



March 10, 2008

Mike Gross  
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333 SW First Avenue  
PO Box 2946  
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Subject: Forebay Fish Analysis and Summary Report  
Bradford Island Remedial Investigation  
Bonneville Dam Forebay, Cascade Locks, Oregon  
Contract No W9128F-04-D-0001, Task Order No. DT06, Modification No. 0001

Dear Mr. Gross:

Please find the results of analysis of the forebay fin fish provided to URS by the Corps. We understand that these fish were collected by a variety of persons/means during 2006 and 2007, and were stored in a freezer at secure location by the Corps until they were provided to URS on September 20, 2007. The fish were analyzed in general accordance with the *Quality Assurance Project Plan, River Operable Unit Remedial Investigation*, prepared by URS, dated September 2007.

This summary report consists of the following:

- Tabulated data for each sample analyzed
- Sample location map based on information provided to URS by the Corps
- A case narrative discussing the laboratory data quality and usability

The original laboratory data deliverables both the .pdf and electronic versions are available upon request.

This information will be utilized in the remedial investigation and risk assessment as provided in the *RI/FS Management Plan*.

We look forward to working with you on this important project.

Sincerely,  
URS CORPORATION

Jeff Wallace, R.G.  
Project Manager

Attachments:

- Analytical Results Tables 1 through 4
- Figure 1: Fish Sample Locations
- QA/QC Review of Laboratory Analytical Data – Forebay Fish

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**Table 2**  
**Fish Tissue Metals Analytical Results and Screening Criteria**  
Bradford Island - Remedial Investigation  
Archived Fish from Bonneville Dam Forebay

Parameter								Metals (EPA SW-846) (units = µg/kg or ppb)																
Sample ID	Lab Sample ID	Sample Date	Moisture (%)	Total Lipids (%)	Weight (g)	Size (mm)	Basis	Method	6010B	6010B	6020	6010B	6020	6010B	6010B	6010B	6010B	6010B	6010B	7471A	6010B	6010B	6010B	6010B
									Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Thallium	Vanadium	Zinc	
060605100SB	K0708602-001	6/5/2006	74.6	7.8	255	270	D		39,000	50 U	670	9,120	2	43	700	218	4,160	78	280 J	1,220	58	290	54,800	
060605101SB	K0708602-002	6/5/2006	72.2	11.6	730	330	D		24,000	50 U	2,500	4,660	2	25	900 U	186	2,100	63	1,230 J	980	71	150	46,600	
060605200SB	K0708602-003	6/5/2006	75.2	6.7	226	270	D		45,700	50 U	690	7,880	20 U	91	1,100	235	5,740	33	527 J	1,610	45	230	61,000	
060605201SB	K0708602-004	6/5/2006	74.6	6.8	397	299	D		15,800	50 U	1,540	9,560	19 U	25	1,000 U	178	2,840	69	736 J	890	58	150	59,300	
060605202SB	K0708602-005	6/5/2006	74.5	5.5	539	300	D		18,600	50 U	1,310	6,780	19 U	25	1,100	211	3,010	36	298 J	1,400	60	140	57,900	
060605203SB	K0708602-006	6/5/2006	72.8	10.4	1502	476	D		4,600 J	50 U	1,280	3,200	3	41	1,000 U	219	1,770	18 J	1,040 J	1,120 J	34	110	66,300	
060605204SB	K0708602-007	6/5/2006	72.8	13.3	652	343	D		5,100	50 U	2,070	3,540	2	24	1,000 U	164	1,610	19	1,160 J	780	65	100	44,800	
060605205SB	K0708602-008	6/5/2006	73.2	10.4	850	394	D		17,600	50 U	1,920	4,220	20 U	48	1,000 U	220	2,870	18	1,370 J	1,210	59	170	55,100	
060605207SB	K0708602-009	6/5/2006	75.2	10.1	369	330	D		9,100	50 U	1,800	3,470	19 U	34	1,000 U	178	2,360	42	1,230 J	860	65	160	53,700	
060605208SB	K0708602-010	6/5/2006	72.6	8.7	1191	419	D		4,800	50 U	1,800	5,740	20 U	15	1,000 U	210	1,580	14	1,360 J	1,070	49	180	48,600	
060605209SB	K0708602-011	6/5/2006	72.3	14.7	680	381	D		14,100	50 U	2,160	7,080	20 U	20	1,000 U	235	2,120	18	905 J	1,220	55	200	51,900	
060606102SB	K0708602-012	6/6/2006	74.5	8.3	387	265	D		60,700	50 U	1,230	5,260	20 U	26	800	223	2,700	37	515 J	1,110	74	520	48,300	
060606103SB	K0708602-013	6/6/2006	69.6	8.0	1074	411	D		8,200	50 U	1,150	4,200	20 U	13	1,000 U	249	1,780	18	1,690 J	1,290	42	220	51,100	
060606104SB	K0708602-014	6/6/2006	73.2	8.9	719	380	D		4,000	50 U	2,090	2,700	19 U	71	900 U	175	2,090	39	1,430 J	1,020	57	210	60,100	
060606210SB	K0708602-015	6/6/2006	74.3	6.8	284	298	D		40,200	50 U	2,090	3,820	19 U	109	3,400	202	2,410	141	789 J	1,290	84	200	52,300	
060815402SB	K0708602-016	8/15/2006	69.5	17.3	1063	406	D		13,900	50 U	630	8,640	19 U	18	900 U	205	2,970	41	988 J	1,070	26	250	51,600	
060815403SB	K0708602-017	8/15/2006	70.3	18.6	284	273	D		4,500	50 U	990	5,870	20 U	25	1,000 U	190	1,990	28	557 J	990	46	240	50,300	
060815405SB	K0708602-018	8/15/2006	69.6	15.4	964	406	D		6,500	50 U	1,490	4,070	19 U	17	1,000 U	167	1,200	51	1,640 J	930	48	260	43,300	
060815406SB	K0708602-019	8/15/2006	70.1	22.0	369	314	D		25,200	40 U	1,370	5,550	18 U	22	900 U	153	1,690	16	492 J	760	47	310	38,200	
070505LS	K0708602-020	5/5/2007	67.6	32.2	1400/1686/1666	478/480/546.1	D		60,800 J	50 U	1,070	5,930	20 U	131	1,500	239	2,250	136	428 J	1,060	17	510	54,000	
060605100SB	K0708602-001	6/5/2006	74.6	2.0	255	270	W		9,890	12 U	170	2,320	0.6	11	190 J	55.3	1,060	20	71 J	309	14.8	70	13,900	
060605101SB	K0708602-002	6/5/2006	72.2	3.2	730	330	W		6,660	13 U	700	1,300	0.5	7	260 U	51.6	583	18	342 J	271	19.8	40	12,900	
060605200SB	K0708602-003	6/5/2006	75.2	1.7	226	270	W		11,300	12 U	170	1,950	4.9 U	23	270	58.2	1,420	8	131 J	399	11.2	60	15,100	
060605201SB	K0708602-004	6/5/2006	74.6	1.7	397	299	W		4,000	12 U	390	2,430	4.9 U	6	250 U	45.2	721	17	187 J	225	14.6	40	15,100	
060605202SB	K0708602-005	6/5/2006	74.5	1.4	539	300	W		4,750	12 U	330	1,730	4.8 U	6	290	53.7	767	9	76 J	357	15.4	40	14,800	
060605203SB	K0708602-006	6/5/2006	72.8	2.8	1502	476	W		1,260 J	14 U	350	870	0.7	11	270 U	59.4	482	5 J	283 J	304 J	9.3	30	18,000	
060605204SB	K0708602-007	6/5/2006	72.8	3.6	652	343	W		1,370	13 U	560	960	0.6	7	260 U	44.7	439	5	315 J	213	17.7	30	12,200	
060605205SB	K0708602-008	6/5/2006	73.2	2.8	850	394	W		4,720	13 U	520	1,130	5.3 U	13	270 U	58.8	769	5	367 J	324	15.7	50	14,800	
060605207SB	K0708602-009	6/5/2006	75.2	2.5	369	330	W		2,250	12 U	450	860	4.8 U	9	240 U	44.1	586	10	305 J	213	16.2	40	13,300	
060605208SB	K0708602-010	6/5/2006	72.6	2.4	1191	419	W		1,330	14 U	490	1,570	5.4 U	4	270 U	57.5	434	4	372 J	292	13.3	50	13,300	
060605209SB	K0708602-011	6/5/2006	72.3	4.1	680	381	W		3,900	14 U	600	1,960	5.5 U	6	280 U	65	588	5	251 J	338	15.3	50	14,400	
060606102SB	K0708602-012	6/6/2006	74.5	2.1	387	265	W		15,500	13 U	310	1,340	5.0 U	7	200	56.7	688	9	131 J	282	18.8	130	12,300	
060606103SB	K0708602-013	6/6/2006	69.6	2.4	1074	411	W		2,490	15 U	350	1,280	5.9 U	4	300 U	75.8	540	5	512 J	392	12.8	70	15,500	
060606104SB	K0708602-014	6/6/2006	73.2	2.4	719	380	W		1,060	12 U	560	720	5.0 U	19	250 U	46.9	560	10	383 J	273	15.3	60	16,100	
060606210SB	K0708602-015	6/6/2006	74.3	1.7	284	298	W		10,300	12 U	540	980	4.9 U	28	860	51.9	619	36	203 J	333	21.5	50	13,400	
060815402SB	K0708602-016	8/15/2006	69.5	5.3	1063	406	W		4,240	15 U	190	2,640	5.8 U	5	290 U	62.5	905	12	301 J	327	7.9	80	15,800	
060815403SB	K0708602-017	8/15/2006	70.3	5.5	284	273	W		1,330	15 U	290	1,740	5.8 U	7	290 U	56.6	591	8	165 J	295	13.6	70	14,900	
060815405SB	K0708602-018	8/15/2006	69.6	4.7	964	406	W		1,970	15 U	450	1,240	5.9 U	5	290 U	50.8	364	16	498 J	281	14.5	80	13,200	
060815406SB	K0708602-019	8/15/2006	70.1	6.6	369	314	W		7,540	13 U	410	1,660	5.3 U	7	270 U	45.7	505	5	147 J	228	14.2	90	11,400	
070505LS	K0708602-020	5/5/2007	67.6	10.4	1400/1686/1666	478/480/546.1	W		19,700 J	16 U	350	1,920	6.4 U	42	480	77.5	728	44	139 J	343	5.6	170	17,500	
ODEQ ATLS for Fish/Shellfish (2007) <sup>1</sup> (µg/kg wet)								Birds (Individual)	NE	NE	13,000	NE	NE	8,400	NE	NE	NE	9,300	74	NE	NE	NE	NE	
								Mammals (Individual)	NE	NE	7,600	NE	NE	5,600	NE	NE	NE	34,000	120	NE	NE	NE	NE	
								Humans <sup>3</sup> (subsistence/tribal)	NE	NE	0.76	NE	NE	490	NE	NE	NE	500	49	NE	NE	NE	NE	
ODEQ CTLs for Fish/Shellfish (2007) <sup>2</sup> (µg/kg wet)								Freshwater	NE	NE	6,600	NE	NE	150	NE	NE	NE	120	88 (inorganic)	NE	NE	NE	NE	

**Notes:**  
µg/kg = microgram per kilogram  
ATL = Acceptable Tissue Levels  
CTL = Critical Tissue Level  
D = Dry Weight  
EPA = U.S. Environmental Protection Agency  
J = The reported value is an estimate  
MRL = method reporting limit  
NE = Not Established  
Non-detect values reported at the MRL

ODEQ = Oregon Department of Environmental Quality  
PCBs = Polychlorinated Biphenyls  
U = The analyte was not detected above the reported sample quantification limit  
UJ = The analyte was not detected. The reported sample quantification limit is an estimate  
[Yellow Box] = reported concentration exceeded one or more screening criteria listed.  
W = Wet Weight  
1 = Table A-3a in Guidance for Assessing Bioaccumulative Chemicals of Concern in Sediment, Oregon Department of Environmental Quality (ODEQ), Final January 31, 2007.  
2 = Table A-4 in Guidance for Assessing Bioaccumulative Chemicals of Concern in Sediment, Oregon Department of Environmental Quality (ODEQ), Final January 31, 2007.  
3 = Lowest values of either carcinogen or non-carcinogen criteria.

**Table 3**  
**Fish Tissue SVOC Analytical Results and Screening Criteria**  
 Bradford Island - Remedial Investigation  
 Archived Fish from Bonneville Dam Forebay

Sample ID	Lab Sample ID	Sample Date	Moisture (%)	Total Lipids (%)	Weight (g)	Size (mm)	Basis	Semivolatile Organic Compounds (units = µg/kg or ppb)																							
								EPA 8270C SIM																							
								Acenaphthene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Bis(2-ethylhexyl) phthalate	Butyl benzyl phthalate	Carbazole	Chrysene	Dibenz(a,h)anthracene	Di-n-butyl phthalate	Di-n-octyl phthalate	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	p-Cresol (4-methylphenol)	Phenanthrene	Pyrene				
060605100SB	K0708602-001	6/5/2006	74.6	7.8	255	270	D	0.78 J	0.45 J	1.9 UJ	1.9 UJ	0.44 J	1.9 UJ	0.44 J	710 UJ	150 UJ	150 UJ	1.9 UJ	1.9 UJ	150 UJ	150 UJ	1.9 UJ	1.6 J	1.9 UJ	150 UJ	2.4 J	0.54 J				
070505LS	K0708602-020	5/5/2007	67.6	32.2	1400/1686/1666	478/480/546.1	D	15 UJ	14 J	15 UJ	19 J	15 UJ	6.3 J	34 J	540 UJ	110 UJ	110 UJ	15 UJ	11 J	110 UJ	110 UJ	18 J	15 UJ	20 J	110 UJ	15 UJ	23 J				
ODEQ ATLS for Fish/Shellfish (2007) <sup>1</sup> (µg/kg wet)								Birds (Individual)		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE		
ODEQ ATLS for Fish/Shellfish (2007) <sup>1</sup> (µg/kg wet)								Mammals (Individual)		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	9.5
ODEQ ATLS for Fish/Shellfish (2007) <sup>1</sup> (µg/kg wet)								Humans <sup>3</sup> (subsistence/tribal)		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	15,000
ODEQ CTLs for Fish/Shellfish (2007) <sup>2</sup> (µg/kg wet)								Freshwater		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	1,000

**Notes:**

µg/kg = microgram per kilogram  
 ATL = Acceptable Tissue Levels  
 CTL = Critical Tissue Level  
 D = Dry Weight  
 EPA = U.S. Environmental Protection Agency  
 J = The reported value is an estimate.  
 MRL = method reporting limit  
 NE = Not Established  
 Non-detect values reported at the MRL

ODEQ = Oregon Department of Environmental Quality  
 PCBs = Polychlorinated Biphenyls  
 U = The analyte was not detected above the reported sample quantification limit.  
 UJ = The analyte was not detected. The reported sample quantification limit is an estimate.  
 J = reported concentration exceeded one or more screening criteria listed.

W = Wet Weight

- 1 = Table A-3a in Guidance for Assessing Bioaccumulative Chemicals of Concern in Sediment, Oregon Department of Environmental Quality (ODEQ), Final January 31, 2007.
- 2 = Table A-4 in Guidance for Assessing Bioaccumulative Chemicals of Concern in Sediment, Oregon Department of Environmental Quality (ODEQ), Final January 31, 2007.
- 3 = Lowest values of either carcinogen or non-carcinogen criteria.

**Table 4a  
Fish Tissue PCB Congener Analysis Results  
Lab Sample ID's L10448-1 through L10448-7**

Bradford Island - Remedial Investigation  
Archived Fish from Bonneville Dam Forebay

IUPAC #	COELUTING CONGENERS <sup>1</sup>	060605100SB L10448-1	060605101SB L10448-2	060605200SB L10448-3	060605201SB L10448-4	060605202SB L10448-5	060605203SB L10448-6	060605204SB L10448-7
1		0.186 UJ	0.65 J	0.747 J	0.234 UJ	0.189 UJ	0.346 J	0.309 UJ
2		0.088 J-EMPC	0.698 J	0.482 J	0.129 J	0.276 J	0.407 J	0.614 J
3		0.144 UJ	0.437 UJ	0.438 UJ	0.125 UJ	0.154 UJ	0.378 UJ	0.271 UJ
4		1.62 J	4.27 J	2.03 J	1.93 J	1.53 J	3.58 J	5.78 J
5		0.124 UJ	0.285 J	0.193 J	0.138 J	0.072 J	0.222 J	0.247 J
6		0.756 J	2.01 J	1.95 J	1.07 J	1.01 J	1.98 J	2.86 J
7		0.154 J	0.61 J	0.366 J	0.25 J	0.234 J	0.428 J	0.517 J
8		3.33 J	8.87 J	4.46 J	5.1 J	4.44 J	8.56 J	11.3 J
9		0.217 J	0.664 J	0.361 J	0.297 J	0.283 J	0.6 J	0.701 J
10		0.114 UJ	0.267 J	0.125 UJ	0.112 UJ	0.098 J	0.186 J	0.337 J
11		9.35 J	92.7 J	11.5 J	8.08 J	25.4 J	41.4 J	130 J
12	12 + 13	0.111 C UJ	1.12 C J	1.48 C J	0.317 C J	0.0585 C UJ	0.736 C J	0.058 C UJ
13	12 + 13	C12 J	C12 J	C12 J	C12 J	C12 J	C12 J	C12 J
14		0.112 UJ	0.149 J	0.123 UJ	0.107 UJ	0.0587 UJ	0.092 J	0.157 J
15		1.25 J	2.68 J	1.31 J	1.02 J	0.809 J	1.91 J	3.49 J
16		4.05 J	11.1 J	5.6 J	8.25 J	6.42 J	11.8 J	19.1 J
17		6.52 J	24.2 J	10.1 J	16.7 J	10.2 J	20.9 J	39.4 J
18	18 + 30	13.9 C J	40.3 C J	19.4 C J	34.3 C J	21.9 C J	43.6 C J	59.7 C J
19		1.42 J	3.18 J	1.65 J	2.24 J	1.74 J	3.35 J	9.56 J
20	20 + 28	66.1 C J	255 C J	132 C J	196 C J	99.9 C J	241 C J	235 C J
21	21 + 33	13.4 C J	34.9 C J	16.8 C J	40.5 C J	18.7 C J	42.7 C J	46.2 C J
22		12.4 J	32.9 J	13.2 J	34.1 J	19.2 J	50.5 J	57 J
23		0.0849 UJ	0.342 J	0.153 J	0.14 J	0.086 J	0.293 J	0.162 J
24		0.271 J	0.667 J	0.315 J	0.496 J	0.405 J	1 J	1.1 J
25		2.36 J	21.1 J	4.53 J	6.41 J	3.86 J	10.5 J	10.7 J
26	26 + 29	7.6 C J	43.6 C J	13.2 C J	21.4 C J	10.5 C J	28.3 C J	27.8 C J
27		0.875 J	4.66 J	1.48 J	2.01 J	1.46 J	3.8 J	7.72 J
28	20 + 28	C20 J	C20 J	C20 J	C20 J	C20 J	C20 J	C20 J
29	26 + 29	C26 J	C26 J	C26 J	C26 J	C26 J	C26 J	C26 J
30	18 + 30	C18 J	C18 J	C18 J	C18 J	C18 J	C18 J	C18 J
31		32.3 J	150 J	46.4 J	90.7 J	55.6 J	147 J	118 J
32		2.13 J	12.1 J	2.71 J	6.56 J	2.87 J	6.36 J	10.2 J
33	21 + 33	C21 J	C21 J	C21 J	C21 J	C21 J	C21 J	C21 J
34		0.088 J	1.23 J	0.286 J	0.297 J	0.222 J	0.764 J	0.852 J
35		0.0861 UJ	0.0894 UJ	0.148 J-EMPC	0.129 UJ	0.0812 UJ	0.0808 UJ	0.0913 UJ
36		0.0781 UJ	0.0811 UJ	0.0839 UJ	0.118 UJ	0.0737 UJ	0.0734 UJ	0.0829 UJ
37		5.02 J	39.8 J	13.4 J	6.44 J	6.15 J	17.1 J	24.5 J
38		0.079 J-EMPC	1.65 J-EMPC	0.176 J-EMPC	0.149 J-EMPC	0.112 J-EMPC	0.253 J-EMPC	0.168 J-EMPC
39		0.504 J	8.73 J-EMPC	0.859 J	0.93 J-EMPC	0.507 J	1.65 J	1.47 J
40	40 + 41 + 71	28.9 C J	1180 C J	43.8 C J	64.5 C J	42.2 C J	114 C J	107 C J
41	40 + 41 + 71	C40 J	C40 J	C40 J	C40 J	C40 J	C40 J	C40 J
42		21.8 J	544 J	42.4 J	43.9 J	31.6 J	112 J	98.2 J
43		4.32 J	91.7 J	9.09 J	13.2 J	7.36 J	18.1 J	14 J
44	44 + 47 + 65	152 C J	6390 C J	1290 C J	401 C J	253 C J	641 C J	450 C J
45	45 + 51	6.02 C J	105 C J	10.8 C J	12.9 C J	10.7 C J	29.8 C J	31.2 C J
46		1.22 J	15.9 J	1.58 J	2.55 J	2.27 J	4.43 J	5.76 J
47	44 + 47 + 65	C44 J	C44 J	C44 J	C44 J	C44 J	C44 J	C44 J
48		19.4 J	352 J	32.2 J	46.2 J	25.9 J	79 J	70 J
49	49 + 69	121 C J	5360 C J	1490 C J	317 C J	179 C J	545 C J	346 C J
50	50 + 53	5.72 C J	249 C J	8.88 C J	10.1 C J	8.8 C J	26.9 C J	27.9 C J
51	45 + 51	C45 J	C45 J	C45 J	C45 J	C45 J	C45 J	C45 J
52		289 J	18500 J	3240 J	723 J	476 J	1220 J	678 J
53	50 + 53	C50 J	C50 J	C50 J	C50 J	C50 J	C50 J	C50 J
54		0.069 J	1.81 J	0.14 UJ	0.336 J	0.19 J	0.523 J	2.13 J
55		0.202 UJ	0.84 UJ	0.563 UJ	0.311 UJ	0.225 UJ	0.549 UJ	0.445 UJ
56		18.9 J	1030 J	272 J	45.6 J	43.9 J	136 J	124 J
57		0.92 J	4.37 J	6.79 J	2.03 J	1.44 J	3.01 J	2.7 J
58		0.43 J	0.834 UJ	0.559 UJ	1.51 J	0.221 UJ	0.541 UJ	2.65 J
59	59 + 62 + 75	12.5 C J	131 C J	28.8 C J	31.3 C J	18.2 C J	48.8 C J	39.1 C J
60		66.7 J	1410 J	1200 J	226 J	91.2 J	237 J	197 J
61	61 + 70 + 74 + 76	464 C J	23500 C J	19500 C J	1410 C J	729 C J	2260 C J	1140 C J
62	59 + 62 + 75	C59 J	C59 J	C59 J	C59 J	C59 J	C59 J	C59 J
63		24.3 J	368 J	451 J	59.2 J	27.6 J	69.7 J	47.9 J
64		68.3 J	2610 J	113 J	167 J	113 J	317 J	231 J
65	44 + 47 + 65	C44 J	C44 J	C44 J	C44 J	C44 J	C44 J	C44 J
66		401 J	10300 J	10300 J	1030 J	483 J	1160 J	912 J
67		2.44 J	27.2 J	23.5 J	8.32 J	3.64 J	11.6 J	9.53 J
68		6.74 J	23.5 J	30.1 J	9.21 J	7.08 J	14.4 J	9.92 J
69	49 + 69	C49 J	C49 J	C49 J	C49 J	C49 J	C49 J	C49 J
70	61 + 70 + 74 + 76	C61 J	C61 J	C61 J	C61 J	C61 J	C61 J	C61 J
71	40 + 41 + 71	C40 J	C40 J	C40 J	C40 J	C40 J	C40 J	C40 J
72		4.75 J	39.8 J	33 J	12 J	7.05 J	15.9 J	13.5 J
73		0.0495 UJ	0.0499 UJ	0.127 UJ	0.0805 UJ	0.0616 UJ	0.0496 UJ	0.0495 UJ
74	61 + 70 + 74 + 76	C61 J	C61 J	C61 J	C61 J	C61 J	C61 J	C61 J
75	59 + 62 + 75	C59 J	C59 J	C59 J	C59 J	C59 J	C59 J	C59 J
76	61 + 70 + 74 + 76	C61 J	C61 J	C61 J	C61 J	C61 J	C61 J	C61 J
77		24.1 J	165 J	205 J	44.8 J	31.5 J	70.3 J	62.4 J
78		0.776 J	16.2 J	31.4 J	1.94 J	0.226 UJ	0.551 UJ	0.446 UJ
79		4.67 J	683 J	596 J	12.4 J	9.99 J	54.2 J	10.8 J
80		0.176 UJ	0.734 UJ	0.492 UJ	0.279 UJ	0.202 UJ	0.493 UJ	0.399 UJ
81		1.43 J	19.5 J	23.8 J	3.84 J	2.05 J	4.22 J	3.24 J
82		49.1 J	10100 J	680 J	78.1 J	95.2 J	296 J	54.1 J
83	83 + 99	1550 C J	75300 C J	63200 C J	5230 C J	1820 C J	5930 C J	2530 C J
84		65.3 J	14200 J	196 J	125 J	154 J	438 J	123 J
85	85 + 116 + 117	464 C J	23400 C J	18600 C J	1470 C J	549 C J	1650 C J	800 C J
86	86 + 87 + 97 + 108 + 119 + 125	750 C J	78300 C J	22600 C J	1480 C J	934 C J	3740 C J	924 C J
87	86 + 87 + 97 + 108 + 119 + 125	C86 J	C86 J	C86 J	C86 J	C86 J	C86 J	C86 J
88	88 + 91	79.4 C J	10500 C J	608 C J	144 C J	126 C J	487 C J	144 C J
89		1.87 J	347 J	3.28 J	4.08 J	3.9 J	10.3 J	3.86 J
90	90 + 101 + 113	1490 C J	117000 C J	35800 C J	3020 C J	1750 C J	6610 C J	2110 C J
91	88 + 91	C88 J	C88 J	C88 J	C88 J	C88 J	C88 J	C88 J
92		272 J	17600 J	3430 J	669 J	353 J	1040 J	498 J
93	93 + 95 + 98 + 100 + 102	437 C J	47700 C J	6020 C J	939 C J	659 C J	2360 C J	725 C J
94		0.746 UJ	88.1 J	1.27 J	1.14 J	1.48 J	5.9 J	3.56 J
95	93 + 95 + 98 + 100 + 102	C93 J	C93 J	C93 J	C93 J	C93 J	C93 J	C93 J
96		1.41 J	161 J	2.72 J	3.82 J	2.37 J	6.22 J	4.54 J
97	86 + 87 + 97 + 108 + 119 + 125	C86 J	C86 J	C86 J	C86 J	C86 J	C86 J	C86 J
98	93 + 95 + 98 + 100 + 102	C93 J	C93 J	C93 J	C93 J	C93 J	C93 J	C93 J
99	83 + 99	C83 J	C83 J	C83 J	C83 J	C83 J	C83 J	C83 J
100	93 + 95 + 98 + 100 + 102	C93 J	C93 J	C93 J	C93 J	C93 J	C93 J	C93 J
101	90 + 101 + 113	C90 J	C90 J	C90 J	C90 J	C90 J	C90 J	C90 J
102	93 + 95 + 98 + 100 + 102	C93 J	C93 J	C93 J	C93 J	C93 J	C93 J	C93 J
103		5.3 J	306 J	52.3 J	10.9 J	8.31 J	28.5 J	12.8 J
104		0.0667 UJ	0.994 J	0.252 UJ	0.156 J-EMPC	0.112 J-EMPC	0.536 J	0.908 J
105		966 J	50400 J	45500 J	2980 J	1230 J	3540 J	1540 J
106		0.375 UJ	4.07 UJ	3.99 UJ	0.748 UJ	0.433 UJ	0.753 UJ	0.513 UJ
107	107 + 124	64.3 C J	3230 C J	3810 C J	118 C J	60.3 C J	377 C J	78.3 C J
108	86 + 87 + 97 + 108 + 119 + 125	C86 J	C86 J	C86 J	C86 J	C86 J	C86 J	C86 J
109		295 J	8940 J	10600 J	584 J	317 J	954 J	392 J
110	110 + 115	1080 C J	120000 C J	7140 C J	2190 C J	1500 C J	4920 C J	1660 C J
111		2.87 J	4.22 J	5.84 J	6.44 J	3.53 J	5.73 J-EMPC	5.71 J
112		0.479 UJ	1.01 UJ	0.365 UJ	0.231 UJ	0.59 UJ	0.178 UJ	0.199 UJ
113	90 + 101 + 113	C90 J	C90 J	C90 J	C90 J	C90 J	C90 J	C90 J
114		92.6 J	3200 J	4040 J	281 J	106 J	337 J	120 J
115	110 + 115	C110 J	C110 J	C110 J	C110 J	C110 J	C110 J	C110 J

**Table 4a**  
**Fish Tissue PCB Congener Analysis Results**  
**Lab Sample ID's L10448-1 through L10448-7**

Bradford Island - Remedial Investigation  
 Archived Fish from Bonneville Dam Forebay

IUPAC #	COELUTING CONGENERS <sup>1</sup>	060605100SB L10448-1	060605101SB L10448-2	060605200SB L10448-3	060605201SB L10448-4	060605202SB L10448-5	060605203SB L10448-6	060605204SB L10448-7
116	85 + 116 + 117	C85 J	C85 J	C85 J	C85 J	C85 J	C85 J	C85 J
117	85 + 116 + 117	C85 J	C85 J	C85 J	C85 J	C85 J	C85 J	C85 J
118		3310 J	138000 J	132000 J	8310 J	3610 J	10800 J	3750 J
119	86 + 87 + 97 + 108 + 119 + 125	C86 J	C86 J	C86 J	C86 J	C86 J	C86 J	C86 J
120		15 J	51.7 J	35.1 J	28.2 J	17.5 J	28.5 J	28.9 J
121		1.32 J	4.33 J	1.56 J	3.64 J	1.8 J	3.53 J	3.25 J
122		0.413 UJ	474 J	523 J	0.876 UJ	11 J	56.3 J	11.5 J
123		55.7 J	1600 J	2450 J	118 J	63.3 J	217 J	69.5 J
124	107 + 124	C107 J	C107 J	C107 J	C107 J	C107 J	C107 J	C107 J
125	86 + 87 + 97 + 108 + 119 + 125	C86 J	C86 J	C86 J	C86 J	C86 J	C86 J	C86 J
126		5.05 J	55.3 J	75.5 J	9.74 J	8.07 J	15.9 J	11.1 J
127		6.9 J	241 J	265 J	26.8 J	7.03 J	34.4 J	9.34 J
128	128 + 166	603 C J	30800 C J	21000 C J	2300 C J	806 C J	2500 C J	1240 C J
129	129 + 138 + 160 + 163	4320 C J	168000 C J	126000 C J	14000 C J	5220 C J	16200 C J	8070 C J
130		172 J	9060 J	7720 J	302 J	232 J	1060 J	268 J
131		9.5 J	1520 J	395 J	16.5 J	16.9 J	119 J	12.3 J
132		228 J	38700 J	3080 J	421 J	399 J	1910 J	352 J
133		83.5 J	1460 J	1450 J	208 J	96.5 J	281 J	162 J
134	134 + 143	48.6 C J	5130 C J	3170 C J	83.2 C J	75.3 C J	458 C J	76.7 C J
135	135 + 151 + 154	492 C J	19700 C J	4910 C J	1220 C J	703 C J	2380 C J	1170 C J
136		87 J	9020 J	247 J	172 J	118 J	439 J	166 J
137		283 J	11900 J	15300 J	1100 J	317 J	1220 J	344 J
138	129 + 138 + 160 + 163	C129 J	C129 J	C129 J	C129 J	C129 J	C129 J	C129 J
139	139 + 140	68.7 C J	3090 C J	1660 C J	271 C J	81.4 C J	284 C J	130 C J
140	139 + 140	C139 J	C139 J	C139 J	C139 J	C139 J	C139 J	C139 J
141		250 J	18800 J	5770 J	723 J	294 J	1210 J	365 J
142		0.661 UJ	2.91 UJ	2.57 UJ	1.36 UJ	0.699 UJ	0.756 UJ	0.78 UJ
143	134 + 143	C134 J	C134 J	C134 J	C134 J	C134 J	C134 J	C134 J
144		52.3 J	3490 J	1920 J	96.6 J	67.5 J	361 J	77.5 J
145		0.174 J-EMPC	37.9 J	0.585 J	0.481 J	0.322 J	1.27 J	0.371 J
146		883 J	16000 J	19000 J	1720 J	966 J	2950 J	1300 J
147	147 + 149	725 C J	59800 C J	31700 C J	1220 C J	1160 C J	6370 C J	1180 C J
148		3.39 J	61.2 J	8.95 J	8.09 J	5.48 J	17.1 J	9.25 J
149	147 + 149	C147 J	C147 J	C147 J	C147 J	C147 J	C147 J	C147 J
150		1.44 J	72.4 J	13.1 J	2.61 J	2.41 J	11.6 J	3.54 J
151	135 + 151 + 154	C135 J	C135 J	C135 J	C135 J	C135 J	C135 J	C135 J
152		1.04 J	81.4 J	3.55 J	2.9 J	1.28 J	3.86 J	2.82 J
153	153 + 168	4920 C J	111000 C J	117000 C J	16100 C J	5540 C J	16800 C J	8500 C J
154	135 + 151 + 154	C135 J	C135 J	C135 J	C135 J	C135 J	C135 J	C135 J
155		3.5 J	14.4 J	3.36 J	9.17 J	4.27 J	8.39 J	9.28 J
156	156 + 157	654 C J	26600 C J	31400 C J	2220 C J	735 C J	2890 C J	846 C J
157	156 + 157	C156 J	C156 J	C156 J	C156 J	C156 J	C156 J	C156 J
158		304 J	17400 J	12900 J	1400 J	403 J	1520 J	660 J
159		4.52 J	179 J	121 J	8.3 J	8.21 J	41 J	8.36 J
160	129 + 138 + 160 + 163	C129 J	C129 J	C129 J	C129 J	C129 J	C129 J	C129 J
161		0.434 UJ	1.91 UJ	1.69 UJ	0.944 UJ	0.485 UJ	0.525 UJ	0.542 UJ
162		23.2 J	530 J	610 J	63.5 J	27 J	90.1 J	38.3 J
163	129 + 138 + 160 + 163	C129 J	C129 J	C129 J	C129 J	C129 J	C129 J	C129 J
164		97 J	7230 J	6480 J	192 J	131 J	643 J	162 J
165		2.69 J	23.3 J	17.3 J	7.27 J	3.3 J	8.05 J	6.29 J
166	128 + 166	C128 J	C128 J	C128 J	C128 J	C128 J	C128 J	C128 J
167		226 J	6500 J	9650 J	428 J	239 J	961 J	250 J
168	153 + 168	C153 J	C153 J	C153 J	C153 J	C153 J	C153 J	C153 J
169		1.52 UJ	7.28 UJ	4.49 UJ	2.75 UJ	1.29 UJ	5.03 UJ	2.6 UJ
170		457 J	12100 J	9940 J	2280 J	661 J	2100 J	1140 J
171	171 + 173	150 C J	3890 C J	1810 C J	685 C J	233 C J	711 C J	493 C J
172		69.6 J	1560 J	1280 J	299 J	106 J	380 J	171 J
173	171 + 173	C171 J	C171 J	C171 J	C171 J	C171 J	C171 J	C171 J
174		104 J	4840 J	3590 J	209 J	182 J	994 J	190 J
175		18.4 J	314 J	237 J	46.3 J	24.9 J	94.3 J	35.7 J
176		17.2 J	624 J	211 J	29.3 J	29.1 J	191 J	38.8 J
177		251 J	3800 J	3400 J	371 J	344 J	1630 J	429 J
178		171 J	1580 J	1080 J	476 J	236 J	720 J	447 J
179		92.8 J	1840 J	191 J	210 J	159 J	686 J	302 J
180	180 + 193	1460 C J	20600 C J	18800 C J	5930 C J	2020 C J	5400 C J	3040 C J
181		10.8 J	357 J	397 J	42.4 J	13 J	56.9 J	19.3 J
182		3.79 J	81.8 J	34.7 J	16.9 J	7.22 J	16.1 J	10.9 J
183	183 + 185	426 C J	6240 C J	4050 C J	1620 C J	573 C J	1660 C J	1060 C J
184		3.59 J	24.4 J	7.99 J	10.1 J	4.56 J	10.7 J	10.7 J
185	183 + 185	C183 J	C183 J	C183 J	C183 J	C183 J	C183 J	C183 J
186		0.0545 UJ	5.14 J	0.189 UJ	0.107 UJ	0.071 UJ	0.0926 UJ	0.0495 UJ
187		1510 J	8670 J	7970 J	2500 J	1730 J	4520 J	2260 J
188		3.76 J	18.2 J	12.3 J	6.22 J	4.27 J	10.8 J	6.04 J
189		21.6 J	482 J	531 J	75.9 J	25 J	113 J	39 J
190		180 J	2350 J	1570 J	647 J	229 J	624 J	440 J
191		27.5 J	465 J	419 J	117 J	34.8 J	98 J	60 J
192		0.0591 UJ	0.504 UJ	0.205 UJ	0.122 UJ	0.081 UJ	0.106 UJ	0.0519 UJ
193	180 + 193	C180 J	C180 J	C180 J	C180 J	C180 J	C180 J	C180 J
194		170 J	1720 J	1170 J	688 J	215 J	654 J	399 J
195		85.6 J	777 J	433 J	357 J	125 J	330 J	265 J
196		117 J	881 J	597 J	445 J	141 J	349 J	255 J
197	197 + 200	19.2 C J	189 C J	88.1 C J	60.8 C J	26.1 C J	105 C J	49.5 C J
198	198 + 199	243 C J	1610 C J	1150 C J	547 C J	277 C J	896 C J	371 C J
199	198 + 199	C198 J	C198 J	C198 J	C198 J	C198 J	C198 J	C198 J
200	197 + 200	C197 J	C197 J	C197 J	C197 J	C197 J	C197 J	C197 J
201		41 J	226 J	135 J	76.8 J	47 J	159 J	70.5 J
202		104 J	642 J	296 J	284 J	128 J	486 J	267 J
203		241 J	1620 J	702 J	828 J	279 J	804 J	587 J
204		0.401 J	1.71 J	0.991 J	1.09 J	0.527 J	1.17 J	0.903 J
205		11.1 J	97.9 J	42.2 J	39.9 J	14 J	49.8 J	29.1 J
206		93.9 J	749 J	335 J	276 J	103 J	364 J	217 J
207		18.9 J	107 J	60.7 J	50.6 J	21.5 J	56 J	41.6 J
208		30.3 J	163 J	95.8 J	57.8 J	35.3 J	132 J	58 J
209		39.1 J	164 J	83.2 J	74.2 J	43 J	140 J	93.6 J

Total PCBs <sup>2</sup> (pg/g)	33,736 J	1,440,099 J	879,179 J	96,669 J	42,015 J	137,049 J	59,380 J
<b>Total PCBs<sup>2</sup> (ug/kg or ppb)</b>	<b>34 J</b>	<b>1,440 J</b>	<b>879 J</b>	<b>97 J</b>	<b>42 J</b>	<b>137 J</b>	<b>59 J</b>

**Notes:**

All results are in units of pg/g (picograms/gram)

C = concentration represents coeluting congeners

J = The reported value is an estimate.

J-EMPC = The analyte was not positively identified; the associated numerical value is the Estimated Maximum Potential Concentration.

Non-detect values reported at the analytical reporting limit

PCBs = Polychlorinated Biphenyls

RL = method reporting limit

U = The analyte was not detected above the reported sample quantification limit.

ug/kg = micrograms per kilogram

1= When two or more congeners can not be resolved in the chromatogram they are considered to be 'coeluting' and are reported as a single

2=Total PCBs are calculated by summing all 209 congeners, excluding results flagged as U, UJ, or J-EMPC

**Table 4b**  
**Fish Tissue PCB Congener Analysis Results**  
**Lab Sample ID's L10448-8 through L10448-14**

Bradford Island - Remedial Investigation  
 Archived Fish from Bonneville Dam Forebay

IUPAC #	COELUTING CONGENERS <sup>1</sup>	0606052055B L10448-8	0606052075B L10448-9	0606052085B L10448-10	0606052095B L10448-11	0606061025B L10448-12	0606061035B L10448-13	0606061045B L10448-14
1		0.773 J	0.243 UJ	0.293 UJ	1.73 J	0.572 J	0.484 J	0.235 UJ
2		0.561 J	0.37 J	0.519 J	1.46 J	0.686 J	0.548 J	0.237 J
3		0.442 UJ	0.241 UJ	0.253 UJ	1.07 J	0.372 UJ	0.328 UJ	0.0502 UJ
4		3.17 J	3.09 J	2.5 J	8.16 J	2.95 J	3.76 J	2.13 J
5		0.23 J	0.156 J	0.203 UJ	0.784 J	0.353 UJ	0.219 UJ	0.09 J
6		1.61 J	1.77 J	1.45 J	9.01 J	3.84 J	1.98 J	1.43 J
7		0.449 J	0.347 J	0.313 J	3.98 J	0.315 UJ	0.457 J	0.225 J
8		6.68 J	7.6 J	7.19 J	40.1 J	6.89 J	8.63 J	5.25 J
9		0.579 J	0.385 J	0.381 J	5.89 J	0.387 J	0.788 J	0.318 J
10		0.176 J	0.155 J	0.186 UJ	0.422 J	0.323 UJ	0.206 J	0.134 J
11		53 J	57.2 J	95.6 J	136 J	39.3 J	67.5 J	35.4 J
12	12 + 13	1.77 C J	0.122 C UJ	0.178 C UJ	5.72 C J	2.78 C J	1.6 C J	0.831 C J
13	12 + 13	C12 J	C12 J	C12 J	C12 J	C12 J	C12 J	C12 J
14		0.122 J	0.127 J	0.179 UJ	0.264 J	0.321 UJ	0.199 UJ	0.099 J
15		1.95 J	1.85 J	2.53 J	14.1 J	2.1 J	2.18 J	1.83 J
16		9.76 J	10.2 J	10.6 J	39.5 J	7.89 J	12.2 J	6.26 J
17		27.2 J	16.4 J	17.3 J	317 J	13.3 J	53.1 J	8.97 J
18	18 + 30	44 C J	34.1 C J	39.2 C J	825 C J	26.5 C J	69.5 C J	19.8 C J
19		2.79 J	2.77 J	2.87 J	8.54 J	2.73 J	4.5 J	1.89 J
20	20 + 28	414 C J	149 C J	276 C J	5550 C J	124 C J	452 C J	83 C J
21	21 + 33	39 C J	27.6 C J	42.7 C J	606 C J	21.5 C J	49.6 C J	15.3 C J
22		33.8 J	28.6 J	56.3 J	380 J	18.9 J	43.2 J	15.2 J
23		0.351 J	0.135 UJ	0.239 J	1.95 UJ	0.474 UJ	0.348 J	0.095 J
24		0.754 J	0.657 J	0.698 J-EMPC	2.82 J	0.51 J	0.763 J	0.415 J
25		12 J	4.48 J	9.33 J	418 J	4.3 J	11.8 J	2.65 J
26	26 + 29	49.1 C J	15.6 C J	24.9 C J	745 C J	13.9 C J	61.2 C J	8.94 C J
27		4.79 J	2.52 J	3.03 J	46.8 J	2.19 J	12 J	1.32 J
28	20 + 28	C20 J	C20 J	C20 J	C20 J	C20 J	C20 J	C20 J
29	26 + 29	C26 J	C26 J	C26 J	C26 J	C26 J	C26 J	C26 J
30	18 + 30	C18 J	C18 J	C18 J	C18 J	C18 J	C18 J	C18 J
31		117 J	79.5 J	127 J	5070 J	66.7 J	162 J	43.7 J
32		14.3 J	3.98 J	6.27 J	198 J	3.98 J	32.5 J	2.41 J
33	21 + 33	C21 J	C21 J	C21 J	C21 J	C21 J	C21 J	C21 J
34		0.758 J	0.326 J	0.544 J-EMPC	7.4 J	0.464 UJ	1.3 J	0.19 J-EMPC
35		0.111 UJ	0.142 UJ	0.155 UJ	2.13 UJ	0.486 UJ	0.238 UJ	0.0502 UJ
36		0.101 UJ	0.129 UJ	0.141 UJ	1.88 UJ	0.449 UJ	0.22 UJ	0.0502 UJ
37		46.5 J	10.3 J	19.9 J	696 J	15.2 J	41.1 J	6.02 J
38		1.01 J-EMPC	0.186 J	0.406 J-EMPC	12.3 J	0.445 UJ	1.45 J-EMPC	0.083 J-EMPC
39		6.17 J	0.993 J	1.56 J-EMPC	112 J-EMPC	1.51 J	7.99 J	0.495 J
40	40 + 41 + 71	653 C J	51.7 C J	119 C J	14200 C J	95 C J	688 C J	21.2 C J
41	40 + 41 + 71	C40 J	C40 J	C40 J	C40 J	C40 J	C40 J	C40 J
42		541 J	39.6 J	123 J	10100 J	66.8 J	377 J	15.9 J
43		97.3 J	8.42 J	19.8 J	1990 J	23.1 J	108 J	4.52 J
44	44 + 47 + 65	6430 C J	302 C J	850 C J	138000 C J	894 C J	6400 C J	135 C J
45	45 + 51	64.9 C J	11.9 C J	27 C J	1040 C J	14 C J	70.9 C J	7.19 C J
46		8.54 J	2.51 J	4.15 J	96.3 J	2.43 J	7.84 J	1.66 J
47	44 + 47 + 65	C44 J	C44 J	C44 J	C44 J	C44 J	C44 J	C44 J
48		299 J	37 J	77.8 J	4900 J	56.7 J	305 J	18.2 J
49	49 + 69	7290 C J	236 C J	636 C J	123000 C J	886 C J	6590 C J	102 C J
50	50 + 53	132 C J	8.52 C J	27.8 C J	3160 C J	13.7 C J	54.9 C J	5.53 C J
51	45 + 51	C45 J	C45 J	C45 J	C45 J	C45 J	C45 J	C45 J
52		24100 J	585 J	1180 J	351000 J	2990 J	21200 J	256 J
53	50 + 53	C50 J	C50 J	C50 J	C50 J	C50 J	C50 J	C50 J
54		1.45 J	0.266 J	0.677 J	7.71 J	0.573 UJ	2.74 J	0.152 J
55		0.677 UJ	0.36 UJ	0.478 UJ	26.4 UJ	0.304 UJ	0.876 UJ	0.479 UJ
56		357 J	44.9 J	145 J	24900 J	87.5 J	253 J	19.6 J
57		6.38 J	1.83 J	3.28 J	27.6 UJ	1.98 J	0.863 UJ	1.1 J
58		0.667 UJ	1.57 J	0.471 UJ	25.4 UJ	0.297 UJ	0.855 UJ	1.04 J
59	59 + 62 + 75	162 C J	25.3 C J	63.8 C J	2120 C J	33.1 C J	162 C J	12.6 C J
60		2070 J	156 J	484 J	30200 J	315 J	1750 J	68.2 J
61	61 + 70 + 74 + 76	22400 C J	1010 C J	2360 C J	368000 C J	4730 C J	19800 C J	445 C J
62	59 + 62 + 75	C59 J	C59 J	C59 J	C59 J	C59 J	C59 J	C59 J
63		573 J	38.2 J	120 J	9180 J	164 J	571 J	21.2 J
64		2870 J	135 J	415 J	45400 J	397 J	2450 J	65.2 J
65	44 + 47 + 65	C44 J	C44 J	C44 J	C44 J	C44 J	C44 J	C44 J
66		12700 J	735 J	1700 J	143000 J	2690 J	12700 J	335 J
67		20.3 J	5 J	12.9 J	278 J	7.81 J	27.3 J	3.32 J
68		15.8 J	7.94 J	22.6 J	297 J	14.3 J	26.2 J	4.29 J
69	49 + 69	C49 J	C49 J	C49 J	C49 J	C49 J	C49 J	C49 J
70	61 + 70 + 74 + 76	C61 J	C61 J	C61 J	C61 J	C61 J	C61 J	C61 J
71	40 + 41 + 71	C40 J	C40 J	C40 J	C40 J	C40 J	C40 J	C40 J
72		48.9 J	9.54 J	23.4 J	469 J	10.6 J	45.6 J	5.71 J
73		0.0491 UJ	0.132 UJ	0.119 UJ	0.516 UJ	0.519 UJ	0.221 UJ	0.0502 UJ
74	61 + 70 + 74 + 76	C61 J	C61 J	C61 J	C61 J	C61 J	C61 J	C61 J
75	59 + 62 + 75	C59 J	C59 J	C59 J	C59 J	C59 J	C59 J	C59 J
76	61 + 70 + 74 + 76	C61 J	C61 J	C61 J	C61 J	C61 J	C61 J	C61 J
77		214 J	36.7 J	77.2 J	3530 J	102 J	186 J	21.7 J
78		0.679 UJ	1.43 J	0.479 UJ	343 J	0.302 UJ	0.872 UJ	0.609 J
79		558 J	8.22 J	26 J	11000 J	37.9 J	192 J	3.22 J
80		0.607 UJ	0.323 UJ	0.429 UJ	22.6 UJ	0.269 UJ	0.775 UJ	0.622 J
81		19.1 J-EMPC	2.33 J	5.76 J	23.1 UJ	8.07 J	11.7 J	1.21 J
82		5760 J	37.2 J	151 J	125000 J	209 J	1130 J	12.1 J
83	83 + 99	105000 C J	3470 C J	6850 C J	1050000 C J	16400 C J	88200 C J	1250 C J
84		6710 J	72.6 J	306 J	180000 J	340 J	1690 J	33.2 J
85	85 + 116 + 117	30300 C J	985 C J	2030 C J	327000 C J	4910 C J	26600 C J	350 C J
86	86 + 87 + 97 + 108 + 119 + 125	72700 C J	1020 C J	2520 C J	890000 C J	5580 C J	38900 C J	326 C J
87	86 + 87 + 97 + 108 + 119 + 125	C86 J	C86 J	C86 J	C86 J	C86 J	C86 J	C86 J
88	88 + 91	7680 C J	90 C J	433 C J	168000 C J	453 C J	2780 C J	38.5 C J
89		143 J	2.75 J	5.54 J	3000 J	12.4 J	102 J	0.863 J
90	90 + 101 + 113	127000 C J	2350 C J	5740 C J	1400000 C J	10700 C J	74900 C J	880 C J
91	88 + 91	C88 J	C88 J	C88 J	C88 J	C88 J	C88 J	C88 J
92		19500 J	530 J	1280 J	213000 J	2110 J	14400 J	231 J
93	93 + 95 + 98 + 100 + 102	30600 C J	614 C J	1860 C J	573000 C J	3170 C J	20800 C J	282 C J
94		26 J	0.809 J	6.3 J	906 J	3.63 UJ	5.75 J	0.483 J
95	93 + 95 + 98 + 100 + 102	C93 J	C93 J	C93 J	C93 J	C93 J	C93 J	C93 J
96		100 J	2.75 J	5.53 J	1710 J	14.9 J	103 J	1.19 J
97	86 + 87 + 97 + 108 + 119 + 125	C86 J	C86 J	C86 J	C86 J	C86 J	C86 J	C86 J
98	93 + 95 + 98 + 100 + 102	C93 J	C93 J	C93 J	C93 J	C93 J	C93 J	C93 J
99	83 + 99	C83 J	C83 J	C83 J	C83 J	C83 J	C83 J	C83 J
100	93 + 95 + 98 + 100 + 102	C93 J	C93 J	C93 J	C93 J	C93 J	C93 J	C93 J
101	90 + 101 + 113	C90 J	C90 J	C90 J	C90 J	C90 J	C90 J	C90 J
102	93 + 95 + 98 + 100 + 102	C93 J	C93 J	C93 J	C93 J	C93 J	C93 J	C93 J
103		278 J	8.15 J	30.1 J	5180 J	25.7 J	164 J	3.77 J
104		0.778 J	0.221 UJ	0.648 J-EMPC	9.27 J-EMPC	1.06 UJ	0.455 UJ	0.13 J-EMPC
105		66300 J	2090 J	3910 J	766000 J	11200 J	57700 J	717 J
106		4.87 UJ	0.401 UJ	0.998 UJ	65.3 UJ	2.37 UJ	3.93 UJ	3.32 UJ
107	107 + 124	2410 C J	83 C J	136 C J	55600 C J	472 C J	1720 C J	38.7 C J
108	86 + 87 + 97 + 108 + 119 + 125	C86 J	C86 J	C86 J	C86 J	C86 J	C86 J	C86 J
109		13100 J	432 J	922 J	185000 J	3260 J	11200 J	207 J
110	110 + 115	111000 C J	1680 C J	4280 C J	1270000 C J	8470 C J	60600 C J	593 C J
111		5.58 J-EMPC	5.01 J	12.5 J	56 UJ	4.89 J	9.2 J	3.33 J
112		0.631 UJ	0.279 UJ	0.935 UJ	56.1 UJ	2.37 UJ	1.82 UJ	0.0698 UJ
113	90 + 101 + 113	C90 J	C90 J	C90 J	C90 J	C90 J	C90 J	C90 J
114		4870 J	173 J	332 J	65700 J	1680 J	4470 J	59.4 J
115	110 + 115	C110 J	C110 J	C110 J	C110 J	C110 J	C110 J	C110 J

**Table 4b  
Fish Tissue PCB Congener Analysis Results  
Lab Sample ID's L10448-8 through L10448-14**

Bradford Island - Remedial Investigation  
Archived Fish from Bonneville Dam Forebay

IUPAC #	COELUTING CONGENERS <sup>1</sup>	060605205SB L10448-8	060605207SB L10448-9	060605208SB L10448-10	060605209SB L10448-11	060606102SB L10448-12	060606103SB L10448-13	060606104SB L10448-14
116	85 + 116 + 117	C85 J	C85 J	C85 J	C85 J	C85 J	C85 J	C85 J
117	85 + 116 + 117	C85 J	C85 J	C85 J	C85 J	C85 J	C85 J	C85 J
118		199000 J	6430 J	10300 J	2180000 J	52400 J	164000 J	2420 J
119	86 + 87 + 97 + 108 + 119 + 125	C86 J	C86 J	C86 J	C86 J	C86 J	C86 J	C86 J
120		59.6 J-EMPC	25.9 J	51.2 J	344 J	29.5 J	77.6 J	16.3 J
121		4.69 J	2.74 J	6.89 J	58 UJ	2.53 UJ	6.64 J	1.59 J
122		207 J	5.96 J	22.6 J	9000 J	2.75 UJ	4.56 UJ	3.52 UJ
123		1940 J	81 J	136 J	35600 J	948 J	2070 J	32.3 J
124	107 + 124	C107 J	C107 J	C107 J	C107 J	C107 J	C107 J	C107 J
125	86 + 87 + 97 + 108 + 119 + 125	C86 J	C86 J	C86 J	C86 J	C86 J	C86 J	C86 J
126		85.7 J	8.9 J	14.3 J	1260 J	26.2 J	45.3 J	6.42 J
127		341 J	16.1 J	26.6 J	3700 J	142 J	416 J	5.94 J
128	128 + 166	42000 C J	1590 C J	2740 C J	336000 C J	6640 C J	33300 C J	652 C J
129	129 + 138 + 160 + 163	239000 C J	10400 C J	20400 C J	1940000 C J	42300 C J	197000 C J	4410 C J
130		11200 J	271 J	707 J	126000 J	1190 J	5270 J	121 J
131		992 J	9.83 J	43.3 J	18200 J	50.5 J	285 J	3.19 J
132		23200 J	240 J	1180 J	394000 J	777 J	3870 J	100 J
133		2110 J	175 J	353 J	22300 J	519 J	1760 J	92 J
134	134 + 143	3770 C J	58.6 C J	198 C J	63500 C J	235 C J	1120 C J	26.2 C J
135	135 + 151 + 154	19900 C J	1090 C J	2680 C J	266000 C J	2070 C J	13300 C J	539 C J
136		5920 J	138 J	364 J	89500 J	484 J	2960 J	60.1 J
137		20000 J	606 J	997 J	220000 J	5410 J	19600 J	199 J
138	129 + 138 + 160 + 163	C129 J	C129 J	C129 J	C129 J	C129 J	C129 J	C129 J
139	139 + 140	4370 C J	185 C J	330 C J	41300 C J	695 C J	3450 C J	74.7 C J
140	139 + 140	C139 J	C139 J	C139 J	C139 J	C139 J	C139 J	C139 J
141		24000 J	462 J	1330 J	250000 J	2050 J	16700 J	188 J
142		3.11 UJ	0.923 UJ	1.47 UJ	207 J	1.34 UJ	2.66 UJ	0.71 UJ
143	134 + 143	C134 J	C134 J	C134 J	C134 J	C134 J	C134 J	C134 J
144		3460 J	75.2 J	244 J	53200 J	251 J	1410 J	30.9 J
145		19 J	0.263 J-EMPC	0.756 J	356 J	0.947 UJ	8.05 J	0.076 J-EMPC
146		25100 J	1440 J	3290 J	291000 J	7220 J	21800 J	725 J
147	147 + 149	37500 C J	738 C J	4390 C J	598000 C J	2150 C J	11400 C J	358 C J
148		60 J	7.44 J	21.6 J	667 J	9.36 J	44.1 J	3.98 J
149	147 + 149	C147 J	C147 J	C147 J	C147 J	C147 J	C147 J	C147 J
150		37.2 J	1.41 J	8.48 J	863 J	2.73 J	9.25 J	0.865 J
151	135 + 151 + 154	C135 J	C135 J	C135 J	C135 J	C135 J	C135 J	C135 J
152		76.3 J	2.39 J	5.33 J	891 J	9.98 J	61.5 J	1.09 J
153	153 + 168	179000 C J	11200 C J	23100 C J	1440000 C J	48200 C J	169000 C J	5570 C J
154	135 + 151 + 154	C135 J	C135 J	C135 J	C135 J	C135 J	C135 J	C135 J
155		12.9 J	8.48 J	14.6 J	1.01 UJ	5.88 J	17.4 J	5.76 J
156	156 + 157	44600 C J	1360 C J	2390 C J	403000 C J	12800 C J	38600 C J	541 C J
157	156 + 157	C156 J	C156 J	C156 J	C156 J	C156 J	C156 J	C156 J
158		24500 J	914 J	1730 J	237000 J	3500 J	19700 J	366 J
159		129 J	5.18 J	26.1 J	3140 J	12.1 J	56.4 J	3.82 J
160	129 + 138 + 160 + 163	C129 J	C129 J	C129 J	C129 J	C129 J	C129 J	C129 J
161		2.16 UJ	0.641 UJ	1.02 UJ	79.8 UJ	0.955 UJ	1.89 UJ	0.466 UJ
162		846 J	47.4 J	83.7 J	9120 J	245 J	814 J	25.4 J
163	129 + 138 + 160 + 163	C129 J	C129 J	C129 J	C129 J	C129 J	C129 J	C129 J
164		8820 J	154 J	478 J	91900 J	601 J	3780 J	71.2 J
165		26 J	5.87 J	11.5 J	88 UJ	8.76 J	27.6 J	3.71 J
166	128 + 166	C128 J	C128 J	C128 J	C128 J	C128 J	C128 J	C128 J
167		9350 J	311 J	574 J	116000 J	3650 J	7990 J	161 J
168	153 + 168	C153 J	C153 J	C153 J	C153 J	C153 J	C153 J	C153 J
169		11.2 UJ	3.27 UJ	5.08 UJ	127 UJ	8.24 UJ	14.5 UJ	3.47 UJ
170		18900 J	1310 J	2570 J	198000 J	4720 J	13700 J	727 J
171	171 + 173	5310 C J	520 C J	1050 C J	60300 C J	890 C J	3840 C J	301 C J
172		2540 J	191 J	441 J	31600 J	652 J	1760 J	106 J
173	171 + 173	C171 J	C171 J	C171 J	C171 J	C171 J	C171 J	C171 J
174		4060 J	134 J	755 J	117000 J	303 J	1320 J	75.5 J
175		424 J	38 J	103 J	6570 J	104 J	282 J	20.8 J
176		362 J	22.3 J	124 J	11700 J	31.7 J	168 J	12.2 J
177		4150 J	408 J	1210 J	87300 J	1240 J	1960 J	205 J
178		2160 J	481 J	970 J	27700 J	627 J	1780 J	280 J
179		1680 J	244 J	632 J	26800 J	221 J	1090 J	136 J
180	180 + 193	33300 C J	3570 C J	7510 C J	348000 C J	18200 C J	26800 C J	2150 C J
181		639 J	28.7 J	49.6 J	6320 J	172 J	496 J	13.8 J
182		122 J	11.7 J	28.2 J	1130 J	27 J	101 J	7.71 J
183	183 + 185	9230 C J	1180 C J	2510 C J	120000 C J	2000 C J	6770 C J	667 C J
184		28.5 J	10.6 J	18.2 J	122 J	7.27 J	29.3 J	7.56 J
185	183 + 185	C183 J	C183 J	C183 J	C183 J	C183 J	C183 J	C183 J
186		0.441 UJ	0.0658 UJ	0.148 UJ	42.4 J	0.396 UJ	0.34 UJ	0.0502 UJ
187		12300 J	2470 J	5940 J	159000 J	9320 J	9470 J	1350 J
188		19.7 J	5.77 J	13 J	139 J	7.69 J	17.6 J	3.66 J
189		841 J	49.1 J	91 J	9300 J	324 J	661 J	31.1 J
190		3580 J	487 J	870 J	36500 J	1210 J	2670 J	301 J
191		756 J	70.6 J	138 J	9430 J	300 J	616 J	40.9 J
192		0.503 UJ	0.075 UJ	0.168 UJ	11.4 UJ	0.45 UJ	0.387 UJ	0.0502 UJ
193	180 + 193	C180 J	C180 J	C180 J	C180 J	C180 J	C180 J	C180 J
194		3090 J	421 J	783 J	52500 J	1790 J	2410 J	310 J
195		1220 J	242 J	467 J	18800 J	568 J	1050 J	187 J
196		1600 J	260 J	535 J	31000 J	991 J	1210 J	176 J
197	197 + 200	227 C J	45.5 C J	112 C J	6130 C J	55.2 C J	165 C J	32.7 C J
198	198 + 199	3050 C J	401 C J	986 C J	59600 C J	2060 C J	1840 C J	240 C J
199	198 + 199	C198 J	C198 J	C198 J	C198 J	C198 J	C198 J	C198 J
200	197 + 200	C197 J	C197 J	C197 J	C197 J	C197 J	C197 J	C197 J
201		370 J	73 J	180 J	6980 J	211 J	260 J	47.3 J
202		988 J	294 J	540 J	11000 J	288 J	860 J	214 J
203		2760 J	618 J	1130 J	21900 J	654 J	2060 J	438 J
204		1.96 J	0.933 J	1.63 J	2.98 UJ	0.724 J	2.47 J	0.682 J
205		155 J	32.2 J	56.4 J	1520 J	42.9 J	123 J	24.8 J
206		1440 J	233 J	364 J	13600 J	271 J	928 J	199 J
207		191 J	41.9 J	71.9 J	2550 J	71.5 J	134 J	36.5 J
208		304 J	57.1 J	110 J	3140 J	91.8 J	182 J	44.9 J
209		221 J	82.5 J	127 J	1080 J	65.4 J	214 J	85.3 J
	Total PCBs <sup>2</sup> (pg/g)	1,733,581 J	69,709 J	148,815 J	19,309,259 J	325,185 J	1,305,475 J	32,157 J
	Total PCBs <sup>2</sup> (ug/kg or ppb)	1,734 J	70 J	149 J	19,309 J	325 J	1,305 J	32 J

**Notes:**

All results are in units of pg/g (picograms/gram)

C = concentration represents coeluting congeners

J = The reported value is an estimate.

J-EMPC = The analyte was not positively identified; the associated numerical value is the Estimated Maximum Potential Concentration.

Non-detect values reported at the RL

PCBs = Polychlorinated Biphenyls

RL = method reporting limit

U = The analyte was not detected above the reported sample quantification limit.

ug/kg = micrograms per kilogram

1= When two or more congeners can not be resolved in the chromatogram they are considered to be 'coeluting' and are reported as a single

2=Total PCBs are calculated by summing all 209 congeners, excluding results flagged as U, UJ, or J-EMPC



**Table 4c**  
**Fish Tissue PCB Congener Analysis Results**  
**Lab Sample ID's L10448-15 through L10448-20**

Bradford Island - Remedial Investigation  
 Archived Fish from Bonneville Dam Forebay

IUPAC #	COELUTING CONGENERS <sup>1</sup>	060606210SB L10448-15	060815402SB L10448-16	060815403SB L10448-17	060815405SB L10448-18	060815406SB L10448-19	0705051S L10448-20
1		0.194 UJ	7.14 J	1.31 J	0.428 J	0.226 UJ	0.861
2		0.262 J	2.84 J	1.44 J	1.01 J	0.829 J	1.21
3		0.263 UJ	8.28 J	1.09 J	0.535 UJ	0.279 UJ	0.482 UJ
4		1.79 J	909 J	11.5 J	2.21 J	1.77 J	13.2
5		0.12 J	138 J	0.424 J	0.293 UJ	0.153 J	0.781
6		1.01 J	1620 J	13.7 J	1.66 J	0.912 J	6.8
7		0.282 J	396 J	5.86 J	0.504 J	0.276 J	0.791
8		4.62 J	7240 J	50.4 J	6.14 J	4.78 J	27.4
9		0.266 J	643 J	16.4 J	4.94 J	0.284 J	1.18
10		0.131 J-EMPC	54.3 J	0.934 J	0.343 J	0.178 J	0.563
11		28.4 J	230 J	404 J	495 J	562 J	456
12	12 + 13	0.622 C J	72.2 C J	11.4 C J	9.28 C J	0.126 C UJ	0.12 C U
13	12 + 13	C12 J	C12 J	C12 J	C12 J	C12 J	C12
14		0.089 J-EMPC	0.557 J	0.176 J	0.269 UJ	0.13 J	0.199
15		1.3 J	1570 J	282 J	112 J	9.51 J	7.07
16		5.82 J	7050 J	117 UJ	10.1 J	5.61 J	68.5
17		9.45 J	14300 J	1360 J	37.9 J	7.65 J	97.3
18	18 + 30	20 C J	23000 C J	3090 C J	130 C J	19.1 C J	164 C
19		1.71 J	1290 J	23 J	2.66 J	1.65 J	12.1
20	20 + 28	90.8 C J	76900 C J	16100 C J	1210 C J	112 C J	514 C
21	21 + 33	15.8 C J	19100 C J	2280 C J	45.4 C J	14.8 C J	112 C
22		16.8 J	23500 J	856 J	45.5 J	15.2 J	164
23		0.102 J	86.4 J	79.3 UJ	0.486 J-EMPC	0.197 UJ	0.443
24		0.371 J	438 J	72.8 UJ	0.79 J	0.323 J	2.31
25		3.11 J	4840 J	1140 J	125 J	3.31 J	16.3
26	26 + 29	9.6 C J	11100 C J	2340 C J	279 C J	10.6 C J	43.9 C
27		1.3 J	1050 J	224 J-EMPC	12.7 J	1.25 J	18.8
28	20 + 28	C20 J	C20 J	C20 J	C20 J	C20 J	C20
29	26 + 29	C26 J	C26 J	C26 J	C26 J	C26 J	C26
30	18 + 30	C18 J	C18 J	C18 J	C18 J	C18 J	C18
31		47.8 J	59700 J	12200 J	837 J	47.1 J	248
32		2.53 J	7510 J	647 J	12.6 J	2.07 J	16.3
33	21 + 33	C21 J	C21 J	C21 J	C21 J	C21 J	C21
34		0.195 J-EMPC	192 J	103 J	4.1 J	0.274 J	1.61
35		0.05 UJ	2.4 UJ	87.5 UJ	0.31 UJ	0.29 J-EMPC	0.194 U
36		0.05 UJ	2.24 UJ	79.2 UJ	0.29 UJ	0.298 J-EMPC	0.181 U
37		5.12 J	5850 J	2950 J	189 J	28 J	32.8
38		0.093 J	30.3 J	78.2 UJ	1.93 J	0.192 UJ	0.696 J-EMPC
39		0.556 J	264 J	349 J	9.61 J	0.8 J	4.52
40	40 + 41 + 71	29.2 C J	13600 C J	22900 C J	799 C J	21.2 C J	262 C
41	40 + 41 + 71	C40 J	C40 J	C40 J	C40 J	C40 J	C40
42		27.3 J	11400 J	19000 J	879 J	15.1 J	327
43		5.91 J	2280 J	15800 J	104 J	4.05 J	25.2
44	44 + 47 + 65	281 C J	47500 C J	200000 C J	10100 C J	115 C J	1690 C
45	45 + 51	20.5 C J	7400 C J	1720 C J	63.2 C J	8.63 C J	65.1 C
46		1.63 J	1490 J	307 J	7.73 J	2.01 J	12.7
47	44 + 47 + 65	C44 J	C44 J	C44 J	C44 J	C44 J	C44
48		23.4 J	11000 J	13900 J	339 J	13.3 J	202
49	49 + 69	173 C J	34200 C J	194000 C J	15100 C J	82 C J	1010 C
50	50 + 53	7.57 C J	2630 C J	6170 C J	124 C J	6.83 C J	90.9 C
51	45 + 51	C45 J	C45 J	C45 J	C45 J	C45 J	C45
52		424 J	54300 J	733000 J	43900 J	225 J	1950
53	50 + 53	C50 J	C50 J	C50 J	C50 J	C50 J	C50
54		0.135 J	56.1 J	90.2 J	1.02 J	0.35 UJ	0.901
55		0.476 UJ	185 J	28800 J	7.12 UJ	0.596 UJ	1.51 UJ
56		26.2 J	2560 J	52400 J	3280 J	20 J	292
57		1.39 J	231 J	631 UJ	19.2 J	1.66 J	5.69
58		1.38 J	46.8 J	654 UJ	7.05 UJ	1.03 J	8.25
59	59 + 62 + 75	18.4 C J	4870 C J	6050 C J	250 C J	9.05 C J	124 C
60		100 J	2600 J	52200 J	5430 J	60.3 J	623
61	61 + 70 + 74 + 76	719 C J	39800 C J	1000000 C J	87000 C J	566 C J	3710 C
62	59 + 62 + 75	C59 J	C59 J	C59 J	C59 J	C59 J	C59
63		30.6 J	1470 J	15400 J	1520 J	45.9 J	167
64		96.7 J	20400 J	56100 J	2800 J	47.9 J	702
65	44 + 47 + 65	C44 J	C44 J	C44 J	C44 J	C44 J	C44
66		510 J	18500 J	371000 J	39600 J	505 J	2530
67		5.02 J	988 J	985 J	81.3 J	4.14 J	22.8
68		20.8 J	101 J	611 UJ	76.8 J	15.8 J	40.1
69	49 + 69	C49 J	C49 J	C49 J	C49 J	C49 J	C49
70	61 + 70 + 74 + 76	C61 J	C61 J	C61 J	C61 J	C61 J	C61
71	40 + 41 + 71	C40 J	C40 J	C40 J	C40 J	C40 J	C40
72		7.99 J	219 J	826 J	87.6 J	6.85 J	35.1
73		0.05 UJ	0.0491 UJ	20600 J	0.494 UJ	0.361 UJ	0.24 U
74	61 + 70 + 74 + 76	C61 J	C61 J	C61 J	C61 J	C61 J	C61
75	59 + 62 + 75	C59 J	C59 J	C59 J	C59 J	C59 J	C59
76	61 + 70 + 74 + 76	C61 J	C61 J	C61 J	C61 J	C61 J	C61
77		23.6 J	334 J	8950 J	577 J	56.8 J	110
78		0.447 UJ	15.1 J	1340 J	6.7 UJ	1.32 J	1.42 U
79		6.88 J	300 J	21400 J	1850 J	6.37 J	53.2
80		0.819 J	6.53 UJ	552 UJ	6.16 UJ	1.15 J	2.37 J-EMPC
81		1.3 J	19.8 J	1190 J	6.15 UJ	3.58 J	9.02
82		33.4 J	2130 J	175000 J	10300 J	21.9 J	197
83	83 + 99	2570 C J	41700 C J	1680000 C J	117000 C J	1110 C J	8420 C
84		62.8 J	3630 J	201000 J	7280 J	42.5 J	562
85	85 + 116 + 117	723 C J	11800 C J	483000 C J	52200 C J	252 C J	2170 C
86	86 + 87 + 97 + 108 + 119 + 125	843 C J	25200 C J	1350000 C J	81900 C J	345 C J	4710 C
87	86 + 87 + 97 + 108 + 119 + 125	C86 J	C86 J	C86 J	C86 J	C86 J	C86
88	88 + 91	89.8 C J	4040 C J	170000 C J	10600 C J	44.4 C J	862 C
89		1.56 J	123 J	3620 J	231 J	1.28 UJ	13.4
90	90 + 101 + 113	2150 C J	41600 C J	1920000 C J	125000 C J	816 C J	10600 C
91	88 + 91	C88 J	C88 J	C88 J	C88 J	C88 J	C88
92		476 J	7390 J	297000 J	25600 J	154 J	1900
93	93 + 95 + 98 + 100 + 102	570 C J	21500 C J	932000 C J	54500 C J	266 C J	4180 C J
94		0.748 J	109 J	1290 J	40.2 J	1.34 UJ	13.9
95	93 + 95 + 98 + 100 + 102	C93 J	C93 J	C93 J	C93 J	C93 J	C93
96		1.79 J	230 J	1500 J	135 J	0.877 J	8.8
97	86 + 87 + 97 + 108 + 119 + 125	C86 J	C86 J	C86 J	C86 J	C86 J	C86
98	93 + 95 + 98 + 100 + 102	C93 J	C93 J	C93 J	C93 J	C93 J	C93
99	83 + 99	C83 J	C83 J	C83 J	C83 J	C83 J	C83
100	93 + 95 + 98 + 100 + 102	C93 J	C93 J	C93 J	C93 J	C93 J	C93
101	90 + 101 + 113	C90 J	C90 J	C90 J	C90 J	C90 J	C90
102	93 + 95 + 98 + 100 + 102	C93 J	C93 J	C93 J	C93 J	C93 J	C93
103		8.42 J	217 J	6620 J	576 J	4.31 J	49.7
104		0.094 J-EMPC	4.03 J	68.6 J	1.06 J-EMPC	0.781 UJ	1.08
105		1600 J	30100 J	1300000 J	109000 J	738 J	4350
106		5.73 UJ	44.7 UJ	1610 J	29.5 UJ	3.7 UJ	11.2 U
107	107 + 124	62.9 C J	1330 C J	88700 C J	6320 C J	45.2 C J	241 C
108	86 + 87 + 97 + 108 + 119 + 125	C86 J	C86 J	C86 J	C86 J	C86 J	C86
109		366 J	4970 J	208000 J	23200 J	389 J	1090
110	110 + 115	1370 C J	36300 C J	1530000 C J	91800 C J	498 C J	8230 C
111		4.24 J	7.76 J	482 J	21.7 J	5.71 J	16.3
112		0.0624 UJ	0.729 UJ	300 UJ	4.86 UJ	0.86 UJ	0.47 U
113	90 + 101 + 113	C90 J	C90 J	C90 J	C90 J	C90 J	C90
114		122 J	2330 J	89800 J	11200 J	115 J	289
115	110 + 115	C110 J	C110 J	C110 J	C110 J	C110 J	C110
116	85 + 116 + 117	C85 J	C85 J	C85 J	C85 J	C85 J	C85
117	85 + 116 + 117	C85 J	C85 J	C85 J	C85 J	C85 J	C85
118		4970 J	92100 J	3270000 J	312000 J	3820 J	10300
119	86 + 87 + 97 + 108 + 119 + 125	C86 J	C86 J	C86 J	C86 J	C86 J	C86

**Table 4c**  
**Fish Tissue PCB Congener Analysis Results**  
**Lab Sample ID's L10448-15 through L10448-20**  
 Bradford Island - Remedial Investigation  
 Archived Fish from Bonneville Dam Forebay

IUPAC #	COELUTING CONGENERS <sup>1</sup>	060606210SB L10448-15	060815402SB L10448-16	060815403SB L10448-17	060815405SB L10448-18	060815406SB L10448-19	0705051LS L10448-20
120		20.4 J	35.1 J	621 J	99 J	23.8 J	58.7
121		2.33 J	3.49 J	328 UJ	5.71 J	1.36 J	11.3
122		6.08 UJ	296 J	24400 J	1610 J	5.17 J	39.1
123		57.4 J	1200 J	55300 J	6100 J	75 J	179
124	107 + 124	C107 J	C107 J	C107 J	C107 J	C107 J	C107
125	86 + 87 + 97 + 108 + 119 + 125	C86 J	C86 J	C86 J	C86 J	C86 J	C86
126		7.55 J	48 UJ	3030 J	125 J	12.3 J	19.1
127		12 J	191 J	8100 J	878 J	6.66 J	20.2
128	128 + 166	1300 C J	13100 C J	427000 C J	67600 C J	399 C J	2600 C
129	129 + 138 + 160 + 163	8540 C J	81400 C J	2530000 C J	252000 C J	4700 C J	23400 C
130		237 J	3050 J	175000 J	21000 J	242 J	1260
131		9.41 J	331 J	29100 J	2380 J	7.73 J	90.5
132		216 J	6160 J	425000 J	37400 J	158 J	2720
133		140 J	862 J	27900 J	4180 J	122 J	431
134	134 + 143	56.7 C J	1220 C J	93900 C J	8960 C J	43.6 C J	442 C
135	135 + 151 + 154	910 C J	6210 C J	272000 C J	30200 C J	395 C J	4980 C
136		117 J	1870 J	78000 J	8580 J	50.2 J	739
137		481 J	7880 J	274000 J	39500 J	314 J	730
138	129 + 138 + 160 + 163	C129 J	C129 J	C129 J	C129 J	C129 J	C129
139	139 + 140	158 C J	1480 C J	49200 C J	7460 C J	36.7 C J	324 C
140	139 + 140	C139 J	C139 J	C139 J	C139 J	C139 J	C139
141		466 J	7660 J	242000 J	35300 J	137 J	1610
142		1.91 UJ	20.4 UJ	758 UJ	72.1 UJ	0.715 UJ	7.91 U
143	134 + 143	C134 J	C134 J	C134 J	C134 J	C134 J	C134
144		71.6 J	997 J	61000 J	6970 J	41.5 J	530
145		0.137 J-EMPC	6.49 J	469 J	34.9 J	0.414 UJ	2.83
146		1180 J	10300 J	313000 J	48400 J	1430 J	4360
147	147 + 149	756 C J	12800 C J	948000 C J	86000 C J	709 C J	13000 C
148		6.79 J	24.1 J	776 J	99.2 J	3.73 J	41.2
149	147 + 149	C147 J	C147 J	C147 J	C147 J	C147 J	C147
150		1.86 J	19.7 J	1250 J	92.7 J	1.56 J	23.1
151	135 + 151 + 154	C135 J	C135 J	C135 J	C135 J	C135 J	C135
152		1.87 J	26.9 J	522 J	92.1 J	0.483 J	7.13
153	153 + 168	8780 C J	73000 C J	1890000 C J	202000 C J	7180 C J	26400 C
154	135 + 151 + 154	C135 J	C135 J	C135 J	C135 J	C135 J	C135
155		6.54 J	6.74 J	60.2 J	13.7 J	4.01 J	16.9
156	156 + 157	1200 C J	16900 C J	486000 C J	83000 C J	791 C J	1770 C
157	156 + 157	C156 J	C156 J	C156 J	C156 J	C156 J	C156
158		737 J	7890 J	254000 J	39300 J	190 J	1760
159		5.12 J	56 J	3990 J	336 J	8.56 J	74.2
160	129 + 138 + 160 + 163	C129 J	C129 J	C129 J	C129 J	C129 J	C129
161		1.26 UJ	13.4 UJ	504 UJ	47.3 UJ	0.469 UJ	5.19 U
162		39.1 J	355 J	11100 J	1900 J	33.3 J	72.6
163	129 + 138 + 160 + 163	C129 J	C129 J	C129 J	C129 J	C129 J	C129
164		145 J	2380 J	112000 J	14600 J	82.4 J	781
165		4.81 J	15.5 UJ	596 UJ	54.8 J	5.19 J	17
166	128 + 166	C128 J	C128 J	C128 J	C128 J	C128 J	C128
167		270 J	4710 J	140000 J	21000 J	356 J	565
168	153 + 168	C153 J	C153 J	C153 J	C153 J	C153 J	C153
169		3.18 UJ	15.1 UJ	607 UJ	28 UJ	4.39 UJ	11.1
170		994 J	7860 J	177000 J	36200 J	632 J	2190
171	171 + 173	380 C J	1690 C J	42900 C J	8260 C J	122 C J	1120 C
172		134 J	1000 J	22100 J	3960 J	119 J	478
173	171 + 173	C171 J	C171 J	C171 J	C171 J	C171 J	C171
174		117 J	1340 J	73500 J	8130 J	157 J	1640
175		29.6 J	154 J	4970 J	715 J	35.7 J	181
176		20.8 J	164 J	8700 J	829 J	22.5 J	417
177		293 J	1690 J	58800 J	8090 J	506 J	2800
178		341 J	1080 J	14900 J	2760 J	255 J	1430
179		180 J	609 J	14400 J	2080 J	86.7 J	1600
180	180 + 193	2430 C J	17300 C J	248000 C J	59100 C J	3450 C J	7180 C
181		23.3 J	228 J	6480 J	1070 J	14.6 J	33.8
182		10.7 J	47.5 J	1120 J	194 J	7.49 J	31.6
183	183 + 185	822 C J	3710 C J	72000 C J	15100 C J	598 C J	3140 C
184		8.12 J	12.1 J	139 J-EMPC	36.6 J	3.23 J	20.7
185	183 + 185	C183 J	C183 J	C183 J	C183 J	C183 J	C183
186		0.077 J-EMPC	0.946 J	46.6 J	5.53 J	0.158 UJ	0.459 J-EMPC
187		1760 J	8810 J	100000 J	20900 J	3590 J	8530
188		4.84 J	10.7 J	213 J	32.2 J	6.34 J	20.8
189		40.7 J	402 J	10100 J	1880 J	41.9 J	78
190		347 J	1390 J	29200 J	6200 J	252 J	732
191		50.5 J	299 J	7110 J	1240 J	45.4 J	120
192		0.053 UJ	0.342 UJ	48.5 UJ	1.28 UJ	0.169 UJ	0.202 U
193	180 + 193	C180 J	C180 J	C180 J	C180 J	C180 J	C180
194		295 J	1860 J	17900 J	5150 J	341 J	695
195		175 J	648 J	6840 J	1800 J	157 J	422
196		173 J	812 J	8560 J	2070 J	197 J	450
197	197 + 200	32.1 C J	104 C J	2030 C J	315 C J	26.5 C J	168 C
198	198 + 199	288 C J	1980 C J	17500 C J	4200 C J	443 C J	1100 C
199	198 + 199	C198 J	C198 J	C198 J	C198 J	C198 J	C198
200	197 + 200	C197 J	C197 J	C197 J	C197 J	C197 J	C197
201		55.5 J	183 J	2050 J-EMPC	448 J	70.1 J	274
202		233 J	582 J	3110 J	1290 J	134 J	830
203		415 J	997 J	10300 J	3080 J	273 J	1040
204		0.668 J	1.21 J	55.9 J	3.13 J	0.449 J	1.68
205		23.5 J	64.5 J	923 J	237 J	16.9 J	58.7
206		179 J	546 J	5570 J	2020 J	111 J	368
207		31.6 J	88.1 J	702 J	247 J	27 J	62.4
208		45.3 J	168 J	1370 J	404 J	53 J	165
209		69.8 J	132 J	841 J	342 J	51.7 J	144
Total PCBs <sup>2</sup> (pg/g)		54,799 J	1,192,782 J	26,502,017 J	2,482,139 J	40,777 J	200,913
<b>Total PCBs<sup>2</sup> (ug/kg or ppb)</b>		<b>55 J</b>	<b>1,193 J</b>	<b>26,502 J</b>	<b>2,482 J</b>	<b>41 J</b>	<b>201</b>

**Notes:**

All results are in units of pg/g (picograms/gram)

C = concentration represents coeluting congeners

J = The reported value is an estimate.

J-EMPC = The analyte was not positively identified; the associated numerical value is the Estimated Maximum Potential Concentration.

Non-detect values reported at the RL

PCBs = Polychlorinated Biphenyls

RL = method reporting limit

U = The analyte was not detected above the reported sample quantification limit.

ug/kg = micrograms per kilogram

1= When two or more congeners can not be resolved in the chromatogram they are considered to be 'coeluting' and are reported as a single concentration.

2=Total PCBs are calculated by summing all 209 congeners, excluding results flagged as U, UJ, or J-EMPC



BONNEVILLE DAM FOREBAY FISH COLLECTIONS 2006/2007					
All Fish Homogenized as Whole Body					
MAP NUMBER	URS Sample ID	Collection Date	SIZE (MM)	WEIGHT (g)	Total PCBs (all 209 congeners) µg/kg (ppb)
Smallmouth Bass analyzed Individually					
1	060605100SB	6/5/06	270	255	34
2	060605101SB	6/5/06	330	730	1,440
3	060605200SB	6/5/06	270	226	879
4	060605201SB	6/5/06	299	397	97
5	060605202SB	6/5/06	300	539	42
6	060605203SB	6/5/06	476	1502	137
7	060605204SB	6/5/06	343	652	59
8	060605205SB	6/5/06	394	850	1,734
9	060605207SB	6/5/06	330	369	70
10	060605208SB	6/5/06	419	1191	149
11	060605209SB	6/5/06	381	680	19,309
12	060606102SB	6/6/06	265	387	325
13	060606103SB	6/6/06	411	1074	1,305
14	060606104SB	6/6/06	380	719	32
15	060606210SB	6/6/06	298	284	55
16	060815402SB	8/15/06	406	1063	1,193
17	060815403SB	8/15/06	273	284	26,502
18	060815405SB	8/15/06	406	964	2,482
19	060816406SB	8/16/06	314	369	41
Large Scale Sucker homogenized into single sample					
20	070505LS	5/5/07	478	1400	201
		6/8/07	480	1686	
		6/23/07	546.1	1666	

<b>Explanation</b>	JOB No. 25695254.00009	DESIGNED: CW	PROJ. ENGINEER: -
<b>Fish Sample Locations</b> Smallmouth Bass Large Scale Sucker	Imagery provided by USACE	DRAWN BY: SB	APPROVED BY: JTW
		CHECKED BY: -	DATE: MARCH 2008

 111 S.W. Columbia, Suite 1500 Portland, Oregon 97201 (tel) 503-222-7200 (fax) 503-222-4292	BRADFORD ISLAND
	CASCADE LOCKS, OREGON

FISH SAMPLE LOCATIONS	
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DRAWING NUMBER: FIGURE 1	
GIS FILE NUMBER: Fig 1.mxd	
SHEET:	REV.

O:\25692709 USACE\ES3-F0072173.00 Bradford1\Omaha DT-01\In-water QAPP\Figures-non-pdf\FIG 1 Fish Sample Locations.mxd

## Quality Assurance/Quality Control Review of Laboratory Analytical Data Forebay Fish

URS retrieved twenty-two fish from the USACE storage facility near Bonneville Dam on September 20, 2007. The samples included nineteen smallmouth bass and three large-scale sucker. The three large-scale sucker were composited into one sample. Fish were captured from the Bonneville Dam forebay and vicinity under the supervision of the USACE in 2006 and 2007 and archived frozen by USACE until they were provided to URS for laboratory analysis. Table 1 summarizes the sample IDs, capture date and requested analyses. Whole-body fish samples were homogenized using an industrial blender by Columbia Analytical Services (CAS), located in Kelso Washington. An aliquot of the homogenized tissue was sent to Axys Analytical Services Ltd located in Sidney, British Columbia (Axys) to perform the PCB congener analysis by EPA Method 1668A, *Chlorinated Biphenyl Congeners in Water, Soil, Sediment, and Tissue by High Resolution Gas Chromatography/High Resolution Mass Spectrometry*. The Axys analytical data reports include a listing of Axys Method 1668A modifications.

The following table lists the parameters analyzed on one or more of the samples. Table 1 summarizes the samples by URS and laboratory IDs.

Method	Analytical Parameter
EPA 1668A	Polychlorinated Biphenyls (PCBs) - Congeners
EPA 8082M	Polychlorinated Biphenyls (PCBs) - Aroclors
EPA 8270C SIM	Semi-Volatile Organic Compounds (SVOCs)
6000/7000 Series	Metals
Puget Sound Estuary Program (PSEP 1996)	Percent Lipids
Freeze Dry	Percent Solids

Analyses were performed in general accordance with the referenced methods. The analytical results for all samples were subjected to a quality assurance/quality control (QA/QC) review. This QA/QC review includes evaluation of representativeness (sample collection/handling), accuracy (spike and/or standard recoveries), analytical precision (duplicate relative percent difference), comparability (use of standard methods) and completeness (percent of usable data). Specifically, the following items were reviewed when appropriate: compliance with the QAPP, chain of custody (COC), laboratory case narrative, proper sample preservation and handling procedures, holding times, initial and continuing calibrations, quantitation limits, field/method/trip blank analyses, matrix/matrix spike duplicate recoveries, laboratory duplicate results, field duplicate results, blank spike recoveries (laboratory control samples), data completeness and format, data qualifiers assigned by the laboratory, and analyte identification. The following items were reviewed on 10% of the data: primary and secondary column verification, instrument calibration and a verification of the reported electronic data with the hard copy deliverable. The data review process for this investigation followed the Bradford Island Bonneville Lock and Dam Project, River Operable Unit Remedial Investigation Quality Assurance Project Plan (QAPP) (USACE 2007). Additionally, because the QAPP-referenced *Department of Defense Quality Systems Manual* does not discuss PCB congeners, the data

## Quality Assurance/Quality Control Review of Laboratory Analytical Data Forebay Fish

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review process utilized guidance from EPA's *Contract Laboratory Program National Functional Guidelines (NFGs) for Organic Data Review (USEPA 1999)*, and *EPA Region 10 Standard Operating Procedure (SOP) for the Validation of Method 1668 Toxic, Dioxin-like, PCB data (USEPA 1995)* as appropriate for the methods performed. The non-congener data results were reviewed in accordance with the criteria contained in the DoD QSM (DoD QSM, 2006) and the above listed methods and the following EPA guidance documents in that order; EPA's *Contract Laboratory Program National Functional Guidelines (EPA NFGs) for Organic Data Review (USEPA, October 1999)*, EPA's *NFGs for Inorganic Data Review (USEPA, October 2004)* and *EPA Region 10 SOP for the Validation of Method 1668 Toxic, Dioxin-like, PCB data (USEPA 1995)*. Project-specific QC criteria are listed in the above mentioned QAPP. A summary of qualifiers assigned to results in this investigation as part of this review is included in Table 2. Samples are referenced by both by their URS sample identification assigned in the field as well as the laboratory identification. Qualifiers that may be assigned to the results of this investigation include the following:

- 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.
- J-EMPC – The analyte was not positively identified; the associated numerical value is the **Estimated Maximum Potential Concentration** of the analyte in the sample used only for PCB congener results.
- 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.
- DNR - Do Not Report

Final sample results and qualifiers are presented in the analytical tables provided in the sampling report.

Multiple dilutions were required by Axys for most tissue samples and various extraction sample sizes were necessary for some tissue samples in order to reach appropriate concentration levels for analysis by Method 1668A. Axys indicated which congeners exceeded instrument calibration range in undiluted or less diluted samples in the analytical report. Only congeners exceeding instrument calibration range were reported from the more diluted analyses.

Additionally, as part of the electronic data deliverable, Axys only reported one result per congener per sample, selecting results from more diluted analyses to replace results exceeding calibration range in the less diluted analyses.

## **REPRESENTATIVENESS**

### **Chain-of-Custody and Holding Times**

The chain-of-custody (COC) forms from URS to CAS indicate that samples were maintained under chain of custody and forms were signed upon release and receipt. All coolers were submitted at temperatures within the EPA-recommended range of  $4^{\circ}\text{C} \pm 2^{\circ}\text{C}$ . Data were not qualified based on cooler temperatures. USACE provided temperature logger data showing samples were maintained frozen between sample collection and URS receipt. USACE was made aware of the hold time exceedances detailed below and advised URS to proceed with the sample analysis despite these issues.

The chain-of-custody (COC) forms from CAS to Axys indicate that samples were maintained under COC and forms were signed upon release and receipt. The condition of samples upon receipt by Axys was appropriate and all samples listed on COC were present and analyzed with one exception. For samples reported in data package DPWG24485, two sample jars were labeled with the same client ID of 060815402SB and a jar listed as 0608403SB on the COC was missing. Axys contacted URS, and URS was able to identify which jar was sample ID 060815403SB using other identification labels on the jars. Jar number K0708602-016 was sample ID 060815402SB and logged in as Axys ID L10448-16, and jar number K0708602-017 was sample ID 060815403SB and logged in as Axys ID L10448-17. Because all samples listed on the COC were present and analyzed, data qualification based on sample custody was not considered necessary.

All coolers were received by the Axys laboratory at temperatures within the EPA-recommended range of less than 6 degrees Celsius ( $^{\circ}\text{C}$ ). Samples were kept frozen at  $-20^{\circ}\text{C}$  prior to extraction and analysis.

Samples were analyzed outside of the technical hold time as detailed below:

- PCB (as congeners or Aroclors) hold times are one year from sampling date for fish tissue if frozen. All samples were analyzed outside this hold time with the exception of sample 070505LS. PCB Aroclors were only analyzed for 070505LS, therefore no qualification is necessary. All PCB congener sample results with the exception of 070505LS were qualified as estimated and flagged 'J' due to hold time.
- SVOC hold time is one year from sampling data for tissue if frozen. The hold time was exceeded for all samples except 070505LS by a maximum of five months. All SVOC sample results with the exception of 070505LS were qualified as estimated and flagged 'J/UJ' due to hold time.

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- The hold time for inorganic mercury is 28 days for frozen solid matrixes. All samples were analyzed from six months to 17 months. The mercury data was not rejected based on hold time due to the fact that it is believed that a large percentage of the mercury in these samples is in the form of methyl mercury due to the higher tropic level of the sample. The short hold time for inorganic mercury is due to the loss of analyte from evaporation; however, methyl mercury is more resistant to loss via evaporation. Methyl mercury was not specifically analyzed in these samples nor are there specific hold times for methyl mercury listed in QSM DoD. All mercury results are qualified as estimated and flagged 'J'. The end user should be aware of the potential low bias of the mercury results due to hold time.

### Review of Blanks

Method blanks were used to check for laboratory contamination and instrument bias. The laboratory analyzed at least one method blank for each batch, per QAPP requirements. Qualification of samples due to method or field blank contamination followed guidelines set forth in the EPA NFGs.

#### *Non-congener Results*

For non-congener organic analyses, sample results less than five times (5x) the associated method blank or field blank concentration and between the method detection limit (MDL) and the method reporting limit (MRL) were flagged as non-detect 'U' at the MRL. When sample results were less than 5x the blank concentration but above the MRL, the reported result was qualified as non-detect 'U' (10x for common laboratory contaminants). Target compounds detected in the method or field blanks but reported as not detected in the associated samples were not qualified. Target compounds reported with concentrations greater than 5x the blank concentration were not qualified. Field blanks were not collected during this sampling event.

All analytical tests indicate non-detects for method blanks with the following exceptions:

- Di-n-butyl phthalate was detected in the two method blanks associated with all samples. For those samples with results less than 10x the associated method blank detection, the reported di-n-butyl phthalate concentration was qualified non-detect and flagged 'U'. Results for the following four samples were estimated and flagged: 060605101SB (K0708602-002), 060605202SB (K0708602-005), 060605208SB (K0708602-010) and 060606103SB (K0708602-013). Those samples that were reported as non-detect for di-n-butyl phthalate were not qualified.

#### *Congener Results*

PCB congener sample results that were reported as detected at a concentration less than five times (5x) the associated method blank concentration were flagged 'U' or non-detect at the reported concentration. Target compounds reported with concentrations greater than 5x the blank concentration were not qualified. Target compounds detected in the method blank but reported as not detected in the associated samples were not qualified.

Method 1668A stipulates using a method blank as similar to the matrix as possible. Method blanks were prepared using corn oil to approximate the lipid content of the tissue matrices. Method blank analytical results were non-detects with the exception of some PCB congeners in the method blanks associated with the tissue samples. Table 2 indicates the results that were qualified non-detect based on method blank concentrations.

## ACCURACY

### Instrument Calibration

#### *Non-congener Results*

Initial calibrations (ICALs) and continuing calibrations (CCALs) were reviewed for all analyses. The laboratory performed initial multipoint calibrations for all target and surrogate compounds as required by the analytical methods. ICALs and CCALs were analyzed at the proper frequency and at the appropriate concentrations required by the methods.

Instrument calibrations were acceptable for all analyses performed with the following exceptions:

- The ICAL performed on the SVOCs had %RSD recoveries slightly higher than the laboratory set limit of 15%: benzyl butyl phthalate (15.5%), bis(2-ethylhexyl) phthalate (16.3%) and di-n-octyl phthalate (18.3%). However, these analytes were within the 20% mean RSD limit set by the EPA method and the 20% limit set by DoD QSM (Box 52). Therefore, no further action was deemed necessary for these analytes.

#### *Congener Results*

Initial calibrations (ICALs) and continuing calibration verifications (CCVs) were reviewed for PCB congener analyses. The laboratory performed initial multipoint calibrations for all target and surrogate compounds as required by the Method 1668A. ICALs, CCVs and OPR (ongoing precision recovery) standards were analyzed at the proper frequency and at the appropriate concentrations required by EPA Method 1668A. All calibration compounds analyzed associated with the tissue samples meet the acceptance criteria as listed in the method.

### Labeled Internal Standard Recovery Review (congener analysis only)

PCB congener samples were spiked with labeled internal standards. These standards are used to quantitate target congeners and the calculations of target compound concentrations are designed to compensate for low extraction and/or cleanup efficiencies. In addition, their recovery is measured against recovery standards added after extraction to evaluate extraction and/or cleanup efficiency which could affect sensitivity and could also affect accuracy for target compounds not quantitated against a chemically identical, isotopically labeled standard. The percent recovery of the labeled standards is compared with the limits set forth in EPA Method 1668A.

PCB congener samples reported in data package DPWG24485 (Table 1) were spiked with labeled quantification standards prior to extraction. PCB congener samples reported in data package DPWG24050 (Table 1) were spiked with labeled quantification standards into the raw sample extracts after splitting rather than to the tissue subsamples prior to extraction. The data



for these samples (samples reported in data package DPWG24050) are therefore recovery-corrected for possible losses during cleanup, but not for any possible losses sustained during extraction. Efficient extraction was however demonstrated by monitoring the recoveries of the labeled extraction standards. Internal standard recoveries were acceptable for the tissue sample analyses performed.

Cleanup standards are added prior to cleanup and quantitated using injection standards added just prior to analysis. The cleanup standards were within the 30-135% control limits set by EPA Method 1668A.

### Surrogate Recovery Review (non-congener analysis only)

Each sample analyzed for organic compounds was spiked with surrogates (system monitoring compounds). Surrogate recoveries are a measure of accuracy for the overall analysis of each individual sample.

Surrogate recoveries were acceptable for all analytes with the following exceptions:

- The surrogate percent recoveries in sample 060605101SB (K0708602-002) for fluorene-d10 and fluoranthene-d10 were slightly below the lower control limit of 60% at 59% and 58%, respectively. Recoveries within the LCS/LCSD for these analytes were in control, indicating the QC batch was in control. Sample results for all SVOCs in this sample were previously qualified 'J/UJ' due to hold time, further qualifications are deemed unnecessary.

### Laboratory Control Samples and Matrix Spike/Matrix Spike Duplicate Review

Laboratory control samples (LCSs) are used to monitor the laboratory's day-to-day performance of routine analytical methods, independent of matrix effects and to assess accuracy for the target compounds. Matrix spike/matrix spike duplicate (MS/MSD) samples are analyzed to assess the ability of the laboratory to recover the target compounds from the sample matrix. At least one LCS and one MS/MSD were analyzed for each batch per method requirements. MS/MSD samples are not required for PCB congener analysis, also ongoing precision and recovery (OPR) samples are used in place of LCS to monitor laboratory performance.

LCS, OPR and MS/MSD recoveries were acceptable for all analytical tests with the following exceptions:

- The typical LCS for metals was replaced by using two tissue standard reference materials (SRM) containing metals. The recovery of nickel in SRM Dolt-3 was slightly above the upper SRM limit. All other QC criteria were in control for nickel, including nickel recovery in the second SRM; therefore, data were not flagged based on the one SRM result.
- The MS for metals was performed on project sample 060605203SB (K0708602-006). Recovery of aluminum, lead and nickel were below the lower control limit. The post-spike, SRMs and a second MS performed on 070505LS (K0708602-020) were all within control limits, indicating the laboratory analysis was in control and that matrix inference with these analytes may account for the lower recovery in sample 060605203SB.

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Aluminum, lead and nickel results were estimated and flagged 'J' in sample 060605203SB.

- PCB-Aroclor MS/MSD recoveries for Aroclor 1016 and 1260 were outside control limits due to elevated concentrations of Aroclor 1254 in the MS sample. The MS/MSD was performed on a project sample, however on a clam tissue matrix. Data was not qualified based on MS/MSD recoveries due to differences in sample matrix. This problem will be remedied in the future all MS/MSD samples will be performed on not only project-specific samples but samples of similar tissue matrices (i.e fish vs. clam tissue). The LCS and other QC samples within the analytical batch were in control, indicating the batch was in control.
- MS/MSD recoveries for 4-methylphenol, di-n-butyl phthalate and di-n-octyl phthalate in QC batch KWG0711371 were above the upper control limits. Sample results for all SVOCs associated with this analytical batch were previously qualified 'J/UJ' due to hold time, further qualifications are deemed unnecessary.
- LCS/LCSD recoveries in analytical batch KWG0711371 were slightly above the upper control limit of 115% for carbazole with 119% and 117%, respectively and above the control limit of 110% for di-n-butyl phthalate with 114% and 120%, respectively. All other laboratory-specific QC parameters were within control for these analytes. Again, sample results for all SVOCs associated with this analytical batch were previously qualified 'J/UJ' due to hold time, further qualifications are deemed unnecessary.
- LCS/LCSD recoveries in analytical batch KWG0711938, associated with sample 060605208SB (K0708602-010), were below the lower control limit of 40% for 4-methylphenol with 11% and 13%, respectively. The sample result was non-detect for this analyte in this sample. This does indicate a low bias in this analytical sample for this analyte, the end user should consider this in the data evaluation. Again, sample results for all SVOCs associated with this analytical batch were previously qualified 'J/UJ' due to hold time, further qualifications are deemed unnecessary.

### PRECISION

#### Duplicate Review

Field duplicates were not collected for this sampling event due to the nature of sample matrix. Laboratory precision on the site matrix was evaluated based on the laboratory duplicate analyses and RPD results for MSD and LCSD analyses.

Laboratory duplicate precision was acceptable with the following exceptions:

- The RPD for aluminum exceeded the limit of 25% in the laboratory duplicate performed on sample 070505LS (K078602-020) with 26%. Results for aluminum in sample 070505LS were estimated and qualified 'J' due to hold RPD precision.

## COMPARABILITY

Comparability is the qualitative parameter expressing confidence with which one data set can be compared with another. Comparability of data is attained by following established sampling protocol and method procedures for sample collection and analysis, respectively. The sample results from this sampling event are comparable to other sampling events because of the use of standard techniques to collect representative samples, consistent application of analytical method protocols, and reporting analytical results with appropriate units and reporting limits.

### Compound Quantification

Congener results were reported on a wet weight basis without accounting for percent moisture or percent lipids. Homologue totals were obtained by summing the concentration of all detected congeners at each level of chlorination. Toxic Equivalents (TEQs) were calculated using World Health Organization 2005 Toxicity Equivalence Factors. Chromatographic peaks that did not meet the method ion abundance ratio criteria were not included in the homologue totals or TEQ calculations.

The area response of PCB 118 in samples 060605200SB and 060605205SB (Axys ID L10448-3 and L10448-8 from data package DPWG24050) was slightly above the calibrated linear range of the instrument after the extract dilution. As other congeners have a response in this range, the quantification of the data is not considered affected and further dilutions were not taken.

Due to the levels found for PCB 52, 101, and 138 in sample 060605209SB (Axys ID L10448-11 from data package DPWG24050), the standards used to quantify the surrogates (labeled PCB 52, 101, and 138) are elevated. This results in an apparent low recovery of the labeled compounds used for quantification. However, the target (native) congener quantification is not affected.

Sample 060605209SB (Axys ID L10448-11 from data package DPWG24050) required a higher-level dilution for congeners exceeding instrument calibration range such that the sample was refortified with labeled quantification standards (indicated by the "NK" suffix added to the Axys ID. Consequently, affected congener results (reported from Axys ID L10448-11NK) are not recovery corrected for losses during extraction and chromatographic cleanup.

Samples 060815403SB and 060815405SB (Axys IDs L10448-17 and L10448-18 from data package DPWG24485) required a higher-level dilution for congeners exceeding instrument calibration range such that the sample was refortified with labeled quantification standards (indicated by the "NK" suffix added to the Axys ID. Consequently, affected congener results (reported from Axys ID L10448-11NK) are not recovery corrected for losses during extraction and chromatographic cleanup.

Results for sample 060815403SB (Axys ID L10448-17 from data package DPWG24485) still exceeded calibration after several dilutions and the sample was re-extracted using a smaller sample size (2 grams) to account for the high level PCB congeners. The re-extraction was analyzed on February 2, 2008 for all PCB congeners exceeding the instrument calibration range for analysis of the initial sample extract. Results for this analysis were reported in data package DPWG24605 on February 21, 2008. Axys analytical reports indicated which PCB congeners

were to be reported from the various dilutions and analyses performed on sample 060815403SB (Axys ID L10448-17) to yield acceptable results within the instrument calibration range.

The internal standard method is used to calculate concentrations of PCB congeners that do not have chemically identical labeled standards. The internal standard method is dependent upon consistent detector response over the calibration range. If detector response varies concentrations can be biased high or low based on the variations in detector sensitivity.

During congener analysis, PFK (perfluorokerosene) is used as a lock mass reference standard to measure changes in detector sensitivity. Each lock mass must not vary more than 20% throughout its respective retention time window as required by Method 1668A. Variations of more than 20% indicate the presence of co-eluting interferences or decreased sensitivity. No PCB congener results were qualified due to lock mass variations.

As detailed in Table 2, some congener and homologue total results were qualified as non-detect due to method blank contamination. Results were qualified as non-detect at the reported concentrations; therefore, these non-detect results have elevated detection limits which should be considered by the data user as part of evaluating the data for end-use objectives.

### Compound Identification

Ion abundance ratios are used to identify PCB congeners. Results that met all other qualitative identification criteria but were more than 15% different from the theoretical ion abundance criterion set by EPA Method 1668A are flagged in the laboratory report with a 'K' flag. Those results flagged 'K' with ion abundance ratios outside the identified quantitation criteria are considered estimated maximum possible concentrations (EMPC) and were re-flagged 'J-EMPC' during this review. If the analyte result was previously qualified 'U' by method blank detection, the result retained the 'U' qualifier and it was not qualified further because an ion ratio was out of limits (there is no ion ratio criterion for non-detects). Due to the volume of the J-EMPC qualifiers, they are not tabulated in this report; however, the database has been updated and the flags will appear in any future data tables that are created from the project database.

Ion ratios outside the control limits are generally a consequence of co-eluting interferences to either one or both quantitation peaks. In these cases, Axys chose to use the quantitation peak areas as recorded; no adjustments were made to force the peaks to match the theoretical ion abundance ratios. EMPC results should be considered by the data users as part of evaluating the data for end-use objectives.

### COMPLETENESS

The laboratory reported all requested analyses and the deliverable data reports were complete. Completeness is defined as the percentage of usable data out of the total amount of data generated. The project completeness goal is 100 percent. Some data were qualified as estimated 'J' or 'J-EMPC' and some as non-detect 'U'. A summary of qualifiers can be found in Tables 2 and 3. Completeness for the site investigation was 100%.

## REFERENCES

- DOD QSM 2006. Department of Defense Environmental Data Quality Workgroup. Department of Defense (DOD) Quality Systems Manual (QSM) for Environmental Laboratories. Final Version 3. January 2006. Retrieved from [http://www.navylabs.navy.mil/Archive/DoDV3.pdf] on 3/3/06
- PSEP 1996. Puget Sound Estuary Program *Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound*, January 1996 and subsequent chapter revisions.
- URS 2007. Quality Assurance Project Plan, *River Operable Unit Remedial Investigation, Bradford Island, Bonneville Lock and Dam Project, Cascade Locks, Oregon*. September 2007.
- USEPA 1999. U.S. Environmental Protection Agency (USEPA) Contract Laboratory Program National Functional Guidelines for Organic Data Review. October 1999.
- USEPA 1995. U.S. Environmental Protection Agency (USEPA) Region 10 SOP for the Validation of Method 1668 Toxic, Dioxin-like, PCB Data. December 1995.

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**Table 1  
Sample Location and Analyses Summary**

URS Sample ID	Sample Collection Date	CAS ID	Method Analyses
060605100SB	June 5, 2006	K0708602-001	SVOCs and Metals
060605101SB		K0708602-002	
060605200SB		K0708602-003	
060605201SB		K0708602-004	
060605202SB		K0708602-005	
060605203SB		K0708602-006	
060605204SB		K0708602-007	
060605205SB		K0708602-008	
060605207SB		K0708602-009	
060605208SB		K0708602-010	
060605209SB		K0708602-011	
060606102SB		K0708602-012	
060606103SB		K0708602-013	
060606104SB		K0708602-014	
060606210SB		K0708602-015	
060815402SB	August 15, 2006	K0708602-016	SVOCs, Metals and PCB (as Aroclors and congeners)
060815403SB		K0708602-017	
060815405SB		K0708602-018	
060816406SB		K0708602-019	
070505LS	May 5, 2007	K0708602-020	SVOCs, Metals and PCB (as Aroclors and congeners)

URS ID	Sample Collection Date	Axys ID	Axys Data Package
060605100SB	June 5, 2006	L10448-1	DPWG24050 (PCB Congeners by Method 1668A)
060605101SB		L10448-2	
060605200SB		L10448-3	
060605201SB		L10448-4	
060605202SB		L10448-5	
060605203SB		L10448-6	
060605204SB		L10448-7	
060605205SB		L10448-8	
060605207SB		L10448-9	
060605208SB		L10448-10	
060605209SB		L10448-11	
060605102SB		L10448-12	
060605103SB		L10448-13	
060605104SB		L10448-14	
060605210SB		L10448-15	
060815402SB	L10448-16		
060815403SB	L10448-17		
060815405SB	L10448-18		
060815406SB	L10448-19		
070505LS	May 5, 2007	L10448-20	

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**Table 2  
Summary of Qualifiers (non-congener data only)**

LAB ID	URS ID	ANALYTE	QUALIFIER	RATIONAL
060605100SB 060605101SB 060605200SB 060605201SB 060605202SB 060605203SB 060605204SB 060605205SB 060605207SB 060605208SB 060605209SB 060606102SB 060606103SB 060606104SB 060606210SB 060815402SB 060815403SB 060815405SB 060816406SB	K0708602-001 K0708602-002 K0708602-003 K0708602-004 K0708602-005 K0708602-006 K0708602-007 K0708602-008 K0708602-009 K0708602-010 K0708602-011 K0708602-012 K0708602-013 K0708602-014 K0708602-015 K0708602-016 K0708602-017 K0708602-018 K0708602-019	SVOCs PCB congeners	J/UJ	Hold Time
060605100SB 060605101SB 060605200SB 060605201SB 060605202SB 060605203SB 060605204SB 060605205SB 060605207SB 060605208SB 060605209SB 060606102SB 060606103SB 060606104SB 060606210SB 060815402SB 060815403SB 060815405SB 060816406SB 070505LS	K0708602-001 K0708602-002 K0708602-003 K0708602-004 K0708602-005 K0708602-006 K0708602-007 K0708602-008 K0708602-009 K0708602-010 K0708602-011 K0708602-012 K0708602-013 K0708602-014 K0708602-015 K0708602-016 K0708602-017 K0708602-018 K0708602-019 K0708602-020	Mercury	J/UJ	Hold Time
060605203SB	K0708602-006	aluminum lead nickel	J	MS recoveries
060605101SB 060605202SB 060605208SB 060606103SB	K0708602-002 K0708602-005 K0708602-010 K0708602-013	di-n-butyl phthalate	U	Method Blank Detection
070505LS	K0708602-020	aluminum	J	RPD

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**Table 3**

**Method Blank Qualifiers Assigned During Data Review (PCB Congeners)**

Congener IUPAC #	Co-elutors	060605100SB <sup>1</sup>	060605101SB <sup>1</sup>	060605200SB <sup>1</sup>	060605201SB <sup>1</sup>	060605202SB <sup>1</sup>	060605203SB <sup>1</sup>	060605204SB <sup>1</sup>	060605205SB <sup>1</sup>	060605207SB <sup>1</sup>	060605208SB <sup>1</sup>
PCB001		0.186U			0.234U	0.189U		0.309U		0.243U	0.293U
PCB003		0.144U	0.437U	0.438U	0.125U	0.154U	0.378U	0.271U	0.442U	0.241U	0.253U
<b>Homologue Totals</b>											
Mono-chlorinated		0.33U			0.363U						

**Table 3 cont.**

Congener IUPAC #	Co-elutors	060605209SB <sup>1</sup>	060605102SB <sup>1</sup>	060605103SB <sup>1</sup>	060605104SB <sup>2</sup>	060605210SB <sup>2</sup>	060815402SB <sup>2</sup>	060815403SB <sup>2</sup>	060815405SB <sup>2</sup>	060815406SB <sup>2</sup>	070505LS <sup>2</sup>
PCB001					0.235U	0.194U				0.226U	
PCB003				0.328U	0.237U	0.263U			0.535U	0.279U	0.482U

**Notes:**

<sup>1</sup> Based on method blank results reported in data package DPWG24050.

<sup>2</sup> Based on method blank results reported in data package DPWG24485.

Concentrations reported in units of pg/g wet weight