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East Waterway
Sediment Monitoring, 2012

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Port Gardner
East Waterway
Sediment Monitoring, 2012

by

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Abstract

The East Waterway of Everett's Port Gardner has been identified under the Washington State Department of Ecology's Toxics Cleanup Program's Puget Sound Initiative for sediment cleanup and source control. In June 2012, the Port Gardner East Waterway was sampled to provide information on current concentrations of metals, petroleum hydrocarbons, polychlorinated biphenyls (PCBs), base/neutral/acids (BNAs), dioxin/furans, and several conventionals in surface sediments.

Metals concentrations were generally low for the eight SMS metals analyzed. Copper at site 05 was the only metal concentration exceeding both Ecology's Sediment Management Standards (SMS) Sediment Quality Standards (SQS) and Cleanup Screening Level (CSL), at about 19 times the next highest copper concentration. Overall, metals concentrations were highest from sites 03 and 04.

Total Petroleum Hydrocarbons gas and diesel were analyzed from sites 01 and 02. Neither gas nor diesel was detected at either site, but low concentrations of lube oil were detected at both sites.

Sediment results showed PCB-1254 was the only Aroclor detected. Concentrations ranged from 4.7 to 32.0 ug/Kg, dry weight. None of the values measured were above Ecology's SQS or CSL criteria.

Thirty-three individual BNA compounds were quantified in sediments. Only one of the polycyclic aromatic hydrocarbon concentrations measured exceeded the SQS criteria. Two of the other sites had at least one BNA exceedance. Site 02 exceeded criteria for 1,4-Dichlorobenzene, Bis(2-Ethylhexyl Phthalate), and N-Nitrosodiphenylamine, while site 04 exceeded criteria for 4-Methylphenol. The highest number of detected BNA compounds was from sites 01, 02, and then 04.

Dioxin is not addressed in SMS numeric criteria. Dioxin toxic equivalents (TEQs) ranged from 0.490 to 21.4 ng/Kg TEQ. Three sites were reported above the Puget Sound-wide background levels of 4.0 ng/Kg TEQ and two sites above a maximum concentration allowable for open-water disposal under the dredge materials management program (DMMP) of 10 ng/Kg, TEQ (DMMP, 2010; USACE, 2009).

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Background

The East Waterway of Everett's Port Gardner has been identified under the Washington State Department of Ecology's (Ecology) Toxics Cleanup Program's Puget Sound Initiative as a priority site for sediment cleanup and source control. Previous investigations have documented sediment concentrations exceeding Sediment Management Standards (SMS).

The goal of the Port Gardner East Waterway sediment sampling was to provide information on current concentrations of metals, petroleum hydrocarbons, polychlorinated biphenyls (PCBs), base/neutral/acids (BNAs), dioxin/furans, and several conventionals. Results from the Port Gardner East Waterway sediment study may assist in directing decisions regarding further evaluations for cleanup or restoration.

Study Area and Sample Locations

Everett's Port Gardner East Waterway is located in eastern Possession Sound. Figure 1 shows the Port Gardner East Waterway study area including locations of the eight study sites where sediment was collected. For brevity, Port Gardner East Waterway will be described throughout the remainder of the document as the East Waterway.

Table 1 lists the site identification, latitude/longitude coordinates of each sample retained for analysis, sample time, and depth of water to sediment. Site selection was both targeted and random. Sites 01 and 02 were placed near-shore, in the vicinity of Dunlap Towing, to evaluate potential petroleum release from former bulk storage facilities located in the adjacent uplands. The other six sites were selected based on a probabilistic random stratified sampling design (see Dutch et al., 2009).

Table 1. East Waterway Sediment Collection Locations, June 19, 2012.

Site Number: PSAMPEW-12-	Replicate Grab	Latitude	Longitude	Sample Time	Depth to Substrate (m)
01	1	47.982467	-122.219483	1459	6.8
	2	47.982448	-122.219478	1521	6.1
02	1	47.982658	-122.219193	1615	6.8
	2	47.982645	-122.219188	1630	6.7
03	1	47.984883	-122.222310	1045	9.9
	2	47.984902	-122.222317	1108	10.0
	3	47.984887	-122.222315	1117	9.9
	4	47.984880	-122.222330	1133	10.0
04	1	47.981958	-122.221497	1222	10.6
	2	47.981958	-122.221477	1235	11.0
05	1	47.980553	-122.225678	1555	17.0
06	1	47.979713	-122.227658	1650	20.8
	2	47.979705	-122.227655	1701	20.7
07	1	47.976620	-122.230810	1741	49.0
08	1	47.976387	-122.234397	1719	79.9

Datum: NAD 83 HARN

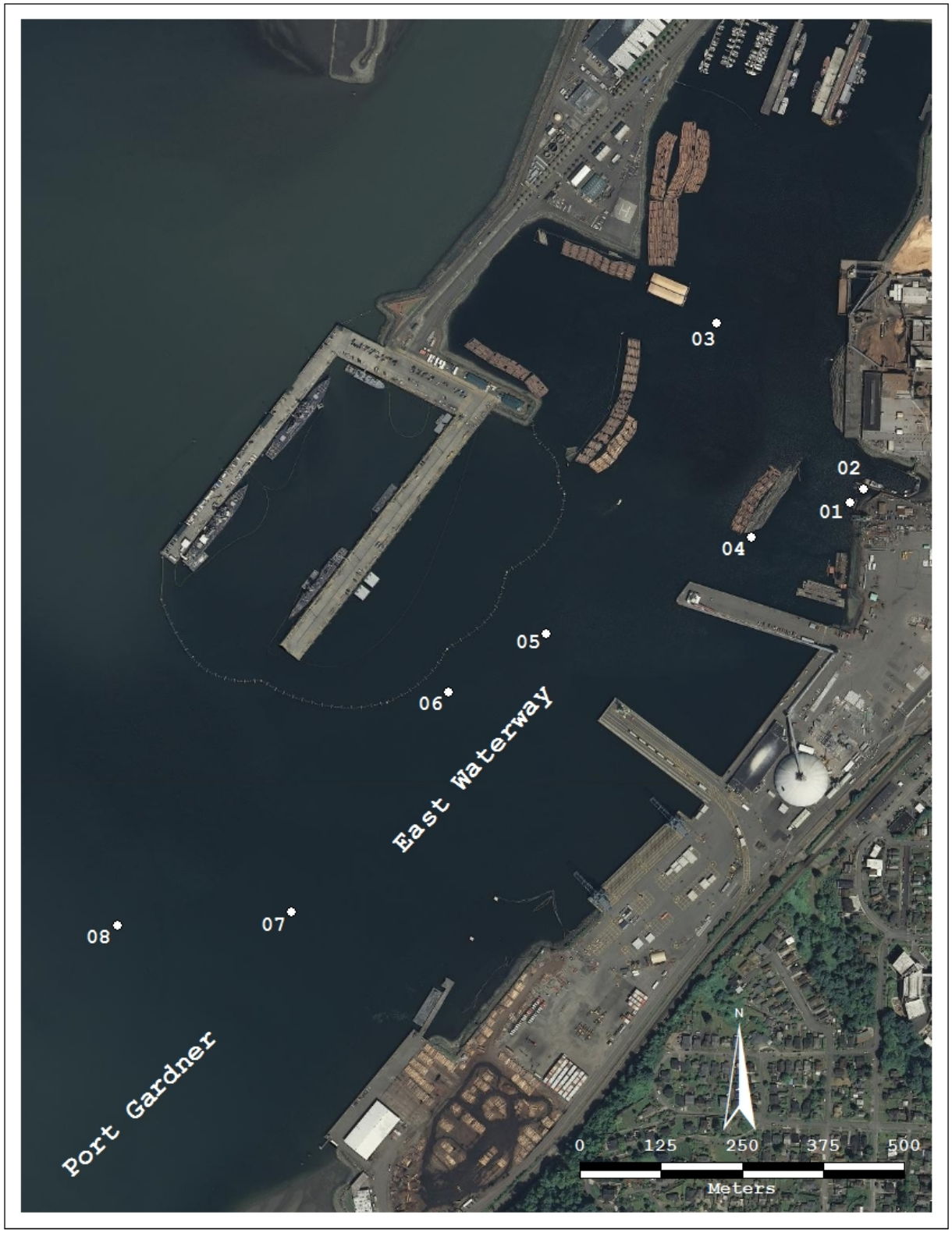

Figure 1. East Waterway Study Area and Sediment Station Locations.

Quality Assurance Summary

Written case narratives assessing the data quality for the study are provided by Manchester Environmental Laboratory (MEL). The narratives include descriptions of the analytical methods, a review of sample holding times, instrument calibration checks, blank results, surrogate recoveries, matrix spike recoveries, laboratory control samples, and laboratory duplicate analyses. The case narratives and complete data reports can be obtained from the report author by request.

The quality assurance review verified that laboratory performance met most of the quality control specifications outlined in the analytical methods. The quality of the data reported here is appropriate for all intended uses. To verify that results generated for the study were of the quality needed, control sample results were compared to measurement quality objectives established in the Quality Assurance Project Plan (Coots, 2012). Data quality results for the study are in the Appendix B, Tables B1 through B4. Specific quality issues noted in the case narratives are discussed below.

Sample Condition and Holding

All study samples were received at MEL in good condition and within the proper sample temperature of less than 6°C. Preparation and analysis of sediment was conducted within method holding times for all analyses except total sulfides. Total sulfides samples were analyzed one day beyond the U.S. Environmental Protection Agency's (EPA's) "suggested" seven-day holding time and qualified as estimates ("J"). No "official" EPA holding time criteria exists for total sulfides.

Conventional Parameters

Conventional parameters included total organic carbon (TOC), ammonia-N, total sulfides, total volatile solids, and grain size (percent fines).

Total Organic Carbon

Quality control measures for the TOC analyses were all within established method limits.

Ammonia-N and Total Sulfides

To prevent oxidation/volatilization, ammonia-N and total sulfide samples were collected undisturbed directly into appropriate containers as single grabs avoiding headspace. Because samples were collected without mixing or homogenization they are more likely to show higher sub-sampling variability.

Total sulfides were originally analyzed by EPA method 376.2. The laboratory was not accredited for this method so samples were re-analyzed by EPA SW-846 method 9030BM. The second analysis was conducted one day beyond the seven day "suggested" holding time. Reported results were from the second analyses. All total sulfide results were "J" qualified for being analyzed beyond the "suggested" holding time. Currently there is no "official" holding time for the method.

The matrix spike result from site 07 recovered low for total sulfide. All other quality control sample results were within established criteria so no corrective action was taken.

Total Volatile Solids

Quality control measures for total volatile solids analyses were all within established method limits.

Grain Size (Fines)

Quality control measures were generally met for grain size analyses. The 1206037-01 sample required resplitting because the original split was too low in fines to meet the allowable range designated by PSEP methodology.

Metals

Matrix spike recoveries were within acceptance limits except for mercury. Mercury from site 01 was reported having the matrix spike (MS) and matrix spike duplicate (MSD) both outside acceptance ranges, most likely due to sample heterogeneity. The source sample was "J" qualified as an estimate.

Total Petroleum Hydrocarbons - Gas and Diesel

TPH-gx and TPH-dx analysis was conducted on sediment from sites 01 and 02. To avoid volatilization TPH-gx samples were collected undisturbed directly into sample containers as single grabs, with no head space. No homogenization or mixing occurred in the field.

PCBs

All Initial calibration (ICAL), verification (ICV), back calculations (BC) and continuing calibrations (CCV) were within quality control limits. No target analytes were detected in method blanks and surrogate recoveries were within quality control limits for the method.

Laboratory control (LCS) and duplicate samples (LCSD) were within quality control limits. The MS sample recoveries and relative percent differences (RPD) of duplicates were also within quality control limits. Some Aroclor reporting limits were raised due to interference and reported as estimated reporting limits (UJ).

Base/Neutral/Acids

ICAL, ICV, and BC were within quality control limits with a few exceptions. These exceptions lead to the qualification in some samples of the detected compounds carbazole and dibenzo(a,h)anthracene. Samples that were "J" qualified as estimates included 02, 04, and 08 for carbazole and 01, 03, 04, and 07 for dibenzo(a,h)anthracene.

Spike recoveries for LCS were within quality control limits with a few exceptions. Benzoic acid was not recovered and triethyl citrate recovered at less than 10%. Both sets of results for these compounds were rejected (REJ).

Surrogate recoveries were within quality control limits with a few exceptions. Surrogate recoveries were low for 4-Chloroaniline-D4 and 4-6-Dinitro-2-methylphenol. Because other surrogates in these samples were acceptable no qualifiers were added based on these results.

The Qualitative Identification reference spectra for cholesterol samples from sites 01 and 02, and phenol from sites 02 and 06 failed to meet the qualifier ion ratios and were qualified "NJ" (analyte tentatively identified, the result is an approximate concentration).

Dioxin and Furans

All ICAL and ICV standards met acceptance criteria. LCS, the duplicate LCSD, and RPDs were within acceptance criteria. Recoveries of all target analytes in laboratory control samples were within method specified control limits. All surrogate recoveries met acceptance criteria.

Some target compounds were detected in laboratory blanks. These congeners were also detected in samples. All congeners detected in samples were greater than 10 times the blank contamination, so no qualification was needed.

All field and laboratory samples are spiked with labeled standards prior to extraction. Recoveries were within the method specified control limits. Most congeners reported as detected met the isotopic abundance ratio and retention time criteria for positive identification with a few exceptions. These exceptions were flagged with an "NJ" qualifier.

Recovery of the MS and MSD sample 1206037-02 did not meet acceptance limits. The congeners 1,2,3,4,6,7,8-HpCDD and 1,2,3,4,6,7,8,9-OCDD recovered high, with the failure attributed to matrix interference. These high recoveries may have impacted other congeners in the sample. The sample congeners were qualified as estimates (J). While recovery limits were not met for the matrix spike pair, the RPD between the MS and MSD did meet acceptance limits.

Results and Discussion

Results of analyses are summarized below. Complete data sets for sediment grain size (or particle size distribution), PCBs, BNAs, and Dioxin/Furans can be found in Appendix A.

Study results were compared to SMS criteria, the Sediment Quality Standards (SQS) and Cleanup Screening Levels (CSL). The SQS numeric chemical criteria correspond to sediment quality that results in no adverse effect to the benthic community or, in concept, to higher organisms and humans. CSL criteria establish the level above which Puget Sound sediments are defined as a cleanup site.

SMS criteria require most results to be TOC-normalized for comparison. Additionally, a few compounds are compared on a dry weight basis. Figure 1 shows the study area and sample locations.

Conventional Parameters

East Waterway sediments were collected and analyzed from eight sites for ammonia-N, TOC, total sulfides, total volatile solids, and grain size. Analytical methods used for these conventional parameters are listed below:

- Total Organic Carbon: PSEP, 1997, CO_2 by Non-dispersive infrared spectroscopy.
- Ammonia-N: EPA 350.1, Automated phenate.
- Total Sulfides: EPA SW-846 method 9030BM.
- Total Volatile Solids: PSEP, 1997, Loss after combustion (550 ^{o}C).
- Grain Size: Modified ASTM with Hydrometer, sieve-pipette.

Table 2 below provides a summary of results for the conventional parameters. Percent fines (silts + clay) are reported for grain size. All grain size results can be found in Appendix A, Table A1. All total sulfide results in Table 2 are "J" qualified as estimates. The laboratory initially analyzed total sulfide samples by a method different than that requested. They reanalyzed the samples by the requested method but were one day over EPA's "recommended" holding time by completion. There is no "official" EPA holding time designated for total sulfides.

Except for percent fines, sites 03 and 04 had the two highest concentrations for each parameter (in bold**)** in Table 2. In addition to concentration data, summary statistics were included describing mean, median, and range. These parameters are not specifically addressed by SMS numeric criteria.

Table 2. East Waterway Surface Sediment Results for Percent Fines, Ammonia-N, Total Organic Carbon, Total Sulfides, and Total Volatile Solids.

Site ID PSAMPEW-12-	Percent Fines (silt + clay)	Ammonia-N (mg-N/Kg)	Total Organic Carbon (TOC %, 70 °C)	Total Sulfides (mg/Kg)	Total Volatile Solids (TVS, %)
01	8.7	5.48	5.42	833 J	6.02
02	3.7	2.38	1.11	530 J	2.52
03	**59.3**	**12.5**	**8.05**	**1,820 J**	**20.7**
04	54.2	**10.3**	**6.86**	**2,150 J**	**15.0**
05	27.0	3.14	1.27	3.67 J	3.46
06	26.1	1.74	1.51	1.76 J	4.14
07	**55.7**	4.92	3.56	44.6 J	7.89
08	50.7	2.83	3.43	105 J	7.18
Mean	NA	5.41	3.90	686	8.36
Median	NA	4.03	3.50	318	6.60
Range	NA	1.74 - 12.5	1.11 - 8.05	1.76 - 2,150	2.52 - 20.7

J: Analyte positively identified, result is an estimate.
Bold: Identifies the 2 highest sample results per parameter.
NA: Not applicable.

Metals

Analysis of trace metals in sediment from the eight sites in East Waterway followed EPA 3050B methods for preparation and EPA 200.8 for analysis by ICP/MS (inductively coupled plasma, mass spectrometry). Mercury preparation and analysis was completed by EPA 245.5 methods using CVAA (cold vapor atomic absorption). The complete set of metals results can be found below in Table 3. Results for trace metals can be compared directly to the SMS criteria, also given in the table, because both are reported on a dry weight basis.

Only one exceedance of SMS criteria was reported for metals. Site 05 had a dry weight copper concentration reported of 1040 mg/Kg, roughly 2.5 times the criterion. This appeared to be an outlier, when defined as greater than 1.5 times the interquartile range. The next highest result was only about 5% the concentration reported from site 05. Except for this one high copper result, concentrations at the other sites ranged from 26.0 to 54.4 mg/Kg, dw. Overall sites 03 and 04 had the highest metals concentrations for the eight metals analyzed, followed by site 01.

Table 3. East Waterway Results for Metals in Surface Sediment and SMS Criteria (mg/Kg, dw).

Site ID PSAMPEW-12-	Silver (6.1/6.1)[1]	Arsenic (57/93)	Cadmium (5.1/6.7)	Chromium (260/270)	Copper (390/390)	Mercury (0.41/0.59)	Lead (450/530)	Zinc (410/960)
01	**0.559**	9.45	0.730	35.5	**54.4**	**0.353 J**	**41.3**	105
02	0.230	8.61	0.500	29.7	34.4	0.0585	23.4	91.6
03	0.251	**11.7**	**1.51**	**50.2**	50.5	**0.159**	19.5	**124**
04	**0.256**	**12.2**	**1.54**	**49.3**	48.2	0.152	25.0	**150**
05	0.100	5.77	0.281	27.5	**1040**	0.0723	**27.0**	41.0
06	0.089	5.89	0.281	30.4	26.0	0.0875	10.9	76.6
07	0.174	7.92	0.681	41.5	32.8	0.123	14.4	65.6
08	0.176	8.22	0.700	41.8	30.8	0.0901	13.5	71.7
Mean	0.229	8.72	0.778	38.2	165/39.6[2]	0.137	21.9	90.7
Median	0.203	8.42	0.691	38.5	41.3/34.4[2]	0.107	21.4	84.1
Range	0.089-0.559	5.77-12.2	0.281-1.54	27.5-50.2	26.0-1040	0.0585-0.353	10.9-41.3	41.0-150

1: SQS/CSL criterion for individual metals.
2: Mean and median includes outlier/excludes outlier.
: Value exceeds the SQS/CSL criterion.
Bold: Two highest sediment concentrations for each metal.

Total Petroleum Hydrocarbons - Gas and Diesel

East Waterway sediment was analyzed for total petroleum hydrocarbons (TPH) gas and diesel from sites 01 and 02 only (Figure 1). Analytical methods were provided by Ecology Publication Number 97-602. Analysis was conducted using gas chromatography/flame ionization detector (GC/FID) for diesel and lube oil, and purge and trap/gas chromatography/flame ionization detector (PT/GC/FID) for gasoline.

Sediment from site 01 and 02 was analyzed for TPH gas, diesel and lube oil. Gas and diesel were not detected in either sample, while lube oil was detected in both. SMS criteria do not address petroleum products. As an alternative the Model Toxics Control Act (MTCA) Method A criteria were used for comparison. The TPH-dx lube oil was reported at about an order of magnitude lower than the MTCA Method A value. Table 4 below presents results for TPH-gas, TPH-diesel and lube oil.

Table 4. East Waterway Sediment Results for TPH Gasoline, Diesel, and Lube Oil (mg/Kg, dw).

Site ID PSAMPEW-12-	NWTPH-gx Gasoline	MTCA[1] Method A	NWTPH-dx Diesel	MTCA Method A	NWTPH-dx Lube oil	MTCA Method A
01	0.57 U	100	22 U	2000	210	2000
02	0.51 U		20 U		180	

U: Not detected at the detection limit shown.
1: Model Toxic Control Act cleanup levels.

PCB Aroclors

Surface sediments were analyzed from eight sites for PCB Aroclors by method SW-846 EPA 8082B GC/ECD. The complete set of PCB results, including Aroclor reporting limits, can be found in Appendix A, Table A2. A summary of PCB dry weight and TOC-normalized concentrations, percent solids, TOC, and comparative criteria are presented below in Table 5.

PCB-1254 was detected at all sites − the only Aroclor above reporting limits for the study. Dry weight concentrations ranged from 4.7 to 32 ug/Kg, dw. The two highest concentrations were from near-shore sites 01 and 02 (Figure 1). Other study sites were roughly half or less.

Aroclor concentrations in surface sediments were low compared to Sediment Management Standards (WAC 172-204). When the samples were normalized to TOC content, total PCB concentrations ranged from 98 to 2,790 ug/Kg, TOC.

Table 5. PCB Aroclors and Total Organic Carbon Detected in East Waterway Surface Sediment.

Site ID PSAMPEW-12-	Percent Solids	TOC (%)	PCB-1254 (ug/Kg, dw)	Total PCBs (ug/Kg, TOC)	Total PCBs SQS[1] Criterion (ug/Kg, dw/TOC)	Total PCBs CSL[2] Criterion (ug/Kg, dw/TOC)
01	66.6	5.42	32	590	130/12,000	1000/65,000
02	72.6	1.11	31	2,790		
03	30.4	8.05	7.9	98		
04	37.2	6.86	16	233		
05	71.6	1.27	4.7	370		
06	66.6	1.51	15	993		
07	54.2	3.56	19	534		
08	56.1	3.43	7.0	204		

1: Sediment Quality Standards (WAC 173-204-320).
2: Cleanup Screening Levels (WAC 173-204-520).

Base/Neutral/Acids

Surface sediments were analyzed from eight sites for base/neutral/acids (BNAs) using method SW-846 EPA 8270 by capillary GC/MS. Sample extraction and cleanup was completed by EPA methods 3541 and 3630, respectively. The complete set of results can be found in Table A3. A summary of detected BNA compounds TOC-normalized, along with Sediment Management Standards (SMS) criteria are presented below in Table 6.

Table 6 shows BNA results normalized to the samples' TOC content for comparison to criteria that are also OC-normalized. Results for organic compounds are given on a dry weight basis in Table A3, along with the dry weight equivalents to "SQS" and "CSL" criteria based on apparent effects thresholds (AETs). If the compound was not detected in Table 6 an "nd" place holder is shown. Estimated results ("J" and "NJ" qualified) were used at full value. Reporting limits for non-detected compounds can be found in the complete data set in Table A3.

Under SMS criteria total LPAHs are defined as the sum of the concentrations of: naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene. 2-Methylnaphthalene is not included in the LPAH total under SMS. Total HPAHs are defined as: fluoranthene, pyrene, benz[a]anthracene, chrysene, total benzofluoranthenes, benzo[a]pyrene, indeno[1,2,3-cd]pyrene, dibenz[a,h]anthracene, and benzo[ghi]perylene.

No exceedance of SQS and CSL numerical criteria for LPAHs was reported. Fluoranthene a HPAH, did not exceed SQS or CSL values but was reported over the dry weight equivalent to the SQS criterion at site 01. For other BNAs two of the eight study sites (02 and 04) had at least one criterion exceedance. Site 02 exceeded criteria for four compounds (Fluoranthene, 1,4-Dichlorobenzene, Bis(2-Ethylhexyl)Phthalate, and N-Nitrodiphenylamine as a dry weight equivalent), while site 04 exceeded both SQS and CSL for one compound (4-Methylphenol) on a dry weight basis. The sites with the highest total number of detected BNA compounds were reported from sites 02, 01, and then 04 (Figure 1).

Table 6. Summary of Total Organic Carbon Normalized BNA Detected in East Waterway Surface Sediments (mg/Kg, TOC).

Analyte PSAMPEW-12-	01	02	03	04	05	06	07	08	SQS Criteria	CSL Criteria
LPAH										
Naphthalene	6.83	21.6	1.99	11.7	11.8	15.2	15.7	6.71	99	170
Acenaphthylene	1.14	1.98	0.385 J	1.09	2.05	1.79	1.85	0.875	66	66
Acenaphthene	3.88	9.91	0.460 J	3.50	2.76	2.38	2.50	1.43	16	57
Fluorene	3.32	7.21	0.708	3.64	2.91	2.45	3.09	1.63	23	79
Phenanthrene	18.4	29.7	2.98	10.2	10.2	8.61	10.67	6.41	100	480
Anthracene	4.24	8.83	1.62	4.81	3.46	3.24	4.21	2.48	220	1,200
LPAH Sum[1]	37.8	79.2	8.14	34.9	33.2	33.7	38.0	19.5	370	780
HPAH										
Fluoranthene	36.9	45.0	5.09	11.8	11.0	10.6	12.4	8.16	160	1,200
Pyrene	36.9	50.4	6.71	19.0	14.2	12.6	13.8	9.33	1,000	1,400
Benz[a]anthracene	8.86	13.5	2.73	4.52	3.39	2.78	3.37	2.71	110	2,700
Chrysene	15.5	19.8	4.47	6.12	5.12	3.78	4.49	3.50	110	460
Total benzofluoranthenes (b,k,j)	16.8	23.7	4.84	7.58	5.75	4.77	5.48	4.05	230	450
Benzo(a)pyrene	5.54	10.8	2.11	3.21	3.07	2.25	2.70	2.16	99	210
Indeno(1,2,3-cd)pyrene	2.40	5.59	1.14	1.46	1.97	1.72	1.40	1.14	34	88
Dibenzo(a,h)anthracene	0.554 J	nd	0.236 J	0.350 J	nd	nd	0.275 J	nd	12	33
Benzo(g,h,i)perylene	1.70	3.96	0.758 J	1.02	1.34 J	1.06 J	1.01 J	0.729 J	31	78
HPAH Sum[2]	125	173	28.1	55.0	45.8	39.5	44.8	31.8	960	5,300
Total PAH	163	252	36.2	90.0	79.0	73.2	82.9	51.3	-	-
1,4-Dichlorobenzene	1.02 J	**4.23 J**	nd	nd	nd	nd	nd	nd	3.10	9.00
1-Methylnaphthalene	1.31	3.33	nd	1.60	2.84	1.46 J	1.46	0.904 J	NA	NA
2-Methylnaphthalene	1.84	5.04	nd	2.48	4.65	2.52	2.67	1.46	38	64
3B-Coprostanol	nd	70.3	19.9	20.4	49.6	nd	nd	24.5	NA	NA
4-Methylphenol[3]	400	270	330 J	**1300**	63 J	81 J	240	75 J	670[3]	670[3]
Benzo(b)fluoranthene	12.4	17.1	3.48	5.39	4.02	3.38	3.93	2.83	NA	NA
Benzo(k)fluoranthene	4.43	6.58	1.37	2.19	1.73	1.39	1.54	1.22	NA	NA
Bis(2-Ethylhexyl) Phthalate	4.24	**50.4**	nd	nd	nd	nd	nd	nd	47	78
Bisphenol A	1.84	11.7	nd	1.90	nd	nd	nd	nd	NA	NA
Butyl benzyl phthalate	0.812	nd	0.398 J	nd	nd	1.06 J	nd	nd	4.9	64
Carbazole	1.84 J	2.70 J	nd	0.816 J	nd	nd	nd	0.671 J	NA	NA
Cholesterol	48.0 NJ	153	44.7	40.8	126	99.3	36.5	43.7	NA	NA
Dibenzofuran	2.95	6.76	0.65 J	3.64	2.52 J	2.45	3.37	1.75	15	58
Di-N-Butylphthalate	nd	13.5	nd	nd	nd	nd	nd	nd	220	1,700
N-Nitrosodiphenylamine	nd	4.14	nd	nd	nd	nd	nd	nd	11	11
Pentachlorophenol[3]	nd	16 J	nd	nd	nd	nd	nd	nd	360[3]	690[3]
Phenol[3]	59 J	47 NJ	nd	nd	nd	73 NJ	43 J	nd	420[3]	1200[3]
Retene	31.4	99.1	5.22	35.0	10.2	13.9	8.99	8.46	NA	NA
Total Number of Detections	29	31	23	26	23	24	24	24		

Bold: Visual aid to a compound greater than criteria.

nd: Not detected at the EDL shown. NA = Not Available.

Underline: TOC-normalized reporting limit was greater than the SQS criteria, (pentachlorophenol not normalized) see Table A2.

1: Total of all detected low molecular weight PAHs.

2: Total of all detected high molecular weight PAHs.

3: 4-Methylphenol, pentachlorophenol, and phenol are not TOC normalized; criteria are on a dry weight basis. Units =ug/Kg.

Dioxin and Furans

East Waterway surface sediments were analyzed for the seventeen 2,3,7,8-substituted dioxin and furan congeners by methods EPA 1613B HRGC/HRMS. Table 7 below presents a summary of results for dioxin and furans and TCDD TEQs for each sample.

Dioxin and furan data qualified as estimates (J and NJ) were included at full value when summing TEQ totals. Sample congeners qualified as not detected (U and UJ) were not included in TEQs.

Table 7. Dioxin and Furan TEQs in East Waterway Surface Sediments (ng/Kg, TEQ).

PSAMPEW-12-	01	02	03	04	05	06	07	08
Dioxin TEQ	4.15	2.15	15.3	7.52	0.554	0.314	0.669	0.259
Furan TEQ	1.20	0.552	6.15	3.58	0.375	0.235	0.716	0.231
2,3,7,8-TCDD TEQ	5.35	2.70	21.4	11.1	0.929	0.549	1.39	0.490
DMMP Puget Sound Benchmarks: 4.0 and 10.0 ng/Kg TEQ								
MTCA Soils Background: 5.21 ng/Kg TEQ								

Currently there are no management criteria to compare dioxin levels from sediment, although some benchmarks are available. The dredge materials management program (DMMP) adopted a Puget Sound-wide sediment background level of 4.0 ng/Kg TEQ and a maximum concentration allowable for open-water disposal of 10 ng/Kg, TEQ (DMMP, 2010; USACE, 2009). The Washington State background levels for dioxin TEQs in forested and open land-use soils is 5.21 ng/Kg, TEQ. Bradley (2010) also provides a comparison of potential enrichment, as the MTCA cleanup level value.

Sites 03 and 04 had the highest 2,3,7,8-TCDD TEQs reported for the study, exceeding the Puget Sound sediment background concentration by five and two times, respectively. Site 01 was reported just over Puget Sound sediments and statewide soils background TEQs.

Summary of Sediment Results Exceeding SMS

Table 8 below shows results for exceedance of SMS criteria reported for the study. Sample site, compound, results including qualifier, and the exceedance is presented.

Table 8. Sediment Results Exceeding SMS Criteria or Dry Weight Equivalents, June 19, 2012.

Sample Site PSAMPEW-12-	Compound	Result	SMS Criteria		Units	Basis
01	Fluoranthene	2000	1700	SQS	ug/Kg	dry wt
02	1,4-Dichlorobenzene	4.2 J	3.1	SQS	mg/Kg	TOC
02	Bis(2-Ethylhexyl)Phthalate	50.5	47	SQS	mg/Kg	TOC
02	N-Nitrosodiphenylamine	46	40	CSL	ug/Kg	dry wt
02	N-Nitrosodiphenylamine	46	28	SQS	ug/Kg	dry wt
04	4-Methylphenol	1300	670	CSL	ug/Kg	dry wt
04	4-Methylphenol	1300	670	SQS	ug/Kg	dry wt
05	Copper	1040	390	CSL	mg/Kg	dry wt
05	Copper	1040	390	SQS	mg/Kg	dry wt
01[1]	Dioxin TEQ	5.33	-	-	ng/Kg	dry wt
03[1,2]	Dioxin TEQ	21.4	-	-	ng/Kg	dry wt
04[1,2]	Dioxin TEQ	11.1	-	-	ng/Kg	dry wt

1: Result exceeds a proposed Puget Sound background benchmark of 4.0 ng/Kg TEQ.

2: Result exceeds a maximum concentration allowable for open-water disposal under the dredge materials management program (DMMP) of 10.0 ng/Kg TEQ.

Conclusions

In June 2012, sediment was collected at eight sites from the East Waterway of Port Gardner and analyzed for metals, TPH gas and diesel, PCBs, BNAs, dioxin/furans, and several conventionals. The goal was to provide current concentrations of surface sediments within the waterway to assist in directing decisions regarding further evaluations for cleanup or restoration. Overall concentrations were low for most parameters. A total of six analytes exceeded criteria or benchmarks, five BNAs (Fluoranthene, 1,4-Dichlorobenzene, Bis(2-ethylhexyl) Phthalate, N-Nitrosodiphenylamine, and 4-methylphenol) and one metal (copper). While SMS does not address dioxin, a benchmark value of 4.0 ng/Kg TEQ for a Puget Sound background has been adopted for use by the DMMP. Dioxin TEQs were greater than the proposed Puget Sound background levels at three sites. Two of the three were also greater than the maximum allowable for open water disposal of dredged materials under the DMMP program (10.0 ng/Kg TEQ).

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Appendices

Appendix A: East Waterway Surface Sediment Results

Table A1. Apparent Grain Size Results for East Waterway Surface Sediment.

Site ID[1]	Sieve Size (microns)	% Gravel	% Very Coarse Sand	% Coarse Sand	% Medium Sand	% Fine Sand	% Very Fine Sand	% Total Sand	% Silt	% Clay	Percent Fines[2]
		>2000 um	2000-1000 um	1000-500 um	500-250 um	250-125 um	125-62 um	2000-62.5 um	62.5-3.9 um	<3.9 um	
PSAMPEW-12-	01	47.4	12.0	10.3	8.8	7.0	5.8	44.0	5.8	2.9	8.7
PSAMPEW-12-	02	33.3	7.8	16.6	26.4	8.5	3.7	62.9	2.5	1.2	3.7
PSAMPEW-12-	03	9.2	5.7	5.9	6.1	6.1	7.6	31.5	43.0	16.3	59.3
PSAMPEW-12-	04	2.3	4.7	5.2	6.9	8.6	18.0	43.4	39.5	14.7	54.2
PSAMPEW-12-	05	5.2	6.9	18.0	23.3	7.0	12.7	67.8	21.9	5.1	27.0
PSAMPEW-12-	06	9.4	6.4	10.9	19.2	11.9	16.1	64.5	21.1	5.0	26.1
PSAMPEW-12-	07	1.5	0.8	1.6	4.0	8.1	28.4	42.9	45.6	10.1	55.7
PSAMPEW-12-	08	0.9	1.6	4.9	9.3	9.3	23.3	48.4	39.8	10.9	50.7

1: Refer to Figure 2 for station locations.
2: Fines defined as total silts + clays.

Table A2. PCB Aroclor Results from East Waterway Surface Sediment (ug/Kg,dw).

Site ID PSAMPEW-12	TOC (%)	PCB-1016	PCB-1221	PCB-1232	PCB-1242	PCB-1248	PCB-1254	PCB-1260	PCB-1262	PCB-1268
01	5.42	3.7 U	1.8 U	3.7 U	3.7 UJ	15 UJ	**32**	4.2 UJ	1.8 U	1.8 U
02	1.11	3.2 U	1.6 U	3.2 U	3.2 UJ	13 UJ	**31**	6.1 UJ	1.6 U	1.6 U
03	8.05	8.1 U	4.1 U	8.1 U	4.1 U	4.1 U	**7.9**	4.1 U	4.1 U	4.1 U
04	6.86	6.5 U	3.3 U	6.5 U	6.5 U	13 UJ	**16**	6.7 UJ	3.3 U	3.3 U
05	1.27	7.0 UJ	1.7 U	3.5 U	7.0 UJ	3.5 UJ	**4.7**	1.7 U	1.7 U	1.7 U
06	1.51	3.6 U	1.8 U	3.6 U	3.6 UJ	7.3 UJ	**15**	5.4 UJ	1.8 U	1.8 U
07	3.56	9.1 UJ	2.3 U	4.5 U	2.3 U	9.1 UJ	**19**	4.5 UJ	2.3 U	2.3 U
08	3.43	4.4 U	2.2 U	4.4 U	4.4 UJ	8.9 UJ	**7.0**	2.2 U	2.2 U	2.2 U

U: Not detected at the detection limit shown.
UJ: Not detected at the estimated detection limit shown.
Bold: Visual aid for detected compounds.

Table A3. Base/Neutral/Acids Results for East Waterway Surface Sediment (ug/Kg, dw).

Analyte / PSAMPEW-12-	01	02	03	04	05	06	07	08	Dry Wt. Equiv. to "SQS"	Dry Wt. Equiv. to "CSL"
1,2,4-Trichlorobenzene	37 U	34 U	82 U	65 U	34 U	36 U	46 U	44 U	31	51
1,2-Dichlorobenzene	75 U	69 U	160 U	130 U	67 U	73 U	91 U	88 U	35	50
1,2-Diphenylhydrazine	19 U	17 U	41 U	33 U	17 U	18 U	23 U	22 U		
1,3-Dichlorobenzene	75 U	69 U	160 U	130 U	67 U	73 U	91 U	88 U		
1,4-Dichlorobenzene	55 J	47 J	160 U	130 U	67 U	73 U	91 U	88 U	110	110
1-Methylnaphthalene	71	37	82 U	110	36	22 J	52	31 J		
2,4,5-Trichlorophenol	75 U	69 U	160 U	130 U	67 U	73 U	91 U	88 U		
2,4,6-Trichlorophenol	75 U	69 U	160 U	130 U	67 U	73 U	91 U	88 U		
2,4-Dichlorophenol	190 U	170 U	410 U	330 U	170 U	180 U	230 U	220 U		
2,4-Dimethylphenol	190 U	170 U	410 U	330 U	170 U	180 U	230 U	220 U	29	29
2,4-Dinitrophenol	190 UJ	170 UJ	410 UJ	330 UJ	170 U	180 UJ	230 UJ	220 UJ		
2,4-Dinitrotoluene	75 U	69 U	160 U	130 U	67 U	73 U	91 U	88 U		
2,6-Dinitrotoluene	75 U	69 U	160 U	130 U	67 U	73 U	91 U	88 U		
2-Chloronaphthalene	37 U	34 U	82 U	65 U	34 U	36 U	46 U	44 U		
2-Chlorophenol	75 U	69 U	160 U	130 U	67 U	73 U	91 U	88 U		
2-Methylnaphthalene	100	56	82 U	170	59	38	95	50	670	670
2-Methylphenol	190 U	170 U	410 U	330 U	170 U	180 U	230 U	220 U	63	63
2-Nitroaniline	370 U	340 U	820 U	650 U	340 U	360 U	460 U	440 U		
2-Nitrophenol	37 U	34 U	82 U	65 U	34 U	36 U	46 U	44 U		
3,3'-Dichlorobenzidine	75 UJ	69 UJ	160 UJ	130 UJ	67 UJ	73 UJ	91 UJ	88 UJ		
3B-Coprostanol	190 U	780	1600	1400	630	180 U	230 U	840		
3-Nitroaniline	75 UJ	69 UJ	160 UJ	130 UJ	67 UJ	73 UJ	91 UJ	88 UJ		
4,6-Dinitro-2-Methylphenol	75 UJ	69 UJ	160 UJ	130 UJ	67 UJ	73 UJ	91 UJ	88 UJ		
4-Bromophenyl phenyl ether	37 U	34 U	82 U	65 U	34 U	36 U	46 U	44 U		
4-Chloro-3-Methylphenol	190 U	170 U	410 U	330 U	170 U	180 U	230 U	220 U		
4-Chloroaniline	750 UJ	690 UJ	1600 UJ	1300 UJ	670 UJ	730 UJ	910 UJ	880 UJ		
4-Chlorophenyl-Phenylether	19 U	17 U	41 U	33 U	17 U	18 U	23 U	22 U		
4-Methylphenol	400	270	330 J	**1300**	63 J	81 J	240	75 J	670	670
4-Nitroaniline	75 UJ	69 UJ	160 UJ	130 UJ	67 UJ	73 UJ	91 UJ	88 UJ		
4-Nitrophenol	190 U	170 U	410 U	330 U	170 U	180 U	230 U	220 U		
4-nonylphenol	19 U	17 U	41 U	33 U	17 U	18 U	23 U	22 U		
Acenaphthene	210	110	37 J	240	35	36	89	49	500	500
Acenaphthylene	62	22	31 J	75	26	27	66	30	1300	1300
Anthracene	230	98	130	330	44	49	150	85	960	960
Benz[a]anthracene	480	150	220	310	43	42	120	93	1300	1600
Benzo(a)pyrene	300	120	170	220	39	34	96	74	1600	1600
Benzo(b)fluoranthene	670	190	280	370	51	51	140	97		
Benzo(ghi)perylene	92	44	61 J	70	17 J	16 J	36 J	25 J	670	720
Benzo(k)fluoranthene	240	73	110	150	22	21	55	42		

Table A3 (cont.). Base/Neutral/Acids Results for East Waterway Surface Sediment (ug/Kg, dw).

Analyte / PSAMPEW-12-	01	02	03	04	05	06	07	08	Dry Wt. Equiv. to SQS	Dry Wt. Equiv. to CSL
Benzoic Acid	REJ	REJ	REJ	REJ	REJ	REJ	REJ	REJ	650	650
Benzyl Alcohol	190 U	170 U	410 U	330 U	170 U	180 U	230 U	220 U	57	73
Bis(2-chloro-1-methylethyl) ether	19 U	17 U	41 U	33 U	17 U	18 U	23 U	22 U		
Bis(2-Chloroethoxy)Methane	19 U	17 U	41 U	33 U	17 U	18 U	23 U	22 U		
Bis(2-Chloroethyl)Ether	37 U	34 U	82 U	65 U	34 U	36 U	46 U	44 U		
Bis(2-Ethylhexyl) Phthalate	230	560	82 U	65 U	34 U	36 U	46 U	44 U	1300	3100
Bisphenol A	100	130	41 U	130	17 U	18 U	23 U	22 U		
Butyl benzyl phthalate	44	34 U	32 J	65 U	34 U	16 J	46 U	44 U	63	900
Caffeine	37 U	34 U	82 U	65 U	34 UJ	36 U	46 U	44 U		
Carbazole	100 J	30 J	82 UJ	56 J	34 UJ	36 UJ	46 UJ	23 J		
Cholesterol	2600 NJ	1700 NJ	3600	2800	1600	1500	1300	1500		
Chrysene	840	220	360	420	65	57	160	120	1400	2800
Dibenzo(a,h)anthracene	30 J	34 UJ	19 J	24 J	34 UJ	36 UJ	9.8 J	44 UJ	230	230
Dibenzofuran	160	75	52 J	250	32 J	37	120	60	540	540
Diethyl phthalate	19 U	17 U	41 U	33 U	17 U	18 U	23 U	22 U	200	1200
Dimethyl phthalate	19 U	17 U	41 U	33 U	17 U	18 U	23 U	22 U	71	160
Di-N-Butylphthalate	40 UJ	150	59 UJ	33 U	32 UJ	43 UJ	23 U	48 UJ	1400	5100
Di-N-Octyl Phthalate	37 UJ	34 UJ	82 UJ	65 UJ	34 UJ	36 UJ	46 UJ	44 UJ	6200	6200
Fluoranthene	**2000**	500	410	810	140	160	440	280	1700	2500
Fluorene	180	80	57	250	37	37	110	56	540	540
Hexachlorobenzene	19 U	17 U	41 U	33 U	17 U	18 U	23 U	22 U	22	70
Hexachlorobutadiene	75 U	69 U	160 U	130 U	67 U	73 U	91 U	88 U	11	120
Hexachlorocyclopentadiene	75 UJ	69 UJ	160 UJ	130 UJ	67 UJ	73 UJ	91 UJ	88 UJ		
Hexachloroethane	19 U	17 U	41 U	33 U	17 U	18 U	23 U	22 U		
Indeno(1,2,3-cd)pyrene	130	62	92	100	25	26	50	39	600	690
Isophorone	37 U	34 U	82 U	65 U	34 U	36 U	46 U	44 U		
Naphthalene	370	240	160	800	150	230	560	230	2100	2100
Nitrobenzene	19 U	17 U	41 U	33 U	17 U	18 U	23 U	22 U		
N-Nitrosodi-n-propylamine	19 U	17 U	41 U	33 U	17 U	18 U	23 U	22 U		
N-Nitrosodiphenylamine	37 U	**46**	82 U	65 U	34 U	36 U	46 U	44 U	28	40
Pentachlorophenol	190 UJ	16 J	410 UJ	330 UJ	170 UJ	180 UJ	230 UJ	220 UJ	360	690
Phenanthrene	1000	330	240	700	130	130	380	220	1500	1500
Phenol	59 J	47 NJ	160 U	130 U	67 U	73 NJ	43 J	88 U	420	1200
Pyrene	2000	560	540	1300	180	190	490	320	2600	3300
Retene	1700	1100	420	2400	130	210	320	290		
Triclosan	19 UJ	17 UJ	41 UJ	33 UJ	17 UJ	18 UJ	23 UJ	22 UJ		
Triethyl citrate	REJ	REJ	REJ	REJ	REJ	REJ	REJ	REJ		
Tris(2-chloroethyl) phosphate (TCEP)	19 U	17 U	41 U	33 U	17 U	18 U	23 U	22 U		

U: Not detected at the reporting limit shown. J: Analyte positively identified, result is an estimate.
UJ: Not detected at the approximate reporting limit shown. REJ: Sample result rejected due to quality control issues.
Bold: Exceeds SMS criteria on a dry weight equivalent basis.
Underlined: The non-detected value is greater than the dry weight equivalent to the SMS criteria.

Table A4. Dioxin and Furan Concentrations and TEQs in East Waterway Surface Sediment (ng/Kg, dw).

PSAMPEW-12-Congener	TEF[1]	01	02	03	04	05	06	07	08
2,3,7,8-TCDD	1	0.142 UJ	0.126 UJ	1.12	0.724 J	0.140 UJ	0.111 UJ	0.159 UJ	0.157 UJ
1,2,3,7,8-PeCDD	1	0.682 J	0.315 J	5.75	3.13	0.258 J	0.174 J	0.316 J	0.151 J
1,2,3,4,7,8-HxCDD	0.1	1.82 J	0.559 J	9.00	4.02	0.250 J	0.140 UJ	0.477 J	0.179 NJ
1,2,3,6,7,8-HxCDD	0.1	4.25	2.71	19.5	7.83	0.753 J	0.403 J	0.893 J	0.235 J
1,2,3,7,8,9-HxCDD	0.1	1.78 J	0.796 J	12.3	4.77	0.487 J	0.225 J	0.686 J	0.223 J
1,2,3,4,6,7,8-HpCDD	0.01	220	104 J	362	159	12.4	6.51	12.2	3.73
OCDD	0.0003	1620	1300 J	2320	1390	78.3	39.6	84.3	24.2
TEQ[2] - Dioxin Only Total:		4.15	2.15	15.3	7.52	0.554	0.314	0.669	0.259
2,3,7,8-TCDF	0.1	1.88	1.10	16.3	12.2	1.51	1.07	4.81	1.35
1,2,3,7,8-PeCDF	0.03	0.670 J	0.228 J	3.50	2.18 J	0.221 J	0.139 J	0.235 UJ	0.143 J
2,3,4,7,8-PeCDF	0.3	1.47	0.420 J	6.20	3.83	0.348 J	0.188 J	0.400 J	0.209 J
1,2,3,4,7,8-HxCDF	0.1	1.40 J	0.442 J	5.30	2.31 J	0.245 J	0.137 NJ	0.274 J	0.189 J
1,2,3,6,7,8-HxCDF	0.1	0.912 J	0.293 J	3.84	1.93 J	0.207 J	0.110 J	0.257 J	0.123 UJ
2,3,4,6,7,8-HxCDF	0.1	1.07 NJ	0.531 J	7.69	3.26	0.239 J	0.162 NJ	0.290 J	0.146 UJ
1,2,3,7,8,9-HxCDF	0.1	0.692 NJ	0.147 UJ	1.78 J	0.849 J	0.117 J	0.0785 UJ	0.192 UJ	0.187 UJ
1,2,3,4,6,7,8-HpCDF	0.01	12.7	14.9	62.2	26.7	2.79	2.44 J	3.18	0.966 J
1,2,3,4,7,8,9-HpCDF	0.01	0.857 J	0.848 J	3.83	1.93 J	0.233 J	0.114 J	0.197 UJ	0.193 UJ
OCDF	0.0003	31.1	83.0	119	73.4	5.45	4.38 J	5.03	1.72 J
TEQ - Furan Only Total:		1.20	0.552	6.15	3.58	0.375	0.235	0.716	0.231
2,3,7,8-TCDD TEQ[3]:		5.35	2.70	21.4	11.1	0.929	0.549	1.39	0.490
DMMP Benchmarks: 4.0 and 10.0 ng/Kg TEQ MTCA Background: 5.21 ng/Kg TEQ[4].									

1: Toxic equivalent factor.
2: Toxic equivalency.
3: Normalized toxic equivalency compared to 2,3,7,8-tetrachlorodibenzo-p-dioxin.
4: The basis for MTCA natural background. The 90th percentile of dioxin data from forested and open space areas.
UJ: Analyte not detected at the approximate quantitation limit shown.
J: Analyte positively identified the result is an estimated concentration.
NJ: Analyte tentatively identified the result is an approximate concentration.
MTCA: Model Toxics Control Act
DMMP: Dredge Material Management Program

Appendix B: Data Quality Results

Table B1. Laboratory Quality Control Results for East Waterway Sediment.

Sample No.	Analysis Date	Analysis	Quality Assurance Type	Result	Units
B12G216-BLK1	8/1/2012	Silver	Lab Blank	0.050 U	mg/Kg, dw[1]
B12G216-BS1	8/1/2012	Silver	Spike Blank	102	%[2]
B12G216-BLK1	8/1/2012	Arsenic	Lab Blank	0.050 U	mg/Kg, dw
B12G216-BS1	8/1/2012	Arsenic	Spike Blank	104	%
B12G216-BLK1	8/1/2012	Cadmium	Lab Blank	0.050 U	mg/Kg, dw
B12G216-BS1	8/1/2012	Cadmium	Spike Blank	103	%
B12G216-BLK1	8/1/2012	Chromium	Lab Blank	0.250 U	mg/Kg, dw
B12G216-BS1	8/1/2012	Chromium	Spike Blank	102	%
B12G216-BLK1	8/1/2012	Copper	Lab Blank	0.050 U	mg/Kg, dw
B12G216-BS1	8/1/2012	Copper	Spike Blank	103	%
B12G216-BLK1	8/1/2012	Mercury	Lab Blank	0.0036 U	mg/Kg, dw
B12G216-BS1	8/1/2012	Mercury	Spike Blank	106	%
B12G216-BLK1	8/1/2012	Lead	Lab Blank	0.050 U	mg/Kg, dw
B12G216-BS1	8/1/2012	Lead	Spike Blank	98	%
B12G216-BLK1	8/1/2012	Zinc	Lab Blank	2.50	mg/Kg, dw
B12G216-BS1	8/1/2012	Zinc	Spike Blank	108	%
1206037-01	7/6/2012	Decachlorobiphenyl	Surrogate	66	%
1206037-02	7/6/2012	Decachlorobiphenyl	Surrogate	66	%
1206037-03	7/6/2012	Decachlorobiphenyl	Surrogate	76	%
1206037-04	7/6/2012	Decachlorobiphenyl	Surrogate	71	%
1206037-05	7/6/2012	Decachlorobiphenyl	Surrogate	67	%
1206037-06	7/6/2012	Decachlorobiphenyl	Surrogate	72	%
1206037-07	7/6/2012	Decachlorobiphenyl	Surrogate	68	%
1206037-08	7/6/2012	Decachlorobiphenyl	Surrogate	72	%
1206037-10	7/6/2012	Decachlorobiphenyl	Surrogate	68	%
B12G020-BLK1	7/6/2012	Decachlorobiphenyl	Surrogate	83	%
B12G020-BS1	7/6/2012	Decachlorobiphenyl	Surrogate	85	%
B12G020-DUP1	7/6/2012	Decachlorobiphenyl	Surrogate	67	%
B12G020-MS1	7/6/2012	Decachlorobiphenyl	Surrogate	71	%
B12G020-MSD1	7/6/2012	Decachlorobiphenyl	Surrogate	71	%
B12F174-BLK1	6/22/2012	% Solids	Lab Blank	0.001 U	%
B12G077-BLK1	7/19/2012	TOC	Lab Blank	0.10 U	%
B12G077-SRM1	7/19/2012	TOC	SRM[3]	89	%
B12G200-SRM1	7/19/2012	TOC	SRM	95	%
B12G200-SRM1	8/3/2012	TOC	Lab Blank	0.10 U	%

Sample No.	Analysis Date	Analysis	Quality Assurance Type	Result	Units
B12F174-BLK1	6/22/2012	TVS	Lab Blank	0.10 U	%
1206037-01	6/21/2012	1,4-Difluorobenzene	Surrogate	95	%
1206037-01	6/21/2012	Benzene, 1,4-dibromo-2-methyl	Surrogate	87	%
1206037-02	6/21/2012	1,4-Difluorobenzene	Surrogate	94	%
1206037-02	6/21/2012	Benzene, 1,4-dibromo-2-methyl	Surrogate	117	%
B12F148-BLK1	6/21/2012	1,4-Difluorobenzene	Surrogate	93	%
B12F148-BLK1	6/21/2012	Benzene, 1,4-dibromo-2-methyl	Surrogate	80	%
B12F148-BS1	6/21/2012	1,4-Difluorobenzene	Surrogate	106	%
B12F148-BS1	6/21/2012	Benzene, 1,4-dibromo-2-methyl	Surrogate	130	%
B12F148-BSD1	6/21/2012	1,4-Difluorobenzene	Surrogate	105	%
B12F148-BSD1	6/21/2012	Benzene, 1,4-dibromo-2-methyl	Surrogate	130	%
B12F148-Dup1	6/21/2012	1,4-Difluorobenzene	Surrogate	95	%
B12F148-Dup1	6/21/2012	Benzene, 1,4-dibromo-2-methyl	Surrogate	94	%
1206037-01	7/3/2012	Pentacosane	Surrogate	109	%
1206037-02	7/3/2012	Pentacosane	Surrogate	105	%
B12G016-BLK1	7/3/2012	Pentacosane	Surrogate	114	%
B12G016-BS1	7/3/2012	Pentacosane	Surrogate	106	%
B12G016-DUP1	7/3/2012	Pentacosane	Surrogate	109	%
B12G016-MS1	7/3/2012	Pentacosane	Surrogate	94	%
B12G016-MSD1	7/3/2012	Pentacosane	Surrogate	101	%
B12G016-BS1	7/3/2012	Lube oil	LCS[4]	96	%
B12G016-MS1	7/3/2012	Lube oil	MS[5]	74	%
B12G016-MSD1	7/3/2012	Lube oil	MSD[6]	84	%
B12F148-BLK1	6/21/2012	Gasoline	Lab Blank	0.60 U	mg/Kg, dw
B12G016-BS1	6/21/2012	Gasoline	Spike Blank	92	%
B12G016-BSD1	6/21/2012	Gasoline	Spike Blank Dupe	94	%

1: Results reported in dry weight.
2: Percent of spiked or surrogate recovered.
3: Standard reference material.
4: Laboratory control sample.
5: Matrix spike.
6: Matrix spike duplicate.

Table B2. Laboratory Duplicate and Field Replicate Quality Control Results for East Waterway Sediment.

Analysis	Sample ID		QA Type	Results		RPD[1]
	No. 1	No. 2		No. 1	No. 2	
Silver	1206037-03	1206037-10	field rep	0.251	0.219	14
Silver	B12G216-MS1	B12G216-MSD1	MS/MSD[2]	18.4	18.3	0.3
Arsenic	1206037-03	1206037-10	field rep	11.7	10.7	8.9
Arsenic	B12G216-MS1	B12G216-MSD1	MS/MSD	26.9	26.6	0.9
Cadmium	1206037-03	1206037-10	field rep	1.51	1.38	9.0
Cadmium	B12G216-MS1	B12G216-MSD1	MS/MSD	19.7	19.5	0.9
Chromium	1206037-03	1206037-10	field rep	50.2	44.5	12
Chromium	B12G216-MS1	B12G216-MSD1	MS/MSD	61.3	60.9	0.7
Copper	1206037-03	1206037-10	field rep	50.5	45.5	10
Copper	B12G216-MS1	B12G216-MSD1	MS/MSD	50.7	50.9	0.3
Mercury	1206037-03	1206037-10	field rep	0.159	0.141	12.0
Mercury	B12G216-MS1	B12G216-MSD1	MS/MSD	0.212	0.228	7.0
Lead	1206037-03	1206037-10	field rep	19.5	17.4	11
Lead	B12G216-MS1	B12G216-MSD1	MS/MSD	32.9	32.6	0.8
Zinc	1206037-03	1206037-10	field rep	124	110	12
Zinc	B12G216-MS1	B12G216-MSD1	MS/MSD	87.4	83.7	4.0
% Solids	1206037-03	1206037-10	Field Rep	30.4	30.4	0
% Solids	B12F174-DUP1	1206037-02	Lab Dupe	72.9	72.6	0.5
TOC	1206037-03	1206037-10	Field Rep	8.05	8.77	8.6
TVS	1206037-03	1206037-10	Field Rep	20.7	21.8	5.2
TVS	B12F174-DUP1	1206037-02	Lab Dupe	2.72	2.52	7.6
TOC	B12G200-DUP1	1207039-16	Lab Dupe	0.864	0.97	11
TOC	B12G200-DUP2	1207039-16	Lab Dupe	0.868	0.97	11
Lube oil	B12G016-DUP1	1206037-01	Lab Dupe	210	180	16
# 2 Diesel	B12G016-DUP1	1206037-01	Lab Dupe	21 U	22 U	NC
Gasoline	B12F148-DUP1	1206037-01	Lab Dupe	57 U	57 U	NC

1: Relative percent difference (absolute difference of two samples divided by their mean x 100).
2: Matrix spike/matrix spike duplicate.
QA: Quality assurance.
U: Not detected at the reporting limit shown.
NC: Not calculated.

Table B3. Base/Neutral/Acids Laboratory Quality Control Results for East Waterway Sediment.

Analyte	Method Blank B12G010-Blk1	LCS (% Recovery) B12G010-BS1	Laboratory Duplicate (RPD[1]) B12G010-DUP1	Matrix Spike (% Recovery) B12G010-MS1	Matrix Spike Dup (% Recovery/RPD) B12G010MSD-1
1,2,4-Trichlorobenzene	25 U	66	NC	86	88/0.5
1,2-Dichlorobenzene	50 U	64	NC	85	87/0.5
1,2-Diphenylhydrazine	12 U	107	NC	115	119/1
1,3-Dichlorobenzene	50 U	62	NC	82	84/0.1
1,4-Dichlorobenzene	50 U	63	NC	84	86/0.2
1-Methylnaphthalene	25 U	78	NC	92	92/2
2,4,5-Trichlorophenol	50 U	87	NC	99	101/0.3
2,4,6-Trichlorophenol	50 U	85	NC	100	103/1
2,4-Dichlorophenol	120 U	78	NC	98	99/2
2,4-Dimethylphenol	120 U	75	NC	100	102/0.4
2,4-Dinitrophenol	120 UJ	16	NC	86	89/1
2,4-Dinitrotoluene	50 U	96	NC	95	99/2
2,6-Dinitrotoluene	50 U	96	NC	98	100/0.3
2-Chloronaphthalene	25 U	84	NC	99	102/1
2-Chlorophenol	50 U	69	NC	91	93/0.3
2-Methylnaphthalene	25 U	78	NC	91	91/2
2-Methylphenol	120 U	76	NC	99	102/0.8
2-Nitroaniline	250 U	101	NC	102	106/2
2-Nitrophenol	25 U	72	NC	94	96/0.1
3,3'-Dichlorobenzidine	50 UJ	130	NC	26	30/11
3B-Coprostanol	120 U	93	2	71	75/2
3-Nitroaniline	50 UJ	150	NC	93	99/4
4,6-Dinitro-2-Methylphenol	50 UJ	45	NC	96	102/3
4-Bromophenyl phenyl ether	25 U	94	NC	98	101/0.8
4-Chloro-3-Methylphenol	120 U	95	NC	106	106/3
4-Chloroaniline	500 UJ	128	NC	101	109/6
4-Chlorophenyl-Phenylether	12 U	89	NC	93	95/0.3
4-Methylphenol	120 U	83	44	106	110/1
4-Nitroaniline	50 UJ	139	NC	84	94/9
4-Nitrophenol	120 U	77	NC	90	93/0.9
4-nonylphenol	12 U	103	NC	109	115/3
Acenaphthene	12 U	87	12	94	96/0.7
Acenaphthylene	12 U	87	7	93	95/0.5
Anthracene	12 U	97	0.2	99	102/1
Benz[a]anthracene	12 U	101	4	107	106/3
Benzo(a)pyrene	12 U	100	6	108	102/8
Benzo(b)fluoranthene	12 U	96	6	99	95/6
Benzo(ghi)perylene	25 U	96	29	105	101/6
Benzo(k)fluoranthene	12 U	100	9	100	99/3

Analyte	Method Blank B12G010-Blk1	LCS (% Recovery) B12G010-BS1	Laboratory Duplicate (RPD[1]) B12G010-DUP1	Matrix Spike (% Recovery) B12G010-MS1	Matrix Spike Dup (% Recovery/RPD) B12G010MSD-1
Benzoic Acid	REJ	0	NC	16	4/120
Benzyl Alcohol	120 U	77	NC	102	104/1
Bis(2-chloro-1-methylethyl) ether	12 U	72	NC	96	98/0.3
Bis(2-Chloroethoxy)Methane	12 U	79	NC	97	99/0.8
Bis(2-Chloroethyl)Ether	25 U	69	NC	88	89/0.9
Bis(2-Ethylhexyl) Phthalate	25 U	111	NC	136	133/4
Bisphenol A	12 U	82	NC	133	138/1
Butyl benzyl phthalate	25 U	109	NC	120	126/2
Caffeine	25 U	59	NC	17	24/31
Carbazole	25 UJ	108	NC	110	115/2
Cholesterol	12 U	86	33	98	97/2
Chrysene	12 U	103	8	106	104/4
Dibenzo(a,h)anthracene	25 UJ	96	25	104	107/0.8
Dibenzofuran	25 U	92	0.7	99	99/2
Diethyl phthalate	12 U	92	NC	92	95/1
Dimethyl phthalate	12 U	92	NC	93	94/1
Di-N-Butylphthalate	5.6 J	102	NC	103	111/5
Di-N-Octyl Phthalate	25 UJ	102	NC	105	112/4
Fluoranthene	12 U	97	20	97	96/2
Fluorene	12 U	92	0.5	95	96/2
Hexachlorobenzene	12 U	88	NC	91	95/2
Hexachlorobutadiene	50 U	61	NC	82	83/2
Hexachlorocyclopentadiene	50 UJ	49	NC	61	45/33
Hexachloroethane	12 U	62	NC	64	69/5
Indeno(1,2,3-cd)pyrene	12 U	91	16	101	100/4
Isophorone	25 U	79	NC	95	96/1
Naphthalene	25 U	71	0.07	89	89/2
Nitrobenzene	12 U	71	NC	93	94/1
N-Nitrosodi-n-propylamine	12 U	83	NC	107	109/0.03
N-Nitrosodiphenylamine	25 U	108	NC	106	109/0.4
Pentachlorophenol	120 UJ	56	NC	78	83/3
Phenanthrene	12 U	96	17	100	99/3
Phenol	50 U	76	NC	100	102/0.7
Pyrene	12 U	108	6	120	117/4
Retene	12 U	105	10	102	105/0.7
Triclosan	12 UJ	66	NC	77	75/4
Triethyl citrate	REJ	2	NC	103	111/4
Tris(2-chloroethyl) phosphate (TCEP)	12 U	82	NC	97	102/3

1: Relative percent difference.

U: Not detected at the limit shown. NC: Not calculated. UJ: Not detected at the estimated limit shown.

Table B4. Base/Neutral/Acids Surrogate Laboratory Quality Control Results from East Waterway Sediment.

Analyte	Sample ID (PSAMPEW-12-)	Result[1] (ug/Kg,dw)	Spike Level[2] (ug/Kg,dw)	Recovery[3] (%)	Recovery[4] Limits (%)
1,2-Dichlorobenzene-D4	01	518	596	87	20-130
2,4-Dichlorophenol-D3	01	521	596	87	50-150
2-Chlorophenol-D4	01	541	596	91	20-130
2-Fluorobiphenyl	01	595	596	100	30-115
2-Fluorophenol	01	475	596	80	25-121
2-Nitrophenol-D4	01	573	596	96	20-120
4,6-Dinitro-2-methylphenol-D2	01	296	596	50	50-150
4-Chloroaniline-D4	01	107	596	**18**	20-120
4-Methylphenol-D8	01	643	596	108	50-150
4-Nitrophenol-D4	01	563	596	94	20-120
Acenaphthylene-D8	01	551	596	92	50-150
Anthracene-D10	01	569	596	95	50-150
Benzo(a)pyrene-D12	01	530	596	89	50-150
Bis(2-Chloroethyl)Ether-D8	01	494	596	83	50-150
Dimethylphthalate-D6	01	527	596	88	50-150
Fluorene-D10	01	544	596	91	50-150
Nitrobenzene-D5	01	544	596	91	23-130
Phenol-D5	01	587	596	99	24-113
Pyrene-D10	01	646	596	108	50-150
Terphenyl-D14	01	570	596	96	18-137
1,2-Dichlorobenzene-D4	02	470	551	85	20-130
2,4-Dichlorophenol-D3	02	467	551	85	50-150
2-Chlorophenol-D4	02	487	551	88	20-130
2-Fluorobiphenyl	02	529	551	96	30-115
2-Fluorophenol	02	416	551	76	25-121
2-Nitrophenol-D4	02	519	551	94	20-120
4,6-Dinitro-2-methylphenol-D2	02	317	551	58	50-150
4-Chloroaniline-D4	02	139	551	25	20-120
4-Methylphenol-D8	02	577	551	105	50-150
4-Nitrophenol-D4	02	513	551	93	20-120
Acenaphthylene-D8	02	499	551	91	50-150
Anthracene-D10	02	525	551	95	50-150
Benzo(a)pyrene-D12	02	481	551	87	50-150
Bis(2-Chloroethyl)Ether-D8	02	448	551	81	50-150
Dimethylphthalate-D6	02	486	551	88	50-150
Fluorene-D10	02	490	551	89	50-150
Nitrobenzene-D5	02	493	551	90	23-130
Phenol-D5	02	529	551	96	24-113
Pyrene-D10	02	591	551	107	50-150

Analyte	Sample ID (PSAMPEW-12-)	Result[1] (ug/Kg,dw)	Spike Level[2] (ug/Kg,dw)	Recovery[3] (%)	Recovery[4] Limits (%)
Terphenyl-D14	02	533	551	97	18-137
1,2-Dichlorobenzene-D4	03	1120	1310	86	20-130
2,4-Dichlorophenol-D3	03	1070	1310	82	50-150
2-Chlorophenol-D4	03	1190	1310	91	20-130
2-Fluorobiphenyl	03	1230	1310	94	30-115
2-Fluorophenol	03	1080	1310	83	25-121
2-Nitrophenol-D4	03	1230	1310	94	20-120
4,6-Dinitro-2-methylphenol-D2	03	608	1310	**47**	50-150
4-Chloroaniline-D4	03	93.9	1310	**7**	20-120
4-Methylphenol-D8	03	1360	1310	104	50-150
4-Nitrophenol-D4	03	1060	1310	81	20-120
Acenaphthylene-D8	03	1110	1310	85	50-150
Anthracene-D10	03	1180	1310	90	50-150
Benzo(a)pyrene-D12	03	1050	1310	80	50-150
Bis(2-Chloroethyl)Ether-D8	03	1070	1310	82	50-150
Dimethylphthalate-D6	03	1090	1310	83	50-150
Fluorene-D10	03	1070	1310	82	50-150
Nitrobenzene-D5	03	1150	1310	88	23-130
Phenol-D5	03	1270	1310	97	24-113
Pyrene-D10	03	1320	1310	101	50-150
Terphenyl-D14	03	1170	1310	90	18-137
1,2-Dichlorobenzene-D4	04	929	1050	89	20-130
2,4-Dichlorophenol-D3	04	912	1050	87	50-150
2-Chlorophenol-D4	04	978	1050	94	20-130
2-Fluorobiphenyl	04	1030	1050	98	30-115
2-Fluorophenol	04	870	1050	83	25-121
2-Nitrophenol-D4	04	1020	1050	98	20-120
4,6-Dinitro-2-methylphenol-D2	04	419	1050	**40**	50-150
4-Chloroaniline-D4	04	235	1050	23	20-120
4-Methylphenol-D8	04	1170	1050	112	50-150
4-Nitrophenol-D4	04	995	1050	95	20-120
Acenaphthylene-D8	04	952	1050	91	50-150
Anthracene-D10	04	1020	1050	98	50-150
Benzo(a)pyrene-D12	04	933	1050	89	50-150
Bis(2-Chloroethyl)Ether-D8	04	889	1050	85	50-150
Dimethylphthalate-D6	04	939	1050	90	50-150
Fluorene-D10	04	942	1050	90	50-150
Nitrobenzene-D5	04	967	1050	93	23-130
Phenol-D5	04	1060	1050	102	24-113
Pyrene-D10	04	1190	1050	114	50-150
Terphenyl-D14	04	1050	1050	100	18-137

Analyte	Sample ID (PSAMPEW-12-)	Result[1] (ug/Kg,dw)	Spike Level[2] (ug/Kg,dw)	Recovery[3] (%)	Recovery[4] Limits (%)
1,2-Dichlorobenzene-D4	05	490	536	91	20-130
2,4-Dichlorophenol-D3	05	463	536	86	50-150
2-Chlorophenol-D4	05	512	536	95	20-130
2-Fluorobiphenyl	05	546	536	102	30-115
2-Fluorophenol	05	462	536	86	25-121
2-Nitrophenol-D4	05	525	536	98	20-120
4,6-Dinitro-2-methylphenol-D2	05	285	536	53	50-150
4-Chloroaniline-D4	05	383	536	71	20-120
4-Methylphenol-D8	05	591	536	110	50-150
4-Nitrophenol-D4	05	484	536	90	20-120
Acenaphthylene-D8	05	500	536	93	50-150
Anthracene-D10	05	530	536	99	50-150
Benzo(a)pyrene-D12	05	476	536	89	50-150
Bis(2-Chloroethyl)Ether-D8	05	467	536	87	50-150
Dimethylphthalate-D6	05	482	536	90	50-150
Fluorene-D10	05	487	536	91	50-150
Nitrobenzene-D5	05	506	536	94	23-130
Phenol-D5	05	548	536	102	24-113
Pyrene-D10	05	557	536	104	50-150
Terphenyl-D14	05	531	536	99	18-137
1,2-Dichlorobenzene-D4	06	494	584	85	20-130
2,4-Dichlorophenol-D3	06	484	584	83	50-150
2-Chlorophenol-D4	06	536	584	92	20-130
2-Fluorobiphenyl	06	565	584	97	30-115
2-Fluorophenol	06	491	584	84	25-121
2-Nitrophenol-D4	06	557	584	95	20-120
4,6-Dinitro-2-methylphenol-D2	06	360	584	62	50-150
4-Chloroaniline-D4	06	271	584	47	20-120
4-Methylphenol-D8	06	609	584	104	50-150
4-Nitrophenol-D4	06	501	584	86	20-120
Acenaphthylene-D8	06	518	584	89	50-150
Anthracene-D10	06	550	584	94	50-150
Benzo(a)pyrene-D12	06	491	584	84	50-150
Bis(2-Chloroethyl)Ether-D8	06	490	584	84	50-150
Dimethylphthalate-D6	06	506	584	87	50-150
Fluorene-D10	06	508	584	87	50-150
Nitrobenzene-D5	06	525	584	90	23-130
Phenol-D5	06	571	584	98	24-113
Pyrene-D10	06	566	584	97	50-150
Terphenyl-D14	06	535	584	92	18-137
1,2-Dichlorobenzene-D4	07	591	729	81	20-130

Analyte	Sample ID (PSAMPEW-12-)	Result[1] (ug/Kg,dw)	Spike Level[2] (ug/Kg,dw)	Recovery[3] (%)	Recovery[4] Limits (%)
2,4-Dichlorophenol-D3	07	622	729	85	50-150
2-Chlorophenol-D4	07	626	729	86	20-130
2-Fluorobiphenyl	07	724	729	99	30-115
2-Fluorophenol	07	532	729	73	25-121
2-Nitrophenol-D4	07	686	729	94	20-120
4,6-Dinitro-2-methylphenol-D2	07	403	729	55	50-150
4-Chloroaniline-D4	07	264	729	36	20-120
4-Methylphenol-D8	07	766	729	105	50-150
4-Nitrophenol-D4	07	644	729	88	20-120
Acenaphthylene-D8	07	665	729	91	50-150
Anthracene-D10	07	696	729	96	50-150
Benzo(a)pyrene-D12	07	616	729	85	50-150
Bis(2-Chloroethyl)Ether-D8	07	585	729	80	50-150
Dimethylphthalate-D6	07	643	729	88	50-150
Fluorene-D10	07	662	729	91	50-150
Nitrobenzene-D5	07	635	729	87	23-130
Phenol-D5	07	689	729	95	24-113
Pyrene-D10	07	743	729	102	50-150
Terphenyl-D14	07	691	729	95	18-137
1,2-Dichlorobenzene-D4	08	605	706	86	20-130
2,4-Dichlorophenol-D3	08	603	706	85	50-150
2-Chlorophenol-D4	08	642	706	91	20-130
2-Fluorobiphenyl	08	709	706	100	30-115
2-Fluorophenol	08	564	706	80	25-121
2-Nitrophenol-D4	08	683	706	97	20-120
4,6-Dinitro-2-methylphenol-D2	08	340	706	**48**	50-150
4-Chloroaniline-D4	08	358	706	51	20-120
4-Methylphenol-D8	08	762	706	108	50-150
4-Nitrophenol-D4	08	612	706	87	20-120
Acenaphthylene-D8	08	647	706	92	50-150
Anthracene-D10	08	695	706	98	50-150
Benzo(a)pyrene-D12	08	639	706	91	50-150
Bis(2-Chloroethyl)Ether-D8	08	583	706	83	50-150
Dimethylphthalate-D6	08	630	706	89	50-150
Fluorene-D10	08	635	706	90	50-150
Nitrobenzene-D5	08	637	706	90	23-130
Phenol-D5	08	698	706	99	24-113
Pyrene-D10	08	778	706	110	50-150
Terphenyl-D14	08	705	706	100	18-137
1,2-Dichlorobenzene-D4	10	1110	1300	85	20-130
2,4-Dichlorophenol-D3	10	1100	1300	85	50-150

Analyte	Sample ID (PSAMPEW-12-)	Result[1] (ug/Kg,dw)	Spike Level[2] (ug/Kg,dw)	Recovery[3] (%)	Recovery[4] Limits (%)
2-Chlorophenol-D4	10	1190	1300	91	20-130
2-Fluorobiphenyl	10	1240	1300	95	30-115
2-Fluorophenol	10	1050	1300	80	25-121
2-Nitrophenol-D4	10	1230	1300	95	20-120
4,6-Dinitro-2-methylphenol-D2	10	592	1300	**46**	50-150
4-Chloroaniline-D4	10	70.1	1300	**5**	20-120
4-Methylphenol-D8	10	1380	1300	106	50-150
4-Nitrophenol-D4	10	1200	1300	92	20-120
Acenaphthylene-D8	10	1170	1300	90	50-150
Anthracene-D10	10	1260	1300	97	50-150
Benzo(a)pyrene-D12	10	1170	1300	90	50-150
Bis(2-Chloroethyl)Ether-D8	10	1090	1300	83	50-150
Dimethylphthalate-D6	10	1130	1300	87	50-150
Fluorene-D10	10	1170	1300	90	50-150
Nitrobenzene-D5	10	1150	1300	88	23-130
Phenol-D5	10	1270	1300	97	24-113
Pyrene-D10	10	1400	1300	108	50-150
Terphenyl-D14	10	1230	1300	95	18-137
1,2-Dichlorobenzene-D4	MB	345	400	86	20-130
2,4-Dichlorophenol-D3	MB	294	400	73	50-150
2-Chlorophenol-D4	MB	341	400	85	20-130
2-Fluorobiphenyl	MB	354	400	89	30-115
2-Fluorophenol	MB	304	400	76	25-121
2-Nitrophenol-D4	MB	190	400	47	20-120
4,6-Dinitro-2-methylphenol-D2	MB	22.5	400	**6**	50-150
4-Chloroaniline-D4	MB	412	400	103	20-120
4-Methylphenol-D8	MB	361	400	90	50-150
4-Nitrophenol-D4	MB	185	400	46	20-120
Acenaphthylene-D8	MB	342	400	86	50-150
Anthracene-D10	MB	361	400	90	50-150
Benzo(a)pyrene-D12	MB	346	400	86	50-150
Bis(2-Chloroethyl)Ether-D8	MB	334	400	83	50-150
Dimethylphthalate-D6	MB	357	400	89	50-150
Fluorene-D10	MB	337	400	84	50-150
Nitrobenzene-D5	MB	344	400	86	23-130
Phenol-D5	MB	357	400	89	24-113
Pyrene-D10	MB	371	400	93	50-150
Terphenyl-D14	MB	373	400	93	18-137
1,2-Dichlorobenzene-D4	LCS	242	400	61	20-130
2,4-Dichlorophenol-D3	LCS	269	400	67	50-150
2-Chlorophenol-D4	LCS	250	400	62	20-130

Analyte	Sample ID (PSAMPEW-12-)	Result[1] (ug/Kg,dw)	Spike Level[2] (ug/Kg,dw)	Recovery[3] (%)	Recovery[4] Limits (%)
2-Fluorobiphenyl	LCS	305	400	76	30-115
2-Fluorophenol	LCS	220	400	55	25-121
2-Nitrophenol-D4	LCS	259	400	65	20-120
4,6-Dinitro-2-methylphenol-D2	LCS	158	400	**40**	50-150
4-Chloroaniline-D4	LCS	385	400	96	20-120
4-Methylphenol-D8	LCS	315	400	79	50-150
4-Nitrophenol-D4	LCS	280	400	70	20-120
Acenaphthylene-D8	LCS	312	400	78	50-150
Anthracene-D10	LCS	347	400	87	50-150
Benzo(a)pyrene-D12	LCS	340	400	85	50-150
Bis(2-Chloroethyl)Ether-D8	LCS	238	400	60	50-150
Dimethylphthalate-D6	LCS	324	400	81	50-150
Fluorene-D10	LCS	321	400	80	50-150
Nitrobenzene-D5	LCS	252	400	63	23-130
Phenol-D5	LCS	275	400	69	24-113
Pyrene-D10	LCS	385	400	96	50-150
Terphenyl-D14	LCS	373	400	93	18-137
1,2-Dichlorobenzene-D4	Lab Dup-1	1210	1300	93	20-130
2,4-Dichlorophenol-D3	Lab Dup-1	1150	1300	88	50-150
2-Chlorophenol-D4	Lab Dup-1	1280	1300	98	20-130
2-Fluorobiphenyl	Lab Dup-1	1270	1300	97	30-115
2-Fluorophenol	Lab Dup-1	1180	1300	91	25-121
2-Nitrophenol-D4	Lab Dup-1	1300	1300	100	20-120
4,6-Dinitro-2-methylphenol-D2	Lab Dup-1	918	1300	70	50-150
4-Chloroaniline-D4	Lab Dup-1	114	1300	**9**	20-120
4-Methylphenol-D8	Lab Dup-1	1460	1300	112	50-150
4-Nitrophenol-D4	Lab Dup-1	1160	1300	89	20-120
Acenaphthylene-D8	Lab Dup-1	1190	1300	91	50-150
Anthracene-D10	Lab Dup-1	1230	1300	94	50-150
Benzo(a)pyrene-D12	Lab Dup-1	1110	1300	85	50-150
Bis(2-Chloroethyl)Ether-D8	Lab Dup-1	1150	1300	88	50-150
Dimethylphthalate-D6	Lab Dup-1	1120	1300	86	50-150
Fluorene-D10	Lab Dup-1	1160	1300	89	50-150
Nitrobenzene-D5	Lab Dup-1	1220	1300	93	23-130
Phenol-D5	Lab Dup-1	1350	1300	104	24-113
Pyrene-D10	Lab Dup-1	1510	1300	116	50-150
Terphenyl-D14	Lab Dup-1	1330	1300	102	18-137
1,2-Dichlorobenzene-D4	MS1	482	555	87	20-130
2,4-Dichlorophenol-D3	MS1	509	555	92	50-150
2-Chlorophenol-D4	MS1	489	555	88	20-130
2-Fluorobiphenyl	MS1	536	555	97	30-115

Analyte	Sample ID (PSAMPEW-12-)	Result[1] (ug/Kg,dw)	Spike Level[2] (ug/Kg,dw)	Recovery[3] (%)	Recovery[4] Limits (%)
2-Fluorophenol	MS1	448	555	81	25-121
2-Nitrophenol-D4	MS1	525	555	95	20-120
4,6-Dinitro-2-methylphenol-D2	MS1	511	555	92	50-150
4-Chloroaniline-D4	MS1	439	555	79	20-120
4-Methylphenol-D8	MS1	599	555	108	50-150
4-Nitrophenol-D4	MS1	508	555	92	20-120
Acenaphthylene-D8	MS1	496	555	89	50-150
Anthracene-D10	MS1	531	555	96	50-150
Benzo(a)pyrene-D12	MS1	479	555	86	50-150
Bis(2-Chloroethyl)Ether-D8	MS1	458	555	82	50-150
Dimethylphthalate-D6	MS1	487	555	88	50-150
Fluorene-D10	MS1	504	555	91	50-150
Nitrobenzene-D5	MS1	491	555	89	23-130
Phenol-D5	MS1	537	555	97	24-113
Pyrene-D10	MS1	588	555	106	50-150
Terphenyl-D14	MS1	545	555	98	18-137
1,2-Dichlorobenzene-D4	MSD1	471	542	87	20-130
2,4-Dichlorophenol-D3	MSD1	494	542	91	50-150
2-Chlorophenol-D4	MSD1	481	542	89	20-130
2-Fluorobiphenyl	MSD1	527	542	97	30-115
2-Fluorophenol	MSD1	442	542	82	25-121
2-Nitrophenol-D4	MSD1	517	542	95	20-120
4,6-Dinitro-2-methylphenol-D2	MSD1	509	542	94	50-150
4-Chloroaniline-D4	MSD1	458	542	85	20-120
4-Methylphenol-D8	MSD1	582	542	107	50-150
4-Nitrophenol-D4	MSD1	496	542	92	20-120
Acenaphthylene-D8	MSD1	483	542	89	50-150
Anthracene-D10	MSD1	523	542	96	50-150
Benzo(a)pyrene-D12	MSD1	470	542	87	50-150
Bis(2-Chloroethyl)Ether-D8	MSD1	449	542	83	50-150
Dimethylphthalate-D6	MSD1	471	542	87	50-150
Fluorene-D10	MSD1	490	542	90	50-150
Nitrobenzene-D5	MSD1	483	542	89	23-130
Phenol-D5	MSD1	527	542	97	24-113
Pyrene-D10	MSD1	577	542	106	50-150
Terphenyl-D14	MSD1	533	542	98	18-137

1: Field sample result.
2: Amount spiked into field sample.
3: Spike amount measured in field sample.
4: Method acceptance limits for each analyte.
Bold: Spike recovery outside acceptance limits.

Table B5. Laboratory Quality Control Results for Dioxin and Furans in East Waterway Sediment.

Sample ID	Analysis Date	Analysis	QA[1] Type	Result	Units
1206037-01	09/22/2012	13C-2,3,7,8-TCDD	Spike Sample	89	%
1206037-01	09/22/2012	13C-1,2,3,7,8-PeCDD	Spike Sample	86	%
1206037-01	09/22/2012	13C-1,2,3,4,7,8-HxCDD	Spike Sample	87	%
1206037-01	09/22/2012	13C-1,2,3,6,7,8-HxCDD	Spike Sample	84	%
1206037-01	09/22/2012	13C-1,2,3,4,6,7,8-HpCDD	Spike Sample	90	%
1206037-01	09/22/2012	13C-OCDD	Spike Sample	86	%
1206037-01	09/22/2012	13C-2,3,7,8-TCDF	Spike Sample	82	%
1206037-01	09/22/2012	13C-1,2,3,7,8-PeCDF	Spike Sample	84	%
1206037-01	09/22/2012	13C-2,3,4,7,8-PeCDF	Spike Sample	88	%
1206037-01	09/22/2012	13C-1,2,3,4,7,8-HxCDF	Spike Sample	85	%
1206037-01	09/22/2012	13C-1,2,3,6,7,8-HxCDF	Spike Sample	73	%
1206037-01	09/22/2012	13C-2,3,4,6,7,8-HxCDF	Spike Sample	67	%
1206037-01	09/22/2012	13C-1,2,3,7,8,9-HxCDF	Spike Sample	**34**	%
1206037-01	09/22/2012	13C-1,2,3,4,6,7,8-HpCDF	Spike Sample	88	%
1206037-01	09/22/2012	13C-1,2,3,4,7,8,9-HpCDF	Spike Sample	89	%
1206037-01	09/22/2012	37Cl-2,3,7,8-TCDD	Spike Sample	84	%
1206037-01 DUP	09/22/2012	13C-2,3,7,8-TCDD	Spike Sample	85	%
1206037-01 DUP	09/22/2012	13C-1,2,3,7,8-PeCDD	Spike Sample	80	%
1206037-01 DUP	09/22/2012	13C-1,2,3,4,7,8-HxCDD	Spike Sample	97	%
1206037-01 DUP	09/22/2012	13C-1,2,3,6,7,8-HxCDD	Spike Sample	72	%
1206037-01 DUP	09/22/2012	13C-1,2,3,4,6,7,8-HpCDD	Spike Sample	93	%
1206037-01 DUP	09/22/2012	13C-OCDD	Spike Sample	93	%
1206037-01 DUP	09/22/2012	13C-2,3,7,8-TCDF	Spike Sample	78	%
1206037-01 DUP	09/22/2012	13C-1,2,3,7,8-PeCDF	Spike Sample	79	%
1206037-01 DUP	09/22/2012	13C-2,3,4,7,8-PeCDF	Spike Sample	80	%
1206037-01 DUP	09/22/2012	13C-1,2,3,4,7,8-HxCDF	Spike Sample	96	%
1206037-01 DUP	09/22/2012	13C-1,2,3,6,7,8-HxCDF	Spike Sample	89	%
1206037-01 DUP	09/22/2012	13C-2,3,4,6,7,8-HxCDF	Spike Sample	72	%
1206037-01 DUP	09/22/2012	13C-1,2,3,7,8,9-HxCDF	Spike Sample	56	%
1206037-01 DUP	09/22/2012	13C-1,2,3,4,6,7,8-HpCDF	Spike Sample	92	%
1206037-01 DUP	09/22/2012	13C-1,2,3,4,7,8,9-HpCDF	Spike Sample	91	%
1206037-01 DUP	09/22/2012	37Cl-2,3,7,8-TCDD	Spike Sample	85	%
1206037-02	09/22/2012	13C-2,3,7,8-TCDD	Spike Sample	85	%
1206037-02	09/22/2012	13C-1,2,3,7,8-PeCDD	Spike Sample	82	%
1206037-02	09/22/2012	13C-1,2,3,4,7,8-HxCDD	Spike Sample	90	%
1206037-02	09/22/2012	13C-1,2,3,6,7,8-HxCDD	Spike Sample	84	%
1206037-02	09/22/2012	13C-1,2,3,4,6,7,8-HpCDD	Spike Sample	89	%
1206037-02	09/22/2012	13C-OCDD	Spike Sample	88	%
1206037-02	09/22/2012	13C-2,3,7,8-TCDF	Spike Sample	80	%
1206037-02	09/22/2012	13C-1,2,3,7,8-PeCDF	Spike Sample	83	%

Sample ID	Analysis Date	Analysis	QA[1] Type	Result	Units
1206037-02	09/22/2012	13C-2,3,4,7,8-PeCDF	Spike Sample	87	%
1206037-02	09/22/2012	13C-1,2,3,4,7,8-HxCDF	Spike Sample	89	%
1206037-02	09/22/2012	13C-1,2,3,6,7,8-HxCDF	Spike Sample	87	%
1206037-02	09/22/2012	13C-2,3,4,6,7,8-HxCDF	Spike Sample	81	%
1206037-02	09/22/2012	13C-1,2,3,7,8,9-HxCDF	Spike Sample	82	%
1206037-02	09/22/2012	13C-1,2,3,4,6,7,8-HpCDF	Spike Sample	88	%
1206037-02	09/22/2012	13C-1,2,3,4,7,8,9-HpCDF	Spike Sample	88	%
1206037-02	09/22/2012	37Cl-2,3,7,8-TCDD	Spike Sample	84	%
1206037-03	09/22/2012	13C-2,3,7,8-TCDD	Spike Sample	83	%
1206037-03	09/22/2012	13C-1,2,3,7,8-PeCDD	Spike Sample	77	%
1206037-03	09/22/2012	13C-1,2,3,4,7,8-HxCDD	Spike Sample	118	%
1206037-03	09/22/2012	13C-1,2,3,6,7,8-HxCDD	Spike Sample	79	%
1206037-03	09/22/2012	13C-1,2,3,4,6,7,8-HpCDD	Spike Sample	106	%
1206037-03	09/22/2012	13C-OCDD	Spike Sample	106	%
1206037-03	09/22/2012	13C-2,3,7,8-TCDF	Spike Sample	78	%
1206037-03	09/22/2012	13C-1,2,3,7,8-PeCDF	Spike Sample	75	%
1206037-03	09/22/2012	13C-2,3,4,7,8-PeCDF	Spike Sample	75	%
1206037-03	09/22/2012	13C-1,2,3,4,7,8-HxCDF	Spike Sample	110	%
1206037-03	09/22/2012	13C-1,2,3,6,7,8-HxCDF	Spike Sample	79	%
1206037-03	09/22/2012	13C-2,3,4,6,7,8-HxCDF	Spike Sample	64	%
1206037-03	09/22/2012	13C-1,2,3,7,8,9-HxCDF	Spike Sample	54	%
1206037-03	09/22/2012	13C-1,2,3,4,6,7,8-HpCDF	Spike Sample	98	%
1206037-03	09/22/2012	13C-1,2,3,4,7,8,9-HpCDF	Spike Sample	110	%
1206037-03	09/22/2012	37Cl-2,3,7,8-TCDD	Spike Sample	79	%
1206037-04	09/22/2012	13C-2,3,7,8-TCDD	Spike Sample	52	%
1206037-04	09/22/2012	13C-1,2,3,7,8-PeCDD	Spike Sample	51	%
1206037-04	09/22/2012	13C-1,2,3,4,7,8-HxCDD	Spike Sample	59	%
1206037-04	09/22/2012	13C-1,2,3,6,7,8-HxCDD	Spike Sample	**48**	%
1206037-04	09/22/2012	13C-1,2,3,4,6,7,8-HpCDD	Spike Sample	63	%
1206037-04	09/22/2012	13C-OCDD	Spike Sample	60	%
1206037-04	09/22/2012	13C-2,3,7,8-TCDF	Spike Sample	50	%
1206037-04	09/22/2012	13C-1,2,3,7,8-PeCDF	Spike Sample	**49**	%
1206037-04	09/22/2012	13C-2,3,4,7,8-PeCDF	Spike Sample	50	%
1206037-04	09/22/2012	13C-1,2,3,4,7,8-HxCDF	Spike Sample	62	%
1206037-04	09/22/2012	13C-1,2,3,6,7,8-HxCDF	Spike Sample	54	%
1206037-04	09/22/2012	13C-2,3,4,6,7,8-HxCDF	Spike Sample	**44**	%
1206037-04	09/22/2012	13C-1,2,3,7,8,9-HxCDF	Spike Sample	**36**	%
1206037-04	09/22/2012	13C-1,2,3,4,6,7,8-HpCDF	Spike Sample	59	%
1206037-04	09/22/2012	13C-1,2,3,4,7,8,9-HpCDF	Spike Sample	62	%
1206037-04	09/22/2012	37Cl-2,3,7,8-TCDD	Spike Sample	53	%
1206037-05	09/22/2012	13C-2,3,7,8-TCDD	Spike Sample	80	%

Sample ID	Analysis Date	Analysis	QA[1] Type	Result	Units
1206037-05	09/22/2012	13C-1,2,3,7,8-PeCDD	Spike Sample	86	%
1206037-05	09/22/2012	13C-1,2,3,4,7,8-HxCDD	Spike Sample	85	%
1206037-05	09/22/2012	13C-1,2,3,6,7,8-HxCDD	Spike Sample	87	%
1206037-05	09/22/2012	13C-1,2,3,4,6,7,8-HpCDD	Spike Sample	90	%
1206037-05	09/22/2012	13C-OCDD	Spike Sample	85	%
1206037-05	09/22/2012	13C-2,3,7,8-TCDF	Spike Sample	74	%
1206037-05	09/22/2012	13C-1,2,3,7,8-PeCDF	Spike Sample	86	%
1206037-05	09/22/2012	13C-2,3,4,7,8-PeCDF	Spike Sample	85	%
1206037-05	09/22/2012	13C-1,2,3,4,7,8-HxCDF	Spike Sample	87	%
1206037-05	09/22/2012	13C-1,2,3,6,7,8-HxCDF	Spike Sample	86	%
1206037-05	09/22/2012	13C-2,3,4,6,7,8-HxCDF	Spike Sample	79	%
1206037-05	09/22/2012	13C-1,2,3,7,8,9-HxCDF	Spike Sample	83	%
1206037-05	09/22/2012	13C-1,2,3,4,6,7,8-HpCDF	Spike Sample	86	%
1206037-05	09/22/2012	13C-1,2,3,4,7,8,9-HpCDF	Spike Sample	86	%
1206037-05	09/22/2012	37Cl-2,3,7,8-TCDD	Spike Sample	81	%
1206037-06	09/22/2012	13C-2,3,7,8-TCDD	Spike Sample	68	%
1206037-06	09/22/2012	13C-1,2,3,7,8-PeCDD	Spike Sample	83	%
1206037-06	09/22/2012	13C-1,2,3,4,7,8-HxCDD	Spike Sample	81	%
1206037-06	09/22/2012	13C-1,2,3,6,7,8-HxCDD	Spike Sample	79	%
1206037-06	09/22/2012	13C-1,2,3,4,6,7,8-HpCDD	Spike Sample	84	%
1206037-06	09/22/2012	13C-OCDD	Spike Sample	81	%
1206037-06	09/22/2012	13C-2,3,7,8-TCDF	Spike Sample	73	%
1206037-06	09/22/2012	13C-1,2,3,7,8-PeCDF	Spike Sample	83	%
1206037-06	09/22/2012	13C-2,3,4,7,8-PeCDF	Spike Sample	87	%
1206037-06	09/22/2012	13C-1,2,3,4,7,8-HxCDF	Spike Sample	80	%
1206037-06	09/22/2012	13C-1,2,3,6,7,8-HxCDF	Spike Sample	84	%
1206037-06	09/22/2012	13C-2,3,4,6,7,8-HxCDF	Spike Sample	76	%
1206037-06	09/22/2012	13C-1,2,3,7,8,9-HxCDF	Spike Sample	86	%
1206037-06	09/22/2012	13C-1,2,3,4,6,7,8-HpCDF	Spike Sample	82	%
1206037-06	09/22/2012	13C-1,2,3,4,7,8,9-HpCDF	Spike Sample	84	%
1206037-06	09/22/2012	37Cl-2,3,7,8-TCDD	Spike Sample	74	%
1206037-07	09/25/2012	13C-2,3,7,8-TCDD	Spike Sample	72	%
1206037-07	09/25/2012	13C-1,2,3,7,8-PeCDD	Spike Sample	73	%
1206037-07	09/25/2012	13C-1,2,3,4,7,8-HxCDD	Spike Sample	76	%
1206037-07	09/25/2012	13C-1,2,3,6,7,8-HxCDD	Spike Sample	81	%
1206037-07	09/25/2012	13C-1,2,3,4,6,7,8-HpCDD	Spike Sample	86	%
1206037-07	09/25/2012	13C-OCDD	Spike Sample	81	%
1206037-07	09/25/2012	13C-2,3,7,8-TCDF	Spike Sample	66	%
1206037-07	09/25/2012	13C-1,2,3,7,8-PeCDF	Spike Sample	69	%
1206037-07	09/25/2012	13C-2,3,4,7,8-PeCDF	Spike Sample	76	%
1206037-07	09/25/2012	13C-1,2,3,4,7,8-HxCDF	Spike Sample	78	%

Sample ID	Analysis Date	Analysis	QA[1] Type	Result	Units
1206037-07	09/25/2012	13C-1,2,3,6,7,8-HxCDF	Spike Sample	80	%
1206037-07	09/25/2012	13C-2,3,4,6,7,8-HxCDF	Spike Sample	72	%
1206037-07	09/25/2012	13C-1,2,3,7,8,9-HxCDF	Spike Sample	83	%
1206037-07	09/25/2012	13C-1,2,3,4,6,7,8-HpCDF	Spike Sample	83	%
1206037-07	09/25/2012	13C-1,2,3,4,7,8,9-HpCDF	Spike Sample	82	%
1206037-07	09/25/2012	37Cl-2,3,7,8-TCDD	Spike Sample	78	%
1206037-08	09/21/2012	13C-2,3,7,8-TCDD	Spike Sample	78	%
1206037-08	09/21/2012	13C-1,2,3,7,8-PeCDD	Spike Sample	81	%
1206037-08	09/21/2012	13C-1,2,3,4,7,8-HxCDD	Spike Sample	85	%
1206037-08	09/21/2012	13C-1,2,3,6,7,8-HxCDD	Spike Sample	87	%
1206037-08	09/21/2012	13C-1,2,3,4,6,7,8-HpCDD	Spike Sample	84	%
1206037-08	09/21/2012	13C-OCDD	Spike Sample	76	%
1206037-08	09/21/2012	13C-2,3,7,8-TCDF	Spike Sample	74	%
1206037-08	09/21/2012	13C-1,2,3,7,8-PeCDF	Spike Sample	87	%
1206037-08	09/21/2012	13C-2,3,4,7,8-PeCDF	Spike Sample	84	%
1206037-08	09/21/2012	13C-1,2,3,4,7,8-HxCDF	Spike Sample	84	%
1206037-08	09/21/2012	13C-1,2,3,6,7,8-HxCDF	Spike Sample	84	%
1206037-08	09/21/2012	13C-2,3,4,6,7,8-HxCDF	Spike Sample	78	%
1206037-08	09/21/2012	13C-1,2,3,7,8,9-HxCDF	Spike Sample	80	%
1206037-08	09/21/2012	13C-1,2,3,4,6,7,8-HpCDF	Spike Sample	83	%
1206037-08	09/21/2012	13C-1,2,3,4,7,8,9-HpCDF	Spike Sample	77	%
1206037-08	09/21/2012	37Cl-2,3,7,8-TCDD	Spike Sample	80	%
1206037-10	09/21/2012	13C-2,3,7,8-TCDD	Spike Sample	80	%
1206037-10	09/21/2012	13C-1,2,3,7,8-PeCDD	Spike Sample	79	%
1206037-10	09/21/2012	13C-1,2,3,4,7,8-HxCDD	Spike Sample	85	%
1206037-10	09/21/2012	13C-1,2,3,6,7,8-HxCDD	Spike Sample	85	%
1206037-10	09/21/2012	13C-1,2,3,4,6,7,8-HpCDD	Spike Sample	84	%
1206037-10	09/21/2012	13C-OCDD	Spike Sample	79	%
1206037-10	09/21/2012	13C-2,3,7,8-TCDF	Spike Sample	76	%
1206037-10	09/21/2012	13C-1,2,3,7,8-PeCDF	Spike Sample	80	%
1206037-10	09/21/2012	13C-2,3,4,7,8-PeCDF	Spike Sample	82	%
1206037-10	09/21/2012	13C-1,2,3,4,7,8-HxCDF	Spike Sample	92	%
1206037-10	09/21/2012	13C-1,2,3,6,7,8-HxCDF	Spike Sample	83	%
1206037-10	09/21/2012	13C-2,3,4,6,7,8-HxCDF	Spike Sample	80	%
1206037-10	09/21/2012	13C-1,2,3,7,8,9-HxCDF	Spike Sample	82	%
1206037-10	09/21/2012	13C-1,2,3,4,6,7,8-HpCDF	Spike Sample	87	%
1206037-10	09/21/2012	13C-1,2,3,4,7,8,9-HpCDF	Spike Sample	83	%
1206037-10	09/21/2012	37Cl-2,3,7,8-TCDD	Spike Sample	82	%
1206037-11	09/21/2012	13C-2,3,7,8-TCDD	Spike Sample	82	%
1206037-11	09/21/2012	13C-1,2,3,7,8-PeCDD	Spike Sample	82	%
1206037-11	09/21/2012	13C-1,2,3,4,7,8-HxCDD	Spike Sample	89	%

Sample ID	Analysis Date	Analysis	QA[1] Type	Result	Units
1206037-11	09/21/2012	13C-1,2,3,6,7,8-HxCDD	Spike Sample	82	%
1206037-11	09/21/2012	13C-1,2,3,4,6,7,8-HpCDD	Spike Sample	89	%
1206037-11	09/21/2012	13C-OCDD	Spike Sample	91	%
1206037-11	09/21/2012	13C-2,3,7,8-TCDF	Spike Sample	78	%
1206037-11	09/21/2012	13C-1,2,3,7,8-PeCDF	Spike Sample	88	%
1206037-11	09/21/2012	13C-2,3,4,7,8-PeCDF	Spike Sample	87	%
1206037-11	09/21/2012	13C-1,2,3,4,7,8-HxCDF	Spike Sample	86	%
1206037-11	09/21/2012	13C-1,2,3,6,7,8-HxCDF	Spike Sample	87	%
1206037-11	09/21/2012	13C-2,3,4,6,7,8-HxCDF	Spike Sample	80	%
1206037-11	09/21/2012	13C-1,2,3,7,8,9-HxCDF	Spike Sample	86	%
1206037-11	09/21/2012	13C-1,2,3,4,6,7,8-HpCDF	Spike Sample	89	%
1206037-11	09/21/2012	13C-1,2,3,4,7,8,9-HpCDF	Spike Sample	87	%
1206037-11	09/21/2012	37Cl-2,3,7,8-TCDD	Spike Sample	81	%
1206037-12	09/21/2012	13C-2,3,7,8-TCDD	Spike Sample	87	%
1206037-12	09/21/2012	13C-1,2,3,7,8-PeCDD	Spike Sample	79	%
1206037-12	09/21/2012	13C-1,2,3,4,7,8-HxCDD	Spike Sample	100	%
1206037-12	09/21/2012	13C-1,2,3,6,7,8-HxCDD	Spike Sample	79	%
1206037-12	09/21/2012	13C-1,2,3,4,6,7,8-HpCDD	Spike Sample	93	%
1206037-12	09/21/2012	13C-OCDD	Spike Sample	95	%
1206037-12	09/21/2012	13C-2,3,7,8-TCDF	Spike Sample	83	%
1206037-12	09/21/2012	13C-1,2,3,7,8-PeCDF	Spike Sample	80	%
1206037-12	09/21/2012	13C-2,3,4,7,8-PeCDF	Spike Sample	78	%
1206037-12	09/21/2012	13C-1,2,3,4,7,8-HxCDF	Spike Sample	90	%
1206037-12	09/21/2012	13C-1,2,3,6,7,8-HxCDF	Spike Sample	87	%
1206037-12	09/21/2012	13C-2,3,4,6,7,8-HxCDF	Spike Sample	81	%
1206037-12	09/21/2012	13C-1,2,3,7,8,9-HxCDF	Spike Sample	65	%
1206037-12	09/21/2012	13C-1,2,3,4,6,7,8-HpCDF	Spike Sample	90	%
1206037-12	09/21/2012	13C-1,2,3,4,7,8,9-HpCDF	Spike Sample	91	%
1206037-12	09/21/2012	37Cl-2,3,7,8-TCDD	Spike Sample	83	%
NIST SRM 1944	10/01/2012	13C-2,3,7,8-TCDD	SRM	85	%
NIST SRM 1944	10/01/2012	13C-1,2,3,7,8-PeCDD	SRM	80	%
NIST SRM 1944	10/01/2012	13C-1,2,3,4,7,8-HxCDD	SRM	95	%
NIST SRM 1944	10/01/2012	13C-1,2,3,6,7,8-HxCDD	SRM	79	%
NIST SRM 1944	10/01/2012	13C-1,2,3,4,6,7,8-HpCDD	SRM	98	%
NIST SRM 1944	10/01/2012	13C-OCDD	SRM	103	%
NIST SRM 1944	10/01/2012	13C-2,3,7,8-TCDF	SRM	83	%
NIST SRM 1944	10/01/2012	13C-1,2,3,7,8-PeCDF	SRM	80	%
NIST SRM 1944	10/01/2012	13C-2,3,4,7,8-PeCDF	SRM	81	%
NIST SRM 1944	10/01/2012	13C-1,2,3,4,7,8-HxCDF	SRM	98	%
NIST SRM 1944	10/01/2012	13C-1,2,3,6,7,8-HxCDF	SRM	73	%
NIST SRM 1944	10/01/2012	13C-2,3,4,6,7,8-HxCDF	SRM	73	%

Sample ID	Analysis Date	Analysis	QA[1] Type	Result	Units
NIST SRM 1944	10/01/2012	13C-1,2,3,7,8,9-HxCDF	SRM	53	%
NIST SRM 1944	10/01/2012	13C-1,2,3,4,6,7,8-HpCDF	SRM	96	%
NIST SRM 1944	10/01/2012	13C-1,2,3,4,7,8,9-HpCDF	SRM	104	%
NIST SRM 1944	10/01/2012	37Cl-2,3,7,8-TCDD	SRM	82	%
MB	09/22/2012	13C-2,3,7,8-TCDD	Spike Blank	78	%
MB	09/22/2012	13C-1,2,3,7,8-PeCDD	Spike Blank	78	%
MB	09/22/2012	13C-1,2,3,4,7,8-HxCDD	Spike Blank	76	%
MB	09/22/2012	13C-1,2,3,6,7,8-HxCDD	Spike Blank	91	%
MB	09/22/2012	13C-1,2,3,4,6,7,8-HpCDD	Spike Blank	80	%
MB	09/22/2012	13C-OCDD	Spike Blank	73	%
MB	09/22/2012	13C-2,3,7,8-TCDF	Spike Blank	79	%
MB	09/22/2012	13C-1,2,3,7,8-PeCDF	Spike Blank	81	%
MB	09/22/2012	13C-2,3,4,7,8-PeCDF	Spike Blank	88	%
MB	09/22/2012	13C-1,2,3,4,7,8-HxCDF	Spike Blank	81	%
MB	09/22/2012	13C-1,2,3,6,7,8-HxCDF	Spike Blank	89	%
MB	09/22/2012	13C-2,3,4,6,7,8-HxCDF	Spike Blank	80	%
MB	09/22/2012	13C-1,2,3,7,8,9-HxCDF	Spike Blank	84	%
MB	09/22/2012	13C-1,2,3,4,6,7,8-HpCDF	Spike Blank	83	%
MB	09/22/2012	13C-1,2,3,4,7,8,9-HpCDF	Spike Blank	78	%
MB	09/22/2012	37Cl-2,3,7,8-TCDD	Spike Blank	76	%
LCS	09/22/2012	2,3,7,8-TCDD	Spike Sample	98	%
LCS	09/22/2012	1,2,3,7,8-PeCDD	Spike Sample	102	%
LCS	09/22/2012	1,2,3,4,7,8-HxCDD	Spike Sample	105	%
LCS	09/22/2012	1,2,3,6,7,8-HxCDD	Spike Sample	100	%
LCS	09/22/2012	1,2,3,7,8,9-HxCDD	Spike Sample	103	%
LCS	09/22/2012	1,2,3,4,6,7,8-HpCDD	Spike Sample	103	%
LCS	09/22/2012	1,2,3,4,6,7,8,9-OCDD	Spike Sample	98	%
LCS	09/22/2012	2,3,7,8-TCDF	Spike Sample	103	%
LCS	09/22/2012	1,2,3,7,8-PeCDF	Spike Sample	104	%
LCS	09/22/2012	2,3,4,7,8-PeCDF	Spike Sample	105	%
LCS	09/22/2012	1,2,3,4,7,8-HxCDF	Spike Sample	104	%
LCS	09/22/2012	1,2,3,6,7,8-HxCDF	Spike Sample	104	%
LCS	09/22/2012	2,3,4,6,7,8-HxCDF	Spike Sample	113	%
LCS	09/22/2012	1,2,3,7,8,9-HxCDF	Spike Sample	101	%
LCS	09/22/2012	1,2,3,4,6,7,8-HpCDF	Spike Sample	103	%
LCS	09/22/2012	1,2,3,4,7,8,9-HpCDF	Spike Sample	101	%
LCS	09/22/2012	1,2,3,4,6,7,8,9-OCDF	Spike Sample	106	%
LCS	09/22/2012	13C-2,3,7,8-TCDD	Spike Sample	80	%
LCS	09/22/2012	13C-1,2,3,7,8-PeCDD	Spike Sample	82	%
LCS	09/22/2012	13C-1,2,3,4,7,8-HxCDD	Spike Sample	80	%
LCS	09/22/2012	13C-1,2,3,6,7,8-HxCDD	Spike Sample	92	%

Sample ID	Analysis Date	Analysis	QA[1] Type	Result	Units
LCS	09/22/2012	13C-1,2,3,4,6,7,8-HpCDD	Spike Sample	85	%
LCS	09/22/2012	13C-OCDD	Spike Sample	83	%
LCS	09/22/2012	13C-2,3,7,8-TCDF	Spike Sample	78	%
LCS	09/22/2012	13C-1,2,3,7,8-PeCDF	Spike Sample	82	%
LCS	09/22/2012	13C-2,3,4,7,8-PeCDF	Spike Sample	90	%
LCS	09/22/2012	13C-1,2,3,4,7,8-HxCDF	Spike Sample	83	%
LCS	09/22/2012	13C-1,2,3,6,7,8-HxCDF	Spike Sample	89	%
LCS	09/22/2012	13C-2,3,4,6,7,8-HxCDF	Spike Sample	79	%
LCS	09/22/2012	13C-1,2,3,7,8,9-HxCDF	Spike Sample	85	%
LCS	09/22/2012	13C-1,2,3,4,6,7,8-HpCDF	Spike Sample	86	%
LCS	09/22/2012	13C-1,2,3,4,7,8,9-HpCDF	Spike Sample	86	%
LCS	09/22/2012	37Cl-2,3,7,8-TCDD	Spike Sample	77	%
LCSD	09/22/2012	2,3,7,8-TCDD	Spike Sample	97	%
LCSD	09/22/2012	1,2,3,7,8-PeCDD	Spike Sample	105	%
LCSD	09/22/2012	1,2,3,4,7,8-HxCDD	Spike Sample	106	%
LCSD	09/22/2012	1,2,3,6,7,8-HxCDD	Spike Sample	104	%
LCSD	09/22/2012	1,2,3,7,8,9-HxCDD	Spike Sample	112	%
LCSD	09/22/2012	1,2,3,4,6,7,8-HpCDD	Spike Sample	102	%
LCSD	09/22/2012	1,2,3,4,6,7,8,9-OCDD	Spike Sample	100	%
LCSD	09/22/2012	2,3,7,8-TCDF	Spike Sample	107	%
LCSD	09/22/2012	1,2,3,7,8-PeCDF	Spike Sample	106	%
LCSD	09/22/2012	2,3,4,7,8-PeCDF	Spike Sample	103	%
LCSD	09/22/2012	1,2,3,4,7,8-HxCDF	Spike Sample	106	%
LCSD	09/22/2012	1,2,3,6,7,8-HxCDF	Spike Sample	108	%
LCSD	09/22/2012	2,3,4,6,7,8-HxCDF	Spike Sample	111	%
LCSD	09/22/2012	1,2,3,7,8,9-HxCDF	Spike Sample	102	%
LCSD	09/22/2012	1,2,3,4,6,7,8-HpCDF	Spike Sample	110	%
LCSD	09/22/2012	1,2,3,4,7,8,9-HpCDF	Spike Sample	106	%
LCSD	09/22/2012	1,2,3,4,6,7,8,9-OCDF	Spike Sample	106	%
LCSD	09/22/2012	13C-2,3,7,8-TCDD	Spike Sample	76	%
LCSD	09/22/2012	13C-1,2,3,7,8-PeCDD	Spike Sample	77	%
LCSD	09/22/2012	13C-1,2,3,4,7,8-HxCDD	Spike Sample	73	%
LCSD	09/22/2012	13C-1,2,3,6,7,8-HxCDD	Spike Sample	84	%
LCSD	09/22/2012	13C-1,2,3,4,6,7,8-HpCDD	Spike Sample	80	%
LCSD	09/22/2012	13C-OCDD	Spike Sample	72	%
LCSD	09/22/2012	13C-2,3,7,8-TCDF	Spike Sample	75	%
LCSD	09/22/2012	13C-1,2,3,7,8-PeCDF	Spike Sample	79	%
LCSD	09/22/2012	13C-2,3,4,7,8-PeCDF	Spike Sample	87	%
LCSD	09/22/2012	13C-1,2,3,4,7,8-HxCDF	Spike Sample	75	%
LCSD	09/22/2012	13C-1,2,3,6,7,8-HxCDF	Spike Sample	82	%
LCSD	09/22/2012	13C-2,3,4,6,7,8-HxCDF	Spike Sample	75	%

Sample ID	Analysis Date	Analysis	QA[1] Type	Result	Units
LCSD	09/22/2012	13C-1,2,3,7,8,9-HxCDF	Spike Sample	80	%
LCSD	09/22/2012	13C-1,2,3,4,6,7,8-HpCDF	Spike Sample	78	%
LCSD	09/22/2012	13C-1,2,3,4,7,8,9-HpCDF	Spike Sample	77	%
LCSD	09/22/2012	37Cl-2,3,7,8-TCDD	Spike Sample	74	%
1206037-02MS	09/22/2012	2,3,7,8-TCDD	Matrix Spike	97	%
1206037-02MS	09/22/2012	1,2,3,7,8-PeCDD	Matrix Spike	102	%
1206037-02MS	09/22/2012	1,2,3,4,7,8-HxCDD	Matrix Spike	101	%
1206037-02MS	09/22/2012	1,2,3,6,7,8-HxCDD	Matrix Spike	101	%
1206037-02MS	09/22/2012	1,2,3,7,8,9-HxCDD	Matrix Spike	112	%
1206037-02MS	09/22/2012	1,2,3,4,6,7,8-HpCDD	Matrix Spike	**30**	%
1206037-02MS	09/22/2012	1,2,3,4,6,7,8,9-OCDD	Matrix Spike	**-431**	%
1206037-02MS	09/22/2012	2,3,7,8-TCDF	Matrix Spike	99	%
1206037-02MS	09/29/2012	2,3,7,8-TCDF	Matrix Spike	96	%
1206037-02MS	09/22/2012	1,2,3,7,8-PeCDF	Matrix Spike	104	%
1206037-02MS	09/22/2012	2,3,4,7,8-PeCDF	Matrix Spike	101	%
1206037-02MS	09/22/2012	1,2,3,4,7,8-HxCDF	Matrix Spike	110	%
1206037-02MS	09/22/2012	1,2,3,6,7,8-HxCDF	Matrix Spike	97	%
1206037-02MS	09/22/2012	2,3,4,6,7,8-HxCDF	Matrix Spike	108	%
1206037-02MS	09/22/2012	1,2,3,7,8,9-HxCDF	Matrix Spike	96	%
1206037-02MS	09/22/2012	1,2,3,4,6,7,8-HpCDF	Matrix Spike	90	%
1206037-02MS	09/22/2012	1,2,3,4,7,8,9-HpCDF	Matrix Spike	102	%
1206037-02MS	09/22/2012	1,2,3,4,6,7,8,9-OCDF	Matrix Spike	72	%
1206037-02MS	09/22/2012	13C-2,3,7,8-TCDD	Matrix Spike	83	%
1206037-02MS	09/22/2012	13C-1,2,3,7,8-PeCDD	Matrix Spike	80	%
1206037-02MS	09/22/2012	13C-1,2,3,4,7,8-HxCDD	Matrix Spike	89	%
1206037-02MS	09/22/2012	13C-1,2,3,6,7,8-HxCDD	Matrix Spike	68	%
1206037-02MS	09/22/2012	13C-1,2,3,4,6,7,8-HpCDD	Matrix Spike	88	%
1206037-02MS	09/22/2012	13C-OCDD	Matrix Spike	84	%
1206037-02MS	09/22/2012	13C-2,3,7,8-TCDF	Matrix Spike	76	%
1206037-02MS	09/22/2012	13C-1,2,3,7,8-PeCDF	Matrix Spike	79	%
1206037-02MS	09/22/2012	13C-2,3,4,7,8-PeCDF	Matrix Spike	82	%
1206037-02MS	09/22/2012	13C-1,2,3,4,7,8-HxCDF	Matrix Spike	91	%
1206037-02MS	09/22/2012	13C-1,2,3,6,7,8-HxCDF	Matrix Spike	67	%
1206037-02MS	09/22/2012	13C-2,3,4,6,7,8-HxCDF	Matrix Spike	62	%
1206037-02MS	09/22/2012	13C-1,2,3,7,8,9-HxCDF	Matrix Spike	**32**	%
1206037-02MS	09/22/2012	13C-1,2,3,4,6,7,8-HpCDF	Matrix Spike	89	%
1206037-02MS	09/22/2012	13C-1,2,3,4,7,8,9-HpCDF	Matrix Spike	90	%
1206037-02MS	09/22/2012	37Cl-2,3,7,8-TCDD	Matrix Spike	84	%
1206037-02MSD	09/22/2012	2,3,7,8-TCDD	Matrix Spike	103	%
1206037-02MSD	09/22/2012	1,2,3,7,8-PeCDD	Matrix Spike	109	%
1206037-02MSD	09/22/2012	1,2,3,4,7,8-HxCDD	Matrix Spike	110	%

Sample ID	Analysis Date	Analysis	QA[1] Type	Result	Units
1206037-02MSD	09/22/2012	1,2,3,6,7,8-HxCDD	Matrix Spike	109	%
1206037-02MSD	09/22/2012	1,2,3,7,8,9-HxCDD	Matrix Spike	117	%
1206037-02MSD	09/22/2012	1,2,3,4,6,7,8-HpCDD	Matrix Spike	**35**	%
1206037-02MSD	09/22/2012	1,2,3,4,6,7,8,9-OCDD	Matrix Spike	**-429**	%
1206037-02MSD	09/22/2012	2,3,7,8-TCDF	Matrix Spike	109	%
1206037-02MSD	09/29/2012	2,3,7,8-TCDF	Matrix Spike	101	%
1206037-02MSD	09/22/2012	1,2,3,7,8-PeCDF	Matrix Spike	113	%
1206037-02MSD	09/22/2012	2,3,4,7,8-PeCDF	Matrix Spike	109	%
1206037-02MSD	09/22/2012	1,2,3,4,7,8-HxCDF	Matrix Spike	110	%
1206037-02MSD	09/22/2012	1,2,3,6,7,8-HxCDF	Matrix Spike	110	%
1206037-02MSD	09/22/2012	2,3,4,6,7,8-HxCDF	Matrix Spike	116	%
1206037-02MSD	09/22/2012	1,2,3,7,8,9-HxCDF	Matrix Spike	105	%
1206037-02MSD	09/22/2012	1,2,3,4,6,7,8-HpCDF	Matrix Spike	103	%
1206037-02MSD	09/22/2012	1,2,3,4,7,8,9-HpCDF	Matrix Spike	111	%
1206037-02MSD	09/22/2012	1,2,3,4,6,7,8,9-OCDF	Matrix Spike	78	%
1206037-02MSD	09/22/2012	13C-2,3,7,8-TCDD	Matrix Spike	71	%
1206037-02MSD	09/22/2012	13C-1,2,3,7,8-PeCDD	Matrix Spike	72	%
1206037-02MSD	09/22/2012	13C-1,2,3,4,7,8-HxCDD	Matrix Spike	79	%
1206037-02MSD	09/22/2012	13C-1,2,3,6,7,8-HxCDD	Matrix Spike	69	%
1206037-02MSD	09/22/2012	13C-1,2,3,4,6,7,8-HpCDD	Matrix Spike	77	%
1206037-02MSD	09/22/2012	13C-OCDD	Matrix Spike	73	%
1206037-02MSD	09/22/2012	13C-2,3,7,8-TCDF	Matrix Spike	67	%
1206037-02MSD	09/22/2012	13C-1,2,3,7,8-PeCDF	Matrix Spike	72	%
1206037-02MSD	09/22/2012	13C-2,3,4,7,8-PeCDF	Matrix Spike	74	%
1206037-02MSD	09/22/2012	13C-1,2,3,4,7,8-HxCDF	Matrix Spike	76	%
1206037-02MSD	09/22/2012	13C-1,2,3,6,7,8-HxCDF	Matrix Spike	73	%
1206037-02MSD	09/22/2012	13C-2,3,4,6,7,8-HxCDF	Matrix Spike	70	%
1206037-02MSD	09/22/2012	13C-1,2,3,7,8,9-HxCDF	Matrix Spike	70	%
1206037-02MSD	09/22/2012	13C-1,2,3,4,6,7,8-HpCDF	Matrix Spike	74	%
1206037-02MSD	09/22/2012	13C-1,2,3,4,7,8,9-HpCDF	Matrix Spike	76	%
1206037-02MSD	09/22/2012	37Cl-2,3,7,8-TCDD	Matrix Spike	80	%

1: Quality assurance

Appendix C: Glossary, Acronyms, and Abbreviations

Glossary

Aroclor: The registered trademark for a group of polychlorinated biphenyls (PCBs) that were manufactured by the Monsanto Company before 1976.

Dioxins and furans: Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans.

Fines: The total of percent silts plus clays in a grain size analysis.

Grain size: Also known as "particle size analysis". A test to measure size distribution of soil or sediment particles using sieves with standardized screen sizes.

Parameter: Water quality constituent being measured (analyte). A physical, chemical, or biological property whose values determine environmental characteristics or behavior.

Sediment: Solid fragmented material (soil and organic matter) that is transported and deposited by water and covered with water (example, river or lake bottom).

Toxic equivalent factor (TEF): The toxic equivalent factor of individual congeners compared to 2,3,7,8-TCDD as a decimal.

Toxic equivalent quotient (TEQ): Toxic equivalency to 2,3,7,8-TCDD. The total of all TEF normalized dioxin congeners in a sample. Allows comparison to the dioxin criterion for 2,3,7,8-TCDD.

Acronyms and Abbreviations

Ecology	Washington State Department of Ecology
EIM	Environmental Information Management database
EPA	U.S. Environmental Protection Agency
MEL	Manchester Environmental Laboratory
MS	matrix spike
MSD	matrix spike duplicate
PCB	polychlorinated biphenyls
RPD	Relative percent difference
SMS	Sediment Management Standards
SQS	Sediment Quality Standards
CSL	Cleanup Screening Levels
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TEF	(See Glossary above)
TEQ	(See Glossary above)
TOC	Total organic carbon
TVS	Total volatile solids
WAC	Washington Administrative Code

Units of Measurement

°C	degrees centigrade
dw	dry weight
ft	feet
g	gram, a unit of mass
kg	kilograms, a unit of mass equal to 1,000 grams
mg	milligram
mg/Kg	milligrams per kilogram (parts per million)
mL	milliliters
ng/Kg	nanograms per kilogram (parts per trillion)
ug/Kg	micrograms per kilogram (parts per billion)
um	micrometer