

# *Lower Duwamish Waterway Group*

*Port of Seattle / City of Seattle / King County / The Boeing Company*

## *Lower Duwamish Waterway Remedial Investigation*

### **2005 FISH AND CRAB DATA REPORT ADDENDUM: PCB CONGENER DATA FINAL**

**For submittal to**

**The US Environmental Protection Agency**  
**Region 10**  
Seattle, WA

**The Washington State Department of Ecology**  
**Northwest Regional Office**  
Bellevue, WA

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## Acronyms

Acronym	Definition
<b>ARI</b>	Analytical Resources, Inc.
<b>Axys</b>	Axys Analytical Services, Ltd.
<b>EPA</b>	US Environmental Protection Agency
<b>IUPAC</b>	International Union of Pure and Applied Chemistry
<b>LDC</b>	Laboratory Data Consultants, Inc.
<b>LDW</b>	Lower Duwamish Waterway
<b>LDWG</b>	Lower Duwamish Waterway Group
<b>PCB</b>	polychlorinated biphenyl
<b>PSEP</b>	Puget Sound Estuary Program
<b>QAPP</b>	quality assurance project plan
<b>RI</b>	remedial investigation
<b>RL</b>	reporting limit
<b>TEF</b>	toxic equivalency factor
<b>TEQ</b>	toxic equivalent
<b>Windward</b>	Windward Environmental LLC
<b>WHO</b>	World Health Organization
<b>ww</b>	wet weight

## 1.0 Introduction

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This data report is an addendum to the *Lower Duwamish Waterway Remedial Investigation, Data Report: 2005 Fish and Crab Tissue Collection and Chemical Analyses* (Windward 2006). It provides the results of the analysis of six fish tissue samples for individual polychlorinated biphenyl (PCB) congeners, as specified in a memorandum from the Lower Duwamish Waterway Group (LDWG) to the US Environmental Protection Agency (EPA) dated June 29, 2006 (LDWG 2006). These samples were collected in 2005 as part of the Lower Duwamish Waterway (LDW) Phase 2 remedial investigation (RI), according to the fish and crab tissue collection quality assurance project plan (QAPP) (Windward 2004) and QAPP addendum (Windward 2005b).

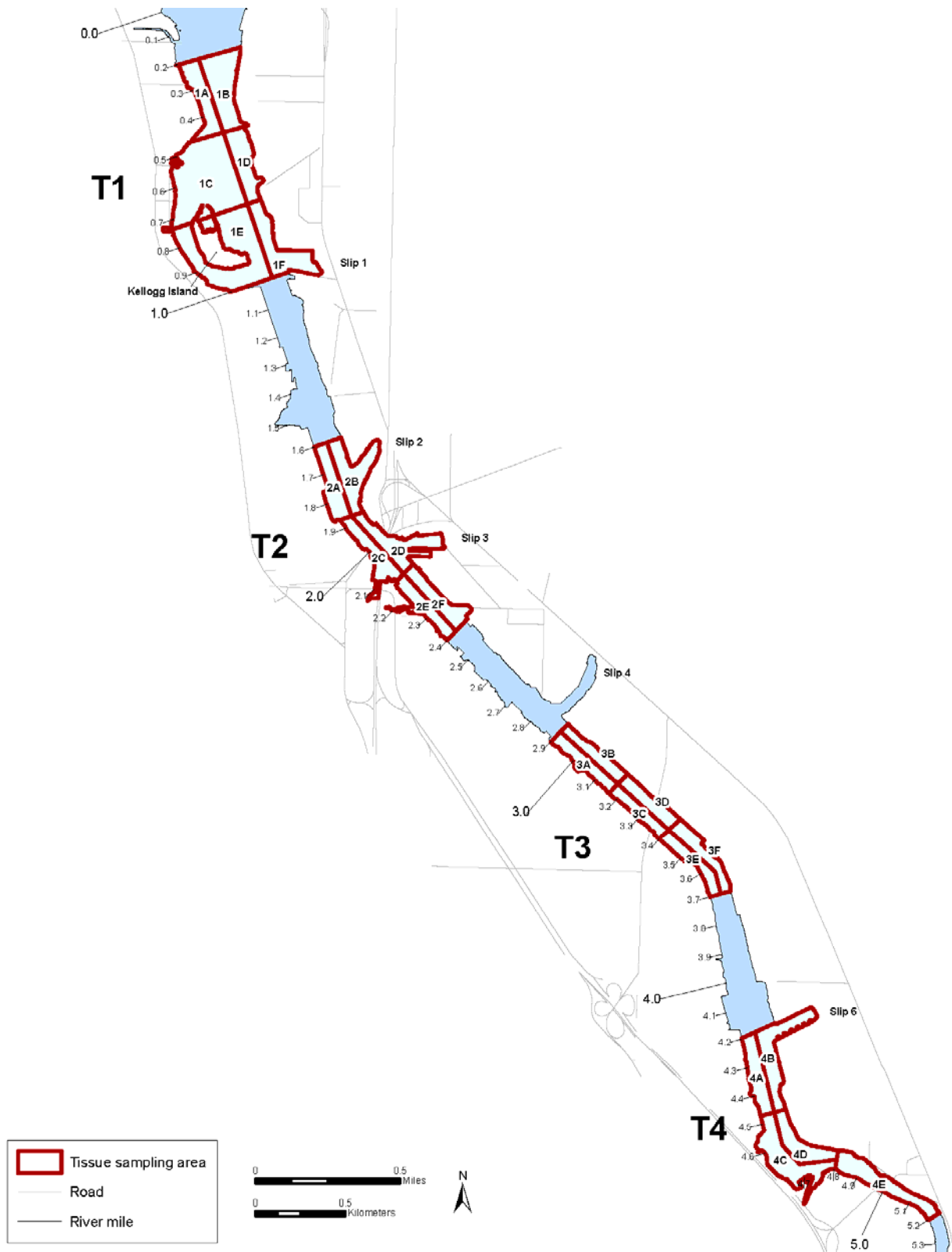
This report includes a summary of sample selection and laboratory analyses and the results of the chemical analyses. The text is supported by the following appendices:

- ◆ Appendix A – PCB congener data tables
- ◆ Appendix B – Data management
- ◆ Appendix C – Data validation report
- ◆ Appendix D – COCs
- ◆ Appendix E – Laboratory Form 1s

## 2.0 Sample Selection and Laboratory Analyses

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Three whole-body composite samples of English sole and three whole-body composite samples of shiner surfperch collected in 2005 were selected for analysis (Table 2-1). The concentration ranges of total PCBs (based on the sum of detected Aroclors) for English sole and shiner surfperch collected in 2005 were reviewed and samples were selected to represent low, middle, and high total PCB concentrations for each of the two species. The three samples for each species were also from three different tissue sampling areas to provide spatial coverage (Figure 1).



**Figure 1. LDW fish and crab tissue sampling areas**

**Table 2-1. Composite samples selected for PCB congener analysis**

SAMPLE ID	TISSUE SAMPLING AREA	SPECIES AND TISSUE TYPE	TOTAL PCBs (as Aroclors) (µg/kg ww)	
			SAMPLE	RANGE FOR ALL 2005 SAMPLES FOR SPECIES/TISSUE TYPE
LDW-05-T1-M-ES-WB-Comp3	1	English sole – whole-body	1,630	880 – 2,400
LDW-05-T2-M-ES-WB-Comp3	2		2,400	
LDW-05-T3-M-ES-WB-Comp2	3		880	
LDW-05-T1-B-SS-WB-Comp1 <sup>a</sup>	1	shiner surfperch – whole-body	660	530 – 2,400
LDW-05-T2-B-SS-WB-Comp1	2		1,300	
LDW-05-T3-D-SS-WB-Comp1	3		2,400	

<sup>a</sup> LDW-05-T1-D-SS-WB-Comp1 was selected for PCB congener analysis in the LDWG memorandum to EPA (LDWG 2006) but was replaced with this sample at EPA's request.

ID – identification

PCB – polychlorinated biphenyl

ww – wet weight

Subsamples of all six composite tissue samples were analyzed earlier for PCBs as Aroclors, lipids, and total solids by Analytical Resources, Inc. (ARI), in October and November of 2005 (Windward 2006) and the remaining composited tissue was then archived frozen at ARI and shipped frozen to Axys Analytical Services, Ltd. (Axys), for PCB congener analysis according to EPA Method 1668A using high-resolution gas chromatography/high-resolution mass spectrometry. Analytical testing adhered to the most recent quality assurance and quality control guidelines and analysis protocols (PSEP 1997; EPA 2002).

### 3.0 Results of Chemical Analyses

The results for all 209 PCB congeners analyzed in the composite fish tissue samples are presented in Appendix A. This section presents the results for the coplanar PCB congeners, which are those PCB congeners for which World Health Organization (WHO) toxic equivalency factors (TEFs) are available (Van den Berg et al. 1998; 2006). The coplanar PCB congeners include PCB-077, PCB-081, PCB-105, PCB-114, PCB-118, PCB-123, PCB-126, PCB-156, PCB-157, PCB-167, PCB-169, and PCB-189. Toxic equivalent (TEQ) values have been calculated using both the 1998 and the 2005 WHO TEF values. The 2005 WHO TEFs will be used to derive TEQs for the risk assessments. The TEQs based on the 1998 TEFs are also provided in this data addendum as a basis for comparison with TEQs presented in earlier data reports (Windward 2005a). Also presented are the total PCB concentrations based on the sum of the detected concentrations of all 209 PCB congeners.

In many samples, two or more PCB congeners cannot be separated analytically. In these samples, the congeners coelute, and the concentration of the combined congeners is reported as one value. The laboratory responsible for the PCB congener

analyses (i.e., Axys) has the convention of assigning the concentration of the coeluting congener to the congener with the lowest International Union of Pure and Applied Chemistry (IUPAC) number. For example, PCB-156 and PCB-157 coelute, and the concentration is reported as PCB-156. PCB-157 is reported as C156 to indicate that it is a component of a coelution. This convention has been followed in presenting congener data throughout this addendum.

With the exception of PCB-169, all of the coplanar PCB congeners were detected in all of the composite fish tissue samples. PCB-169 was detected in two out of three English sole samples and two out of three shiner surfperch samples (Table 3-1).

The concentrations of the individual coplanar PCB congeners and total PCBs (i.e., the sum of the detected concentrations of all 209 PCB congeners) for all composite fish tissue samples are presented in Table 3-2. Total PCB concentrations ranged from 1,433 to 3,214  $\mu\text{g}/\text{kg}$  ww in English sole composite samples. Total PCB concentrations ranged from 683.1 to 2,048  $\mu\text{g}/\text{kg}$  ww in the shiner surfperch composite samples.

**Table 3-1. Coplanar PCB congener and total PCB congener concentrations in fish tissue samples**

ANALYTE	UNIT	ENGLISH SOLE – WHOLE-BODY				SHINER SURFFPERCH – WHOLE-BODY			
		LDW-05-T1-M-ES-WB-Comp3	LDW-05-T2-M-ES-WB-Comp3	LDW-05-T3-M-ES-WB-Comp2	MEAN	LDW-05-T1-B-SS-WB-Comp1	LDW-05-T2-B-SS-WB-Comp1	LDW-05-T3-D-SS-WB-Comp1	MEAN
PCB-077	ng/kg ww	419	1,350	583	784	781	1,250	1,180	1,070
PCB-081	ng/kg ww	83.4	142	42.0	89.1	46.2	234	67.3	116
PCB-105	ng/kg ww	43,400	49,200	19,600	37,400	11,700	21,000	22,400	18,400
PCB-114	ng/kg ww	2,750	3,620	1,200	2,520	741	1,360	1,310	1,140
PCB-118	ng/kg ww	137,000	159,000 J	63,500	120,000	34,100	64,800	76,200	58,400
PCB-123	ng/kg ww	2,190	2,370	1,090	1,880	600	1,230	1,210	1,010
PCB-126	ng/kg ww	169	192	59.5	140	60.2	100	104	88.1
PCB-156	ng/kg ww	19,800 C	24,300 C	8,850 C	17,700	5,800 C	10,600 C	14,800 C	10,400
PCB-157	ng/kg ww	C156	C156	C156	C156	C156	C156	C156	C156
PCB-167	ng/kg ww	8,070	9,910	4,010	7,330	2,470	4,490	6,490	4,480
PCB-169	ng/kg ww	7.13	6.16	84.5 U	6.65	46.7 U	3.45	3.78	3.62
PCB-189	ng/kg ww	1,370	1,350	602	1,110	388	627	1,420	812
PCB congeners (total calc'd)	µg/kg ww	2,589 J	3,214 J	1,433 J	2,412	683.1 J	1,047 J	2,048 J	1,259
Total PCBs (sum of Aroclors)	µg/kg ww	1,630	2,400	880	1,640	660	1,300	2,400	1,450

<sup>a</sup> C156 - PCB-156 and PCB-157 co-elute; the combined concentration is presented as the concentration of PCB-156.

C – concentration represents coelution

J – estimated concentration

PCB – polychlorinated biphenyl

U – not detected at given reporting limit

ww – wet weight



TEQs were calculated using the WHO 1998 mammalian TEFs (Van den Berg et al. 1998) and the WHO 2005 mammalian TEFs (Van den Berg et al. 2006) (Table 3-2). Undetected PCB congeners were assigned a value of half of the reporting limit (RL). PCB TEQs ranged from 14.3 to 54.7 ng/kg ww using the WHO 1998 mammalian TEFs and from 8.49 to 27.1 ng/kg ww using the WHO 2005 mammalian TEFs.

**Table 3-2. PCB TEQs calculated using WHO 1998 and 2005 TEFs for mammals**

SAMPLE ID	PCB TEQs (ng/kg ww)	
	CALCULATED USING WHO 1998 TEFs <sup>a</sup>	CALCULATED USING WHO 2005 TEFs <sup>b</sup>
<b>English sole – whole-body</b>		
LDW-05-T1-M-ES-WB-Comp3	46.8	23.6
LDW-05-T2-M-ES-WB-Comp3	54.7 J	27.1 J
LDW-05-T3-M-ES-WB-Comp2	20.0	10.3
<b>Shiner surfperch – whole-body</b>		
LDW-05-T1-B-SS-WB-Comp1	14.3	8.49
LDW-05-T2-B-SS-WB-Comp1	25.0	13.4
LDW-05-T3-D-SS-WB-Comp1	28.8	14.4

<sup>a</sup> Source: Van den Berg et al. (1998).

<sup>b</sup> Source: Van den Berg et al. (2006).

J – estimated concentration

ID – identification

PCB – polychlorinated biphenyl

RL – reporting limit

TEQ – toxic equivalent

WHO – World Health Organization

## 4.0 Data Validation Results

Independent data validation of the PCB congener data was conducted by Laboratory Data Consultants, Inc. (LDC). LDC conducted full-level validation on all samples. All results were found to be usable for the Phase 2 RI as qualified. The complete data validation report is presented in Appendix C.

The homogenized tissue composite samples were archived frozen at ARI for a period of 10 months prior to their shipment to Axys. Subsamples were shipped frozen overnight, and the chain-of-custody and sample receiving documents were reviewed for documentation of the cooler temperature. The temperature inside the cooler was 0°C, and the samples were noted as frozen upon receipt at Axys. The samples were stored frozen at Axys for 8 days at -20°C until extraction. All analyses of the tissue samples were conducted within the 1-year maximum holding time for frozen samples.

The six composite tissue samples were analyzed for PCB congeners by Axys in one sample delivery group (DPWG19975). Composite samples were analyzed as received. Axys staff noted the presence of discernable pieces of flesh in the shiner surfperch composites. Further homogenization was not conducted. One sample, LDW-05-T2-M-ES-WB-Comp3, had a detected concentration of PCB-118 at 159,000 ng/kg, which was slightly over the calibrated range of the instrument. This result was J-qualified as estimated. No other data were qualified as a result of the data validation.

The method blank contained detected concentrations of PCB congeners ranging from 0.0790 to 4.46 ng/kg. The PCB congener concentrations in the tissue samples were compared to the method blank results, and all of the affected PCB congeners were either not detected or they were present at concentrations greater than five times the concentrations in the blank and thus were not qualified.

## 5.0 References

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Prepared for Lower Duwamish Waterway Group. Windward Environmental LLC, Seattle, WA.

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APPENDIX A PCB CONGENER DATA FOR 2005  
ENGLISH SOLE AND SHINER  
SURFPERCH COMPOSITE  
TISSUE SAMPLES

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**Table A-1. PCB congener data for 2005 English sole and shiner surfperch**

ANALYTE	UNIT	ENGLISH SOLE – WHOLE-BODY			SHINER SURFPERCH – WHOLE-BODY		
		LDW-05-T1-M-ES-WB-Comp3	LDW-05-T2-M-ES-WB-Comp3	LDW-05-T3-M-ES-WB-Comp2	LDW-05-T1-B-SS-WB-Comp1	LDW-05-T2-B-SS-WB-Comp1	LDW-05-T3-D-SS-WB-Comp1
<b>Polychlorinated biphenyls</b>							
PCB-001	ng/kg ww	12.4 J	27.8 J	18.0	8.93	7.40 J	16.1 J
PCB-002	ng/kg ww	2.62 J	4.12 J	2.71 J	1.87 J	3.83 U	4.17 J
PCB-003	ng/kg ww	5.15 J	6.90 J	3.81 J	2.76 J	5.28 J	6.26 J
PCB-004	ng/kg ww	150	384	242	63.5	58.5	150
PCB-005	ng/kg ww	11.6 U	12.5 J	6.69 J	3.63 U	13.4 U	9.63 U
PCB-006	ng/kg ww	158	408	265	34.7	32.6	93.1
PCB-007	ng/kg ww	19.7 J	41.4	20.6	4.44 J	12.6 U	8.84 U
PCB-008	ng/kg ww	488	1,060	506	58.8	58.0	106
PCB-009	ng/kg ww	34.2	63.9	31.9	20.6	14.7 J	34.7
PCB-010	ng/kg ww	10.4 U	26.1 J	13.2	7.72	12.6 U	14.2 J
PCB-011	ng/kg ww	11.9 U	11.3 U	4.03 U	11.0	12.8 U	9.87 U
PCB-012	ng/kg ww	11.6 CU	24.0 CJ	15.6 CJ	8.27 CJ	12.8 CU	19.5 CJ
PCB-013	ng/kg ww	C12	C12	C12	C12	C12	C12
PCB-014	ng/kg ww	11.0 U	10.4 U	3.91 U	3.38 U	12.4 U	9.10 U
PCB-015	ng/kg ww	14.6 U	23.4 U	24.1 U	159	135	227
PCB-016	ng/kg ww	819	1,350	767	60.6	47.6	80.8
PCB-017	ng/kg ww	2,230	3,410	2,130	285	305	514
PCB-018	ng/kg ww	3,650 C	6,730 C	3,770 C	1,310 C	1,530 C	2,290 C
PCB-019	ng/kg ww	356	695	379	122	142	299
PCB-020	ng/kg ww	11,500 C	22,400 C	8,660 C	5,220 C	6,380 C	7,990 C
PCB-021	ng/kg ww	2,620 C	5,350 C	1,700 C	166 C	170 C	313 C
PCB-022	ng/kg ww	1,820	4,000	1,520	312	308	523
PCB-023	ng/kg ww	8.28 U	17.4 U	6.27 J	2.83 J	3.98 J	5.73 U
PCB-024	ng/kg ww	68.6	117	48.0	20.9	24.1 J	47.0
PCB-025	ng/kg ww	582	1,370	1,120	384	506	1,120

ANALYTE	UNIT	ENGLISH SOLE – WHOLE-BODY			SHINER SURFPERCH – WHOLE-BODY		
		LDW-05-T1-M-ES-WB-Comp3	LDW-05-T2-M-ES-WB-Comp3	LDW-05-T3-M-ES-WB-Comp2	LDW-05-T1-B-SS-WB-Comp1	LDW-05-T2-B-SS-WB-Comp1	LDW-05-T3-D-SS-WB-Comp1
PCB-026	ng/kg ww	1,820 C	3,560 C	3,010 C	1,270 C	1,720 C	3,530 C
PCB-027	ng/kg ww	547	892	660	228	227	427
PCB-028	ng/kg ww	C20	C20	C20	C20	C20	C20
PCB-029	ng/kg ww	C26	C26	C26	C26	C26	C26
PCB-030	ng/kg ww	C18	C18	C18	C18	C18	C18
PCB-031	ng/kg ww	4,900	12,000	4,620	2,980	3,360	4,170
PCB-032	ng/kg ww	2,160	2,800	1,470	639	690	1,080
PCB-033	ng/kg ww	C21	C21	C21	C21	C21	C21
PCB-034	ng/kg ww	52.9	115	56.2	17.3	26.0	40.2
PCB-035	ng/kg ww	9.06 U	19.0 U	2.24 U	1.90 U	3.59 U	6.27 U
PCB-036	ng/kg ww	7.94 U	16.7 U	2.00 U	1.70 U	3.21 U	5.49 U
PCB-037	ng/kg ww	406	815	376	940	1,120	1,240
PCB-038	ng/kg ww	37.7	64.8	25.5	7.65	16.9 J	22.5 J
PCB-039	ng/kg ww	193	189	91.7	13.5	19.4 J	32.8
PCB-040	ng/kg ww	12,100 C	14,400 C	7,850 C	1,470 C	1,880 C	2,830 C
PCB-041	ng/kg ww	C40	C40	C40	C40	C40	C40
PCB-042	ng/kg ww	7,510	11,700	5,190	563	748	1,210
PCB-043	ng/kg ww	1,540	2,540	840	156	223	457
PCB-044	ng/kg ww	24,400 C	38,200 C	20,700 C	6,620 C	10,500 C	15,300 C
PCB-045	ng/kg ww	3,320 C	5,280 C	2,610 C	547 C	707 C	1,060 C
PCB-046	ng/kg ww	393	792	401	194	263	331
PCB-047	ng/kg ww	C44	C44	C44	C44	C44	C44
PCB-048	ng/kg ww	5,810	5,760	3,150	511	644	1,070
PCB-049	ng/kg ww	31,100 C	49,200 C	27,600 C	8,930 C	15,000 C	21,800 C
PCB-050	ng/kg ww	2,800 C	4,920 C	2,910 C	1,330 C	1,790 C	2,870 C
PCB-051	ng/kg ww	C45	C45	C45	C45	C45	C45
PCB-052	ng/kg ww	47,300	73,200	44,000	18,000	29,000	48,100
PCB-053	ng/kg ww	C50	C50	C50	C50	C50	C50
PCB-054	ng/kg ww	48.7	71.0	33.7	10.3	12.0 J	23.2 J

ANALYTE	UNIT	ENGLISH SOLE – WHOLE-BODY			SHINER SURFPERCH – WHOLE-BODY		
		LDW-05-T1-M-ES-WB-Comp3	LDW-05-T2-M-ES-WB-Comp3	LDW-05-T3-M-ES-WB-Comp2	LDW-05-T1-B-SS-WB-Comp1	LDW-05-T2-B-SS-WB-Comp1	LDW-05-T3-D-SS-WB-Comp1
PCB-055	ng/kg ww	67.6 U	79.1 U	20.8 U	10.1 U	14.1 U	18.3 U
PCB-056	ng/kg ww	2,590	7,630	3,250	625	850	1,360
PCB-057	ng/kg ww	104	334	248	70.5	146	251
PCB-058	ng/kg ww	65.2 U	245	75.0	32.1	51.3	119
PCB-059	ng/kg ww	3,610 C	5,670 C	2,520 C	979 C	1,490 C	2,070 C
PCB-060	ng/kg ww	9,000	12,500	3,690	1,470	2,370	2,510
PCB-061	ng/kg ww	50,900 C	88,000 C	32,100 C	14,800 C	23,700 C	23,800 C
PCB-062	ng/kg ww	C59	C59	C59	C59	C59	C59
PCB-063	ng/kg ww	1,840	2,750	1,030	536	1,000	814
PCB-064	ng/kg ww	14,700	23,400	8,440	3,260	5,090	5,150
PCB-065	ng/kg ww	C44	C44	C44	C44	C44	C44
PCB-066	ng/kg ww	40,500	59,100	21,900	6,870	13,000	15,000
PCB-067	ng/kg ww	339	883	485	261	433	664
PCB-068	ng/kg ww	192	562	402	121	275	489
PCB-069	ng/kg ww	C49	C49	C49	C49	C49	C49
PCB-070	ng/kg ww	C61	C61	C61	C61	C61	C61
PCB-071	ng/kg ww	C40	C40	C40	C40	C40	C40
PCB-072	ng/kg ww	506	1,100	782	224	461	918
PCB-073	ng/kg ww	3.03 U	3.15 U	0.396 U	0.838 U	1.54 U	2.19 U
PCB-074	ng/kg ww	C61	C61	C61	C61	C61	C61
PCB-075	ng/kg ww	C59	C59	C59	C59	C59	C59
PCB-076	ng/kg ww	C61	C61	C61	C61	C61	C61
PCB-077	ng/kg ww	419	1,350	583	781	1,250	1,180
PCB-078	ng/kg ww	69.6 U	81.4 U	21.1 U	10.2 U	14.3 U	18.8 U
PCB-079	ng/kg ww	1,100	1,420	572	164	285	654
PCB-080	ng/kg ww	60.3 U	70.6 U	18.1 U	8.74 U	12.3 U	16.3 U
PCB-081	ng/kg ww	83.4	142	42.0	46.2	234	67.3
PCB-082	ng/kg ww	6,010	8,930	3,360	421	588	1,290
PCB-083	ng/kg ww	92,100 C	115,000 C	57,400 C	26,100 C	42,000 C	75,900 C

ANALYTE	UNIT	ENGLISH SOLE – WHOLE-BODY			SHINER SURFPERCH – WHOLE-BODY		
		LDW-05-T1-M-ES-WB-Comp3	LDW-05-T2-M-ES-WB-Comp3	LDW-05-T3-M-ES-WB-Comp2	LDW-05-T1-B-SS-WB-Comp1	LDW-05-T2-B-SS-WB-Comp1	LDW-05-T3-D-SS-WB-Comp1
PCB-084	ng/kg ww	8,310	16,600	7,900	2,490	4,010	7,470
PCB-085	ng/kg ww	23,200 C	25,500 C	10,900 C	2,160 C	3,870 C	5,960 C
PCB-086	ng/kg ww	69,500 C	88,400 C	37,900 C	12,500 C	22,200 C	34,400 C
PCB-087	ng/kg ww	C86	C86	C86	C86	C86	C86
PCB-088	ng/kg ww	14,900 C	22,000 C	10,800 C	3,200 C	4,500 C	10,100 C
PCB-089	ng/kg ww	481	771	324	54.5	71.9	120
PCB-090	ng/kg ww	164,000 C	199,000 C	98,400 C	44,900 C	75,600 C	111,000 C
PCB-091	ng/kg ww	C88	C88	C88	C88	C88	C88
PCB-092	ng/kg ww	26,200	32,600	18,400	5,910	11,200	21,400
PCB-093	ng/kg ww	53,500 C	87,600 C	50,400 C	19,500 C	28,000 C	67,300 C
PCB-094	ng/kg ww	243	449	210	37.2	63.7	189
PCB-095	ng/kg ww	C93	C93	C93	C93	C93	C93
PCB-096	ng/kg ww	285	503	293	99.3	157	228
PCB-097	ng/kg ww	C86	C86	C86	C86	C86	C86
PCB-098	ng/kg ww	C93	C93	C93	C93	C93	C93
PCB-099	ng/kg ww	C83	C83	C83	C83	C83	C83
PCB-100	ng/kg ww	C93	C93	C93	C93	C93	C93
PCB-101	ng/kg ww	C90	C90	C90	C90	C90	C90
PCB-102	ng/kg ww	C93	C93	C93	C93	C93	C93
PCB-103	ng/kg ww	2,080	3,170	1,470	727	1,020	3,050
PCB-104	ng/kg ww	32.6	27.0 J	11.6	3.82 J	6.45 J	11.3 J
PCB-105	ng/kg ww	43,400	49,200	19,600	11,700	21,000	22,400
PCB-106	ng/kg ww	136 U	157 U	52.0 U	42.9 U	51.6 U	102 U
PCB-107	ng/kg ww	2,500 C	4,330 C	1,740 C	812 C	1,500 C	1,710 C
PCB-108	ng/kg ww	C86	C86	C86	C86	C86	C86
PCB-109	ng/kg ww	8,640	11,300	4,590	2,550	4,500	5,710
PCB-110	ng/kg ww	108,000 C	153,000 C	70,700 C	21,600 C	32,600 C	62,500 C
PCB-111	ng/kg ww	88.2	135	78.8	40.7	63.0	180
PCB-112	ng/kg ww	46.4 U	27.0 U	5.22 U	7.23 U	15.0 U	14.3 U



ANALYTE	UNIT	ENGLISH SOLE – WHOLE-BODY			SHINER SURFPERCH – WHOLE-BODY		
		LDW-05-T1-M-ES-WB-Comp3	LDW-05-T2-M-ES-WB-Comp3	LDW-05-T3-M-ES-WB-Comp2	LDW-05-T1-B-SS-WB-Comp1	LDW-05-T2-B-SS-WB-Comp1	LDW-05-T3-D-SS-WB-Comp1
PCB-113	ng/kg ww	C90	C90	C90	C90	C90	C90
PCB-114	ng/kg ww	2,750	3,620	1,200	741	1,360	1,310
PCB-115	ng/kg ww	C110	C110	C110	C110	C110	C110
PCB-116	ng/kg ww	C85	C85	C85	C85	C85	C85
PCB-117	ng/kg ww	C85	C85	C85	C85	C85	C85
PCB-118	ng/kg ww	137,000	159,000 J	63,500	34,100	64,800	76,200
PCB-119	ng/kg ww	C86	C86	C86	C86	C86	C86
PCB-120	ng/kg ww	619	958	475	243	375	1,160
PCB-121	ng/kg ww	47.4 U	97.8	36.4	21.4	27.5	136
PCB-122	ng/kg ww	159 U	744	304	169	254	491
PCB-123	ng/kg ww	2,190	2,370	1,090	600	1,230	1,210
PCB-124	ng/kg ww	C107	C107	C107	C107	C107	C107
PCB-125	ng/kg ww	C86	C86	C86	C86	C86	C86
PCB-126	ng/kg ww	169	192	59.5	60.2	100	104
PCB-127	ng/kg ww	151 U	175 U	55.0 U	45.4 U	54.6 U	113 U
PCB-128	ng/kg ww	24,900 C	23,800 C	10,100 C	5,040 C	8,530 C	14,900 C
PCB-129	ng/kg ww	241,000 C	284,000 C	134,000 C	77,200 C	117,000 C	198,000 C
PCB-130	ng/kg ww	11,400	13,500	5,210	3,140	5,530	9,510
PCB-131	ng/kg ww	1,350	1,840	722	248	439	724
PCB-132	ng/kg ww	39,300	51,300	23,700	6,530	8,210	21,800
PCB-133	ng/kg ww	3,340	4,760	1,840	1,160	1,980	4,480
PCB-134	ng/kg ww	6,870 C	9,970 C	3,890 C	1,680 C	2,790 C	6,360 C
PCB-135	ng/kg ww	68,900 C	80,600 C	39,600 C	18,600 C	27,000 C	68,600 C
PCB-136	ng/kg ww	15,500	19,600	10,600	4,480	5,980	17,200
PCB-137	ng/kg ww	6,980	9,130	3,530	2,030	3,970	5,190
PCB-138	ng/kg ww	C129	C129	C129	C129	C129	C129
PCB-139	ng/kg ww	3,810 C	4,700 C	2,000 C	808 C	1,370 C	2,900 C
PCB-140	ng/kg ww	C139	C139	C139	C139	C139	C139
PCB-141	ng/kg ww	32,500	45,700	15,200	6,930	11,000	23,800

ANALYTE	UNIT	ENGLISH SOLE – WHOLE-BODY			SHINER SURFPERCH – WHOLE-BODY		
		LDW-05-T1-M-ES-WB-Comp3	LDW-05-T2-M-ES-WB-Comp3	LDW-05-T3-M-ES-WB-Comp2	LDW-05-T1-B-SS-WB-Comp1	LDW-05-T2-B-SS-WB-Comp1	LDW-05-T3-D-SS-WB-Comp1
PCB-142	ng/kg ww	111 U	127 U	86.5 U	48.2 U	57.5 U	119 U
PCB-143	ng/kg ww	C134	C134	C134	C134	C134	C134
PCB-144	ng/kg ww	10,600	11,200	4,590	2,180	3,560	7,170
PCB-145	ng/kg ww	55.8	76.8	26.3	1.05 U	15.5 J	4.52 U
PCB-146	ng/kg ww	36,500	43,600	15,700	10,400	15,800	41,000
PCB-147	ng/kg ww	143,000 C	188,000 C	87,900 C	29,000 C	36,200 C	111,000 C
PCB-148	ng/kg ww	424	651	272	124	190	699
PCB-149	ng/kg ww	C147	C147	C147	C147	C147	C147
PCB-150	ng/kg ww	444	603	244	141	186	612
PCB-151	ng/kg ww	C135	C135	C135	C135	C135	C135
PCB-152	ng/kg ww	89.3	118	78.4	19.8	28.7	53.6
PCB-153	ng/kg ww	281,000 C	307,000 C	144,000 C	98,100 C	135,000 C	264,000 C
PCB-154	ng/kg ww	C135	C135	C135	C135	C135	C135
PCB-155	ng/kg ww	57.4	46.2	15.2	13.3	18.5 J	48.2
PCB-156	ng/kg ww	19,800 C	24,300 C	8,850 C	5,800 C	10,600 C	14,800 C
PCB-157	ng/kg ww	C156	C156	C156	C156	C156	C156
PCB-158	ng/kg ww	19,000	23,900	8,970	5,300	9,340	16,100
PCB-159	ng/kg ww	1,670	2,000	714	153	202	935
PCB-160	ng/kg ww	C129	C129	C129	C129	C129	C129
PCB-161	ng/kg ww	76.8 U	88.0 U	53.8 U	30.0 U	35.8 U	82.3 U
PCB-162	ng/kg ww	522	508	253	146	278	308
PCB-163	ng/kg ww	C129	C129	C129	C129	C129	C129
PCB-164	ng/kg ww	10,200	14,100	5,360	1,820	2,560	7,530
PCB-165	ng/kg ww	86.2 U	98.7 U	82.1	42.6	58.2	188
PCB-166	ng/kg ww	C128	C128	C128	C128	C128	C128
PCB-167	ng/kg ww	8,070	9,910	4,010	2,470	4,490	6,490
PCB-168	ng/kg ww	C153	C153	C153	C153	C153	C153
PCB-169	ng/kg ww	7.13	6.16	84.5 U	46.7 U	3.45	3.78
PCB-170	ng/kg ww	42,600	47,100	17,700	11,400	17,600	48,100

ANALYTE	UNIT	ENGLISH SOLE – WHOLE-BODY			SHINER SURFPERCH – WHOLE-BODY		
		LDW-05-T1-M-ES-WB-Comp3	LDW-05-T2-M-ES-WB-Comp3	LDW-05-T3-M-ES-WB-Comp2	LDW-05-T1-B-SS-WB-Comp1	LDW-05-T2-B-SS-WB-Comp1	LDW-05-T3-D-SS-WB-Comp1
PCB-171	ng/kg ww	15,400 C	16,400 C	5,980 C	3,510 C	5,420 C	14,700 C
PCB-172	ng/kg ww	8,160	9,330	3,110	1,870	2,830	8,030
PCB-173	ng/kg ww	C171	C171	C171	C171	C171	C171
PCB-174	ng/kg ww	33,300	39,800	14,100	2,700	3,290	17,600
PCB-175	ng/kg ww	2,150	2,190	833	491	773	2,090
PCB-176	ng/kg ww	6,290	6,290	2,550	746	1,080	4,210
PCB-177	ng/kg ww	28,700	29,600	10,800	5,610	8,380	26,600
PCB-178	ng/kg ww	11,700	12,700	4,810	3,130	4,950	12,900
PCB-179	ng/kg ww	21,900	18,900	9,170	3,710	4,940	18,000
PCB-180	ng/kg ww	109,000 C	139,000 C	51,900 C	34,000 C	48,900 C	134,000 C
PCB-181	ng/kg ww	418	488	163	81.3	151	298
PCB-182	ng/kg ww	645	904	235	135	222	726
PCB-183	ng/kg ww	46,200 C	50,300 C	18,200 C	10,600 C	17,500 C	44,800 C
PCB-184	ng/kg ww	46.8	38.8	16.7	9.64	19.0 J	34.3
PCB-185	ng/kg ww	C183	C183	C183	C183	C183	C183
PCB-186	ng/kg ww	5.74 U	5.47 U	1.45 U	1.22 U	1.56 U	4.97 U
PCB-187	ng/kg ww	87,300	89,800	35,200	22,600	31,900	85,600
PCB-188	ng/kg ww	201	146	59.4	36.7	56.7	127
PCB-189	ng/kg ww	1,370	1,350	602	388	627	1,420
Total PCB congeners	ng/kg ww	2,589,000 J	3,214,000 J	1,433,000 J	683,100 J	1,047,000 J	2,048,000 J
PCB TEQ - Mammal WHO 1998 - Half DL	ng/kg ww	46.8	54.7 J	20.0	14.3	25.0	28.8
PCB TEQ - Mammal WHO 2005 - Half DL	ng/kg ww	23.6	27.1 J	10.3	8.49	13.4	14.4

ANALYTE	UNIT	ENGLISH SOLE – WHOLE-BODY			SHINER SURFPERCH – WHOLE-BODY		
		LDW-05-T1-M-ES-WB-Comp3	LDW-05-T2-M-ES-WB-Comp3	LDW-05-T3-M-ES-WB-Comp2	LDW-05-T1-B-SS-WB-Comp1	LDW-05-T2-B-SS-WB-Comp1	LDW-05-T3-D-SS-WB-Comp1
<b>Conventional parameters</b>							
Total solids	% ww	20.99	27.10	25.25	26.21	26.62	29.96
Lipid	% ww	3.13	6.23	4.77	6.01	5.79	6.92

ww – wet weight

Methods for calculating total PCBs and TEQs are presented in Appendix B.

Note: Results for congeners that co-elute with each other are attributed to the congener with the lowest IUPAC number. For example, PCB-129, PCB-160 and PCB-163 co-elute with each other. The concentration for this trio of congeners is shown with PCB-129. For PCB-160 and PCB-163, C129 is shown rather than a concentration to indicate that these congeners co-elute with PCB-129. A similar convention is used for other co-eluting congeners.

Data qualifiers: C–concentration represents coelution, U - not detected at reporting limit shown; J - estimated concentration