAS composited and homogenized the tissue samples and completed analyses for phthalates and selected semivolatile organic compounds, polycyclic aromatic hydrocarbons, mercury and other metals, butyltin compounds, and percent moisture. Axys completed analyses of lipids, organochlorine pesticides, polychlorinated biphenyl congeners, and dioxins and furans.

Tissue sample analysis and QA/QC procedures were completed as described in the Round 2 QAPP and the associated Addendum 6 (Integral and Windward 2004, 2005). The laboratories and methods of analysis for the tissue samples are included in Table A-1. Deviations from the Round 2 QAPP and the associated Addendum 6 are noted in Section 3.4 of the main body of this report.

DRAFT DOCUMENT: DO NOT QUOTE OR CITE
This document is currently under review by US EPA and its federal

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) and QAPP Addendum 6 (Integral and Windward 2005). The precision, accuracy, representativeness, and comparability of the data were assessed during data validation, as described in Section 2.1 below and in the Round 2 QAPP. Completeness is calculated by comparing the total number of acceptable data (nonrejected data) to the total number of data points generated. Completeness for the data is summarized by parameter group in Table A-2. Completeness was greater than 99% overall, which exceeds the QAPP completeness objective of 95%.

2.1. DATA VALIDATION

Data validation was conducted as specified in the Round 2 QAPP and is summarized in Section 3.3 of the main report. The inorganic, organic, PCB congener, and PCDD/F data were validated in accordance with guidance specified by the USEPA Contract Laboratory Program (CLP) *National Functional Guidelines for Inorganic and Organic Data Review* (EPA 1994b, 1999b, 2002b), by U.S. Environmental Protection Agency (EPA) Region 10 standard operating procedures (SOPs) for validation of PCB congener data and PCDD/F data (EPA 1995, 1996), and by *Guidance on Environmental Data Verification and Validation* (EPA 2002a). Modifications were made to the Functional Guidelines to accommodate quality assurance/quality control (QA/QC) requirements of the non-Contract Laboratory Program methods that were used for this project.

Data validation was completed by EcoChem (Seattle, WA). All of the lamprey data were fully validated, as described in the Round 2 QAPP, because only one data package was generated for each analysis for these samples. The following deliverables were reviewed during 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 and laboratory control sample duplicate analyses, surrogate recoveries, and other method specific quality control samples (e.g., serial dilutions for inductively coupled plasma analyses)
- Results for field quality control samples (i.e., equipment blanks, field duplicates, and field split samples)
- Analytical results for the tissue samples.

DRAFT DOCUMENT: DO NOT QUOTE OR CITE
This document is currently under review by US EPA and its federal

In addition to review and assessment of the documentation identified above, the full validation included verification of calculations of reported concentrations for the field and QC samples, verification of intermediate transcriptions, and review of instrument data such as mass spectra to verify analyte identification procedures.

Data qualifiers were assigned during data validation if applicable control limits were not met, in accordance with the EPA data validation guidelines (EPA 1994b, 1995, 1996, 1999b, 2002b) and the quality control requirements included in the referenced methods. The control limits for surrogate recoveries, laboratory control samples, and precision 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 in Appendix B of this report.

2.2. DATA QUALITY

Detailed information on the data quality issues and data validation qualifiers for each parameter group for each data package is included in the data validation reports (Appendix B). A summary of the qualified data by parameter group, with the reasons for qualification, is included in Table A-6. The SCRA database files, Appendix C of this report (provided on CD), includes final qualifiers applied after validation. A table of definitions for the qualifier reason codes is also provided in Table A-5.

The discussion below includes a comparison of the reported detection limits to the target detection limits provided in QAPP Addendum 6 (Integral and Windward 2005), followed by a summary of the qualified data for each parameter group and a discussion of the usability of the data.

2.2.1. Reported Detection Limits

Tissue data for Round 2 and Round 3 of the Portland Harbor remedial investigation and feasibility study (RI/FS) were reported to the method detection limit (MDL) in most cases. When an analyte was not detected, the MDL was reported, adjusted for sample mass used and final extract volume. Sample-specific detection limits were reported for all high resolution gas chromatography/high resolution mass spectrometry (HRGC/HRMS) analyses (PCB congeners, PCDD/Fs and pesticides), as specified in the respective method protocols (EPA methods 1613B and 1668A [EPA 1994a; 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 MDLs and method reporting limits (MRLs) were elevated because of matrix interference or 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 nondetects, as applicable to each sample and analyte. Table A-7 provides the lowest MDLs included in the Round 2 QAPP Addendum 6

DRAFT DOCUMENT: DO NOT QUOTE OR CITE
This document is currently under review by US EPA and its federal

(Integral and Windward 2005) and the minimum and maximum RDL attained by the laboratories for each analyte. Because limited tissue mass was available for some analyses, elevated detection limits were expected for selected parameter groups for these tissue samples. Generally, for the results that were generated using the subsample mass identified in the QAPP, the detection limits reported by the laboratories for the tissue samples were similar to the detection limit goals established in the QAPP. RDLs for PAHs were generally higher than MDLs listed in the QAPP because 5 g of sample were extracted instead of the usual 10 g to accommodate the small sample sizes, with a resultant increase in detection limits by a factor of 2. In addition, MDLs used at the time of sample analysis had been updated by CAS and were higher than those provided in the QAPP, which reflected MDLs in effect in 2005.

2.2.2. Homogenization Quality Control Samples

Quality control samples were prepared at the laboratories to monitor the bias and precision of tissue homogenization and the analytical procedures. Quality control samples included a homogenization split sample and a homogenization blank.

The sample collected from station LW3-LT023c was divided into two jars, as described in sections 3.4 and 3.5 of the R3 lamprey FSR (Windward 2006a). These samples were subsequently composited into a single sample, homogenized, and used to create post-homogenization splits in accordance with EPA's compositing and analysis approach (EPA 2006a, 2007). This procedure allowed the completion of all analyses in duplicate at this location. The split samples are identified as LW3-LTAComp5-1 and LW3-LTAComp5-2. Results for these homogenization split samples are summarized in Table A-8.

The comparability of the split sample results was assessed by calculating the relative percent difference (RPD) of the results. A control limit of 50 RPD is recommended by the Puget Sound Estuary Program (PSEP) and the Puget Sound Ambient Monitoring Program (PSEP 1997) for analytical precision for organic analyses. Because there is no standard control limit for comparison of field replicate results, an RPD of 50 was established as a conservative target control limit for detected results greater than 5 times the reporting limit. Greater variability is expected for results within 5-10 times the reporting limit because the background signal variations (i.e., "noise") are greater relative to the lower analyte levels. The precision of results was acceptable. None of the tissue data were qualified based on the split sample results.

A homogenization blank was generated at CAS in connection with tissue sample preparation analyzed for the same chemicals as the lamprey samples. Due to the extended time period between the creation of the homogenization blanks and final authorization of the analysis scheme for the associated tissue sample, the subsequent analysis of the homogenization blank occurred past standard holding times for most organic analyses and mercury. Results for all organics in the homogenization blank except PCBs and dioxins/furans were qualified as estimated by EcoChem as described

DRAFT DOCUMENT: DO NOT QUOTE OR CITE
This document is currently under review by US EPA and its federal

in their data validation reports (Appendix B). None of the tissue data were qualified because of holding time exceedances in the associated homogenization blank.

2.2.3. Laboratory Quality Control Samples

Laboratory quality control samples were prepared in accordance with the Round 2 QAPP and cited methods to monitor the bias and precision of the sample analysis procedures. Insufficient tissue mass was available to allow preparation of matrix spike/matrix spike duplicate (MS/MSD) or laboratory duplicate samples. Precision was measured using a laboratory control sample/laboratory control sample duplicate. The control limits for surrogate spikes and laboratory control samples are summarized in Tables A-3 and A-4. The evaluation of these QC samples is included as part of the data validation as described in section 2.1 above. Selected results for the lamprey samples were qualified based on results of the laboratory control samples or surrogate recoveries as summarized in Table A-6.

2.2.4. 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. Rejected data are not usable for any purpose. Concentrations associated with rejected data have been removed from the database, and an “R” qualifier is retained to flag the results that were removed.

The overall completeness goal of 95 percent was met for the tissue samples. Selected PCB congener data in two samples were rejected due to poor surrogate recoveries. Four results for hexachlorobutadiene were rejected due poor surrogate recoveries. These results were reported by Axys in connection with the pesticide analysis. Hexachloro-butadiene results were available from CAS in four of the six samples with rejected hexachlorobutadiene results from Axys. Any issues related to rejected data will be addressed in subsequent interpretive reports.

The precision and accuracy of the R3 lamprey data was acceptable and the tissue data are usable for all project purposes. Overall, the data quality was acceptable and will meet program objectives and goals for the remedial investigation and feasibility study.

DRAFT DOCUMENT: DO NOT QUOTE OR CITE
This document is currently under review by US EPA and its federal

3. REFERENCES

EPA. 1994a. Method 1613, tetra- through octa-chlorinated dioxins and furans by isotope dilution HRGC/HRMS. US Environmental Protection Agency, Washington, DC.

EPA. 1994b. USEPA contract laboratory program national functional guidelines for inorganic data review. EPA Publication No. 540/R-94/012. Office of Solid Waste and Emergency Response, US Environmental Protection Agency, Washington, DC.

EPA. 1995. EPA Region 10 SOP For the validation of Method 1668 toxic, dioxin-like, PCB data. Revision 1.0. Environmental Services Division, US Environmental Protection Agency, Region 10, Seattle, WA.

EPA. 1996. EPA Region 10 SOP for the validation of polychlorinated dibenzodioxin (PCDD) and polychlorinated dibenzofuran (PCDF) data. Revision 2.0. Environmental Services Division, US Environmental Protection Agency, Region 10, Seattle, WA.

EPA. 1999a. Method 1668, Revision A: chlorinated biphenyl congeners in water, soil, sediment, and tissue by HRGC/HRMS. EPA-821-R-00-002. US Environmental Protection Agency, Washington, DC.

EPA. 1999b. USEPA contract laboratory program national functional guidelines for organic data review. EPA-540/R-99/008. Office of Emergency and Remedial Response, US Environmental Protection Agency, Washington, DC.

EPA. 2002a. Guidance on environmental data verification and data validation. EPA QA/G-8. EPA/240/R-02/004. Office of Environmental Information, US Environmental Protection Agency, Washington, DC.

EPA. 2002b. USEPA contract laboratory program national functional guidelines for inorganic data review. EPA 540-R-01-008. Office of Emergency and Remedial Response, US Environmental Protection Agency, Washington, DC.

EPA. 2006a. E-mail and letter to Lower Willamette Group from C. Humphrey and E. Blischke dated November 27, 2006 regarding Portland Harbor Round 3 sampling for lamprey ammocoete tissue, alternate proposal with attached Excel file. US Environmental Protection Agency Region 10, Oregon Operations Office, Portland, OR.

EPA. 2006b. Test methods for evaluating solid waste -- physical/chemical methods. SW-846 [online]. US Environmental Protection Agency, Washington, DC. [Cited 4/17/06]. Available from: http://www.epa/sw-846/main.htm.

EPA. 2007. E-mail and letter to Lower Willamette Group from C. Humphrey and E. Blischke dated January 16, 2007 regarding Portland Harbor Round 3 sampling for lamprey ammocoete tissue. Reaffirmation of November 27, 2006 proposed analysis. US Environmental Protection Agency Region 10, Oregon Operations Office, Portland, OR.

Integral, Windward. 2004. Portland Harbor RI/FS: Round 2 quality assurance project plan. Prepared for Lower Willamette Group. Integral Consulting, Inc., Mercer Island, WA and Windward Environmental LLC, Seattle, WA.

Integral, Windward. 2005. Portland Harbor RI/FS: Round 2 quality assurance project plan addendum 6: sampling of benthic invertebrate tissue. IC-05-0032. Prepared for the Lower Willamette Group. Integral Consulting, Inc., Mercer Island, WA; Windward Environmental, LLC, Seattle, WA.

Krone CA, Brown DW, Burrows DG, Bogar RG, Chan S, Varanasi U. 1988. A method for analysis of butyltin species and measurement of butyltins in sediment and English sole livers from Puget Sound. Mar Environ Res 27:1-18.

PSEP. 1997. Recommended quality assurance and quality control guidelines for the collection of environmental data in Puget Sound. Prepared for Puget Sound Estuary Program, US Environmental Protection Agency Region 10. Puget Sound Water Quality Action Team, Olympia, WA.

Windward. 2006a. Portland Harbor RI/FS Round 3 sampling for lamprey (*Lampetra* sp.) tissue field sampling report. Prepared for the Lower Willamette Group. Windward Environmental LLC, Seattle, WA.

Windward. 2006b. Portland Harbor RI/FS. Field sampling plan: round 3 sampling for lamprey (*Lampetra* sp.) ammocoete tissue. WE-06-0003. Prepared for Lower Willamette Group. Windward Environmental LLC, Seattle, WA.

Windward, Integral. 2005. Portland Harbor RI/FS. Field sampling plan: Round 2 sampling of benthic invertebrate tissue. WE-05-0008. Prepared for Lower Willamette Group. Windward Environmental LLC, Seattle, WA; Integral Consulting, Inc., Mercer Island, WA.

Windward, Integral. 2006. Portland Harbor RI/FS. Round 2 sampling of benthic invertebrate tissue: field sampling report. WE-06-0001. Prepared for Lower Willamette Group. Windward Environmental LLC, Seattle, WA; Integral Consulting, Inc., Mercer Island, WA.

Table A-1. Laboratory Methods for Round 3 Lamprey Tissue Samples.

Analysis	Laboratory	Sample Preparation		Quantitative Analysis	
		Protocol	Procedure	Protocol	Procedure
Percent moisture	CAS	CAS SOP	Freeze dry	CAS SOP	Balance
Metals	CAS				
Aluminum, antimony, arsenic, cadmium, copper, lead, nickel, silver, zinc		EPA 3050B/PSEP	Acid digestion	EPA 6020	ICP/MS
Chromium		EPA 3050B/PSEP	Acid digestion	EPA 6010B	ICP/AES
Selenium		EPA 3050B/PSEP	Acid digestion	EPA 7740	GFAA
Mercury		EPA 7470	Acid digestion/oxidation	EPA 7470	CVAA
Butyltin compounds	CAS	Krone et al. 1988 Krone et al. 1988	Solvent extraction Derivatization	Krone et al. 1988	GC/FPD
Selected SVOCs (includes phenols and phthalate esters)	CAS	EPA 3541 EPA 3640A	Automated Soxhlet extraction Gel permeation chromatography	EPA 8270C-SIM	GC/MS-SIM
Polycyclic aromatic hydrocarbons	CAS	EPA 3541 EPA 3640A EPA 3630C	Automated Soxhlet extraction Gel permeation chromatography Silica gel cleanup	EPA 8270C-SIM	GC/MS-SIM
Lipids	Axys	EPA 3540C[a]	Soxhlet extraction	Axys SOP	Balance
PCB congeners [b]	Axys	EPA 1668A	Soxhlet extraction Gel permeation chromatography Acid/base silica column Florisil® chromatography 1% deactivated basic Alumina	EPA 1668A	HRGC/HRMS

Table A-1. Laboratory Methods for Round 3 Lamprey Tissue Samples.

Analysis	Laboratory	Sample Preparation		Quantitative Analysis	
		Protocol	Procedure	Protocol	Procedure
Chlorinated dioxins and furans	Axys	EPA 1613B	Soxhlet extraction Gel permeation chromatography Acid/base silica column Florisil® chromatography Carbon celite Layered silver nitrate/acid/base silica 1% deactivated basic Alumina	EPA 1613B	HRGC/HRMS
Organochlorine Pesticides and selected SVOCs	Axys	Axys SOP	Soxhlet extraction Gel permeation chromatography Acid/base silica column Florisil® chromatography 1% deactivated basic Alumina		HRGC/HRMS

CAS - Columbia Analytical Services
CVAA - cold vapor atomic absorption spectrometry
EPA - U.S. Environmental Protection Agency
GC/ECD - gas chromatography/electron capture detection
GC/FPD - gas chromatography/flame photometric detection
GC/MS - gas chromatography/mass spectrometry
GFAA - graphite furnace atomic absorption spectrometry
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
PSEP - Puget Sound Estuary Program
SIM - selected ion monitoring
SOP - Standard operating procedure
SVOC - semivolatile organic compound

Table A-2. Percent Completeness by Parameter Group.

Analysis	Total # of Data Points[a]	Number of Data Points		Completeness (%)
		Accepted	Rejected	
Conventionals [b]	17	17	0	100
Metals	94	94	0	100
Butyltins	4	4	0	100
SVOCs	63	57	6	90.5
Phenols	25	25	0	100
Phthalates	30	30	0	100
PAHs	119	119	0	100
Organochlorine pesticides	234	234	0	100
PCB congeners	1431	1426	5	99.7
Dioxins/furans	135	135	0	100
Dioxin/furan homologs	90	90	0	100
Round 3 Lamprey Tissue Sampling Project Total	**2242**	**2231**	**11**	**>99**

Notes:

[a] Totals include replicate(split) samples and exclude field blanks.

[b] Lipids, Total Solids.

Table A-3. Control Limits for Surrogate Recovery.

Analysis	CAS Number	Percent Recovery
Butyltins		
Tripropyltin hydride	761-44-4	10 - 114
Semivolatile Organic Compounds		
2,4,6-Tribromophenol	118-79-6	47 - 152
2-Fluoro-1,1'-biphenyl	321-60-8	43 - 133
Nitrobenzene-d5	4165-60-0	35 - 128
Phenol-d6	13127-88-3	43 - 133
p-Terphenyl-d14	1718-51-0	49 - 137
Polycyclic Aromatic Hydrocarbons		
Fluoranthene-d10	93951-69-0	48 - 108
Fluorene-d10	81103-79-9	40 - 97
Organochlorine pesticides		
^{13}C-1,2,3-Trichlorobenzene	C87-61-6	20 - 130
^{13}C-2,4'-DDE	C3424-82-6	40 - 150
^{13}C-2,4'-DDT	C789-02-6	40 - 150
^{13}C-4,4'-DDE	C72-55-9	40 - 150
^{13}C-4,4'-DDT	C50-29-3	40 - 150
^{13}C-Aldrin	C309-00-2	30 - 150
^{13}C-alpha-Endosulfan	C959-98-8	30 - 150
^{13}C-beta-Endosulfan	C33213-65-9	30 - 150
^{13}C-beta-Hexachlorocyclohexane	C319-85-7	30 - 150
^{13}C-cis-Nonachlor	C5103-73-1	30 - 150
^{13}C-delta-Hexachlorocyclohexane	C319-86-8	30 - 150
^{13}C-Dieldrin	C60-57-1	30 - 150
^{13}C-Endrin	C72-20-8	30 - 150
^{13}C-gamma-Hexachlorocyclohexane	C58-89-9	30 - 150
^{13}C-Heptachlor	C76-44-8	30 - 150
^{13}C-Heptachlor epoxide	C1024-57-3	30 - 150
^{13}C-Hexachlorobenzene	C118-74-1	20 - 150
^{13}C-Methoxychlor	C72-43-5	30 - 150
^{13}C-Oxychlordane	C27304-13-8	30 - 200
^{13}C-trans-Chlordane	C5103-74-2	30 - 200
^{13}C-trans-Nonachlor	C39765-80-5	30 - 150
PCB congeners		
PCB001L	234432-85-0	15 - 150
PCB003L	208263-77-8	15 - 150
PCB004L	234432-86-1	25 - 150
PCB015L	208263-67-6	25 - 150
PCB019L	234432-87-2	25 - 150
PCB028L	208263-76-7	30 - 135
PCB037L	208263-79-0	25 - 150

Table A-3. Control Limits for Surrogate Recovery.

Analysis	CAS Number	Percent Recovery
PCB054L	234432-88-3	25 - 150
PCB077L	105600-23-5	25 - 150
PCB081L	208461-24-9	25 - 150
PCB104L	234432-89-4	25 - 150
PCB105L	208263-62-1	25 - 150
PCB111L	235416-29-2	30 - 135
PCB114L	208263-63-2	25 - 150
PCB118L	104130-40-7	25 - 150
PCB123L	208263-64-3	25 - 150
PCB126L	208263-65-4	25 - 150
PCB155L	234432-90-7	25 - 150
PCB156L & 157L	PCB156L_157L	25 - 150
PCB167L	208263-69-8	25 - 150
PCB169L	208263-70-1	25 - 150
PCB170L	160901-80-4	25 - 150
PCB178L	232919-67-4	30 - 135
PCB180L	160901-82-6	25 - 150
PCB188L	234432-91-8	25 - 150
PCB189L	208263-73-4	25 - 150
PCB202L	105600-26-8	25 - 150
PCB205L	234446-64-1	25 - 150
PCB206L	208263-75-6	25 - 150
PCB208L	234432-92-9	25 - 150
PCB209L	105600-27-9	25 - 150
Dioxin/Furans		
^{13}C-1,2,3,4,6,7,8-Heptachlorodibenzofuran	109719-84-8	28 - 143
^{13}C-1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	109719-83-7	23 - 140
^{13}C-1,2,3,4,7,8,9-Heptachlorodibenzofuran	109719-94-0	26 - 138
^{13}C-1,2,3,4,7,8-Hexachlorodibenzofuran	114423-98-2	26 - 152
^{13}C-1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	109719-80-4	32 - 141
^{13}C-1,2,3,6,7,8-Hexachlorodibenzofuran	116843-03-9	26 - 123
^{13}C-1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	109719-81-5	28 - 130
^{13}C-1,2,3,7,8,9-Hexachlorodibenzofuran	116843-04-0	29 - 147
^{13}C-1,2,3,7,8-Pentachlorodibenzofuran	109719-77-9	24 - 185
^{13}C-1,2,3,7,8-Pentachlorodibenzo-p-dioxin	109719-79-1	25 - 181
^{13}C-2,3,4,6,7,8-Hexachlorodibenzofuran	116843-05-1	28 - 136
^{13}C-2,3,4,7,8-Pentachlorodibenzofuran	116843-02-8	21 - 178
^{13}C-2,3,7,8-Tetrachlorodibenzofuran	89059-46-1	24 - 169
^{13}C-2,3,7,8-Tetrachlorodibenzo-p-dioxin	76523-40-5	25 - 164
^{13}C-Octachlorodibenzo-p-dioxin	114423-97-1	17 - 157
^{37}Cl-2,3,7,8-Tetrachlorodibenzo-p-dioxin	85508-50-5	35 - 197

Table A-4. Control Limits for Laboratory Control Samples

Analysis	CAS #	Lab	LCS and LCS Duplicate Recovery (percent)	Relative Percent Difference
Metals				
Aluminum	7429-90-5	CAS	18.2 - 31.9	--
Antimony	7440-36-0	CAS	--	--
Arsenic	7440-38-2	CAS	7.76 - 22.9	--
Cadmium	7440-43-9	CAS	15 - 24	--
Chromium	7440-47-3	CAS	23.4 - 48.2	--
Copper	7440-50-8	CAS	1.74 - 38.6	--
Lead	7439-92-1	CAS	0.02 - 0.437	--
Mercury	7439-97-6	CAS	2.58 - 4.21	--
Nickel	7440-02-0	CAS	1.9 - 27	--
Selenium	7782-49-2	CAS	5.26 - 9.05	--
Silver	7440-22-4	CAS	0.9 - 1.52	--
Zinc	7440-66-6	CAS	20.3 - 107	--
Butyltins				
Butyltin ion	78763-54-9	CAS	10 - 115	40
Dibutyltin ion	14488-53-0	CAS	10 - 94	40
Tetrabutyltin	1461-25-2	CAS	10 - 110	40
Tributyltin ion	36643-28-4	CAS	10 - 97	40
Phenols				
2,4-Dimethylphenol	105-67-9	CAS	10 - 107	40
2-Methylphenol	95-48-7	CAS	45 - 113	40
4-Methylphenol	106-44-5	CAS	45 - 115	40
Pentachlorophenol	87-86-5	CAS	27 - 160	40
Phenol	108-95-2	CAS	52 - 118	40
Phthalates				
Bis(2-ethylhexyl) phthalate	117-81-7	CAS	39 - 174	40
Butylbenzyl phthalate	85-68-7	CAS	56 - 145	40
Dibutyl phthalate	84-74-2	CAS	60 - 146	40
Diethyl phthalate	84-66-2	CAS	61 - 133	40
Dimethyl phthalate	131-11-3	CAS	60 - 120	40
Di-n-octyl phthalate	117-84-0	CAS	49 - 156	40
Semivolatile Organic Compounds				
1,2,4-Trichlorobenzene	120-82-1	CAS	41 - 114	40
1,2-Dichlorobenzene	95-50-1	CAS	41 - 117	40
1,3-Dichlorobenzene	541-73-1	CAS	41 - 112	40
1,4-Dichlorobenzene	106-46-7	CAS	41 - 109	40
Benzyl alcohol	100-51-6	CAS	30 - 122	40
Hexachlorobenzene	118-74-1	CAS	59 - 124	40
Hexachlorobutadiene	87-68-3	CAS	51 - 105	40
Hexachloroethane	67-72-1	CAS	51 - 110	40
N-Nitrosodiphenylamine	86-30-6	CAS	58 - 132	40
PAHs				

Analysis	CAS #	Lab	LCS and LCS Duplicate Recovery (percent)	Relative Percent Difference
2-Methylnaphthalene	91-57-6	CAS	12 - 159	40
Acenaphthene	83-32-9	CAS	44 - 120	40
Acenaphthylene	208-96-8	CAS	44 - 124	40
Anthracene	120-12-7	CAS	47 - 128	40
Benzo(a)anthracene	56-55-3	CAS	51 - 135	40
Benzo(a)pyrene	50-32-8	CAS	49 - 144	40
Benzo(b)fluoranthene	205-99-2	CAS	54 - 138	40
Benzo(g,h,i)perylene	191-24-2	CAS	45 - 138	40
Benzo(k)fluoranthene	207-08-9	CAS	55 - 141	40
Chrysene	218-01-9	CAS	59 - 132	40
Dibenzo(a,h)anthracene	53-70-3	CAS	36 - 155	40
Fluoranthene	206-44-0	CAS	47 - 139	40
Fluorene	86-73-7	CAS	49 - 120	40
Indeno(1,2,3-cd)pyrene	193-39-5	CAS	37 - 148	40
Naphthalene	91-20-3	CAS	42 - 116	40
Phenanthrene	85-01-8	CAS	49 - 121	40
Pyrene	129-00-0	CAS	52 - 129	40
Organochlorine pesticides				
2,4'-DDD	53-19-0	Axys	70 - 130	--
2,4'-DDE	3424-82-6	Axys	70 - 130	--
2,4'-DDT	789-02-6	Axys	70 - 130	--
4,4'-DDD	72-54-8	Axys	70 - 130	--
4,4'-DDE	72-55-9	Axys	70 - 130	--
4,4'-DDT	50-29-3	Axys	70 - 130	--
Aldrin	309-00-2	Axys	70 - 130	--
alpha-Endosulfan	959-98-8	Axys	70 - 130	--
alpha-Hexachlorocyclohexane	319-84-6	Axys	70 - 130	--
beta-Endosulfan	33213-65-9	Axys	70 - 130	--
beta-Hexachlorocyclohexane	319-85-7	Axys	70 - 130	--
cis-Chlordane	5103-71-9	Axys	70 - 130	--
cis-Nonachlor	5103-73-1	Axys	70 - 130	--
delta-Hexachlorocyclohexane	319-86-8	Axys	60 - 130	--
Dieldrin	60-57-1	Axys	60 - 130	--
Endosulfan sulfate	1031-07-8	Axys	70 - 130	--
Endrin	72-20-8	Axys	60 - 130	--
Endrin aldehyde	7421-93-4	Axys	50 - 130	--
Endrin ketone	53494-70-5	Axys	60 - 130	--
gamma-Hexachlorocyclohexane	58-89-9	Axys	70 - 130	--
Heptachlor	76-44-8	Axys	70 - 130	--
Heptachlor epoxide	1024-57-3	Axys	60 - 130	--
Hexachlorobenzene	118-74-1	Axys	70 - 130	--
Hexachlorobutadiene	87-68-3	Axys	--	--
Methoxychlor	72-43-5	Axys	60 - 130	--
Oxychlordane	27304-13-8	Axys	70 - 130	--
trans-Chlordane	5103-74-2	Axys	70 - 130	--
trans-Nonachlor	39765-80-5	Axys	70 - 130	--
PCB congeners				

Analysis	CAS #	Lab	LCS and LCS Duplicate Recovery (percent)	Relative Percent Difference
PCB001	2051-60-7	Axys	50 - 150	--
PCB002	2051-61-8	Axys	--	--
PCB003	2051-62-9	Axys	50 - 150	--
PCB004	13029-08-8	Axys	50 - 150	--
PCB005	16605-91-7	Axys	--	--
PCB006	25569-80-6	Axys	--	--
PCB007	33284-50-3	Axys	--	--
PCB008	34883-43-7	Axys	--	--
PCB009	34883-39-1	Axys	--	--
PCB010	33146-45-1	Axys	--	--
PCB011	2050-67-1	Axys	--	--
PCB012 & 013	PCB012_013	Axys	--	--
PCB014	34883-41-5	Axys	--	--
PCB015	2050-68-2	Axys	50 - 150	--
PCB016	38444-78-9	Axys	--	--
PCB017	37680-66-3	Axys	--	--
PCB018 & 030	PCB018_030	Axys	--	--
PCB019	38444-73-4	Axys	50 - 150	--
PCB020 & 028	PCB020_028	Axys	--	--
PCB021 & 033	PCB021_033	Axys	--	--
PCB022	38444-85-8	Axys	--	--
PCB023	55720-44-0	Axys	--	--
PCB024	55702-45-9	Axys	--	--
PCB025	55712-37-3	Axys	--	--
PCB026 & 029	PCB026_029	Axys	--	--
PCB027	38444-76-7	Axys	--	--
PCB031	16606-02-3	Axys	--	--
PCB032	38444-77-8	Axys	--	--
PCB034	37680-68-5	Axys	--	--
PCB035	37680-69-6	Axys	--	--
PCB036	38444-87-0	Axys	--	--
PCB037	38444-90-5	Axys	50 - 150	--
PCB038	53555-66-1	Axys	--	--
PCB039	38444-88-1	Axys	--	--
PCB040 & 041 & 071	PCB040_041_071	Axys	--	--
PCB042	36559-22-5	Axys	--	--
PCB043	70362-46-8	Axys	--	--
PCB044 & 047 & 065	PCB044_047_065	Axys	--	--
PCB045 & 051	PCB045_051	Axys	--	--
PCB046	41464-47-5	Axys	--	--
PCB048	70362-47-9	Axys	--	--
PCB049 & 069	PCB049_069	Axys	--	--
PCB050 & 053	PCB050_053	Axys	--	--
PCB052	35693-99-3	Axys	--	--
PCB054	15968-05-5	Axys	50 - 150	--
PCB055	74338-24-2	Axys	--	--
PCB056	41464-43-1	Axys	--	--
PCB057	70424-67-8	Axys	--	--
PCB058	41464-49-7	Axys	--	--

Analysis	CAS #	Lab	LCS and LCS Duplicate Recovery (percent)	Relative Percent Difference
PCB059 & 062 & 075	PCB059_062_075	Axys	--	--
PCB060	33025-41-1	Axys	--	--
PCB061 & 070 & 074 & 076	PCB061_070_074	Axys	--	--
PCB063	74472-34-7	Axys	--	--
PCB064	52663-58-8	Axys	--	--
PCB066	32598-10-0	Axys	--	--
PCB067	73575-53-8	Axys	--	--
PCB068	73575-52-7	Axys	--	--
PCB072	41464-42-0	Axys	--	--
PCB073	74338-23-1	Axys	--	--
PCB077	32598-13-3	Axys	50 - 150	--
PCB078	70362-49-1	Axys	--	--
PCB079	41464-48-6	Axys	--	--
PCB080	33284-52-5	Axys	--	--
PCB081	70362-50-4	Axys	50 - 150	--
PCB082	52663-62-4	Axys	--	--
PCB083 & 099	PCB083_099	Axys	--	--
PCB084	52663-60-2	Axys	--	--
PCB085 & 116 & 117	PCB085_116_117	Axys	--	--
PCB086 & 087 & 097 & 108 & 119 & 125	PCB086_087_097	Axys	--	--
PCB088 & 091	PCB088_091	Axys	--	--
PCB089	73575-57-2	Axys	--	--
PCB090 & 101 & 113	PCB090_101_113	Axys	--	--
PCB092	52663-61-3	Axys	--	--
PCB093 & 095 & 098 & 100 & 102	PCB093_095_098	Axys	--	--
PCB094	73575-55-0	Axys	--	--
PCB096	73575-54-9	Axys	--	--
PCB103	60145-21-3	Axys	--	--
PCB104	56558-16-8	Axys	50 - 150	--
PCB105	32598-14-4	Axys	50 - 150	--
PCB106	70424-69-0	Axys	--	--
PCB107 & 124	PCB107_124	Axys	--	--
PCB109	74472-35-8	Axys	--	--
PCB110 & 115	PCB110_115	Axys	--	--
PCB111	39635-32-0	Axys	--	--
PCB112	74472-36-9	Axys	--	--
PCB114	74472-37-0	Axys	50 - 150	--
PCB118	31508-00-6	Axys	50 - 150	--
PCB120	68194-12-7	Axys	--	--
PCB121	56558-18-0	Axys	--	--
PCB122	76842-07-4	Axys	--	--
PCB123	65510-44-3	Axys	50 - 150	--
PCB126	57465-28-8	Axys	50 - 150	--
PCB127	39635-33-1	Axys	--	--
PCB128 & 166	PCB128_166	Axys	--	--
PCB129 & 138 & 160 & 163	PCB129_138_160	Axys	--	--
PCB130	52663-66-8	Axys	--	--
PCB131	61798-70-7	Axys	--	--
PCB132	38380-05-1	Axys	--	--

Analysis	CAS #	Lab	LCS and LCS Duplicate Recovery (percent)	Relative Percent Difference
PCB133	35694-04-3	Axys	--	--
PCB134 & 143	PCB134_143	Axys	--	--
PCB135 & 151 & 154	PCB135_151_154	Axys	--	--
PCB136	38411-22-2	Axys	--	--
PCB137	35694-06-5	Axys	--	--
PCB139 & 140	PCB139_140	Axys	--	--
PCB141	52712-04-6	Axys	--	--
PCB142	41411-61-4	Axys	--	--
PCB144	68194-14-9	Axys	--	--
PCB145	74472-40-5	Axys	--	--
PCB146	51908-16-8	Axys	--	--
PCB147 & 149	PCB147_149	Axys	--	--
PCB148	74472-41-6	Axys	--	--
PCB150	68194-08-1	Axys	--	--
PCB152	68194-09-2	Axys	--	--
PCB153 & 168	PCB153_168	Axys	--	--
PCB155	33979-03-2	Axys	50 - 150	--
PCB156 & 157	PCB156_157	Axys	50 - 150	--
PCB158	74472-42-7	Axys	--	--
PCB159	39635-35-3	Axys	--	--
PCB161	74472-43-8	Axys	--	--
PCB162	39635-34-2	Axys	--	--
PCB164	74472-45-0	Axys	--	--
PCB165	74472-46-1	Axys	--	--
PCB167	52663-72-6	Axys	50 - 150	--
PCB169	32774-16-6	Axys	50 - 150	--
PCB170	35065-30-6	Axys	--	--
PCB171 & 173	PCB171_173	Axys	--	--
PCB172	52663-74-8	Axys	--	--
PCB174	38411-25-5	Axys	--	--
PCB175	40186-70-7	Axys	--	--
PCB176	52663-65-7	Axys	--	--
PCB177	52663-70-4	Axys	--	--
PCB178	52663-67-9	Axys	--	--
PCB179	52663-64-6	Axys	--	--
PCB180 & 193	PCB180_193	Axys	--	--
PCB181	74472-47-2	Axys	--	--
PCB182	60145-23-5	Axys	--	--
PCB183 & 185	PCB183_185	Axys	--	--
PCB184	74472-48-3	Axys	--	--
PCB186	74472-49-4	Axys	--	--
PCB187	52663-68-0	Axys	--	--
PCB188	74487-85-7	Axys	50 - 150	--
PCB189	39635-31-9	Axys	50 - 150	--
PCB190	41411-64-7	Axys	--	--
PCB191	74472-50-7	Axys	--	--
PCB192	74472-51-8	Axys	--	--
PCB194	35694-08-7	Axys	--	--
PCB195	52663-78-2	Axys	--	--

Analysis	CAS #	Lab	LCS and LCS Duplicate Recovery (percent)	Relative Percent Difference
PCB196	42740-50-1	Axys	--	--
PCB197 & 200	PCB197_200	Axys	--	--

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 detection limit.
J	The associated numerical value is an estimated quantity.
R	Rejected.
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 detection limit is an estimated quantity.

Table A-6. Summary of Qualified Data by Parameter Group.

	Number of Samples	Number of Data Points		Total # of Data Points	Detection and Qualification Frequencies (percent)		Reason Codes for Qualification
		Detected	Undetected				
Conventionals	9	17	0	17	100	detected	
					0	undetected	
Metals	8	90	4	94	96	detected	
					4	undetected	
					2	J	Pc
Butyltins	1	1	3	4	25	detected	
					75	undetected	
Phenols	5	1	24	25	4	detected	
					96	undetected	
Phthalates	5	5	25	30	17	detected	
					83	undetected	
					17	U	LB
Semivolatile Organic Compounds	9	10	43	53	19	detected	
					81	undetected	
					2	J	Ci,Cc,LCSR,SSR
					4	R	Ci,Cc,LCSR,SSR
					4	UJ	Ci,Cc,LCSR,SSR,PFP
Polycyclic Aromatic Hydrocarbons	7	75	44	119	63	detected	
					37	undetected	
					4	U	LB
Organochlorine Pesticides	9	196	38	234	84	detected	
					16	undetected	
					9	U	LB, PFP
					4	UJ	Ci
PCB congeners	9	1289	142	1431	90	detected	
					10	undetected	
					3	J	Pc, SSR, Other
					0.3	R	SSR
					2	U	PFP
					0.8	UJ	Pc, SSR, PFP

	Number of Samples	Number of Data Points		Total # of Data Points	Detection and Qualification Frequencies (percent)		Reason Codes for Qualification
		Detected	Undetected				
Dioxin/Furans	9	101	34	135	75	detected	
					25	undetected	
					19	U	LB, PFP
					1	UJ	PFP
Dioxin/Furan Homologs	9	86	4	90	96	detected	
					4	undetected	
					4	U	LB

Notes:

Includes replicates and splits, excludes field blanks.

Reason for Qualification:

- Cc - Calibration (continuing)
- Ci - Calibration (initial)
- LCSR - Laboratory control sample recoveries
- Pc - Precision (all replicates)
- PFP - Potential false positive
- SSR - Surrogate spike recoveries

Table A-7. Expected and Reported Detection Limits.

Analyte	CAS Number	Expected MDL[a,b]	Method Detection Limits[a]		Total No. Data Points	No. Undetected Results
			Minimum	Maximum		
Conventionals (percent)						
Lipids	66455-18-3	--	--	--	9	0
Total solids	TSO	0.01	--	--	8	0
Metals (mg/kg)						
Aluminum	7429-90-5	0.06	--	--	8	0
Antimony	7440-36-0	0.0016	0.002	0.002	8	2
Arsenic	7440-38-2	0.006	--	--	8	0
Cadmium	7440-43-9	0.0012	0.002	0.002	8	1
Chromium	7440-47-3	0.1	0.1	0.1	8	1
Copper	7440-50-8	0.018	--	--	8	0
Lead	7439-92-1	0.0014	--	--	8	0
Mercury	7439-97-6	0.0004	--	--	6	0
Nickel	7440-02-0	0.006	--	--	8	0
Selenium	7782-49-2	0.2	--	--	8	0
Silver	7440-22-4	0.0008	--	--	8	0
Zinc	7440-66-6	0.012	--	--	8	0
Butyltins (µg/kg)						
Butyltin ion	78763-54-9	0.38	0.22	0.22	1	1
Dibutyltin ion	14488-53-0	0.35	0.33	0.33	1	1
Tetrabutyltin	1461-25-2	0.33	0.83	0.83	1	1
Tributyltin ion	36643-28-4	0.38	--	--	1	0
Phenols (µg/kg)						
2,4-Dimethylphenol	105-67-9	13	19	19	5	5
2-Methylphenol	95-48-7	53	8.2	8.2	5	5
4-Methylphenol	106-44-5	15	7.7	7.7	5	5
Pentachlorophenol	87-86-5	31	30	30	5	4
Phenol	108-95-2	17	45	45	5	5
Phthalates (µg/kg)						
Bis(2-ethylhexyl) phthalate	117-81-7	5.1	--	--	5	0

Table A-7. Expected and Reported Detection Limits.

Analyte	CAS Number	Expected MDL[a,b]	Method Detection Limits[a]		Total No. Data Points	No. Undetected Results
			Minimum	Maximum		
Butylbenzyl phthalate	85-68-7	9.4	7.3	7.3	5	5
Dibutyl phthalate	84-74-2	16	16	16	5	5
Diethyl phthalate	84-66-2	14	8.8	8.8	5	5
Dimethyl phthalate	131-11-3	53	7.7	7.7	5	5
Di-n-octyl phthalate	117-84-0	13	11	11	5	5
Semivolatile Organic Compounds (µg/kg)						
1,2,4-Trichlorobenzene	120-82-1	9.9	9.8	9.8	5	5
1,2-Dichlorobenzene	95-50-1	12	11	11	5	5
1,3-Dichlorobenzene	541-73-1	11	11	11	5	5
1,4-Dichlorobenzene	106-46-7	11	11	11	5	5
Benzyl alcohol	100-51-6	6.7	22	22	5	5
Hexachlorobutadiene	87-68-3	---	10	10	4	4
Hexachloroethane	67-72-1	8.5	20	20	5	5
N-Nitrosodiphenylamine	86-30-6	9.5	6.6	6.6	5	5
Polycyclic Aromatic Hydrocarbons (µg/kg)						
2-Methylnaphthalene	91-57-6	0.15	--	--	7	0
Acenaphthene	83-32-9	0.074	--	--	7	0
Acenaphthylene	208-96-8	0.05	0.59	0.6	7	3
Anthracene	120-12-7	0.055	--	--	7	0
Benzo(a)anthracene	56-55-3	0.054	0.19	0.19	7	7
Benzo(a)pyrene	50-32-8	0.076	0.22	0.22	7	6
Benzo(b)fluoranthene	205-99-2	0.045	0.2	0.2	7	4
Benzo(g,h,i)perylene	191-24-2	0.097	0.2	0.2	7	5
Benzo(k)fluoranthene	207-08-9	0.081	0.19	0.19	7	5
Chrysene	218-01-9	0.08	0.17	0.17	7	3
Dibenzo(a,h)anthracene	53-70-3	0.079	0.28	0.28	7	7
Fluoranthene	206-44-0	0.053	--	--	7	0
Fluorene	86-73-7	0.054	--	--	7	0
Indeno(1,2,3-cd)pyrene	193-39-5	0.073	0.2	0.2	7	4
Naphthalene	91-20-3	0.26	--	--	7	0
Phenanthrene	85-01-8	0.066	--	--	7	0

Table A-7. Expected and Reported Detection Limits.

Analyte	CAS Number	Expected MDL[a,b]	Method Detection Limits[a]		Total No. Data Points	No. Undetected Results
			Minimum	Maximum		
Pyrene	129-00-0	0.07	--	--	7	0
Organochlorine pesticides and selected SVOCs (µg/kg)						
2,4'-DDD	53-19-0	0.01	--	--	9	0
2,4'-DDE	3424-82-6	0.01	--	--	9	0
2,4'-DDT	789-02-6	0.01	--	--	9	0
4,4'-DDD	72-54-8	0.01	--	--	9	0
4,4'-DDE	72-55-9	0.01	--	--	9	0
4,4'-DDT	50-29-3	0.01	--	--	9	0
Aldrin	309-00-2	0.02	--	--	9	0
alpha-Endosulfan	959-98-8	0.02	--	--	9	0
alpha-Hexachlorocyclohexane	319-84-6	0.02	0.346	0.346	9	1
beta-Endosulfan	33213-65-9	0.02	0.124	0.151	9	3
beta-Hexachlorocyclohexane	319-85-7	0.02	--	--	9	0
cis-Chlordane	5103-71-9	0.01	--	--	9	0
cis-Nonachlor	5103-73-1	0.01	--	--	9	0
delta-Hexachlorocyclohexane	319-86-8	0.02	0.0338	0.0405	9	2
Dieldrin	60-57-1	0.01	--	--	9	0
Endosulfan sulfate	1031-07-8	0.01	--	--	9	0
Endrin	72-20-8	0.1	0.0224	0.0304	9	4
Endrin aldehyde	7421-93-4	0.1	0.0422	0.0574	9	9
Endrin ketone	53494-70-5	0.1	0.0422	0.0574	9	8
gamma-Hexachlorocyclohexane	58-89-9	0.1	0.0248	0.0338	9	3
Heptachlor	76-44-8	0.1	0.0322	0.0365	9	2
Heptachlor epoxide	1024-57-3	0.1	--	--	9	0
Methoxychlor	72-43-5	0.1	0.0248	0.0338	9	6
Oxychlordane	27304-13-8	0.02	--	--	9	0
trans-Chlordane	5103-74-2	0.02	--	--	9	0
trans-Nonachlor	39765-80-5	0.5	--	--	9	0
Hexachlorobenzene	118-74-1	--	--	--	9	0
Hexachlorobutadiene	87-68-3	0.01	0.0198	0.027	5	4
PCB Congeners (ng/kg)						

Table A-7. Expected and Reported Detection Limits.

Analyte	CAS Number	Expected MDL[a,b]	Method Detection Limits[a]		Total No. Data Points	No. Undetected Results
			Minimum	Maximum		
PCB001	2051-60-7	0.24 - 6.68	--	--	9	2
PCB002	2051-61-8	0.24 - 6.68	--	--	9	1
PCB003	2051-62-9	0.24 - 6.68	0.436	0.436	9	2
PCB004	13029-08-8	0.24 - 6.68	--	--	9	1
PCB005	16605-91-7	0.24 - 6.68	0.313	0.429	9	6
PCB006	25569-80-6	0.24 - 6.68	0.36	0.36	9	1
PCB007	33284-50-3	0.24 - 6.68	0.391	0.536	9	3
PCB008	34883-43-7	0.24 - 6.68	--	--	9	0
PCB009	34883-39-1	0.24 - 6.68	0.431	0.431	9	1
PCB010	33146-45-1	0.24 - 6.68	0.313	0.345	9	3
PCB011	2050-67-1	0.24 - 6.68	--	--	9	0
PCB012 & 013	--	0.24 - 6.68	0.438	0.438	9	1
PCB014	34883-41-5	0.24 - 6.68	0.532	0.729	9	6
PCB015	2050-68-2	0.24 - 6.68	0.313	0.313	9	1
PCB016	38444-78-9	0.24 - 6.68	--	--	9	0
PCB017	37680-66-3	0.24 - 6.68	--	--	9	0
PCB018 & 030	--	0.24 - 6.68	--	--	9	0
PCB019	38444-73-4	0.24 - 6.68	--	--	9	0
PCB020 & 028	PCB020_028	0.24 - 6.68	--	--	9	0
PCB021 & 033	PCB021_033	0.24 - 6.68	--	--	9	0
PCB022	38444-85-8	0.24 - 6.68	--	--	9	0
PCB023	55720-44-0	0.24 - 6.68	0.423	0.518	9	4
PCB024	55702-45-9	0.24 - 6.68	--	--	9	0
PCB025	55712-37-3	0.24 - 6.68	--	--	9	0
PCB026 & 029	PCB026_029	0.24 - 6.68	--	--	9	0
PCB027	38444-76-7	0.24 - 6.68	--	--	9	0
PCB031	16606-02-3	0.24 - 6.68	--	--	9	0
PCB032	38444-77-8	0.24 - 6.68	--	--	9	0
PCB034	37680-68-5	0.24 - 6.68	--	--	9	0
PCB035	37680-69-6	0.24 - 6.68	0.689	0.689	9	1
PCB036	38444-87-0	0.24 - 6.68	--	--	9	0
PCB037	38444-90-5	0.24 - 6.68	--	--	9	0

Table A-7. Expected and Reported Detection Limits.

Analyte	CAS Number	Expected MDL[a,b]	Method Detection Limits[a]		Total No. Data Points	No. Undetected Results
			Minimum	Maximum		
PCB038	53555-66-1	0.24 - 6.68	0.47	0.643	9	7
PCB039	38444-88-1	0.24 - 6.68	--	--	9	0
PCB040 & 041 & 071	PCB040_041_071	0.24 - 6.68	--	--	9	0
PCB042	36559-22-5	0.24 - 6.68	--	--	9	0
PCB043	70362-46-8	0.24 - 6.68	--	--	9	0
PCB044 & 047 & 065	PCB044_047_065	0.24 - 6.68	--	--	9	0
PCB045 & 051	PCB045_051	0.24 - 6.68	--	--	9	0
PCB046	41464-47-5	0.24 - 6.68	--	--	9	0
PCB048	70362-47-9	0.24 - 6.68	--	--	9	0
PCB049 & 069	PCB049_069	0.24 - 6.68	--	--	9	0
PCB050 & 053	PCB050_053	0.24 - 6.68	--	--	9	0
PCB052	35693-99-3	0.24 - 6.68	--	--	9	0
PCB054	15968-05-5	0.24 - 6.68	0.274	0.274	9	1
PCB055	74338-24-2	0.24 - 6.68	0.579	0.656	9	5
PCB056	41464-43-1	0.24 - 6.68	--	--	9	0
PCB057	70424-67-8	0.24 - 6.68	0.407	0.407	9	1
PCB058	41464-49-7	0.24 - 6.68	0.543	0.585	9	2
PCB059 & 062 & 075	PCB059_062_075	0.24 - 6.68	--	--	9	0
PCB060	33025-41-1	0.24 - 6.68	--	--	9	0
PCB061 & 070 & 074 & 076	PCB061_070_074_	0.24 - 6.68	--	--	9	0
PCB063	74472-34-7	0.24 - 6.68	--	--	9	0
PCB064	52663-58-8	0.24 - 6.68	--	--	9	0
PCB066	32598-10-0	0.24 - 6.68	--	--	9	0
PCB067	73575-53-8	0.24 - 6.68	--	--	9	0
PCB068	73575-52-7	0.24 - 6.68	--	--	9	0
PCB072	41464-42-0	0.24 - 6.68	--	--	9	0
PCB073	74338-23-1	0.24 - 6.68	0.47	0.517	9	3
PCB077	32598-13-3	0.24 - 6.68	--	--	9	0
PCB078	70362-49-1	0.24 - 6.68	0.517	0.707	9	9
PCB079	41464-48-6	0.24 - 6.68	--	--	9	0
PCB080	33284-52-5	0.24 - 6.68	0.407	0.557	9	9
PCB081	70362-50-4	0.24 - 6.68	0.36	0.36	9	1

Table A-7. Expected and Reported Detection Limits.

Analyte	CAS Number	Expected MDL[a,b]	Method Detection Limits[a]		Total No. Data Points	No. Undetected Results
			Minimum	Maximum		
PCB082	52663-62-4	0.24 - 6.68	--	--	9	0
PCB083 & 099	PCB083_099	0.24 - 6.68	--	--	9	0
PCB084	52663-60-2	0.24 - 6.68	--	--	9	0
PCB085 & 116 & 117	PCB085_116_117	0.24 - 6.68	--	--	9	0
PCB086 & 087 & 097 & 108 & 119 & 125	PCB086_087_097_	0.24 - 6.68	--	--	9	0
PCB088 & 091	PCB088_091	0.24 - 6.68	--	--	9	0
PCB089	73575-57-2	0.24 - 6.68	--	--	9	0
PCB090 & 101 & 113	PCB090_101_113	0.24 - 6.68	--	--	9	0
PCB092	52663-61-3	0.24 - 6.68	--	--	9	0
PCB093 & 095 & 098 & 100 & 102	PCB093_095_098_	0.24 - 6.68	--	--	9	0
PCB094	73575-55-0	0.24 - 6.68	--	--	9	0
PCB096	73575-54-9	0.24 - 6.68	--	--	9	0
PCB103	60145-21-3	0.24 - 6.68	--	--	9	0
PCB104	56558-16-8	0.24 - 6.68	0.219	0.241	9	2
PCB105	32598-14-4	0.24 - 6.68	--	--	9	0
PCB106	70424-69-0	0.24 - 6.68	0.219	0.3	9	9
PCB107 & 124	PCB107_124	0.24 - 6.68	--	--	9	0
PCB109	74472-35-8	0.24 - 6.68	--	--	9	0
PCB110 & 115	PCB110_115	0.24 - 6.68	--	--	9	0
PCB111	39635-32-0	0.24 - 6.68	0.211	0.211	9	1
PCB112	74472-36-9	0.24 - 6.68	0.235	0.322	9	9
PCB114	74472-37-0	0.24 - 6.68	--	--	9	0
PCB118	31508-00-6	0.24 - 6.68	--	--	9	0
PCB120	68194-12-7	0.24 - 6.68	--	--	9	0
PCB121	56558-18-0	0.24 - 6.68	--	--	9	0
PCB122	76842-07-4	0.24 - 6.68	--	--	9	0
PCB123	65510-44-3	0.24 - 6.68	--	--	9	0
PCB126	57465-28-8	0.24 - 6.68	--	--	9	0
PCB127	39635-33-1	0.24 - 6.68	0.268	0.268	9	1
PCB128 & 166	PCB128_166	0.24 - 6.68	--	--	9	0
PCB129 & 138 & 160 & 163	PCB129_138_160_	0.24 - 6.68	--	--	9	0
PCB130	52663-66-8	0.24 - 6.68	--	--	9	0

Table A-7. Expected and Reported Detection Limits.

Analyte	CAS Number	Expected MDL[a,b]	Method Detection Limits[a]		Total No. Data Points	No. Undetected Results
			Minimum	Maximum		
PCB131	61798-70-7	0.24 - 6.68	--	--	9	0
PCB132	38380-05-1	0.24 - 6.68	--	--	9	0
PCB133	35694-04-3	0.24 - 6.68	--	--	9	0
PCB134 & 143	PCB134_143	0.24 - 6.68	--	--	9	0
PCB135 & 151 & 154	PCB135_151_154	0.24 - 6.68	--	--	9	0
PCB136	38411-22-2	0.24 - 6.68	--	--	9	0
PCB137	35694-06-5	0.24 - 6.68	--	--	9	0
PCB139 & 140	PCB139_140	0.24 - 6.68	--	--	9	0
PCB141	52712-04-6	0.24 - 6.68	--	--	9	0
PCB142	41411-61-4	0.24 - 6.68	0.251	0.343	9	8
PCB144	68194-14-9	0.24 - 6.68	--	--	9	0
PCB145	74472-40-5	0.24 - 6.68	0.258	0.258	9	1
PCB146	51908-16-8	0.24 - 6.68	--	--	9	0
PCB147 & 149	PCB147_149	0.24 - 6.68	--	--	9	0
PCB148	74472-41-6	0.24 - 6.68	--	--	9	0
PCB150	68194-08-1	0.24 - 6.68	--	--	9	0
PCB152	68194-09-2	0.24 - 6.68	--	--	9	0
PCB153 & 168	PCB153_168	0.24 - 6.68	--	--	9	0
PCB155	33979-03-2	0.24 - 6.68	--	--	9	0
PCB156 & 157	PCB156_157	0.24 - 6.68	--	--	9	0
PCB158	74472-42-7	0.24 - 6.68	--	--	9	0
PCB159	39635-35-3	0.24 - 6.68	--	--	9	0
PCB161	74472-43-8	0.24 - 6.68	0.376	0.515	9	9
PCB162	39635-34-2	0.24 - 6.68	--	--	9	0
PCB164	74472-45-0	0.24 - 6.68	--	--	9	0
PCB165	74472-46-1	0.24 - 6.68	--	--	9	0
PCB167	52663-72-6	0.24 - 6.68	--	--	9	0
PCB169	32774-16-6	0.24 - 6.68	0.235	0.322	9	9
PCB170	35065-30-6	0.24 - 6.68	--	--	9	0
PCB171 & 173	PCB171_173	0.24 - 6.68	--	--	9	0
PCB172	52663-74-8	0.24 - 6.68	--	--	9	0
PCB174	38411-25-5	0.24 - 6.68	--	--	9	0

Table A-7. Expected and Reported Detection Limits.

Analyte	CAS Number	Expected MDL[a,b]	Method Detection Limits[a]		Total No. Data Points	No. Undetected Results
			Minimum	Maximum		
PCB175	40186-70-7	0.24 - 6.68	--	--	9	0
PCB176	52663-65-7	0.24 - 6.68	--	--	9	0
PCB177	52663-70-4	0.24 - 6.68	--	--	9	0
PCB178	52663-67-9	0.24 - 6.68	--	--	9	0
PCB179	52663-64-6	0.24 - 6.68	--	--	9	0
PCB180 & 193	PCB180_193	0.24 - 6.68	--	--	9	0
PCB181	74472-47-2	0.24 - 6.68	--	--	9	0
PCB182	60145-23-5	0.24 - 6.68	--	--	9	0
PCB183 & 185	PCB183_185	0.24 - 6.68	--	--	9	0
PCB184	74472-48-3	0.24 - 6.68	--	--	9	0
PCB186	74472-49-4	0.24 - 6.68	0.157	0.214	9	9
PCB187	52663-68-0	0.24 - 6.68	--	--	9	0
PCB188	74487-85-7	0.24 - 6.68	0.391	0.391	9	1
PCB189	39635-31-9	0.24 - 6.68	--	--	9	0
PCB190	41411-64-7	0.24 - 6.68	--	--	9	0
PCB191	74472-50-7	0.24 - 6.68	--	--	9	0
PCB192	74472-51-8	0.24 - 6.68	0.313	0.429	9	9
PCB194	35694-08-7	0.24 - 6.68	--	--	9	0
PCB195	52663-78-2	0.24 - 6.68	--	--	9	0
PCB196	42740-50-1	0.24 - 6.68	--	--	9	0
PCB197 & 200	PCB197_200	0.24 - 6.68	--	--	9	0
PCB198 & 199	PCB198_199	0.24 - 6.68	--	--	9	0
PCB201	40186-71-8	0.24 - 6.68	--	--	9	0
PCB202	2136-99-4	0.24 - 6.68	--	--	9	0
PCB203	52663-76-0	0.24 - 6.68	--	--	9	0
PCB204	74472-52-9	0.24 - 6.68	0.323	2.14	9	3
PCB205	74472-53-0	0.24 - 6.68	--	--	9	0
PCB206	40186-72-9	0.24 - 6.68	--	--	9	0
PCB207	52663-79-3	0.24 - 6.68	--	--	9	0
PCB208	52663-77-1	0.24 - 6.68	--	--	9	0
PCB209	2051-24-3	0.24 - 6.68	--	--	9	0

Dioxin/Furans (ng/kg)

Table A-7. Expected and Reported Detection Limits.

Analyte	CAS Number	Expected MDL[a,b]	Method Detection Limits[a]		Total No. Data Points	No. Undetected Results
			Minimum	Maximum		
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	0.10	0.159	0.159	9	1
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	35822-46-9	0.16	--	--	9	0
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	0.12	0.133	0.181	9	9
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	0.09	0.102	0.102	9	1
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	39227-28-6	0.14	--	--	9	0
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	0.08	--	--	9	0
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	57653-85-7	0.09	--	--	9	0
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	0.12	0.0956	0.13	9	9
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	19408-74-3	0.08	0.121	0.15	9	2
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	0.12	0.13	0.13	9	1
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	40321-76-4	0.10	--	--	9	0
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	0.10	0.115	0.157	9	9
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	0.09	0.127	0.138	9	2
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	0.03	--	--	9	0
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746-01-6	0.03	--	--	9	0
Heptachlorodibenzofuran homologs	38998-75-3	–	--	--	9	0
Heptachlorodibenzo-p-dioxin homologs	37871-00-4	–	--	--	9	0
Hexachlorodibenzofuran homologs	55684-94-1	–	--	--	9	0
Hexachlorodibenzo-p-dioxin homologs	34465-46-8	–	--	--	9	0
Octachlorodibenzofuran	39001-02-0	0.41	0.124	0.134	9	4
Octachlorodibenzo-p-dioxin	3268-87-9	0.73	--	--	9	0
Pentachlorodibenzofuran homologs	30402-15-4	–	--	--	9	0
Pentachlorodibenzo-p-dioxin homologs	36088-22-9	–	--	--	9	0
Tetrachlorodibenzofuran homologs	30402-14-3	–	--	--	9	0
Tetrachlorodibenzo-p-dioxin homologs	41903-57-5	–	--	--	9	0

[a] Tissue method detection limits are listed on a wet weight basis.

[b] QAPP method detection limits listed are based on optimum tissue amounts of 10 grams for each of the organic analyses and 5 grams for metals and mercury. The MDL values are as provided in QAPP addendum 6 for the benthic tissue study.

Table A-8. Results for Homogenization Split Samples.

Analyte	CAS_rn	Sample ID: LW3-LTA-Comp5-1		LW3-LTA-Comp5-2		RPD
		Sampling Date: 10/4/2006		10/4/2006		
		Sample Type: Natural		Homogenization Split		
		Parent Sample:		LW3-LTA-Comp5-1		
Conventionals (percent)						
Lipids	66455-18-3	3.76		3.9		-4
Total solids	TSO	21.3		23		-8
Metals (mg/kg)						
Aluminum	7429-90-5	297		231		25
Antimony	7440-36-0	0.003	*J*	0.003	*J*	0
Arsenic	7440-38-2	0.19		0.16		17
Cadmium	7440-43-9	0.004	*J*	0.003	*J*	29
Chromium	7440-47-3	0.29		0.3		-3
Copper	7440-50-8	4.8		3.92		20
Lead	7439-92-1	0.0954		0.0847		12
Mercury	7439-97-6	0.69	*J*	0.347	*J*	66
Nickel	7440-02-0	0.268		0.268		0
Selenium	7782-49-2	0.31		0.31		0
Silver	7440-22-4	0.0358		0.03		18
Zinc	7440-66-6	29.1		25.8		12
Phenols (µg/kg)						
2,4-Dimethylphenol	105-67-9	19	*U*	19	*U*	NA
2-Methylphenol	95-48-7	8.2	*U*	8.2	*U*	NA
4-Methylphenol	106-44-5	7.7	*U*	7.7	*U*	NA
Pentachlorophenol	87-86-5	30	*U*	30	*U*	NA
Phenol	108-95-2	45	*U*	45	*U*	NA
Phthalates (µg/kg)						
Bis(2-ethylhexyl) phthalate	117-81-7	120	*J*	140	*J*	-15
Butylbenzyl phthalate	85-68-7	7.3	*U*	7.3	*U*	NA
Dibutyl phthalate	84-74-2	16	*U*	16	*U*	NA
Diethyl phthalate	84-66-2	62	*U*	510	*U*	NA
Dimethyl phthalate	131-11-3	7.7	*U*	7.7	*U*	NA
Di-n-octyl phthalate	117-84-0	11	*U*	11	*U*	NA
Semivolatile Organic Compounds (µg/kg)						
1,2,4-Trichlorobenzene	120-82-1	9.8	*U*	9.8	*U*	NA
1,2-Dichlorobenzene	95-50-1	11	*U*	11	*U*	NA
1,3-Dichlorobenzene	541-73-1	11	*U*	11	*U*	NA
1,4-Dichlorobenzene	106-46-7	11	*U*	11	*U*	NA
Benzyl alcohol	100-51-6	22	*U*	22	*U*	NA
Hexachlorobenzene	118-74-1	2.07		1.92		8
Hexachlorobutadiene	87-68-3	--		0.0198	*UJ*	NA
Hexachloroethane	67-72-1	20	*U*	20	*U*	NA
N-Nitrosodiphenylamine	86-30-6	6.6	*U*	6.6	*U*	NA
Polycyclic Aromatic Hydrocarbons (µg/kg)						
2-Methylnaphthalene	91-57-6	3.6		4.6		-24
Acenaphthene	83-32-9	0.48	*J*	0.71	*J*	-39
Acenaphthylene	208-96-8	0.6	*U*	0.59	*U*	NA
Anthracene	120-12-7	2.2		2.6		-17
Benzo(a)anthracene	56-55-3	0.19	*U*	0.75	*U*	NA
Benzo(a)pyrene	50-32-8	0.22	*U*	0.22	*U*	NA
Benzo(b)fluoranthene	205-99-2	0.2	*U*	1.7		NA
Benzo(g,h,i)perylene	191-24-2	0.2	*U*	0.29	*J*	NA
Benzo(k)fluoranthene	207-08-9	0.19	*U*	0.46	*J*	NA
Chrysene	218-01-9	0.17	*U*	0.17	*U*	NA
Dibenzo(a,h)anthracene	53-70-3	0.28	*U*	0.28	*U*	NA
Fluoranthene	206-44-0	8.6		10		-15
Fluorene	86-73-7	2.1		2.8		-29
Indeno(1,2,3-cd)pyrene	193-39-5	0.2	*U*	0.32	*J*	NA

Naphthalene	91-20-3	2.8		3.4		-19
Phenanthrene	85-01-8	4.6		6.3		-31
Pyrene	129-00-0	6.6		7.8		-17
Organochlorine pesticides (µg/kg)						
2,4'-DDD	53-19-0	2.29		2.27		1
2,4'-DDE	3424-82-6	0.523		0.479		9
2,4'-DDT	789-02-6	0.566		0.574		-1
4,4'-DDD	72-54-8	15.5		14.5		7
4,4'-DDE	72-55-9	31.7		28.8		10
4,4'-DDT	50-29-3	2.61		2.48		5
Aldrin	309-00-2	2.07		1.99		4
alpha-Endosulfan	959-98-8	0.184	*J*	0.167	*J*	10
alpha-Hexachlorocyclohexane	319-84-6	0.0387	*J*	0.0285	*J*	30
beta-Endosulfan	33213-65-9	0.179	*J*	0.186	*U*	NA
beta-Hexachlorocyclohexane	319-85-7	0.0268	*J*	0.0227	*J*	17
cis-Chlordane	5103-71-9	3.94		3.99		-1
cis-Nonachlor	5103-73-1	1.81		1.63		10
delta-Hexachlorocyclohexane	319-86-8	0.00606	*J*	0.00249	*J*	84
Dieldrin	60-57-1	0.941		1.03		-9
Endosulfan sulfate	1031-07-8	0.612		0.699		-13
Endrin	72-20-8	0.00725	*U*	0.00463	*U*	NA
Endrin aldehyde	7421-93-4	0.0435	*UJ*	0.0422	*UJ*	NA
Endrin ketone	53494-70-5	0.0435	*U*	0.0422	*U*	NA
gamma-Hexachlorocyclohexane	58-89-9	0.0175	*J*	0.0106	*U*	NA
Heptachlor	76-44-8	0.0159	*J*	0.0114	*U*	NA
Heptachlor epoxide	1024-57-3	0.0421	*J*	0.0386	*J*	9
Methoxychlor	72-43-5	0.0294	*U*	0.0307	*U*	NA
Oxychlordane	27304-13-8	0.256	*J*	0.259	*J*	-1
trans-Chlordane	5103-74-2	2.88		2.77		4
trans-Nonachlor	39765-80-5	5.24		4.78		9
PCB congeners (ng/kg)						
PCB001	2051-60-7	2.5	*J*	--	*R*	NA
PCB002	2051-61-8	29.4	*J*	--	*R*	NA
PCB003	2051-62-9	2.14	*UJ*	--	*R*	NA
PCB004	13029-08-8	21.6	*J*	--	*R*	NA
PCB005	16605-91-7	0.643	*U*	0.939	*UJ*	NA
PCB006	25569-80-6	7.83	*J*	4.4	*UJ*	NA
PCB007	33284-50-3	1.62		0.877	*UJ*	NA
PCB008	34883-43-7	31.3	*J*	20.3	*J*	43
PCB009	34883-39-1	1.91		1.09	*J*	55
PCB010	33146-45-1	0.61	*U*	0.891	*UJ*	NA
PCB011	2050-67-1	889	*J*	576	*J*	43
PCB012 & 013	PCB012_013	22.5	*J*	0.882	*UJ*	NA
PCB014	34883-41-5	0.607	*U*	0.887	*UJ*	NA
PCB015	2050-68-2	29.7		27.9	*U*	NA
PCB016	38444-78-9	44.2		40.1	*J*	10
PCB017	37680-66-3	65.5		57.8	*J*	12
PCB018 & 030	PCB018_030	116		106	*J*	9
PCB019	38444-73-4	17.8		18.9	*J*	-6
PCB020 & 028	PCB020_028	394		380	*J*	4
PCB021 & 033	PCB021_033	114		111	*J*	3
PCB022	38444-85-8	112		111	*J*	1
PCB023	55720-44-0	0.502	*U*	0.423	*UJ*	NA
PCB024	55702-45-9	1.86		1.99	*J*	-7
PCB025	55712-37-3	32.7		31.2	*J*	5
PCB026 & 029	PCB026_029	64.2		61.6	*J*	4
PCB027	38444-76-7	11.7		11.3	*J*	3
PCB031	16606-02-3	301		288	*J*	4
PCB032	38444-77-8	49.2		46.8	*J*	5
PCB034	37680-68-5	3.08		2.51	*J*	20
PCB035	37680-69-6	11		10.9	*UJ*	NA
PCB036	38444-87-0	9.27		7.82	*J*	17

PCB037	38444-90-5	72.1		70.3		3
PCB038	53555-66-1	1.24	*UJ*	0.771	*UJ*	NA
PCB039	38444-88-1	6.01		5.78	*J*	4
PCB040 & 041 & 071	PCB040_041_071	369		352		5
PCB042	36559-22-5	200		188		6
PCB043	70362-46-8	32		31.7		1
PCB044 & 047 & 065	PCB044_047_065	854		796		7
PCB045 & 051	PCB045_051	96		86		11
PCB046	41464-47-5	28.6		25.8		10
PCB048	70362-47-9	138		127		8
PCB049 & 069	PCB049_069	630		579		8
PCB050 & 053	PCB050_053	83.5		73.4		13
PCB052	35693-99-3	1160		1090		6
PCB054	15968-05-5	1.92	*U*	1.51		NA
PCB055	74338-24-2	1.07	*U*	0.961	*U*	NA
PCB056	41464-43-1	303		291		4
PCB057	70424-67-8	3.73		4.32	*U*	NA
PCB058	41464-49-7	4.39		4.73		-7
PCB059 & 062 & 075	PCB059_062_075	72.8		67.4		8
PCB060	33025-41-1	164		152		8
PCB061 & 070 & 074 & 076	PCB061_070_074_	1640		1620		1
PCB063	74472-34-7	42.3		39.4		7
PCB064	52663-58-8	393		369		6
PCB066	32598-10-0	854		829		3
PCB067	73575-53-8	21.9		22		0
PCB068	73575-52-7	12.9		10.4		21
PCB072	41464-42-0	18		16.6		8
PCB073	74338-23-1	0.484	*U*	0.47	*U*	NA
PCB077	32598-13-3	61.5		55.3		11
PCB078	70362-49-1	1.03	*U*	0.923	*U*	NA
PCB079	41464-48-6	20.9		22.7		-8
PCB080	33284-52-5	0.949	*U*	0.85	*U*	NA
PCB081	70362-50-4	2.12		2.37	*U*	NA
PCB082	52663-62-4	142		139		2
PCB083 & 099	PCB083_099	1300		1170		11
PCB084	52663-60-2	369		336		9
PCB085 & 116 & 117	PCB085_116_117	392		355		10
PCB086 & 087 & 097 & 108 & 119 & 125	PCB086_087_097_	1120	*J*	1040	*J*	7
PCB088 & 091	PCB088_091	267		241		10
PCB089	73575-57-2	17.2		15.7		9
PCB090 & 101 & 113	PCB090_101_113	2200		1970		11
PCB092	52663-61-3	410		376		9
PCB093 & 095 & 098 & 100 & 102	PCB093_095_098_	1350		1220		10
PCB094	73575-55-0	8.87		8.33		6
PCB096	73575-54-9	9.89		8.48		15
PCB103	60145-21-3	21.8		20.2		8
PCB104	56558-16-8	0.719		0.603	*U*	NA
PCB105	32598-14-4	499		465		7
PCB106	70424-69-0	0.501	*U*	0.892	*U*	NA
PCB107 & 124	PCB107_124	73.3		67.3		9
PCB109	74472-35-8	156		142		9
PCB110 & 115	PCB110_115	1690		1610		5
PCB111	39635-32-0	2.4		1.92		22
PCB112	74472-36-9	0.492	*U*	0.602	*U*	NA
PCB114	74472-37-0	39.5		36		9
PCB118	31508-00-6	1660		1520		9
PCB120	68194-12-7	10.8		9.64		11
PCB121	56558-18-0	1.11		1.18		-6
PCB122	76842-07-4	15.5		15.6		-1
PCB123	65510-44-3	36.4		34.5		5
PCB126	57465-28-8	7		6.11		14
PCB127	39635-33-1	3.87		3.69		5

PCB128 & 166	PCB128_166	214		206		4
PCB129 & 138 & 160 & 163	PCB129_138_160_	1940		1820		6
PCB130	52663-66-8	134		124		8
PCB131	61798-70-7	18.3		16.6		10
PCB132	38380-05-1	335		323		4
PCB133	35694-04-3	53.5		50.1		7
PCB134 & 143	PCB134_143	87.1		81.6		7
PCB135 & 151 & 154	PCB135_151_154	680		645		5
PCB136	38411-22-2	178		167		6
PCB137	35694-06-5	97.1		89.1		9
PCB139 & 140	PCB139_140	35.3		32.1		9
PCB141	52712-04-6	302		290		4
PCB142	41411-61-4	0.341	*U*	0.61	*U*	NA
PCB144	68194-14-9	97.4		87.4		11
PCB145	74472-40-5	0.754	*U*	0.654		NA
PCB146	51908-16-8	421		404		4
PCB147 & 149	PCB147_149	1320		1220		8
PCB148	74472-41-6	5.22		5.73		-9
PCB150	68194-08-1	3.41		2.9		16
PCB152	68194-09-2	1.41		1.46		-3
PCB153 & 168	PCB153_168	2550		2400		6
PCB155	33979-03-2	2.82		2.56		10
PCB156 & 157	PCB156_157	179		164		9
PCB158	74472-42-7	179		170		5
PCB159	39635-35-3	5.73		6.19		-8
PCB161	74472-43-8	0.388	*U*	0.426	*U*	NA
PCB162	39635-34-2	10.6		9.51		11
PCB164	74472-45-0	60.4		61.8		-2
PCB165	74472-46-1	1.32		1.43		-8
PCB167	52663-72-6	87.7		80		9
PCB169	32774-16-6	1.52	*U*	1.5	*U*	NA
PCB170	35065-30-6	199		199		0
PCB171 & 173	PCB171_173	68.1		63.6		7
PCB172	52663-74-8	76		69		10
PCB174	38411-25-5	153		152		1
PCB175	40186-70-7	17		15.9		7
PCB176	52663-65-7	34.1		33.2		3
PCB177	52663-70-4	149		148		1
PCB178	52663-67-9	120		116		3
PCB179	52663-64-6	134		126		6
PCB180 & 193	PCB180_193	763		727		5
PCB181	74472-47-2	3.88		3.79		2
PCB182	60145-23-5	3.52		3.87		-9
PCB183 & 185	PCB183_185	292		274		6
PCB184	74472-48-3	3.24		3.19		2
PCB186	74472-49-4	0.161	*U*	0.157	*U*	NA
PCB187	52663-68-0	596		569		5
PCB188	74487-85-7	2.07		1.92	*U*	NA
PCB189	39635-31-9	12.2		10.7		13
PCB190	41411-64-7	64.6		63.9		1
PCB191	74472-50-7	8.1		8.56		-6
PCB192	74472-51-8	0.323	*U*	0.313	*U*	NA
PCB194	35694-08-7	105		100		5
PCB195	52663-78-2	30.5		30.2		1
PCB196	42740-50-1	37.8		36.1		5
PCB197 & 200	PCB197_200	13.7		13.3		3
PCB198 & 199	PCB198_199	114		112		2
PCB201	40186-71-8	18.5		17.5		6
PCB202	2136-99-4	70.9		64.5		9
PCB203	52663-76-0	106		103		3
PCB204	74472-52-9	0.256	*U*	0.266	*J*	NA
PCB205	74472-53-0	3.82		3.49		9

PCB206	40186-72-9	48.8		47.3		3
PCB207	52663-79-3	8.87		8.32		6
PCB208	52663-77-1	31.6		30.2		5
PCB209	2051-24-3	90.5		82.5		9
Dioxins/furans (ng/kg)						
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	1.02	*J*	1.09	*U*	NA
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	35822-46-9	7.18		6.68		7
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	0.125	*U*	0.1	*U*	NA
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	0.471	*J*	0.463	*J*	2
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	39227-28-6	0.628	*J*	0.507	*J*	21
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	0.256	*J*	0.259	*J*	-1
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	57653-85-7	2.13		1.97		8
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	0.0986	*U*	0.0956	*U*	NA
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	19408-74-3	0.654	*J*	0.606	*J*	8
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	0.269	*J*	0.252	*J*	7
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	40321-76-4	0.856	*J*	0.735	*J*	15
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	0.262	*U*	0.275	*U*	NA
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	0.547	*J*	0.462	*U*	NA
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	0.807		0.731		10
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746-01-6	0.461		0.389		17
Dioxin/furan homologs (ng/kg)						
Heptachlorodibenzofuran homologs	38998-75-3	3.34		2.3		37
Heptachlorodibenzo-p-dioxin homologs	37871-00-4	9.5		9.33		2
Hexachlorodibenzofuran homologs	55684-94-1	7.91		7.44		6
Hexachlorodibenzo-p-dioxin homologs	34465-46-8	5.33		4.99		7
Octachlorodibenzofuran	39001-02-0	1.26	*J*	1.05	*J*	18
Octachlorodibenzo-p-dioxin	3268-87-9	14.2		12.9		10
Pentachlorodibenzofuran homologs	30402-15-4	7.08		7.05		0
Pentachlorodibenzo-p-dioxin homologs	36088-22-9	1.42		1.22		15
Tetrachlorodibenzofuran homologs	30402-14-3	6.02		5.77		4
Tetrachlorodibenzo-p-dioxin homologs	41903-57-5	1.57		1.65		-5

Notes:

-- data not available

NA - Not Applicable. The analyte was not detected in at least one sample.

Appendix B. Data Validation Report

EcoChem, INC.
Environmental Data Quality

DATA QUALITY EVALUATION

PORTLAND HARBOR

BENTHIC TISSUE – LAMPREY COMPOSITE SAMPLES
FALL 2005

Semivolatile Organic Compounds (SVOC) - Method SW8270-SIM
Polycyclic Aromatic Hydrocarbons (PAH) - Method SW8270-SIM
Organotins - Krone Method
Chlorinated Pesticides - Axys Method MLA-028 Rev 01
Polychlorinated Biphenyl (PCB) Congeners – Axys Method MLA-010 Rev 05
Dioxin/Furan Compounds – Axys Method MLA-017 Rev 12
Metals - Methods SW6010/6020, SW7470/7471A, & SW7742
Total Solids by Freeze Drying – CAS ZFZDRY

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: C22110-8

August 10, 2007

Approved for Release:

Eric Strout
Project Manager/Technical Director
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) (Integral 2004)*; Round 2 QAPP Addendum 6: Sampling of Benthic Invertebrate Tissue* (Integral 2005), and *National Functional Guidelines for Organic and/or Inorganic Data Review* (USEPA 1994, 1999 & 2002). Additional guidance for polychlorinated biphenyl (PCB) congener data validation was from the *EPA Region 10 SOP for the Validation of Method 1668 Toxic, Dioxin-like PCB Data* (USEPA 1995) and for the dioxin/furan data, *EPA Region 10 SOP for the Validation of Polychlorinated Dibenzodioxin (PCDD) and Polychlorinated Dibenzofuran (PCDF) Data* (EPA 1996).

Data qualifier definitions, reason codes, and validation criteria are included as **Appendix A**. Method specific data validation reports, with individual findings for each quality control element, are provided in **Appendix B**. Data validation worksheets and communication records are organized by SDG and will be kept on file 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.

All of the tissue data received a Level IV (full) 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)
- Chromatogram review (pesticide fractions)
- Detection limits
- Instrument performance (initial calibration, continuing calibration, tuning, sensitivity and degradation)
- Compound Identification
- 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: SEMIVOLATILE ORGANIC COMPOUNDS

Five (5) lamprey tissue composite samples were analyzed for semivolatile organic compounds (SVOC) for the Portland Harbor RI/FS Round 3A lamprey tissue study. One homogenization blank was collected to monitor the lamprey tissue composite homogenization process. Columbia Analytical Services, Kelso, Washington completed the SVOC analyses.

The SVOC data for the lamprey tissue composite samples were generally acceptable. A total of five (5) data points (5% of all lamprey tissue composite SVOC results) were qualified as not detected (U) based on laboratory blank contamination.

The laboratory data were evaluated in terms of completeness, holding times, instrument performance, bias, and precision. The results of the QC procedures used during the 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 lamprey tissue composite SVOC analyses.

Holding Times and Sample Preservation

The lamprey tissue samples were originally collected in September and October of 2006, frozen, placed in archive and stored at -20°C until analyses were required. In January, 2007 the tissue samples were shipped to the laboratory. All tissue samples were extracted and analyzed within the specified holding time period.

Instrument Performance

Initial and continuing calibrations were completed for all target analytes and met the criteria for frequency of analysis. All calibrations met the linearity (percent relative standard deviation or correlation coefficient for initial calibration, percent difference for continuing calibrations) control limits. The relative response factor (RRF) values were greater than the 0.05 minimum acceptance limit for all analytes.

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 for most compounds and ten times (10x) for phthalates. 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.

Various target analytes were detected in the method blanks. A total of five (5) results (5% of all lamprey tissue composite SVOC results) were qualified as not detected (U) based on method blank contamination. The qualifiers were issued to diethyl phthalate (5 results).

Accuracy

Surrogate Compound Recoveries

Surrogate compounds were added to all samples. The surrogate recoveries reported by the laboratory met the criteria for acceptable performance.

Matrix Spike Recoveries

There was insufficient tissue sample volume for matrix spike/matrix spike duplicate (MS/MSD) analyses. Accuracy was measured using the surrogates and a laboratory control sample/laboratory control sample duplicate set.

Laboratory Control Sample Recoveries

Laboratory control sample/laboratory control sample duplicate (LCS/LCSD) analyses were performed at the proper frequency. The recoveries reported by the laboratory met the criteria for acceptable performance.

Precision

A laboratory split sample and LCS/LCSD analyses were evaluated for laboratory precision. All relative percent difference (RPD) values met the criteria for acceptable performance.

Method Detection Limits and Method Reporting Limits

To try to meet the project analytical concentration goals (ACG), the laboratory reported non-detects at the method detection limits (MDLs), adjusted for sample size, percent moisture, and any dilution factor. These method reporting limits (MRLs) ranged from 6.6 µg/Kg to 45 µg/Kg for the non-detected results, and all MRL met the target MRLs specified in the QAPP. The ACG were not met for several of the SVOC compounds.

Field Quality Control Samples

Field QC samples collected for the lamprey tissue composite study included a homogenization blank. The results for the field QC samples are discussed in the following section.

Rinse Blanks

One homogenization blank was associated with the lamprey tissue composite samples. This blank was prepared during the lamprey tissue composite homogenization stage. No target analytes were detected in the rinse blank.

SUMMARY OF DATA VALIDATION: POLYCYCLIC AROMATIC HYDROCARBONS

Seven (7) lamprey tissue composite samples were analyzed for polycyclic aromatic hydrocarbon compounds (PAH) for the Portland Harbor RI/FS Round 3A lamprey tissue study. Columbia Analytical Services, Kelso, Washington completed the PAH analyses.

The PAH data for the lamprey tissue composite samples were generally acceptable. No data were rejected for any reason. No data were estimated, and a total of 5 data points (4.2% of all lamprey tissue composite PAH results) were qualified based on blank contamination. 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 the 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 lamprey tissue composite PAH analyses.

Holding Times and Sample Preservation

The lamprey tissue samples were originally collected in September and October of 2006, frozen, placed in archive and stored at -20°C until analyses were required. In January, 2007 the tissue samples were shipped to the laboratory. All tissue samples were extracted and analyzed within the specified holding time period.

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 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.

One target analyte was detected in the method blank. A total of 5 results (4.2% of all lamprey tissue composite PAH results) were qualified as not detected (U) based on method blank contamination. The qualifiers were issued to benzo(a)anthracene (5 results).

Accuracy

Surrogate Compound Recoveries

Surrogate compounds were added to all samples. The surrogate recoveries reported by the laboratory met the criteria for acceptable performance.

Matrix Spike Recoveries

There was insufficient tissue sample volume for matrix spike/matrix spike duplicate (MS/MSD) analyses. Accuracy was measured using the surrogates and a laboratory control sample/laboratory control sample duplicate set.

Laboratory Control Sample Recoveries

Laboratory control sample / laboratory control sample duplicate (LCS/LCSD) analyses met the criteria for frequency of analysis. The recoveries reported by the laboratory met the criteria for acceptable performance.

Precision

A laboratory split sample and LCS/LCSD analyses were evaluated for laboratory precision. All relative percent difference (RPD) values met the criteria for acceptable performance.

Method Detection Limits and Method Reporting Limits

To try to meet the project analytical concentration goals (ACG), the laboratory reported non-detects at the method detection limits (MDLs), adjusted for sample size, percent moisture, and any dilution factor. These method reporting limits (MRLs) ranged from 0.17 µg/Kg to 0.6 µg/Kg for the non-detected results. Several of the MRL were greater than the target 0.5 µg/Kg MRLs specified in the QAPP. The ACG were not met for several of the PAH compounds.

Field Quality Control Samples

Field QC samples collected for the lamprey tissue composite study included a homogenization blank sample. The results for the field QC samples are discussed in the following section.

Rinse Blanks

One homogenization blank was associated with the lamprey tissue composite samples. The rinse blank was prepared during the lamprey tissue composite homogenization stage. No target analytes were detected in the rinse blank.

No data were qualified based on rinse blank contamination.

SUMMARY OF DATA VALIDATION: ORGANOTINS

One (1) lamprey tissue composite sample was analyzed for organotin compounds for the Portland Harbor RI/FS Round 3A lamprey tissue study. One homogenization blank was collected to monitor the lamprey tissue composite homogenization process. Columbia Analytical Services, Kelso, Washington completed the organotin analyses.

The organotin data for the lamprey tissue composite samples were acceptable. No lamprey tissue composite organotin data were qualified.

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 lamprey tissue composite organotin analyses.

Holding Times and Sample Preservation

The lamprey tissue samples were originally collected in September and October of 2006, frozen, placed in archive and stored at -20°C until analyses were required. In January, 2007 the tissue samples were shipped to the laboratory. All tissue samples were extracted and analyzed within the specified holding time period.

Instrument Performance

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

No target analytes were detected in the method blank.

Accuracy

Surrogate Compound Recoveries

A surrogate compound was added to all field and QC samples. All surrogate recovery values met the criteria for acceptable performance.

Matrix Spike Recoveries

There was insufficient tissue sample volume for matrix spike/matrix spike duplicate (MS/MSD) analyses. Accuracy was measured using the surrogates and a laboratory control sample/laboratory control sample duplicate set.

Laboratory Control Sample Recoveries

Laboratory control sample / laboratory control sample duplicate (LCS/LCSD) analyses met the criteria for frequency of analysis. The recoveries reported by the laboratory met the criteria for acceptable performance, with the exception of the LCSD %R value for di-n-butyltin. The %R value for di-n-butyltin was greater than the upper control limit. This analyte was not detected in the associated sample and no qualifiers were assigned.

Precision

A laboratory split sample and LCS/LCSD analyses were evaluated for laboratory precision. All relative percent difference (RPD) values met the criteria for acceptable performance.

Method Detection Limits and Method Reporting Limits

To try to meet the project analytical concentration goals (ACG), the laboratory reported non-detects at the method detection limits (MDLs), adjusted for sample size, percent moisture, and any dilution factor. These method reporting limits (MRLs) ranged from 0.22 µg/Kg to 0.83 µg/Kg for the non-detected results, and all MRL met the target MRLs specified in the QAPP. All ACG were met for the organotin compounds.

Compound Identification

The results from the two analytical columns were compared for agreement. All reported results met confirmation criteria.

Field Quality Control Samples

Field QC samples collected for the benthic lamprey tissue composite study included a homogenization blank sample. The results for the field QC samples are discussed in the following section.

Rinse Blanks

One homogenization blank was associated with the lamprey tissue composite sample. This blank was prepared during the lamprey tissue composite homogenization stage. After qualifiers were issued based on method blank contamination, no positive results remained in the homogenization blank.

SUMMARY OF DATA VALIDATION: PESTICIDE COMPOUNDS

Nine (9) lamprey tissue composite samples were analyzed for chlorinated pesticide compounds for the Portland Harbor RI/FS Round 3A lamprey tissue study. One homogenization blank was collected to monitor the lamprey tissue composite homogenization process. Axys Analytical, Sidney, British Columbia, completed the pesticide analyses.

The pesticide data for the lamprey tissue composite samples were generally acceptable. Six (6) data points (2.4% of all lamprey tissue composite pesticides results) were of unacceptable quality and were rejected. Twenty-eight (28) data points (11.1% of all lamprey tissue composite pesticide results) were qualified as not detected (U). A total of 13 data points (5.2% of all lamprey tissue composite 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 97.6% complete for the lamprey tissue composite pesticide analyses.

Holding Times and Sample Preservation

The lamprey tissue samples were originally collected in September and October of 2006, frozen, placed in archive and stored at -20°C until analyses were required. In January, 2007 the tissue samples were shipped to the laboratory. All tissue samples were extracted and analyzed within the specified holding time period.

Instrument Performance

Calibrations

The analyte hexachlorobutadiene was not included in the standards used for the calibrations. Hexachlorobutadiene was not detected in any sample. The three hexachlorobutadiene reporting limits that were not previously rejected were estimated (UJ) based on the lack of an acceptable calibration. The initial calibration acceptance criteria were not met for endrin aldehyde. The nine (9) endrin aldehyde reporting limits were estimated (UJ). A total of 11 data points (4.4% of the lamprey tissue composite pesticide results) were estimated (UJ) based on calibration outliers.

Initial and continuing calibrations were completed for all other reported analytes at the proper frequency. For all other target analytes, the initial and continuing calibrations met all acceptance criteria.

Endrin/DDT Breakdown

Breakdown evaluation mixtures were analyzed at the proper frequency to measure percent breakdown of 4,4'-DDT and endrin. All percent breakdown values met the 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, including rinse blanks. Any remaining positive results in the rinse blanks are used to evaluate all associated samples.

Method blanks were analyzed at the appropriate frequency. A total of six results (2.4% of all lamprey tissue composite pesticide results) were qualified as not detected (U) based on method blank contamination. The qualifiers were issued to six results for methoxychlor.

Accuracy

Labeled Compound Recoveries

One labeled compound ($^{13}C_{12}$-1,2,3-trichlorobenzene) was not recovered in three lamprey tissue samples. This labeled compound was flagged as "NQ" (not quantifiable) by the laboratory. The quantitation of hexachlorobutadiene is associated with this labeled compound. Due to the significant low bias, the hexachlorobutadiene reporting limit was rejected (R). The $^{13}C_{12}$-1,2,3-trichlorobenzene percent recovery (%R) values were less than the lower control limit in four samples. Hexachlorobutadiene was not detected. The hexachlorobutadiene reporting limits results were estimated (UJ) in these samples.

Labeled compounds were added to all field and QC samples. One or more labeled compounds (usually $^{13}C_{12}$-1,2,3-trichlorobenzene) were not recovered (or the recovery value was less than 10%) in six (6) samples. The quantitation of hexachlorobutadiene is associated with this labeled compound. Due to the significant low bias, the hexachlorobutadiene reporting limit was rejected (R) in those samples. The $^{13}C_{12}$-1,2,3-trichlorobenzene percent recovery (%R) values were less than the lower control limit (but greater than 10%) in three other samples. The hexachlorobutadiene results were estimated (J/UJ) in these samples.

A total of six (6) data points (2.4% of the lamprey tissue composite pesticides results) were rejected. Three (3) data points (1.2%) were estimated based on labeled compound recovery outliers.

Matrix Spike Recoveries

There was insufficient tissue sample volume for matrix spike/matrix spike duplicate (MS/MSD) analyses. Accuracy was measured using the surrogates and an ongoing precision and recovery (OPR) and OPR duplicate set.

Ongoing Precision and Recovery Sample Recoveries

Hexachlorobutadiene was not added to any OPR analysis. The associated hexachlorobutadiene results were estimated (J/UJ), unless previously rejected. Three (3) hexachlorobutadiene results (1.2% of all lamprey tissue composite pesticides results) were estimated based on OPR results.

Precision

A laboratory split sample and OPR/OPR Duplicate analyses were evaluated for laboratory precision. The relative percent difference (RPD) values were within the acceptance limits.

Method Detection Limits and Method Reporting Limits

To meet the project analytical concentration goals (ACG), the laboratory reported non-detects at the method detection limits (MDLs), adjusted for sample size, percent moisture, and any dilution factor. These method reporting limits (MRLs) ranged from 0.000814 µg/Kg to 0.0574 µg/Kg for the non-detected results, meeting the target MRLs specified in the QAPP.

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. A total of 16 data points (6.3% of all lamprey tissue composite pesticide data points) were qualified as not detected because the ion abundance ratio criteria were not met.

Field Quality Control Samples

Field QC samples collected for the lamprey tissue composite study included a homogenization blank. The results for the field QC samples are discussed in the following section.

Rinse Blanks

One homogenization blank was associated with the lamprey tissue composite samples. This blank was prepared during the lamprey tissue composite homogenization stage. Positive results for hexachlorobenzene, gamma-chlordane, and dieldrin were present in this blank. As the associated sample results for these compounds were greater than the action levels, no action was taken and no data were qualified based on rinsate blank contamination.

SUMMARY OF DATA VALIDATION: PCB CONGENERS

Nine (9) lamprey tissue composite samples were analyzed for polychlorinated biphenyl (PCB) congeners for the Portland Harbor RI/FS Round 3A lamprey tissue study. One homogenization blank was collected to monitor the lamprey tissue composite homogenization process. Axys Analytical, Sidney, British Columbia, completed the pesticide analyses.

The PCB congener data for the lamprey tissue composite samples were generally acceptable. Five (5) data points (0.33% of all lamprey tissue composite PCB congener results) were of unacceptable quality and were rejected. A total of 85 data points (5.7% of all lamprey tissue composite PCB congener 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 greater than 99.6% complete for the lamprey tissue composite PCB congener analyses.

Holding Time and Sample Preservation

The lamprey tissue samples were originally collected in September and October of 2006, frozen, placed in archive and stored at -20°C until analyses were required. In January, 2007 the tissue samples were shipped to the laboratory. All tissue sample holding times were acceptable.

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, including rinse blanks. Any remaining positive results in the rinse blanks are used to evaluate all associated samples.

Method blanks were analyzed at the appropriate frequency. No tissue results were qualified based on method blank contamination.

Accuracy

Labeled Compound Recoveries

Labeled compounds were added to all field and QC samples. One or more labeled compounds were not reported in several samples due to interferences that masked the labeled compound. In some cases, the interference also masked the target congener, and no result was reported. These results were rejected (R). If the target analyte was detected but the associated labeled compound was not usable, the laboratory quantitated the target analyte using alternative labeled compounds, or the average of several labeled compounds. These results were "T" flagged by the laboratory. For these results, positive results and reporting limits were estimated (J/UJ).

The recovery values of several other labeled compounds were outside the specified control limits. If the outlier indicated a potential high bias, only the associated positive results were estimated (J). If the outlier indicated a potential low bias, associated positive result sand detection limits were estimated (J/UJ). Five (5) data points (0.33% of the lamprey tissue composite pesticides results) were rejected. A total of 47 data points (3.1%) were estimated based on labeled compound recovery outliers.

Matrix Spike Recoveries

There was insufficient tissue sample volume for matrix spike/matrix spike duplicate (MS/MSD) analyses. Accuracy was measured using the surrogates and an ongoing precision and recovery (OPR) and OPR duplicate set.

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

A laboratory split sample and OPR/OPR Duplicate analyses were evaluated for laboratory precision. The relative percent difference (RPD) values met the criteria for acceptable performance in the OPR and OPR duplicate.

The RPD values for nine compounds were greater than the 40% upper control limit in the laboratory replicate analysis. A total of 14 results (0.94% of the lamprey pesticides results) were estimated (J/UJ) in the replicate samples based on precision outliers.

Method Detection Limits and Method Reporting Limits

To meet the project analytical concentration goals (ACG), the laboratory reported non-detects at the method detection limits (MDLs), adjusted for sample size, percent moisture, and any dilution factor. These method reporting limits (MRLs) ranged from 0.0557 µg/Kg to 3.94 µg/Kg 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 30 data points (2.0% of all lamprey tissue composite PCB congener data points) were qualified as not detected because the ion abundance ratio criteria were not met.

Interferences were noted that potentially affected the quantitation of some of the target congeners in several samples. All of these results were flagged "G" by the laboratory to indicate the potential interference. The results and reporting limits for these PCB congeners were estimated (J/UJ) in the samples. A total of six (6) data points (0.4% of all lamprey tissue composite PCB congener data points) were estimated due to interference.

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 27 positive Aroclor results (1.8% of all lamprey tissue composite PCB congener data points) were qualified as tentatively identified at estimated concentrations.

Field Quality Control Samples

Field QC samples collected for the lamprey tissue composite study included a homogenization blank. The results for the field QC samples are discussed in the following section.

Rinse Blanks

One homogenization blank was associated with the lamprey tissue composite samples. This blank was prepared during the lamprey tissue composite homogenization stage. Various target analytes were detected in the blank. In all cases, these analytes were either not detected or were present at concentrations greater than the action levels in the associated samples. No data were qualified based on homogenization blank contamination.

SUMMARY OF DATA VALIDATION: DIOXIN/FURAN COMPOUNDS

Nine (9) lamprey tissue composite samples were analyzed for dioxin and furan compounds for the Portland Harbor RI/FS Round 3A lamprey tissue study. One homogenization blank was collected to monitor the lamprey tissue composite homogenization process. Axys Analytical, Sidney, British Columbia, completed the dioxin/furan analyses.

The dioxin/furan data for the lamprey tissue composite samples were generally acceptable. No data were rejected or estimated for any reason. Thirty (30) results (13.3% of the lamprey tissue composite dioxin/furan results) were qualified as not detected (U).

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 lamprey tissue composite dioxin/furan analyses.

Holding Time and Sample Preservation

The lamprey tissue samples were originally collected in September and October of 2006, frozen, placed in archive and stored at -20°C until analyses were required. In January, 2007 the tissue samples were shipped to the laboratory. All tissue sample holding times were acceptable.

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

Method blanks were analyzed at the appropriate frequency. A total of 23 results (10.2% of all lamprey tissue composite dioxin/furan results) were qualified as not detected (U) based on method blank contamination.

Accuracy

Labeled Compound Recoveries

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

Matrix Spike Recoveries

There was insufficient tissue sample volume for matrix spike/matrix spike duplicate (MS/MSD) analyses. Accuracy was measured using the surrogates and an ongoing precision and recovery (OPR) and OPR duplicate set.

Ongoing Precision and Recovery Sample Recoveries

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

Precision

A laboratory split sample and OPR/OPR Duplicate analyses were evaluated for laboratory precision. All relative percent difference (RPD) values were acceptable.

Method Detection Limits and Method Reporting Limits

To try to meet the project analytical concentration goals (ACG), the laboratory reported non-detects at the method detection limits (MDLs), adjusted for sample size, percent moisture, and any dilution factor. These MDLs ranged from 0.0541 pg/g to 0.161 pg/g for the non-detected results. The ACG were not met for most of the reported 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 EMPC (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 seven (7) data points (3.1% of all lamprey tissue composite dioxin/furan data points) were qualified as not detected because the ion abundance ratio criteria were not met.

Field Quality Control Samples

Field QC samples collected for the benthic lamprey tissue composite study included a homogenization blank. The results for the field QC samples are discussed in the following section.

Rinse Blanks

One homogenization blank was associated with the lamprey tissue composite samples. This blank was prepared during the lamprey tissue composite homogenization stage. One target analyte was detected in the rinse blank. In all cases, this analyte was detected at concentrations greater than the action levels in the associated samples. No data were qualified based on rinsate blank contamination.

SUMMARY OF DATA VALIDATION: METALS

Eight (8) lamprey tissue composite samples were analyzed for total metals for the Portland Harbor RI/FS Round 3A lamprey tissue study. One homogenization blank was collected to monitor the lamprey tissue composite homogenization process. Columbia Analytical Services, Kelso, Washington completed all analyses. The following analytical methods were used:

Parameter	Method
ICP Metals	SW6010B
ICP-MS Metals	SW6020
Mercury	SW7471A
Selenium	SW7740

The metals data for the lamprey tissue composite samples were generally acceptable. No data were rejected for any reason. A total of two (2) data points (2.8% of all lamprey tissue composite metals 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 the 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 lamprey tissue composite metals analyses.

Holding Time and Sample Preservation

The lamprey tissue samples were originally collected in September and October of 2006, frozen, placed in archive and stored at -20°C until analyses were required. In January, 2007 the tissue samples were shipped to the laboratory. All holding times were met for the tissue sample analyses.

Instrument Performance

Initial and continuing calibrations were completed for all target analytes and met the criteria for frequency of analysis. The 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). No action is taken if the sample result is greater than the action level, or for non-detected results.

Method and instrument blanks were analyzed at the appropriate frequency. Various target analytes were detected in the method and/or instrument blanks. The contaminant levels, associated samples,

and action levels are documented in the data validation worksheets. All sample results were significantly greater than the action levels. No lamprey tissue data were qualified based on method 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).

Matrix Spike Recoveries

Insufficient sample was available to prepare matrix spike samples for the tissue analyses. Laboratory accuracy was evaluated using the recoveries for the Standard Reference Materials (SRM).

Laboratory Control Sample Recoveries

Standard Reference Materials DORM-2 and DOLT-3 were prepared and analyzed in duplicate. The SRM recovery values were within the manufacturer's certified acceptance range. The relative percent difference (RPD) values were less than 30%, with the following exception:

For DORM-2, the RPD for lead (34.6%) was greater than the control limit. The RPD value for lead was within the control limit for DOLT-3, therefore no action was taken. Antimony was not included as a certified value in either SRM. Accuracy for this analyte was evaluated by the post digest spike recovery.

Contract Required Detection Limit Standard Analyses

The CRDL standard recoveries for selenium and silver were less than the lower control limit of 70% for the tissue analyses. All associated sample results were greater than the action levels of twice the reporting limit and no qualification of data was necessary.

The CRDL recoveries for cadmium, copper, lead, and zinc were greater than the upper control limit of 130% for the field blank analyses. The associated results were either not detected or greater than the action level. No qualification of data was required.

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% for sample results greater than 50 times the MDL may indicate the presence of matrix interference, resulting in potential bias. All serial dilution results met the acceptance criteria.

Precision

Laboratory duplicate analyses were evaluated for laboratory precision. The relative percent difference (RPD) value for mercury was outside the acceptance limits. Two (2) results (2.1% of all lamprey tissue composite metals results) were estimated (J) based on laboratory precision outliers.

Method Detection Limits and Method Reporting Limits

The laboratory reported non-detects at the MDLs, adjusted for sample size and any dilution factor. With the exception of one chromium result (MDL 0.1 mg/Kg), one cadmium and two antimony results (MDL 0.002 mg/Kg for each), all metals were detected in all samples.

Field Quality Control Samples

Field QC samples collected for the lamprey tissue composite study included a homogenization blank. The results for the field QC samples are discussed in the following sections.

Rinse Blanks

One homogenization blank was associated with the lamprey tissue composite samples. This blank was prepared during the lamprey tissue composite homogenization stage. Chromium, copper, and zinc were detected in the rinse blank. In all cases, these analytes were either not detected or were present at concentrations greater than the action levels in the associated samples. No data were qualified based on homogenization blank contamination.

SUMMARY OF DATA VALIDATION: CONVENTIONAL PARAMETERS

All lamprey tissue composite samples were analyzed for total solids/percent moisture, using a freeze-drying method. No QC outliers were noted. All total solids/percent moisture results were acceptable as reported.

EcoChem, INC.
Environmental Data Quality

APPENDIX A

DATA QUALIFIER DEFINITIONS, REASON CODES, AND CRITERIA TABLES

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
Volatile Compounds by GC/MS (Based on Organic NFG 1999)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Cooler/Storage Temperature and Preservation	Aqueous/Soil/Sediment <4°C Tissues <-10°C Water: HCl to pH < 2	J(+)/UJ(-) if greater than 6 deg. C (EcoChem PJ)	1
Hold Time	Waters: 14 days preserved 7 Days: unpreserved (for aromatics) Solids: 14 Days	J(+)/UJ(-) if hold times exceeded If exceeded by > 3X HT: J(+)/R(-) (EcoChem PJ)	1
Tuning	BFB Beginning of each 12 hour period Method acceptance criteria	R(+/-) all analytes in all samples associated with the tune	5A
Initial Calibration (Minimum 5 stds.)	RRF > 0.05	J(+)/R(-) if RRF < 0.05	5A
	%RSD < 30%	(EcoChem PJ, see TM-06) J(+) if %RSD > 30%	5A
Continuing Calibration (Prior to each 12 hr. shift)	RRF > 0.05	(EcoChem PJ, see TM-06) If MDL= reporting limit: J(+)/R(-) if RRF < 0.05 If reporting limit > MDL: note in worksheet if RRF <0.05	5B
	%D <25%	(EcoChem PJ, see TM-06) If > +/-90%: J+/R- If -90% to -26%: J+ (high bias) If 26% to 90%: J+/UJ- (low bias)	5B
Method Blank	One per matrix per batch No results > QL	U(+) if sample (+) result is less than QL and less than appropriate 5X or 10X rule (raise sample value to QL)	7
		U(+) if sample (+) result is greater than or equal to QL and less than appropriate 5X and 10X rule (at reported sample value)	7
	No TICs present	R(+) TICs using 10X rule	7
Storage Blank	One per SDG <QL	U(+) the specific analyte(s) results in all assoc.samples using the 5x or 10x rule	7
Trip Blank	Frequency as per project QAPP	Same as method blank for positive results remaining in trip blank after method blank qualifiers are assigned	18
Field Blanks	No results > QL	Apply 5X/10X rule; U(+) < action level	6
MS/MSD (recovery)	One per matrix per batch Use 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 per matrix per batch Use method acceptance criteria	J(+) if RPD > CL	9

Copyright 2004 EcoChem, Inc.

Integral - Portland Harbor Site
Volatile Compounds by GC/MS (Based on Organic NFG 1999)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Lab Duplicate	Results >5X reporting limit (RL): RPD criteria: use QAPP limits, all matrices Results <5X RL: Solid: Absolute difference < 2X RL Aqueous: Absolute difference < 1X RL	J(+)/UJ(-) if outside limits	9
LCS *low conc. H2O VOA*	One per lab batch Within method control limits	J(+) assoc. cmpd if > UCL J(+)/R(-) assoc. cmpd if < LCL J(+)/R(-) all cmpds if half are < LCL	10
LCS *regular VOA (H2O & solid)*	One per lab batch Lab or method control limits	J(+) if %R > UCL J(+)/UJ(-) if %R <LCL J(+)/R(-) if %R < 10% (EcoChem PJ)	10
LCS/LCSD *(if required)*	One set per matrix and batch of 20 samples RPD < 35%	J(+) assoc. cmpd. in all samples	9
Surrogates	Added to all samples Within method control limits	J(+) if %R >UCL J(+)/UJ(-) if %R <LCL but >10% (see PJ1) J(+)/R(-) if <10%	13
Internal Standards	Added to all samples Acceptable Range: IS area 50% to 200% of CCAL area RT within 30 seconds of CC RT	J(+) if > 200% J(+)/UJ(-) if < 50% J(+)/R(-) if < 25% R T>30 seconds, narrate and Notify PM	19
Field Duplicates	Results >5X reporting limit (RL): RPD < 50% (all matrices, QAPP specified) Results <5X RL: Solid: Absolute difference < 2X RL Aqueous: Absolute difference < 1X RL	Narrate; do not qualify	na
TICs	Major ions (>10%) in reference must be present in sample; intensities agree within 20%; check identification	R(+) common laboratory contaminants R(+) target compouds from other fractions See Technical Director for ID issues	14
Quantitation/ Identification	RRT within 0.06 of standard RRT Ion relative intensity within 20% of standard All ions in std. at > 10% intensity must be present in sample	See Technical Director if outliers	14 21 (false +)

PJ1 No action if there are 4+ surrogates and only 1 outlier.

Copyright 2004 EcoChem, Inc.

Integral - Portland Harbor Site
Semivolatile Compounds by GC/MS (Based on Organic NFG 1999)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Cooler/Storage Temperature	Aqueous/Soil/Sediment <4°C Tissues <-10°C	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	Water: J(+)/UJ(-) if ext. > 7 and < 21 days J(+)/R(-) if ext > 21 days (EcoChem PJ) Solids/Wastes: J(+)/UJ(-) if ext. > 14 and < 42 days J(+)/R(-) if ext. > 42 days (EcoChem PJ) J(+)/UJ(-) if analysis >40 days	1
Tuning	DFTPP Beginning of each 12 hour period Method acceptance criteria	R(+/-) all analytes in all samples associated with the tune	5A
Initial Calibration (Minimum 5 stds.)	RRF > 0.05	(EcoChem PJ, see TM-06) If MDL= reporting limit: J(+)/R(-) if RRF < 0.05 If reporting limit > MDL: note in worksheet if RRF <0.05	5A
	%RSD < 30%	(EcoChem PJ, see TM-06) J(+) if %RSD > 30%	5A
Continuing Calibration (Prior to each 12 hr. shift)	RRF > 0.05	(EcoChem PJ, see TM-06) If MDL= reporting limit: J(+)/R(-) if RRF < 0.05 If reporting limit > MDL: note in worksheet if RRF <0.05	5B
	%D <25%	(EcoChem PJ, see TM-06) If > +/-90%: J+/R- If -90% to -26%: J+ (high bias) If 26% to 90%: J+/UJ- (low bias)	5B
Method Blank	One per matrix per batch No results > QL	U(+) if sample (+) result is less than QL and less than appropriate 5X or 10X rule (raise sample value to QL)	7
		U(+) if sample (+) result is greater than or equal to QL and less than appropriate 5X and 10X rule (at reported sample value)	7
	No TICs present	R(+) TICs using 10X rule	7
Field Blanks	No results > QL	Apply 5X/10X rule; U(+) < action level	6

Copyright 2004 EcoChem, Inc.

Integral - Portland Harbor Site
Semivolatile Compounds by GC/MS (Based on Organic NFG 1999)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
MS/MSD (recovery)	One per matrix per batch Use 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 per matrix per batch Use method acceptance criteria	J(+) if RPD > CL	9
Lab Duplicate	Results >5X reporting limit (RL): RPD criteria: use QAPP limits, all matrices Results <5X RL: Solid: Absolute difference < 2X RL Aqueous: Absolute difference < 1X RL	J(+)/UJ(-) if outside limits	9
LCS low conc. H2O SVOA	One per lab batch Within method control limits	J(+) assoc. cmpd if > UCL J(+)/R(-) assoc. cmpd if < LCL J(+)/R(-) all cmpds if half are < LCL	10
LCS regular SVOA (H2O & solid)	One per lab batch Lab or method control limits	J(+) if %R > UCL J(+)/UJ(-) if %R <LCL J(+)/R(-) if %R < 10% (EcoChem PJ)	10
LCS/LCSD *(if required)*	One set per matrix and batch of 20 samples RPD < 35%	J(+) assoc. cmpd. in all samples	9
Surrogates	Minimum of 3 acid and 3 base/neutral compounds Use method acceptance criteria	Do not qualify if only 1 acid and/or 1 B/N surrogate is out unless <10% J(+) if %R > UCL J(+)/UJ(-) if %R < LCL J(+)/R(-) if %R < 10%	13
Internal Standards	Added to all samples Acceptable Range: IS area 50% to 200% of CCAL area RT within 30 seconds of CC RT	J(+) if > 200% J(+)/UJ(-) if < 50% J(+)/R(-) if < 25% R T>30 seconds, narrate and Notify PM	19
Field Duplicates	Results >5X reporting limit (RL): RPD < 50% (all matrices, QAPP specified) Results <5X RL: Solid: Absolute difference < 2X RL Aqueous: Absolute difference < 1X RL	Narrate; do not qualify	na
TICs	Major ions (>10%) in reference must be present in sample; intensities agree within 20%; check identification	R(+) common laboratory contaminants R(+) target compouds from other fractions See Technical Director for ID issues	4
Quantitation/ Identification	RRT within 0.06 of standard RRT Ion relative intensity within 20% of standard All ions in std. at > 10% intensity must be present in sample	See Technical Director if outliers	14 21 (false +)

Copyright 2004 EcoChem, Inc.

Integral - Portland Harbor Site
Butyltins by GC/FPD

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Cooler/Storage Temperature	Aqueous/Soil/Sediment <4°C Tissues <-10°C	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
Initial Calibration	%RSD<30% or correlation co-efficient >0.99	J(high bias), J/UJ(low bias)	5A
Continuing Calibration	%D < 25%	J(high bias), J/UJ(low bias)	5B
Method Blank	One per matrix per batch	U(+) if sample result is < QL and < 5X rule (raise sample value to QL)	7
		U(+) if sample result is > or equal to QL and < 5X rule (at reported sample value)	7
Instrument Blanks	Analyzed at the beginning of every 12 hour sequence No analyte > MRL	Same as Method Blank	7
Field Blanks	No results > QL	Apply 5X rule; U(+) < action level	6
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
Lab Duplicate	Results >5X reporting limit (RL): RPD criteria: use QAPP limits, all matrices Results <5X RL: Solid: Absolute difference < 2X RL Aqueous: Absolute difference < 1X RL	J(+)/UJ(-) if outside limits	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

Copyright 2004 EcoChem, Inc.

Integral - Portland Harbor Site
Butyltins by GC/FPD

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
LCS/LCSD *(if required)*	One set per matrix and batch of 20 samples RPD < 35%	J(+) assoc. cmpd. in all samples	9
Surrogates	tri-n-propyltin added to every sample %R = Laboratory control limits	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 ICAL CF Higher value from either column reported RPD between columns (40%)	J(+) if RPD = 40 - 60% NJ(+) if RPD >60% (EcoChem PJ)	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
Field Duplicates	Results >5X reporting limit (RL): RPD < 50% (all matrices, QAPP specified) Results <5X RL: Solid: Absolute difference < 2X RL Aqueous: Absolute difference < 1X RL	Narrate; do not qualify	na

Copyright 2004 EcoChem, Inc.

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

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Cooler/Storage Temperature	Aqueous/Soil/Sediment <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 > 30 days 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(-)	

Copyright 2004 EcoChem, Inc.

Integral - Portland Harbor Site
Compounds Analyzed By HRMS (Methods 1613B or SW846 - 8290)
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 %D in the closing CCAL are w/in 25%/35%, the avg RF from the 2 CCAL may be used to calculate samples per Section 8.3.2.4 of 8290)	Do not qualify labeled compounds. Narrate in report for labeled compound %D outliers. For native compound %D outliers: *Method 8290:* J(+)/UJ(-) if %D = 20% - 75% J(+)/R(-) if %D > 75% *Method 1613:* J(+)/UJ(-) if %D is outside Table 6 limits J(+)/R(-) if %D is +/- 75% of Table 6 limit	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

Copyright 2004 EcoChem, Inc.

Integral - Portland Harbor Site
Compounds Analyzed By HRMS (Methods 1613B or SW846 - 8290)
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% to LCL J(+) if %R > UCL J(+)/R(-) if %R < 10%	13
	Method 1613B: %R must meet limits specified inTable 7		
Quantitation/ Identification	Ions for analyte, IS, and rec. std. must 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 column (or equiv). 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% (all matrices)	Narrate; do not qualify	na
Two analyses for one sample	Report only one result per analyte	"DNR" results that should not be used	11

Copyright 2004 EcoChem, Inc.

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

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Cooler/Storage Temperature and Preservation	Aqueous/Soil/Sediment <4°C Tissues <-10°C Water Only: Nitric Acid to pH < 2 For Dissolved metals, 0.45 um filter preserve after filtration	EcoChem PJ J(+)/UJ(-) if preservation requirements are not met	1
Holding Time	180 days	EcoChem PJ J(+)/UJ(-)	1
Initial Calibration	Blank + minimum 1 standard once every 24 hours if more than 1 standard r>0.995	EcoChem PJ 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	EcoChem PJ 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	EcoChem PJ J(+)/UJ(-) if %R = 75%-89% J(+) if %R 111-125% R(+) if %R > 125% R(+/-) if %R < 75%	5B
CRI Standard (to check RL)	2X RL (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)	EcoChem PJ R(-),(+)<2XRL if %R <50% (< 30% Sb, Pb, Tl) J(+)<2XRL, UJ(-) if %R 50-69% (30%-49% Sb, Pb,Tl) J(+) <2X RL if %R 130%-180% (150%-200%Sb, Pb, Tl) R(+)<2X RL 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% EcoChem PJ 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	

Copyright 2004 EcoChem, Inc.

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 RL Diff <RL for samples >RL and <5 x RL (may use RPD < 35%, Diff < 2X RL for solids)	J(+)/UJ(-) if RPD > 20% or diff > RL	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% (all matrices)	Narrate; do not qualify	na
Instrument Detection Limit	determined every 3 months	EcoChem PJ	14
Linear Range	determined yearly samples diluted to fall within range	J(+) values over range	20

Copyright 2004 EcoChem, Inc.

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

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Cooler/Storage Temperature and Preservation	Aqueous/Soil/Sediment <4°C Tissues <-10°C Water Only: Nitric Acid to pH < 2 For Dissolved metals, 0.45 um filter preserve after filtration	EcoChem PJ J(+)/UJ(-) if preservation requirements are not met	1
Holding Time	180 days	EcoChem PJ 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	EcoChem PJ No Tune - R all results criteria not met - J(+)/UJ(-)	5A
Initial Calibration	Mininum Blank+1 Standard every 24 hours	EcoChem PJ 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	EcoChem PJ 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	EcoChem PJ J(+)/UJ(-) if %R 75%-89% J(+) if %R = 111-125% R(+) if %R > 125% R(+/-) if %R < 75%	5B
RL Standard (CRI)	2X RL (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)	EcoChem PJ R(-),(+)<2XRL if %R <50% (< 30% Co,Mn, Zn) J(+)<2XRL, UJ(-) if %R 50-69% (30%-49% Co,Mn, Zn) J(+) <2X RL if %R 130%-180% (150%-200% Co,Mn, Zn) R(+)<2X RL 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

Copyright 2004 EcoChem, Inc.

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% EcoChem PJ for ICSA > +/- IDL	17
Post Digestion Spike	If ICP Matrix Spike is outside 75-125% Spike parent sample at 2X the sample conc.	EcoChem PJ - 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 RL Diff<RL for samples >RL and <5 x RL (may use RPD < 35%, Diff < 2X RL for solids)	J(+)/UJ(-) associated samples if RPD > 20% or diff > RL	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% (all matrices)	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	EcoChem PJ	14
Linear Range	determined yearly samples diluted to fall within range	J(+) values over range	20

Copyright 2004 EcoChem, Inc.

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

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Cooler/Storage Temperature and Preservation	Aqueous/Soil/Sediment <4°C Tissues <-10°C Water Only: Nitric Acid to pH < 2 For Dissolved metals, 0.45 um filter preserve after filtration	EcoChem PJ J(+)/UJ(-) if preservation requirements are not met	1
Holding Time	28 days from date sampled	EcoChem PJ J(+)/UJ(-) if holding time exceeded	1
Initial Calibration	Blank + 4 standards r > 0.995 once every 24 hours	EcoChem PJ J(+)/UJ(-) if r<0.995	5A
Initial Calibration Verification (ICV)	Independent source analyzed immediately after cal. %R within +/- 20% of true value	EcoChem PJ 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
RL Standard (CRA)	Beginning of run after ICV/ICB CCV/CCB Conc = RL 70% - 130%	EcoChem PJ R(-),(+)<2XRL if %R <50% J(+)<2XRL, UJ(-) if %R 50-69% J(+) <2X RL if %R 130%-180% R(+)<2X RL 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 RL (+/-)RL for samples >RL and <5 x RL (may use RPD < 35%, Diff < 2X RL for solids)	J(+)/UJ(-) if RPD > 20% or diff > RL	9

Copyright 2004 EcoChem, Inc.

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	QAPP specified RPD < 50% (all matrices)	Narrate; do not qualify	na

Copyright 2004 EcoChem, Inc.

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

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Cooler/Storage Temperature and Preservation	Aqueous/Soil/Sediment <4°C Tissues <-10°C Water Only: Nitric Acid to pH < 2 For Dissolved metals, 0.45 um filter preserve after filtration	J(+)/UJ(-) if preservation requirements are not met	1
Holding Time	180 Days from collection	J(+)/UJ(-) >180 Days	1
Initial Calibration	Blank + 3 standards (1 at RL) every 24 hours; r>0.995	R(+/-) if <5 standards or >24 hours J(+)/UJ(-) if r<0.995	5A
Initial Calibration Verification (ICV)	Independent source > CRA std. conc. Post ICAL & prior to samples +/-10% of the True value	J(+) if %R < 75% J(+)/UJ(-) if %R = 75%-89% J(+) if %R = 111-125% R(-) if %R<75% R(+) if %R>125%	5A
Continuing Cal Verification (CCV)	Every 10 samples,post ICV/ICB and end of run +/- 10% of True value	J(+) if %R < 75% J(+)/UJ(-) if %R 75%-89% J(+) if %R 111-125% R(-) if %R<75% R(+) if %R>125%	5B
RL Standard (CRA)	@ RL; analyzed beginning of run %R = 70%-130%	EcoChem PJ %R <50% - R(-),(+) <2X RL %R 50-69% - J(+) <2X RL, UJ(-) %R 130%-180% - J(+) <2X RL %R>180% - R(+)< 2X RL	14
Initial and Continuing Cal Blanks (ICB/CCB)	After each ICV and CCV - every ten samples (or 2 hours) and end of run blank < IDL and > -RL	Action level 5x(+)/5x(-) For positive blank hit, U(+) values < AL For negative blank hit, J(+)/UJ(-) < AL	7
Prep Blank	One per matrix per batch (Max 20 samples)	Action level 5x(+)/5x(-) For positive blank hit, U(+) values < AL For negative blank hit, J(+)/UJ(-) < AL	7
Field Blanks	No results > QL	Apply 5X rule; U(+) < action level	6
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(-), %R < 75% J(+)/R(-), %R < 30% UJ(-), %R 30-74%	8
Laboratory Duplicate	One per matrix per batch RPD <20% for samples > 5x RL (+/-)RL for samples >RL and <5 x RL (may use RPD < 35%, Diff < 2X RL for solids)	J(+)/UJ(-) associated samples if RPD > 20% or diff > RL	9

Copyright 2004 EcoChem, Inc.

Integral - Portland Harbor Site
Metals by AA-Hydride (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(+)/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 Duplicates	QAPP specified RPD < 50% (all matrices)	Narrate; do not qualify	na
Linear Range	Sample results must be less than 110% of high standard	J(+) values over range	20

Copyright 2004 EcoChem, Inc.

EcoChem, INC.
Environmental Data Quality

APPENDIX B
DATA VALIDATION REPORTS

DATA VALIDATION REPORT
Portland Harbor RI/FS
Lamprey Tissue Study
Semivolatile Organic Compounds - Method SW8270C
Columbia Analytical Services - Kelso

This report documents the review of analytical data from the analyses of archived lamprey tissue and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Columbia Analytical Services, Inc., Kelso, Washington.

SDG	No. Samples	Validation Level
K0700665	5 Tissues 1 Homogenization Rinse Blank	Full Screening

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 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	1	Matrix Spikes/Matrix Spike Duplicates
	Initial Calibration (ICAL)		Laboratory Control Samples (LCS/LCSD)
	Continuing Calibration (CCAL)	1	Laboratory Replicates
2	Laboratory Blanks		Reporting Limits (MDL and MRL)
1	Equipment Blanks	1	Compound Identification
	Surrogate Compounds	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.***

Holding Times and Sample Receipt

The lamprey tissue samples were originally collected in September and October of 2006, frozen, placed in archive and stored at -20°C until analyses were required. In January, 2007 the tissue samples were shipped to the laboratory.

Several coolers were received at the laboratory with internal temperatures greater than the recommended temperature range of 4°C ± 2°C (the maximum recorded temperature was 8°C). Specific cooler temperatures were not listed on the chain-of-custody. The temperature outliers should not impact data quality and no data were qualified.

All tissue samples were extracted and analyzed within the holding time criteria specified in the QAPP. The homogenization blank (RinseBlank_20070202) was extracted 46 days after creation, outside the 7 day holding time criterion for aqueous samples. After qualifiers based on method blank contamination were issued, no target analytes were detected in this blank. The reporting limits for all target analytes were estimated (UJ-1).

Laboratory Blanks

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times the concentration reported in the blank (ten times for phthalates). If a contaminant is reported in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U-7). 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 were analyzed at the appropriate frequency. A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets. Various target analytes were detected in the method blanks. However, only the following analytes were qualified as not detected in one or more samples in the associated laboratory data sets:

Homogenization blank: Di-n-butyl phthalate (1 result), diethyl phthalate (1 result), phenol (1 result)

tissue: Diethyl phthalate (5 results)

Equipment Blanks

Method blanks are used to evaluate all associated equipment blanks. Any remaining positive results in the equipment blanks are used to evaluate all associated samples.

One homogenization rinse blank (RinseBlank_20070202) was submitted. After qualifiers based on method blank contamination were issued, no target analytes were detected in this blank.

Matrix Spike/Matrix Spike Duplicates

There was insufficient tissue sample volume for matrix spike/matrix spike duplicate (MS/MSD) analyses. Accuracy was assessed be evaluating the recovery values for the surrogates and the laboratory control sample/laboratory control sample duplicate (LCS/LCSD) spiked compounds; precision was measured using the laboratory duplicate and LCS/LCSD analyses.

Laboratory Replicates

One sample was composited by the laboratory and then split into laboratory replicates, Samples LW3-LTA-COMP5-1 and LW3-LTA-COMP5-2. Precision was acceptable.

Compound Identification

It was noted by the laboratory that 3-methylphenol could not be separated from 4-methylphenol.

Calculation Verification

Calculation verifications were performed on this SDG. No errors were found.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the appropriate analytical method. Accuracy was acceptable, as demonstrated by the surrogate, MS, and LCS/LCSD %R values. Precision was acceptable as demonstrated by the relative percent difference values for the LCS/LCSD analyses.

Data were estimated based on holding time outliers, and qualified as not detected based on laboratory blank contamination.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Lamprey Tissue Study
Polyaromatic Hydrocarbons (PAH) by Method SW8270-SIM
Columbia Analytical Services - Kelso

This report documents the review of analytical data from the analyses of archived lamprey tissue and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Columbia Analytical Services, Inc., Kelso, Washington.

SDG	No. Samples	Validation Level
K0700665	7 Tissues	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 QC results were also verified (10%).

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

1	Holding Times and Sample Receipt	1	Matrix Spikes/Matrix Spike Duplicates
	Initial Calibration (ICAL)		Laboratory Control Samples (LCS/LCSD)
	Continuing Calibration (CCAL)	1	Laboratory Replicates
2	Laboratory Blanks		Reporting Limits (MDL and MRL)
1	Equipment Blanks		Compound Identification
	Surrogate Compounds	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.***

Holding Times and Sample Receipt

The lamprey tissue samples were originally collected in September and October of 2006, frozen, placed in archive and stored at -20°C until analyses were required. In January, 2007 the tissue samples were shipped to the laboratory. All samples were extracted and analyzed within the holding time criteria specified in the QAPP.

Several coolers were received at the laboratory with internal temperatures greater than the recommended temperature range of 4°C ± 2°C (the maximum recorded temperature was 8°C). Specific cooler temperatures were not listed on the chain-of-custody. The temperature outliers should not impact data quality and no data were qualified.

Laboratory Blanks

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times the concentration reported in the blank. If a contaminant is reported in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U-7). 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 were analyzed at the appropriate frequency. A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets. Various target analytes were detected in the method blanks. Five (5) results for benzo(a)anthracene were qualified as not detected in the associated field samples.

Equipment Blanks

The equipment (homogenization) blank associated with the PAH analyses was analyzed using Method SW8270. The validation of this blank is reported in the SVOC report.

Matrix Spike/Matrix Spike Duplicates

There was insufficient tissue sample volume for matrix spike/matrix spike duplicate (MS/MSD) analyses. Accuracy was assessed be evaluating the recovery values for the surrogates and the laboratory control sample/laboratory control sample duplicate (LCS/LCSD) spiked compounds; precision was measured using the laboratory duplicate and LCS/LCSD analyses.

Laboratory Replicates

One sample was composited by the laboratory and then split into laboratory replicates, Samples LW3-LTA-COMP5-1 and LW3-LTA-COMP5-2. Precision was acceptable.

Calculation Verification

Calculation verifications were performed on this SDG. No errors were found.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory performed an appropriate analytical method. Accuracy was acceptable, as demonstrated by the surrogate and laboratory control sample/laboratory control sample duplicate (LCS/LCSD) percent recovery values. Precision was acceptable as demonstrated by the relative percent difference values for the laboratory duplicate and LCS/LCSD analyses.

Data were qualified as not detected based on laboratory blank contamination.

All other data, as qualified, are acceptable for use

DATA VALIDATION REPORT
Portland Harbor RI/FS
Lamprey Tissue Study
Organotins - Krone Method
Columbia Analytical Services - Kelso

This report documents the review of analytical data from the analyses of archived lamprey tissue and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Columbia Analytical Services, Inc., Kelso, Washington.

SDG	No. Samples	Validation Level
K0700665	1 Tissue 1 Homogenization Rinse Blank	Full Screening

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 QC results were also verified (10%). No errors were found.

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

2	Holding Times and Sample Receipt	1	Matrix Spikes/Matrix Spike Duplicates (MS/MSD)
	Instrument Performance Check	1	Laboratory Control Samples (LCS)
	Initial Calibration (ICAL)		Field Duplicate Analyses
	Continuing Calibration (CCAL)		Reporting Limits (MDL and MRL)
2	Laboratory Blanks	1	Compound Identification
1	Equipment Blanks	1	Calculation Verification (full validation only)
	Surrogate Compounds		

[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

The lamprey tissue samples were originally collected in September and October of 2006, frozen, placed in archive and stored at -20°C until analyses were required. In January, 2007 the tissue samples were shipped to the laboratory.

Several coolers were received at the laboratory with internal temperatures greater than the recommended temperature range of 4°C ± 2°C (the maximum recorded temperature was 8°C). Specific cooler temperatures were not listed on the chain-of-custody. The temperature outliers should not impact data quality and no data were qualified.

All tissue samples were extracted and analyzed within the holding time criteria specified in the QAPP. The homogenization blank (RinseBlank_20070202) was extracted 42 days after creation, outside the 7 day holding time criterion for aqueous samples. After qualifiers based on method blank contamination were issued, no target analytes were detected in this blank. The reporting limits for all target analytes were estimated (UJ-1).

Laboratory Blanks

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times the concentration reported in the blank. If a contaminant is reported in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U-7). 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 were analyzed at the appropriate frequency. A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets. Various target analytes were detected in the method blanks. However, only the following analytes were qualified as not detected in one or more samples in the associated laboratory data sets:

Homogenization blank: Di-n-butyltin (1 result), n-butyltin (1 result)

Equipment Blanks

Method blanks are used to evaluate all associated equipment blanks. Any remaining positive results in the equipment blanks are used to evaluate all associated samples.

One equipment (homogenization) blank, Rinse Blank_20070202, was submitted. After qualifiers based on method blank contamination were issued, no target analytes were detected in this blank.

Matrix Spike/Matrix Spike Duplicates

There was insufficient tissue sample volume for matrix spike/matrix spike duplicate (MS/MSD) analyses. Accuracy was assessed be evaluating the recovery values for the surrogates and the laboratory control sample/laboratory control sample duplicate (LCS/LCSD) spiked compounds; precision was measured using the LCS/LCSD analyses.

Laboratory Control Sample/Laboratory Control Sample Duplicates

For the tissues, the laboratory control sample duplicate (LCSD) recovery value for di-n-butyltin was greater than the 94% upper control limit (at 98%). This analyte was not detected in the associated sample. The reporting limit was no affected by the potential high bias; no action was taken.

Compound Identification

The results from the two analytical columns were compared for agreement. In cases where the relative percent difference (RPD) value between the two columns was greater than 40%, the reported result was "P" flagged by the laboratory. As the elevated RPD value may indicate the presence of an interferent that may result in a high bias, when the RPD value was greater than 40% but less than 60% the reported value was estimated (J-3). If the RPD value was greater than 60%, the result was qualified as a tentative identification (NJ-3).

In the method blank associated with the homogenization blank, the RPD value for n-butyltin was 61.7%. Qualifiers are not applied to QC samples, no action was taken

Calculation Verification

Calculation verifications were performed on this SDG. No calculation or transcription 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, LCS %R values, with the exceptions noted above. Precision was also acceptable as demonstrated by the RPD values for the LCS/LCSD.

Data were estimated based on holding time outliers. Data were qualified as not detected based on laboratory blank contamination.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Lamprey Tissue Study
Chlorinated Pesticides by Axys Method MLA-028
Axys Analytical Services, Ltd.

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

SDG	No. Samples	Validation Level
WG21715	9 Tissues	Full
WG21756	1 Homogenization Rinse Blank	Screening

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 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
2 Initial Calibration (ICAL)
2 Continuing Calibration (CCAL)
2 Laboratory Blanks
1 Field Blanks
2 Labeled Compounds
1 Matrix Spikes/Matrix Spike Duplicates (MS/MSD)
1 Laboratory Replicates
2 Ongoing Precision and Recovery (OPR)
DDT/Endrin Breakdown
2 Compound Identification
Reporting Limits (MDL and MRL)
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.***

Holding Times and Sample Receipt

The lamprey tissue samples were originally collected in September and October of 2006, frozen, placed in archive and stored at -20°C until analyses were required. In January, 2007 the tissue samples were shipped to the laboratory.

Several coolers were received at the laboratory with internal temperatures greater than the recommended temperature range of 4°C ± 2°C (the maximum recorded temperature was 8°C). Specific cooler temperatures were not listed on the chain-of-custody. The temperature outliers should not impact data quality and no data were qualified.

SDG WG21715: All tissue samples were extracted within the one year hold time specified in the QAPP. All extracts were analyzed within 24 days after extraction. All holding times are acceptable.

SDG WG21756: RinseBlank_20070202 was extracted 68 days after the creation of the rinse blank, and analyzed 41 days after extraction. All results in this blank were estimated (J/UJ-1).

Initial Calibration

The percent relative standard deviation (%RSD) value for endrin aldehyde was greater than the control limit of 20% in the ICAL from 4/18/07 on instrument HR GC/MS. The positive results and reporting limits for this compound were qualified as estimated (J/UJ-5A) in all of the tissue samples.

The analyte hexachlorobutadiene was not included in the standards used for calibration. The values reported of this analyte were based on the response of 1,2,4-trichlorobenzene and an experimentally determined ratio of the response of hexachlorobutadiene to that of 1,2,4-trichlorobenzene. All values and/or reporting limits for hexachlorobutadiene were estimated (J/UJ-5A).

Continuing Calibration

All percent difference (%D) values were within the control limit of ±25%. The analyte hexachlorobutadiene was not included in the continuing calibration standards. All values and/or reporting limits for hexachlorobutadiene were estimated (J/UJ-5B).

Laboratory Blanks

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times 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-7). 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 were analyzed at the appropriate frequency. A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets. Various target analytes were detected in the method blanks. However, only the following analytes were qualified as not detected in one or more samples in the associated laboratory data set:

SDG WG21715: methoxychlor (5 results)

SDG WG21756: hexachlorobenzene (1 result)

Equipment Blanks

Method blanks are used to evaluate all associated samples, including equipment blanks. Any remaining positive results in the equipment blanks are used to evaluate all samples. If a contaminant is reported in any field sample and the concentration is less than the action level, the result is qualified as not detected (U-6).

SDG WG21756: One homogenization blank (RinseBlank_20070202) was reported. Positive results for hexachlorobenzene, gamma-chlordane, and dieldrin were present in this blank. As the associated sample results for these compounds were greater than the action levels, no action was taken.

Labeled Compounds

SDG WG21537: The percent recovery (%R) value for $^{13}C_{12}$-1,2,3-trichlorobenzene was less than the lower control limit in the laboratory method blank and all samples. The %R values were also less than 10% in six samples (LW3-LTM-Comp2, LW3-LTM-Comp3, LW3-LTA-Comp2, LW3-LTA-Comp3, LW3-LTA-Comp4, and LW3-LTA-Comp5-1). The target analyte hexachlorobutadiene is associated with this labeled compound. Hexachlorobutadiene results in the field samples were estimated (J/UJ-13) when the %R value was less than the lower acceptance limit (but greater than 10%), and rejected (R-13) when %R values were below 10%. No qualifiers are assigned to the method blank.

Matrix Spikes/Matrix Spike Duplicates

There was insufficient tissue sample volume for matrix spike/matrix spike duplicate (MS/MSD) analyses. Accuracy was assessed be evaluating the recovery values for the labeled compounds and the ongoing precision and recovery (OPR) and OPR duplicate spiked compounds; precision was measured using the laboratory duplicate and OPR/OPR Dup analyses.

Laboratory Replicates

SDG WG21537: One sample was composited by the laboratory and then split into replicates, Samples LW3-LTA-COMP5-1 and LW3-LTA-COMP5-2. A 40% relative percent difference (RPD) value control limit was used to evaluate the tissue sample laboratory duplicate analyses. The RPD value is used to assess precision **only** if both sample results are greater than five times the reporting limit for a given analyte; otherwise the absolute difference between the two results is used to evaluate precision. The absolute difference control limit is equal to twice the reporting limit of the compound.

Precision was acceptable for all compounds detected in the laboratory replicate samples.

Ongoing Precision and Recovery (OPR)

SDG WG21537: Hexachlorobutadiene was not included in the spiking mix. The reported results for hexachlorobutadiene were estimated (J/UJ-10), unless previously rejected based on associated labeled compound recovery outliers.

Compound Identification

The laboratory assigned a "K" flag 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 result may be a false positive. Due to this, these results were qualified as not detected (U-21) at the reported concentration.

Calculation Verification

SDG WG21715: A full (Level IV) validation was performed this SDG. No anomalies were identified.

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 %R values, with the exceptions noted above. Precision was acceptable, as demonstrated by the laboratory and OPR duplicate analyses RPD values.

Data were estimated due to labeled compound outliers, and due to an analyte not being included in the calibration standards and OPR. Data were qualified as not detected due to ion ratio criteria outliers and contamination in the associated laboratory blanks.

Data that were flagged as ‘not quantifiable’ by the laboratory were rejected.

Rejected data are not useable for any purpose. All other data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Lamprey Tissue Study
PCB Congeners by Axys Method MLA-010 (EPA 1668A)
Axys Analytical Services, Ltd.

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

SDG	Number of Samples	Validation Level
WG21715	9 Tissue Samples	Full
WG21756	1 Homogenization Rinse Blank	Screening

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 QC results were also verified (10%).

III. TECHNICAL DATA VALIDATION

The quality control (QC) requirements that were reviewed are listed below.

1 Holding Times and Sample Receipt
Initial Calibration (ICAL)
Continuing Calibration (CCAL)
2 Laboratory Blanks
1 Equipment Blanks
2 Labeled Compounds
1 Matrix Spikes/Matrix Spike Duplicates (MS/MSD)
Ongoing Precision and Recovery (OPR)
2 Laboratory Replicates
2 Compound Identification
Reporting Limits (MDL and MRL)
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.***

Holding Times and Sample Receipt

The lamprey tissue samples were originally collected in September and October of 2006, frozen, placed in archive and stored at -20°C until analyses were required. In January, 2007 the tissue samples were shipped to the laboratory.

Several coolers were received at the laboratory with internal temperatures greater than the recommended temperature range of 4°C ± 2°C (the maximum recorded temperature was 8°C). Specific cooler temperatures were not listed on the chain-of-custody. The temperature outliers should not impact data quality and no data were qualified.

SDG WG21715: All tissue samples were extracted within the one year hold time specified in the QAPP. No analytical holding time was specified. The method states that if the extracts are stored in the dark at a temperature less than -10°C, an analytical holding time of up to one year is acceptable. All extracts were analyzed within 54 days after extraction. All holding times are acceptable.

SDG WG21756: The homogenization blank (RinseBlank_20070202) was extracted 68 days after the creation of the rinse blank and analyzed 41 days after extraction. The QAPP does not discuss holding times for homogenization blanks. The analytical method states that if aqueous samples are stored in the dark at temperatures between 0°C and 4°C, a holding time of up to one year is acceptable. No action was taken.

Laboratory Blanks

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times 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-7). 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 were analyzed at the appropriate frequency. Contaminant levels, associated samples, and action levels are documented in the data validation worksheets. Various target analytes were detected in the method blanks for all SDG. Positive results less than the action levels were qualified as not detected (U-7) in several samples from each associated SDG.

SDG WG21715: Results for 36 target analytes were reported in the associated method blank. The concentrations of these target analytes greater than the action levels in all associated lamprey tissue samples. No data qualified.

SDG WG21756: Results for 43 target analytes were reported in the associated method blank. The concentrations of 30 target analytes were less than these action levels in RinseBlank_20070202 and were qualified as not detected (U-7).

Equipment Blanks

SDG WG21756: One homogenization blank (RinseBlank_20070202) was reported. After qualifiers based on method blank contamination were issued, positive results remained for PCB1, PCB19, PCB22, PCB32, PCB66, PCB68, PCB105, PCB206, Aroclor 1242, Aroclor 1254, and Aroclor 1260. The concentrations of these compounds in the associated samples were greater than the action level. No data were qualified based on homogenization blank contamination.

Labeled Compounds

SDG WG21715: In Samples LW3-LTM-Comp3 and LW3-LTA-Comp5-2, the percent recovery (%R) values for $^{13}C_{12}$-PCB1, $^{13}C_{12}$-PCB3, and/or $^{13}C_{12}$-PCB4 were not quantifiable and were reported by the laboratory as NQ. Some of the associated target PCB congeners were also reported as NQ. These results were rejected (R-13). Other associated PCB congeners were flagged "T" by the laboratory to indicate that these results were quantitated using alternative labeled compounds. These results were estimated (J-13).

The %R values for $^{13}C_{12}$-PCB1, $^{13}C_{12}$-PCB3, $^{13}C_{12}$-PCB4 and/or $^{13}C_{12}$-PCB19 were less than lower control limits in seven of the nine samples. Positive results or reporting limits associated with low %R values were estimated (J/UJ-13).

The %R values for four or more labeled PCB congeners were less than control limits in the method blank, the OPR and OPR duplicate samples. No qualifiers were applied to QC samples.

SDG WG21756: The %R values for $^{13}C_{12}$-PCB1, $^{13}C_{12}$-PCB3, and $^{13}C_{12}$-PCB4 were less than lower control limits in Sample RinseBlank_20070202. The associated positive results or reporting limits were estimated (J/UJ-13).

The %R values for four or more labeled PCB congeners were less than control limits in the method blank, the OPR and OPR duplicate samples. No qualifiers were applied to QC samples.

A detailed list of outliers and qualified samples results and reporting limits is documented in the validation worksheets.

Matrix Spikes/Matrix Spike Duplicates (MS/MSD)

There was insufficient tissue sample volume for matrix spike/matrix spike duplicate (MS/MSD) analyses. Accuracy was assessed be evaluating the recovery values for the labeled compounds and the ongoing precision and recovery (OPR) and OPR duplicate spiked compounds; precision was measured using the laboratory duplicate and OPR/OPR Dup analyses.

Laboratory Replicates

One sample was composited by the laboratory and then split into laboratory replicates, Samples LW3-LTA-COMP5-1 and LW3-LTA-COMP5-2. A 40% relative percent difference (RPD) value control limit was used to evaluate the tissue sample laboratory duplicate analyses. The RPD value is used to assess precision **only** if both sample results are greater than five times the reporting limit for a given analyte; otherwise the absolute difference between the two results is used to evaluate precision. The absolute difference control limit is equal to twice the reporting limit of the compound.

SDG WG21715: The RPD values for PCBs 1, 2, 3, 4, 6, 8, 11, 12/13, and 38 exceeded the 40% control limit in Samples LW3-LTA-Comp5-1 and LW3-LTA-Comp5-2. PCBs 1, 2, 3, and 4 were not quantifiable in the duplicate sample, and were rejected as discussed in the **Labeled Compounds**

section above. Results and reporting limits for the rest of these analytes were estimated (J/UJ-9) in both the parent and duplicate samples.

Compound Identification

The laboratory assigned a "K" flag 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 result may be a false positive. These results were qualified as not detected (U-21) at the reported concentration.

The laboratory did not include Aroclor identification standards to assess pattern matching. Additionally, values reported for Aroclors were calculated from PCB congener results using a laboratory-derived calculation factor, instead of an Aroclor-specific response factor. Therefore, all positive Aroclor results were qualified as estimated and tentatively identified (NJ-14).

SDG WG21715: Interferences were noted that potentially affected the quantitation of PCB66 in Samples LW3-LTA-Comp3 and LW3-LTA-Comp4. The results and reporting limits for this PCB were estimated (J/UJ-14) in these samples. Interferences were noted that potentially affected the quantitation of PCB86/87/97/108/119/125 in Samples LW3-LTA-Comp3, LW3-LTA-Comp4, LW3-LTA-Comp5-1, and LW3-LTA-Comp5-2. The results and reporting limits for this PCB were estimated (J/UJ-14) in these samples. All of these results were flagged “G” by the laboratory to indicate the potential interference.

Calculation Verification

SDG WG21715: A full (Level IV) validation, including calculation verification, was performed for this SDG. No calculation or transcription 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, with the exceptions noted above. Precision was acceptable as demonstrated by the field duplicates, with the exceptions noted above.

Data were estimated due to matrix or spectral interferences, and due to laboratory precision outliers. Data were qualified as not detected due to ion ratio criteria outliers and contamination from the associated laboratory and field blanks. Aroclor results were qualified as tentatively identified at estimated concentrations.

Data that were flagged as ‘not quantifiable’ by the laboratory were rejected and should not be used for any purpose. All other data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Lamprey Tissue Study
Dioxin & Furan Compounds by Axys Method MLA-017 (EPA 1613B)
Axys Analytical Services, Ltd.

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

SDG	No. Samples	Validation Level
WG21715	9 Tissues	Full
WG21756	1 Homogenization Rinse Blank	Screening

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 QC results were also verified (10%).

III. TECHNICAL DATA VALIDATION

The quality control (QC) requirements that were reviewed are listed below.

1 Holding Times and Sample Receipt
Initial Calibration (ICAL)
Continuing Calibration (CCAL)
2 Laboratory Blanks
1 Equipment Blanks
Labeled Compounds
1 Matrix Spikes/Matrix Spike Duplicates (MS/MSD)
Ongoing Precision and Recovery (OPR)
1 Laboratory Replicates
2 Compound Identification
Reporting Limits (MDL and MRL)
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.***

Holding Times and Sample Receipt

The lamprey tissue samples were originally collected in September and October of 2006, frozen, placed in archive and stored at -20°C until analyses were required. In January, 2007 the tissue samples were shipped to the laboratory.

Several coolers were received at the laboratory with internal temperatures greater than the recommended temperature range of 4°C ± 2°C (the maximum recorded temperature was 8°C). Specific cooler temperatures were not listed on the chain-of-custody. The temperature outliers should not impact data quality and no data were qualified.

SDG WG21715: All tissue samples were extracted within the one year holding time specified in the QAPP. No analytical holding time was specified in the QAPP. The method states that if the extracts are stored in the dark at a temperature less than -10°C, an analytical holding time of up to one year is acceptable. All extracts were analyzed within 47 days after extraction. All holding times are acceptable.

SDG WG21756: The homogenization blank (RinseBlank_20070202) was extracted 68 days after the creation of the rinse blank. The QAPP does not discuss holding times for homogenization blanks. The analytical method states that if aqueous samples are stored in the dark at temperatures between 0°C and 4°C, a holding time of up to one year is acceptable. No action was taken.

Laboratory Blanks

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times 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-7). 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 were analyzed at the appropriate frequency. Contaminant levels, associated samples, and action levels are documented in the data validation worksheets. Various target analytes were detected in the method blanks. However, only the following analytes were qualified as not detected in one or more samples in the associated laboratory data sets.

SDG WG21715: 1,2,3,7,8-HxCDD (1 result); 2,3,4,7,8-PeCDF (2 results); 1,2,3,4,7,8-HxCDF (1 result); 1,2,3,7,8,9-HxCDF (1 result); 2,3,4,6,7,8-HxCDF (8 results); 1,2,3,4,7,8,9-HpCDF (6 results), and OCDF (4 results)

SDG WG21756: OCDD (1 result) and OCDF (1 result)

Equipment Blank

SDG WG21756: A homogenization blank (RinseBlank_20070202) was associated with all of the lamprey tissue composites. After qualifiers based on method blank contamination were issued, a positive result for 1,2,3,4,6,7,8-HpCDD remained in the rinse blank. All sample results for this analyte were significantly greater than the action level. No further action was necessary.

Matrix Spikes/Matrix Spike Duplicates

There was insufficient tissue sample volume for matrix spike/matrix spike duplicate (MS/MSD) analyses. Accuracy was assessed be evaluating the recovery values for the labeled compounds and the ongoing precision and recovery (OPR) and OPR duplicate spiked compounds; precision was measured using the laboratory duplicate and OPR/OPR Dup analyses.

Laboratory Replicates

One sample was composited by the laboratory and then split into laboratory replicates, Samples LW3-LTA-COMP5-1 and LW3-LTA-COMP5-2. Precision was acceptable.

Compound Identification

The laboratory assigned a "K" flag to one or more analytes in all samples to indicate that 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 result may be a false positive. Due to this, the results were qualified as not detected (U-21).

All results for 2,3,7,8-TCDF were confirmed on a DB-225 column as required by the method. The 2,3,7,8-TCDF results on the DB-5 column were qualified as do-not-report (DNR-11). The results from the DB-225 column should be used.

Calculation Verification

SDG WG21715: Calculation verification 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 ongoing precision recovery percent recovery values. Precision was acceptable as demonstrated by the laboratory duplicate and OPR and OPR duplicate RPD values.

Data were qualified as not detected due to ion ratio criteria outliers and contamination from the associated laboratory blanks. Data were qualified as do-not-report to indicate which result (of duplicate results) should be used.

Data qualified as do-not-report should not be used for any purpose. All other data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Lamprey Tissue Study
Metals - EPA Method 6010B, 6020
Mercury - EPA Method 7470A, 7471A
Selenium - EPA Method 7742
Columbia Analytical Services - Kelso

This report documents the review of analytical data from the analyses of archived lamprey tissue samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Columbia Analytical Services, Inc., Kelso, Washington.

SDG	No. Samples	Validation Level
K0700665	8 Tissues 1 Homogenization Rinse Blank	Full Screening

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.

I. 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 QC results were also verified (10%).

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

2 Holding Times and Sample Preservation
Initial Calibration
Calibration Verification
1 CRDL Standards
1 Laboratory Blanks
1 Equipment Blanks
1 Laboratory Control Samples
1 Matrix Spike Samples
2 Laboratory Replicates
ICPMS Internal Standards
2 ICP Serial Dilution
1 Reporting Limits and Reported Results
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.***

Holding Times and Sample Preservation

The lamprey tissue samples were originally collected in September and October of 2006, frozen, placed in archive and stored at -20°C until analyses were required. In January, 2007 the tissue samples were shipped to the laboratory.

Several coolers were received at the laboratory with internal temperatures greater than the recommended temperature range of 4°C ± 2°C (the maximum recorded temperature was 8°C). Specific cooler temperatures were not listed on the chain-of-custody. The temperature outliers should not impact data quality and no data were qualified.

RinseBlank_20070202 was analyzed for mercury nineteen days beyond the recommended twenty-eight day holding time. This result was estimated (UJ-1).

CRDL Standards

The CRDL standard recoveries for selenium and silver were less than the lower control limit of 70% for the tissue analyses. All associated sample results were greater than the action levels of twice the reporting limit and no qualification of data was necessary.

The CRDL recoveries for cadmium, copper, lead, and zinc were greater than the upper control limit of 130% for the field blank analyses. The associated results were either not detected or greater than the action level. No qualification of data was required.

Laboratory Blanks

Nickel, selenium, silver and zinc were detected in the method and/or instrument blanks associated with the tissue analyses. All results were greater than the action levels and no qualification of data was necessary.

Silver was detected in the laboratory blanks associated with the field blank. Silver was not detected in this sample; no action was required.

Equipment Blanks

One equipment (homogenization) blank, Rinse Blank_20070202, was submitted. Chromium, copper, and zinc were detected in this blank. In order to establish the effect on the sample data, action levels of five times the blanks concentrations were established. All associated results were either greater than the action levels or were not detected; no qualification of data was necessary.

Matrix Spike Samples

Insufficient sample was available to prepare matrix spike samples for the tissue analyses. Laboratory accuracy was evaluated using the recoveries for the Standard Reference Materials (SRM).

Laboratory Control Samples

Standard Reference Materials DORM-2 and DOLT-3 were prepared and analyzed in duplicate. The SRM recovery values were within the manufacturer's certified acceptance range. The relative percent difference (RPD) values were less than 30%, with the following exception:

For DORM-2, the RPD for lead (34.6%) was greater than the control limit. The RPD value for lead was within the control limit for DOLT-3, therefore no action was taken. Antimony was not included as a certified value in either SRM. Accuracy for this analyte was evaluated by the post digest spike recovery.

Laboratory Replicates

One sample was composited by the laboratory and then split into laboratory replicates, Samples LW3-LTA-COMP5-1 and LW3-LTA-COMP5-2. The RPD value for mercury (66.2%) was greater than the control limit of 30%. The mercury results for these two samples were estimated (J-9).

ICP Serial Dilution

The serial dilution (%D) value for selenium (13%) was greater than the 10% control limit for the Batch QC sample associated with the field blank. The homogenization blank selenium result was estimated (UJ-16).

Reporting Limits and Reported Results

Some samples required additional dilutions due to high concentrations of aluminum. Reporting limits were elevated accordingly. No further action was taken.

Calculation Verification

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

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical methods. Accuracy was acceptable, as demonstrated by the LCS, SRM, matrix spike, and post digestion spike recovery values. Precision was also acceptable as demonstrated by the RPD values for the laboratory split and SRM/SRM duplicate analyses, except as previously noted.

Data were estimated based on a holding time outlier, a laboratory split RPD outlier, and a serial dilution %D outlier.

All data, as qualified, are acceptable for use.