DMR-0601

DMR

Dinnel Marine Resources

QUALITY ASSURANCE EVALUATIONS OF BIOACCUMULATION TESTING OF PORTLAND HARBOR SEDIMENTS USING THE OLIGOCHAETE *LUMBRICULUS VARIEGATUS* AND THE FRESHWATER CLAM *CORBICULA FLUMINEA*

Draft Final Report
22 June 2006

For

Windward Environmental LLC
Seattle, Washington

Prepared By

Dinnel Marine Resources
Anacortes, WA

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1.0 INTRODUCTION

Northwestern Aquatic Sciences (NAS) was the testing laboratory contracted to conduct bioaccumulation testing of sediments collected for the Portland Harbor RI/FS Round 2 Project. NAS conducted the 28-day freshwater clam (*Corbicula fluminea*) and 28-day freshwater oligochaete (*Lumbriculus variegatus*) bioaccumulation tests of the Portland Harbor sediment samples collected in late 2005. NAS is a State of Washington accredited laboratory (Lab accreditation ID number C1238, expiration: 30 September 2006) and is certified to perform both the *Corbicula* and *Lumbriculus* bioaccumulation tests of sediments. A copy of NAS' accreditation certificate and Scope of Accreditation appears in Appendix 1. There is no similar certification program in the State of Oregon.

This report summarizes the Quality Assurance/Quality Control (QA/QC) evaluations of the 28-day freshwater clam (*Corbicula fluminea*) and 28-day freshwater oligochaete (*Lumbriculus variegatus*) bioaccumulation tests conducted by NAS. Thirty five sediment samples were tested by NAS with both test organisms. Testing was conducted in two batches between December 2005 and March 2006.

The QA steps taken to ensure high quality data and maximum data completeness before, during and after this round of testing are described in this report. Major QA tasks by Dinnel Marine Resources (DMR) included the following:

- A pre-test review of NAS' bioaccumulation test protocols
- Pre-test coordination with NAS and Windward Environmental
- Two test-in-progress audits
- An initial evaluation of all data for completeness, correct data entries, and accurate transcription to electronic formats
- A final QA evaluation of overall data quality and usability (this report).

2.0 QUALITY ASSURANCE AUDIT RESULTS

2.1 REVIEW OF LABORATORY PROTOCOLS

EPA test methods (EPA 1998 and 2000), ASTM Standard Testing Guide E1688-97a (ASTM 1997) and NAS' laboratory test protocols (NAS-XXX-CF5, Rev. 4 and NAS-XXX-LV5, Rev. 2) for the *Corbicula* and *Lumbriculus* tests were reviewed in detail prior to the initiation of testing. NAS' protocols were in excellent condition, and no changes were needed other than two protocol

clarifications and the clarification of some project-specific provisions specified by Windward Environmental (2005). A letter requesting these clarifications was sent to NAS by DMR on 5 December 2005. NAS' responses to this letter were sent to DMR on 8 December 2005. Copies of both letters appear in Appendix 2.

2.2 TEST-IN-PROGRESS AUDITS

Two unannounced test-in-progress audits, one for each batch of testing, were conducted by Dr. Paul Dinnel on 19 December 2005 and 10 February 2006. During the first audit visit, one test (*Corbicula*) was being set up on the day of the audit visit. DMR requested that additional audit information for that one test be collected by the NAS' project lead at a later date. All EPA, ASTM and project-specific protocol provisions were being followed without any apparent deviations except that the ambient light intensities were below protocol recommendations for all of the *Corbicula* test tanks and many of the *Lumbriculus* tanks. Completed test-in-progress audit checklists for the *Corbicula* and *Lumbriculus* bioaccumulation tests appear in Appendix 3.

2.3 INITIAL DATA EVALUATIONS

All raw data forms and electronic database files were reviewed for completeness and fidelity of transcription to electronic formats. A 100% check was made of all data entered into NAS' internal electronic database. All errors, omissions, clarifications, or changes needed to NAS' draft report were documented and communicated to NAS. A copy of the initial data evaluation report to NAS appears in Appendix 4. All needed corrections to the data reports were made by NAS and subsequently verified by DMR.

EPA (1998 and 2000) and ASTM (1997) testing parameters were used for QA assessments of the sediment tests. These values are summarized in Table 1 for the *Corbiucula* and *Lumbriculus* tests.

2.4 FINAL QA EVALUATION OF OVERALL DATA QUALITY AND USABILITY

Following corrections to the data reports by NAS personnel, a 100% check was made to verify each correction. Following this, an overall evaluation of data completeness and quality was accomplished (this report). Conclusions regarding dara completeness and quality for each test follow below. These conclusions are summarized in Tables 2-5.

2.4.1 Chain of Custody and Sample Holding

All chain of custody protocols were properly observed in transfers of sediment samples from Windward Environmental to NAS. The test and control sediments were stored at 4° C in a locked cold room until testing was initiated.

Table 1. EPA (1998 and 2000) and ASTM (1997) testing parameters for the *Corbicula* and *Lumbriculus* bioaccumulation tests.

Parameter	*Corbicula*	*Lumbriculus*
Temperature, °C	19 - 21	22 - 24
Dissolved oxygen, mg/liter	>2.5	>2.5
Light intensity, foot candles	50 – 100	50 – 100
Photoperiod	16L:8D	16L:8D

2.4.2 *Lumbriculus* Test No. 686-26

1. A *Lumbriculus variegatus* bioaccumulation test was conducted on 17 Portland Harbor sediment samples. A negative control sediment was run concurrently with the Portland Harbor test sediments.

2. Testing was initiated within 10 days following sediment collection, which was within the 14 day storage limit recommended for sediments by PSEP (1995) and well within the 8 week limit recommended by EPA (2000) and the PSDDA (1994) Program (although these limits were generally established for toxicity testing, not bioaccumulation testing).

3. This test was completed with two protocol deviations and one water quality deviation. The protocol deviations were: 1) the pre-test holding time for *Lumbriculus* was less than 24 hours for two of the test sediments and 2) the light intensity was less than the 50-100 foot candle range recommended by the protocol. The test animal holding time (used to cull out animals adversely affected by shipping and handling) deviation had no apparent effect on the test results since 4-day survival in the initial toxicity screening tests was ≥95% for all test sediments. The light intensity deviation also had little probable effect on the test results. Lighting is generally used to encourage test animal burial in the sediments. Audit observations of this test showed that almost all animals were buried in the sediments.

   The water quality deviation was that on day 6 the water temperature in one test aquarium was 0.1 °C higher than the protocol limit. The effect of this short term deviation is considered inconsequential to the test results.

4. A preliminary 4-day toxicity screening test was conducted on the test sediments prior to bioaccumulation testing to eliminate any sediment samples that were acutely toxic to *Lumbriculus*. Four-day survival in the negative control sediment was 100%. Survival in all

test sediments was ≥95%. A reference toxicant test using potassium chloride as the toxicant resulted in an LC50 of 0.707 g/liter KCl. This value was within NAS' control chart warning limits for this species and toxicant.

5. The maximum ammonia concentration measured in the overlying water during this test in any one sample was 3.5 mg/liter total ammonia. Neither EPA (2000) or ASTM (1997) provide any limits for ammonia. However, one study by Schubauer-Berigan et al. (1995) determined that the LC50 of total ammonia for *Lumbriculus* was 75 mg/liter at a pH of 7.2. Additionally, given that the 4-day test animal survivals in the initial toxicity screening test were all ≥95%, ammonia had no apparent effect on the test results.

6. Replication was three-fold for all samples. However, test animals from each of the three replicates were all composited into one sample for tissue analyses per the instructions of the study sponsor.

7. Data completeness for the 17 (plus 1 control) samples tested with *Lumbriculus* was >99%.

8. **Final QA determination:** All test results are of excellent quality and fully usable for any purpose.

Table 2. Summary of *Lumbriculus* Test No. 686-26.

Lumbriculus variegatus, 14 December 2005 to 18 January 2006:

Number of test samples, including control sediment: 18

Sediment holding time <8 weeks?: Yes

Protocol deviations?: Yes. A minor deviation on test animal holding time for two sediments and light intensities less than recommended by the protocol. Both deviations are considered minor and probably did not affect bioaccumulation rates of potential chemical contaminants.

Average negative control mortality in the 4-day screening test: 0%

Average mortality in the test sediments in the 4-day screening test: ≤5%

Reference toxicant LC50: 0.707 g/liter potassium chloride. This value is within NAS' control chart warning limits.

Water quality parameter deviations?: One. Temperature in one test tank on day 6 of testing was 0.1 °C higher than the protocol limit. This deviation is very minor and likely had no effect on the test results.

Ammonia concentrations < critical limits?: Probably, since 4-day survivals in the toxicity screening test were all ≥95% and ammonia concentrations were well below the published LC50 value of 75 mg/liter (pH 6.2).

QA reviewer conclusion: All data are of excellent quality and fully usable for any purpose.

2.4.3 *Lumbriculus* Test No. 686-29

1. A *Lumbriculus variegatus* bioaccumulation test was conducted on 18 Portland Harbor sediment samples. A negative control sediment was run concurrently with the Portland Harbor test sediments.

2. Testing was initiated within 52 days following sediment collection, which was beyond the 14 day storage limit recommended for sediments by PSEP (1995) but within the 8 week limit recommended by EPA (2000) and the PSDDA (1994) Program (although these limits were generally established for toxicity testing, not bioaccumulation testing).

3. This test was completed with no protocol deviations and one water quality deviation. The water quality deviation was that on day 18 the water temperature in one test aquarium was 0.1 °C higher than the protocol limit. The effect of this short term deviation is considered inconsequential to the test results.

4. A preliminary 4-day toxicity screening test was conducted on the test sediments prior to bioaccumulation testing to eliminate any sediment samples that were acutely toxic to *Lumbriculus*. Four-day survival in the negative control sediment was 100%. Survival in all test sediments was ≥95%. A reference toxicant test using potassium chloride as the toxicant resulted in an LC50 of 0.707 g/liter KCl. This value was within NAS' control chart warning limits for this species and toxicant.

5. The maximum ammonia concentration measured in the overlying water during this test in any one sample was 3.0 mg/liter total ammonia. Neither EPA (2000) or ASTM (1997) provide any limits for ammonia. However, one study by Schubauer-Berigan et al. (1995) determined that the LC50 of total ammonia for *Lumbriculus* was 75 mg/liter at a pH of 7.2. Additionally, given that the 4-day test animal survivals in the initial toxicity screening test were all ≥95%, ammonia had no apparent effect on the test results.

6. Replication was three-fold for all samples. However, test animals from each of the three replicates were all composited into one sample for tissue analyses per the instructions of the study sponsor.

7. Data completeness for the 18 (plus 1 control) samples tested with *Lumbriculus* was >99%.

8. **Final QA determination:** All test results are of excellent quality and fully usable for any purpose.

Table 3. Summary of *Lumbriculus* Test No. 686-29.

Lumbriculus variegatus, 1 February through 9 March 2006:

Number of test samples, including control sediment: 19
Sediment holding time <8 weeks?: Yes
Protocol deviations?: No.
Average negative control mortality in the 4-day screening test: 0%
Average mortality in the test sediments in the 4-day screening test: ≤5%
Reference toxicant LC50: 0.707 g/liter potassium chloride. This value is within NAS' control chart warning limits.
Water quality parameter deviations?: One. Temperature in one test tank on Day 18 of testing was 0.1 °C higher than the protocol limit. This deviation is very minor and likely had no effect on the test results.
Ammonia concentrations < critical limits?: Probably, since 4-day survivals in the screening test were all ≥95 % and ammonia concentrations were well below the published LC50 value of 75 mg/liter (pH 6.2).

QA reviewer conclusion: All data are of excellent quality and fully usable for any purpose.

2.4.4 *Corbicula* Test No. 686-27

1. A *Corbicula fluminea* bioaccumulation test was conducted on 17 Portland Harbor sediment samples. A negative control sediment was run concurrently with the Portland Harbor test sediments.

2. Testing was initiated within 16 days following sediment collection, which was slightly beyond the 14 day storage limit recommended for sediments by PSEP (1995) but within the 8 week limit recommended by EPA (2000) and the PSDDA (1994) Program (although these limits were generally established for toxicity testing, not bioaccumulation testing).

3. This test was completed with one protocol deviation and one water quality deviation. The protocol deviation was that light intensity was less than the recommended 50 to 100 foot candles. The light intensity deviation probably had little effect on the test results. Lighting is generally used to encourage test animal burial in the sediments. Audit observations of this test showed that almost all animals were buried in the sediments.

   The water quality deviation was that on days 13, 14 and 24, the water temperature in all test aquaria was as much as 1.5 °C lower than the protocol limit. The effect of these temperature deviations is considered minor, although the feeding rates of *Corbicula* could have been slightly lower than normal on those days, which might have slightly retarded the bioaccumulation of potential chemical contaminants.

5. The maximum ammonia concentration measured in the overlying water during this test in any one sample was 1.2 mg/liter total ammonia. Neither EPA (2000) or ASTM (1997) provide any limits for ammonia for *Corbicula*. However, overall 28-day survival of *Corbicula* in the test sediments was >97% for all test sediments. Thus, it is unlikely that there were any significant effects of ammonia in this test.

6. Replication was three-fold for all samples. However, test animals from each of the three replicates were all composited into one sample for tissue analyses per the instructions of the study sponsor.

7. Data completeness for the 17 (plus 1 control) samples tested with *Corbicula* was 100%.

8. **Final QA determination:** All test results are of good quality and fully usable for any purpose.

Table 4. Summary of *Corbicula* Test No. 686-27.

Corbicula fluminea, 22 December 2005 through 19 January 2006:

Number of test samples, including control sediment: 18

Sediment holding time <8 weeks?: Yes

Protocol deviations?: Yes. Light intensities were less than recommended by the protocols. This deviation was likely inconsequential because almost all clams stayed buried in the test sediments.

Average 28-day mortality in the test tanks: <3%.

Water quality parameter deviations?: One. Temperature in all test tanks on days 13, 14 and 24 were as much as 1.5 °C below the protocol limit. These deviations probably had little effect on the bioaccumulation test except that if feeding was reduced by the lower temperatures, there could have been a slight decrease in the bioaccumulation of potential chemical contaminants.

Ammonia concentrations < critical limits?: Probably, since 28-day survivals in the test sediment aquaria were all >97%.

QA reviewer conclusion: All data are of good quality and fully usable for any purpose. Bioaccumulation rates may have been very slightly slowed by lower than recommended water temperatures on days 13, 14 and 24.

2.4.5 *Corbicula* Test No. 686-30

1. A *Corbicula fluminea* bioaccumulation test was conducted on 18 Portland Harbor sediment samples. A negative control sediment was run concurrently with the Portland Harbor test sediments.

2. Testing was initiated within 44 days following sediment collection, which was beyond the 14 day storage limit recommended for sediments by PSEP (1995) but within the 8 week limit recommended by EPA (2000) and the PSDDA (1994) Program (although these limits were generally established for toxicity testing, not bioaccumulation testing).

3. This test was completed with one protocol deviation and one water quality deviation. The protocol deviation was that light intensity was less than the recommended 50 to 100 foot candles. The light intensity deviation probably had little effect on the test results. Lighting is generally used to encourage test animal burial in the sediments. Audit observations of this test showed that almost all animals were buried in the sediments.

   The water quality deviation was that on days 21, 22 and 23, the water temperature in all test aquaria was as much as 0.5 °C lower than the protocol limit. The effect of these temperature deviations is considered minor, although the feeding rates of *Corbicula* could have been slightly lower than normal on those days, which might have very slightly retarded the bioaccumulatiou of potential chemical contaminants.

5. The maximum ammonia concentration measured in the overlying water during this test in any one sample was 2.0 mg/liter total ammonia. Neither EPA (2000) or ASTM (1997) provide any limits for ammonia for *Corbicula*. However, overall 28-day survival of *Corbicula* in the test sediments was >98% for all test sediments. Thus, it is unlikely that there were any significant effects of ammonia in this test.

6. Replication was three-fold for all samples. However, test animals from each of the three replicates were all composited into one sample for tissue analyses per the instructions of the study spousor.

7. Data completeness for the 18 (plus 1 control) samples tested with *Corbicula* was 100%.

8. **Final QA determination:** All test results are of excellent quality and fully usable for any purpose.

Table 5. Summary of *Corbicula* Test No. 686-30.

Corbicula fluminea, 27 January through 24 February 2006:

Number of test samples, including control sediment: 19

Sediment holding time <8 weeks?: Yes

Protocol deviations?: Yes. Light intensities were less than recommended by the protocols. This deviation was likely inconsequential because almost all clams stayed buried in the test sediments.

Average 28-day mortality in the test tanks: <2%.

Water quality parameter deviations?: One. Temperature in all test tanks on days 21, 22 and 23 were as much as 0.5 °C below the protocol limit. These deviations probably had little effect on the bioaccumulation test except that if feeding was reduced by the lower temperatures, there could have been a very slight decrease in the bioaccumulation of potential chemical contaminants.

Ammonia concentrations < critical limits?: Probably, since 28-day survivals in the test sediment aquaria were all >98%.

QA reviewer conclusion: All data are of excellent quality and fully usable for any purpose. Bioaccumulation rates may have been very slightly slowed by lower than recommended water temperatures on days 21, 22 and 23.

3.0 REFERENCES

ASTM (American Society for Testing and Materials). 1997. Determination of bioaccumulation of sediment-associated contaminants by benthic invertebrates. ASTM Standard Method No. E1688-97a. ASTM, Philadelphia, PA.

EPA (U. S. Environmental Protection Agency). 1998. Evaluation of dredged material proposed for discharge in waters of the U. S. – Testing Manual: Inland Testing Manual. EPA-823-B-98-004.

EPA (U. S. Environmental Protection Agency). 2000. Methods for measuring the toxicity and bioaccumulation of sediment-associated contaminants with freshwater invertebrates. Second edition. EPA/600/R-99/064.

PSDDA (Puget Sound Dredged Disposal Analysis). 1994. Dredged Analysis Information System (DAIS), Version 4.4. Electronic database from Seattle District, U. S. Army Corps of Engineers.

PSEP (Puget Sound Estuary Program). 1995. Recommended guidelines for conducting laboratory bioassays on Puget Sound sediments. Final Report by PTI Environmental Services for the U. S. Environmental Protection Agency, Region 10, Seattle, WA.

Schubauer-Berigan, M.K., P.D. Monson, C.W. West and G.T. Ankley. 1995. Influence of pH on the toxicity of ammonia to *Chironomus tentans* and *Lumbriculus variegatus*. Environ. Toxicol. Chem. 14(4):713-717.

Windward Environmental. 2005. Portland Harbor RI/FS. Round 2 Quality Assurance Project Plan. Addendum 6: Sampling of benthic invertebrate tissue. Appendix A: Sediment bioaccumulation testing. QA Plan prepared for The Lower Willamette Group by Windward Environmental LLC, Seattle, WA.

Appendix 1

Northwestern Aquatic Sciences' State of Washington Accreditation Certificate and Scope of Accreditation

The State of Washington Department of Ecology

This is to certify that

Northwestern Aquatic Sciences
Newport, OR

has complied with provisions set forth in Chapter 173-50 WAC and is hereby recognized by the Department of Ecology as an ACCREDITED LABORATORY for the analytical parameters listed on the accompanying Scope of Accreditation. This certificate is effective October 1, 2005, and shall expire September 30, 2006.

Witnessed under my hand on October 5, 2005.

Perry F. Brake, Chemist
Lab Accreditation Section Manager

Laboratory ID
C1238

Scope of Accreditation

Northwestern Aquatic Sciences

Newport, OR

is accredited by the State of Washington Department of Ecology to perform analyses for the parameters listed below using the analytical methods indicated. This Scope of Accreditation may apply to any of the following matrix types: non-potable water, drinking water, solid and chemical materials, and air and emissions. Accreditation for all parameters is final unless indicated otherwise in a note. Accreditation is for the latest version of a method unless otherwise specified in a note. EPA refers to the U.S. Environmental Protection Agency. SM refers to American Public Health Association's publication, Standard Methods for the Examination of Water and Wastewater, 18th, 19th or 20th Edition, unless otherwise noted. ASTM stands for the American Society for Testing and Materials. PSEP stands for Puget Sound Estuary Program. Other references are detailed in the notes section.

Matrix Type/Parameter Name	Reference	Method Number	Notes
Non-potable Water			
Ampelisca abdita	EPA	100.4	4
Ampelisca abdita	PSEP	1995	
Ampelisca abdita	ASTM	E 1367	
Atherinops affinis (West Coast)	EPA	1006.0	6,8
Bioaccumulation, Bedded Sediments	EPA	600/R-93/183	7
Bioaccumulation, Benthic Invert	ASTM	E 1688	
Bioconcentration, Fish, Mollusks	ASTM	E 1022	
Ceriodaphnia dubia	EPA	1002.0	2,8
Ceriodaphnia dubia	EPA	2002.0	1,8
Chironomus tentans	EPA	100.5	5
Chironomus tentans	ASTM	E 1706	
Chironomus tentans	EPA	100.2	5
Corbicula fluminea	ASTM	E 1688	
Crassostrea gigas	PSEP	1995	
Crassostrea gigas (West Coast)	EPA	1005.0	6,8
Cyprinodon variegatus	EPA	1004.0	3,8
Cyprinodon variegatus	EPA	2004.0	1,8
Dangerous Waste Static Salmonid	WDOE	80-12 Part A	
Daphnia magna	EPA	2021.0	1,8

Matrix Type/Parameter Name	Reference	Method Number	Notes
Daphnia pulex	EPA	2021.0	1,8
Dendraster excentricus	ASTM	E 1563	
Dendraster excentricus	PSEP	1995	
Dendraster excentricus (West Coast)	EPA	1008.0	6,8
Eohaustorius estuarius	ASTM	E 1367	
Eohaustorius estuarius	PSEP	1995	
Eohaustorius estuarius	EPA	100.4	4
Holmesimysis costata	EPA	821-R-02-012	1,8
Holmesimysis costata (West Coast)	EPA	1007.0	6,8
Hyalella azteca	EPA	100.4	5
Hyalella azteca	EPA	100.1	5
Hyalella azteca	ASTM	E 1706	
Leptocheirus plumulosus	ASTM	E 1367	
Leptocheirus plumulosus	EPA	100.4	4
Lumbriculus variegatus	EPA	100.3	5
Lumbriculus variegatus	ASTM	E 1688	
Macoma spp.	ASTM	E 1688	
Menidia beryllina	EPA	1006.0	3,8
Menidia spp.	EPA	2006.0	1,8
Mysidopsis bahia	EPA	1007.0	3,8
Mysidopsis bahia	EPA	2007.0	1,8
Mytilus spp.	PSEP	1995	
Mytilus spp. (West Coast)	EPA	1005.0	6,8
Neanthes arenaceodentata	PSEP	1995	
Nereis/Neanthes spp.	ASTM	E 1688	
Oncorhynchus mykiss	EPA	2019.0	1,8
Pimephales promelas	EPA	2000.0	1,8
Pimephales promelas, Chronic	EPA	1000.0	2,8
Rhepoxynius abronius	EPA	100.4	4
Rhepoxynius abronius	PSEP	1995	

Matrix Type/Parameter Name	Reference	Method Number	Notes
Rhepoxynius abronius	ASTM	E 1367	
Salvelinus fontinalis	EPA	2019.0	1,8
Strongylocentrotus purpuratus	ASTM	E 1563	
Strongylocentrotus purpuratus (WC)	EPA	1008.0	6,8
Strongylocentrotus purpuratus (WC)	EPA	600/R-95/136	6,8
Strongylocentrotus spp.	PSEP	1995	

Accredited Parameter Note Detail

(1) USEPA. "Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms." EPA-821-R-02-012. Fifth Edition. Oct 2002. (2) USEPA. "Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms." EPA-821-R-02-013. Fourth Edition. Oct 2002. (3) USEPA. "Short-term Methods for Measuring the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms." EPA-821-R-02-014. Fourth Edition. Oct 2002. (4) USEPA. "Methods for Assessing the Toxicity of Sediment-associated Contaminants with Estuarine and Marine Amphipods." EPA 600/R/R-94/025. June 1994. (5) USEPA. "Methods for Measuriing the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates." EPA 600/R-99/064. Second Edition. March 2000. (6) USEPA. "Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to West Coast Marine and Estuarine Organisms," EPA 600/R-95/136. Third Edition. Aug 1995. (7) USEPA. "Bedded Sediment Bioaccumulation Tests." EPA/600/R-93/183. Sept 1993. (8) Meets requirements of "Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria," Washington Dept. of Ecology, Pub. No. WQ-R-80, Rev. June 2005.

10/5/2005

Authentication Signature

Perry Brake -- Section Manager, Washington State Department of Ecology -- Lab Accreditation Section

Appendix 2

Dinnel Marine Resources' Letter to Northwestern Aquatic Sciences Requesting Clarifications to NAS' Test Protocols and NAS's Responses

DMR

Dinnel Marine Resources
1519 13th St.
Anacortes, WA 98221
360-299-8468

5 December 2005

Mr. Gerald Irissarri
Port of Portland Bioassay Project Manager
Northwestern Aquatic Sciences
PO Box 1437
Newport, OR 97365

Dear Gerald:

Thank you for sending copies of NAS's *Corbicula* and *Lumbriculus* protocols to be used for Port of Portland bioaccumulation testing, and for a copy of your most recent State of Washington laboratory certification. I have finished my reviews of your two bioaccumulation protocols and have only two minor comments plus a request for additional clarification.

First, in your *Corbicula* protocol, section 1.3 and the summary table, you state that "one to five replicate aquaria" can be used for testing. This is at odds with section 7.1, which says three to five replicates.

Second, in yonr *Lumbriculus* protocol, section 5.3 and in the summary table, yon state that the age of the test animals is variable. Both ASTM and EPA protocols call for the use of adults only. I suspect that you mean to use adults (of variable age), but this should be clarified in your protocol.

After reviewing your two protocols, which do conform very closely to the published ASTM and EPA protocols, I still find a need to learn more about your project-specific testing parameters. The ASTM and EPA protocols are written with a range of possibilities for various test parameters, but for this project it would be very helpful to know what your specific test parameters for both tests will be for the following items:

- Size of the test chambers
- Amount of sediment to be used in each test chamber
- Overlying water volume
- Source of your overlying water
- Actual overlying water renewal schedule
- Number of test organisms to be used in each test chamber (if known prior to receiving the test organisms)

- Sources of the test animals
- Duration of the depuration time for *Lumbriculus*
- Number of replicates/treatment for both tests.

The last item on the list is perhaps the most important to be decided. ASTM and EPA protocols generally recommend 4 to 5 replicates per treatment, but allow for fewer (generally no less than 3) under some project-specific circumstances. I suggest that this issue be resolved with the project sponsor before testing begins (if you've not already done so).

One thing that you might wish to consider is periodic collection of samples of overlying water for contaminant concentrations. ASTM Standard Guide E 1688, section 13.4.1.1 states: "At a minimum, overlying water should be sampled for contaminants from each treatment at the beginning, middle and end of the test period..." In my mind, it would be better to sample the overlying water *source* rather than overlying water from each treatment, since the water in the test chambers may be contaminated with toxicants in the sediments. Note that if NAS already collects routine chemical contaminant data on its overlying water source, then this may be sufficient.

Additionally, you might note that the ASTM *Lumbriculus* protocol (Table A8.2, item B3), states: "Food used to culture organisms should be analyzed before the start of a test for compounds to be evaluated in the bioaccumulation test."

As usual, I will make one or more unannounced test audit visits during your Port of Portland bioaccumulation testing.

Sincerely,

Paul A. Dinnel
Project QA/QC auditor

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Tel: 541-265-7225, Fax: 541-265-2799, E-mail: girissarri@nwaquatic.com

December 8, 2005

Dr. Paul Dinnel
Dinnel Marine Research
1519 13th Street
Anacortes, WA 98221

Dear Paul:

This is in response to your Dec 5 comments about our *Lumbriculus* and *Corbicula* bioaccumulation protocols.

-We try to make our protocols flexible and inclusive. Section 7.1 of the *Corbicula* protocol should consistently state that 1-5 replicates can be used for testing.

-The variable age of the *Lumbriculus* does refer to adults only. *Lumbriculus varigatus* reproduces primarily by asexual fragmentation. Although they can produce young by egg laying in cocoons similarly to earthworms, apparently this has never been observed in laboratory cultures.

We have worked out the specific test parameters that will be followed for the Portland Harbor RI/FS bioaccumulation tests:

1. Size of test chambers: 10-gal aquaria for *Lumbriculus*, 5-gal for *Corbicula*

2. Amount of sediment to be used in each test chamber:
   a. 3.5 gal for *Lumbriculus*
   b. 6.3 liters for *Corbicula*

3. Overlying water volumes:
   a. 3.5 gal for *Lumbriculus*
   b. 8 liters for *Corbicula*

4. Source of overlying water: dechlorinated municipal tap water

5. Overlying water renewal schedule: 3 times weekly (M, W, F)

6. Number of test organisms to be used in test chambers: This is somewhat dependant upon the TOC of individual sediments. However we hope to add approximately 25-30 grams of wet tissue per aquaria for each species.

7. Source of animals: Virginia Polytechnic Institute and State University in Blacksburg, Virginia for *Corbicula* and Aquatic Foods, Inc., Fresno, CA for *Lumbriculus*.

8. Depuration time for *Lumbriculus*: 6-8 hours

9. Number of replicates/treatment: We will set up 3 replicates of aquaria, but the resulting tissue to be used for chemical analysis will be consolidated into one replicate.

We plan to collect samples of the dilution water periodically during the course of the bioaccumulation studies. Because 0-time animals will be collected prior to the exposure period and the animals will not be

fed during the test, we do not plan on collecting samples of food used in culturing the animals. The *Corbicula* clams are collected in a pristine location in the wild, which would make food collection difficult.

If you have any more questions, please do not hesitate to call me at 541-265-7225 or email girissarri@nwaquatic.com.

Sincerely,

Gerald Irissarri
Project Manager

Appendix 3

Results of the Test-in-Progress Audits of Northwestern Aquatic Sciences' Bioaccumulation Testing

CHECKLIST FOR THE 28-DAY *Lumbriculus variegatus* BIOACCUMULATION TEST

Project name: PORT HARBOR, BIOACCUMULATION Auditor: DINNEL

Laboratory: NORTHWESTERN AQUATIC SCIENCES Test type: BIOACCUMULATION

Test personnel: GERALD TRISSARI, BILL MONTGOMERY, SUSAN GAGE, PAULA CARSON Test Protocol: NAS-XXX-LV5

Test initiation Date: 14 DEC '05 Number of samples: 17 + CONTROL

Protocol deviations:
NONE

Other notes:

Sediment Shipping and Holding Conditions

Samples received: 21, SO FAR # Samples tested: 17

Holding time at test initiation: < 5 DAYS (SO FAR)

Sample holding conditions: 4°, COLD ROOM IN DARK

Problems noted in shipping and holding: NONE

Testing Conditions

Protocol available? YES # Samples tested: 9, SO FAR

Multiple batches?: YES Test chamber size: 10 GAL AQUARIA

Test species: LUMBRICULUS VARIEGATUS Test animal holding time: 2 DAYS

Holding conditions: 20-23°C, 16:8 LIGHT:DARK Fed during holding? NO

Test animal selection criteria? ADULTS # of *Lumbriculus*/chamber: 33.3g WORM WET WEIGHT / AQUARIUM (∴, VARIABLE # OF WORMS)

Overlying water source tested for toxicants?
TO BE DECIDED BY SPONSOR YET.

Other notes:

CHECKLIST FOR THE 28-DAY *Lumbriculus variegatus* BIOACCUMULATION TEST

Quality Assurance Audit

Audit date: 19 DEC '05

Days/hours after initiation: 3-5 DAYS POST INITIATION

Source neg. control sediment: BEAVER CREEK, OR

# of reference sediments: 0

Amount of sediment used: 3.5 GAL/AQUARIUM

Final water volume: 3.5 GAL/AQUARIUM

Freshwater source: TAP WATER, DE-CHLORINATED (ACTIVATED CARBON)

Freshwater treatment: AERATED BEFORE USE

Freshwater holding time: < 1 WEEK.

Number of replicates: 3, BUT BIOMASS CONSOLIDATED INTO ONE SAMPLE.

Sediment equilibration period: 24 HOURS

Test animals randomized? YES

of *Lumbriculus*/chamber: 33.3 g OF WORMS, WET WEIGHT (≈ 25 g OF WORM WEIGHT)

Feeding during test? NO

Lumbriculus buried in sediments? YES FOR ALL BUT ONE TANK (#35) - ONLY PARTIAL BURIAL & SOME MORTALITY

Water renewal schedule: M, W & F, 2/3 OF OVERLYING WATER

Test chambers aerated? YES, DUE EXPECTATIONS OF LOW DO DURING TESTING (GENTLE AERATION)

Water temperature: 22.9 - 23.7

FROM BENCH SHEETS

Water hardness: 34 - 77

Water alkalinity: 30 - 70 mg/l

Water DO: 4.0 - 7.6 mg/l

Water pH: 6.6 - 7.3

Light intensity: 500-1000 LUX

Photoperiod: 16 : 8 LIGHT : DARK

Sulfide and Ammonia measured at T_0 and T_{end}? AMMONIA ONLY

Positive control test? YES, w/ KCl

Internal QA checks? JULIE FIORE

Test termination criteria: NA

Lumbriculus depuration time: 6-8 HOURS, WATER ONLY

Daily test records maintained? YES

Lab QA officer: JULIE FIORE

Protocol or Water Quality Deviations or Problems Noted:

ALL CHAMBERS AERATED DURING TESTING DUE TO EXPECTATION THAT DO'S WILL DROP BELOW 2.5 mg/l IN AT LEAST SOME TREATMENTS.

Other Notes:

4 DAY TOXICITY TEST WILL BE RUN STARTING 12/21. DELAYED DUE TO CHANGING TEST SCHEDULE. KCl REF-TOX. TEST TO BE CONDUCTED AT SAME TIME.

QA Auditor: _____ **Date:** _____

CHECKLIST FOR THE 28-DAY *Corbicula fluminea* BIOACCUMULATION TEST

Project name: P686-29

Auditor: PAUL DINNEL

Laboratory: NORTHWESTERN AQUATIC SCIENCES

Test type: BIOACCUMULATION

Test personnel: GERALD IRISSARRI, GARY BUHLER, SUSAN GAGE, BILL MONTGOMERY, GREG HUTCHINSON, PAULA CARSON.

Test Protocol: NAS-XXX-CF5 REVISION 2 (11-9-05)

Test initiation Date: 1-19-06

Number of samples: 17 TEST SEDIMENTS 1 CONTROL

Protocol deviations:

1.) TEMP OUTSIDE PROTOCOL LIMITS OF 20±1°C

2.) LIGHT INTENSITY OUTSIDE PROTOCOL LIMITS OF 50-100 FT-C

Other notes:

Sediment Shipping and Holding Conditions

Samples received: 35 TEST SEDIMENTS

Samples tested: 18 FOR THIS FIRST BATCH

Holding time at test initiation: 8-16 DAYS

Sample holding conditions: ~4°C, SEALED CONTAINERS, DARKNESS

Problems noted in shipping and holding: NONE

Testing Conditions

Protocol available? YES

Samples tested: 17 + NEGATIVE CONTROL

Multiple batches?: ~~YES~~ NO

Test chamber size: 5 gal AQUARIA

Test species: CORBICULA FLUMINEA

Test animal holding time: 2 DAYS

Holding conditions: ~~20°~~ GRADUAL TEMP INCREASE FROM 9.0°C TO 17.4°C

Fed during holding? NO

Test animal selection criteria?

of *Corbicula*/chamber: 59

Overlying water source tested for toxicants?
DECHLORINATED, AERATED MUNICIPAL TAP WATER

Other notes:

INFORMATION COLLECTED BY: GERALD IRISSARRI

CHECKLIST FOR THE 28-DAY *Corbicula fluminea* BIOACCUMULATION TEST

Quality Assurance Audit

Audit date: 1-17-06

Days/hours after initiation: 26 DAYS

Source neg. control sediment: BEAVER CREEK, OR

# of reference sediments: NONE

Amount of sediment used: 6.3 L

Final water volume: 8 L

Freshwater source: DECHLORINATED MUNICIPAL TAP WATER

Freshwater treatment: DECHLORINATED, AERATED

Freshwater holding time: 1-3 DAYS

Number of replicates: 3, CONSOLIDATED INTO ONE AT TEST TERMINATION

Sediment equilibration period: 24 HRS

Test animals randomized? YES

No of *Corbicula*/chamber: 59

Feeding during test? NO

Corbicula buried in sediments? YES

Water renewal schedule: 3X PER WEEK

Test chambers aerated? YES

Water temperature: 17.5 - 20.8

Water hardness: 34-68 mg/L

Water alkalinity: 26 - 70 mg/L

Water DO: 4.6 - 9.2 mg/L

Water pH: 5.9 - 7.6

Light intensity: 151 TO 581 LUX 14 - 54 FT-C

Photoperiod: 16:8, L:D

Sulfide and Ammonia measured at T_0 and T_{end}? OVER LYING AMMONIA ONLY, NO SULFIDES

Positive control test? NO

Internal QA checks? YES

Test termination criteria:

Corbicula depuration time: NONE

Daily test records maintained? YES

Lab QA officer: L.K. NEMETH, J. FIORE

Protocol or Water Quality Deviations or Problems Noted:

TEMP OUTSIDE PROTOCOL LIMITS OF 20±1°C

Other Notes:

INFORMATION COLLECTED BY: GERALD IRISSARRI

QA Auditor: _____ **Date:** _____

CHECKLIST FOR THE 28-DAY *Lumbriculus variegatus* BIOACCUMULATION TEST

Project name: PORTLAND HARBOR, BIOACCUMULATION Auditor: PAUL DINNEL

Laboratory: NORTHWESTERN AQUATIC SCIENCES, NEWPORT, OR Test type: BIOACCUMULATION

Test personnel: GERALD IRISSARRI, GARY BUHLER, BILL MONTGOMERY, SUSAN GAGE, GREG HUTCHINSON Test Protocol: NAS-XXX-LVS REVISION 4

Test initiation Date: 2/1/06 - 2/8/06 Number of samples: 18 + 1 CONTROL

Protocol deviations:
NONE

Other notes:

Sediment Shipping and Holding Conditions

Samples received: 18 # Samples tested: 18

Holding time at test initiation: ≤ 51 DAYS

Sample holding conditions: 4°, SEALED CONTAINERS, DARK

Problems noted in shipping and holding: NONE

Testing Conditions

Protocol available? YES # Samples tested: 18 + 1 CONTROL

Multiple batches?: YES (2) Test chamber size: 10 GAL AQUARIA

Test species: LUMBRICULUS VARIEGATUS Test animal holding time: 1-10 DAYS

Holding conditions: 23°C IN AQUARIA 16:8 LIGHT:DARK CYCLE Fed during holding? NO

Test animal selection criteria? HEALTHY ADULTS # of *Lumbriculus*/chamber: 33.4 g / TANK

Overlying water source tested for toxicants?
YES

Other notes:

CHECKLIST FOR THE 28-DAY *Lumbriculus variegatus* BIOACCUMULATION TEST

Quality Assurance Audit

Audit date: 10 FEB 2006

Days/hours after initiation: 1-9 DAYS

Source neg. control sediment: BEAVER CREEK, OR

# of reference sediments: NONE

Amount of sediment used: 3 1/2 GAL/AQUARIA

Final water volume: 3 1/2 GAL WATER VOL.

Freshwater source: DECHLOR. CITY WATER

Freshwater treatment: DECHLORINATE & AERATE

Freshwater holding time: 24-72 HRS.

Number of replicates: 3 TANKS

Sediment equilibration period: 24 HR.

Test animals randomized? YES

No of *Lumbriculus* /chamber: 33.4 g/AQUARIUM

Feeding during test? NONE

Lumbriculus buried in sediments? YES

Water renewal schedule: 3 X/WEEK

Test chambers aerated? YES

Water temperature: 22.1 - 23.6 °C

Water hardness: 34-60 mg/l

Water alkalinity: 30-70 mg/l

Water DO: 5.1 - 8.0 mg/l

Water pH: 6.3 - 7.3

Light intensity: 500-1000 LUX

Photoperiod: 16:8 LIGHT:DARK

Sulfide and Ammonia measured at T_0 and T_{end}? JUST AMMONIA

Positive control test? YES - KCl 96 HR.

Internal QA checks? YES

Test termination criteria: END OF 28 DAYS WITH ≥ 30g OF TISSUE

Lumbriculus depuration time: 6-8 HOURS

Daily test records maintained? YES

Lab QA officer: JULIE FIORE

Protocol or Water Quality Deviations or Problems Noted: NONE

Other Notes:

QA Auditor: PAUL DINNEL **Date:** 2/10/06

CHECKLIST FOR THE 28-DAY *Corbicula fluminea* BIOACCUMULATION TEST

Project name: PORTLAND HARBOR, BIOACCUMULATION Auditor: PAUL DINNEL

Laboratory: NORTHWESTERN AQUATIC SCIENCES, NEWPORT OREGON Test type: BIOACCUMULATION

Test personnel: GERALD IRISSARRI, GARY BUHLER, BILL MONTGOMERY, SUSAN GAGE, GREG HUTCHINSON Test Protocol: NAS-XXX-CFS REVISION 2

Test initiation Date: 27 JAN 2006 Number of samples: 18 + 1 CONTROL

Protocol deviations:
LIGHT INTENSITY A LITTLE LOW FOR SOME TREATMENTS BUT STEPS BEING TAKEN TO INCREASE TO PROTOCOL REQUIREMENTS

Other notes:

Sediment Shipping and Holding Conditions

Samples received: 18 # Samples tested: 18

Holding time at test initiation: 44 DAYS

Sample holding conditions: 4°C IN SEALED CONTAINER, DARK

Problems noted in shipping and holding: NONE

Testing Conditions

Protocol available? YES # Samples tested: 18 + 1 CONTROL

Multiple batches?: YES (2) Test chamber size: 5 GAL AQUARIA

Test species: CORBICULA FLUMINEA Test animal holding time: 3 DAYS

Holding conditions: IN TRAYS, ACCLIMATED TO 20° OVER TWO DAYS Fed during holding? NO

Test animal selection criteria? ADULTS # of *Corbicula*/chamber: 25g TISSUE/CHAMBER = 61 CLAMS

Overlying water source tested for toxicants? YES

Other notes:

CHECKLIST FOR THE 28-DAY *Corbicula fluminea* BIOACCUMULATION TEST

Quality Assurance Audit

Audit date: 10 FEB 2006

Days/hours after initiation: 14 DAYS

Source neg. control sediment: BEAVER CREEK, OR

# of reference sediments: NONE

Amount of sediment used: 6.3 LITERS

Final water volume: 8 LITERS WATER

Freshwater source: CITY WATER

Freshwater treatment: DECHLOR. & AERATED

Freshwater holding time: 1-3 DAYS

Number of replicates: 3 TANKS/TREATMENT

Sediment equilibration period: 24 HR

Test animals randomized? YES

No of *Corbicula*/chamber: 61

Feeding during test? NO

Corbicula buried in sediments? MOSTLY A FEW ON TOP IN MANY TANKS

Water renewal schedule: 3X/WEEK

Test chambers aerated? YES

Water temperature: 19.5 - 20.7 °C

Water hardness: 34-68 mg/l

Water alkalinity: 20-70 mg/l

Water DO: 7.9 - 9.1 mg/l

Water pH: 6.7-7.7

Light intensity: 500-1000 LUX EXCEPT SOME TANKS INITIALLY < 500 LUX

Photoperiod: 16:8 LIGHT : DARK

Sulfide and Ammonia measured at T_0 and T_{end}? AMMONIA ONLY

Positive control test? NONE

Internal QA checks? YES

Test termination criteria: 28 DAYS AND ≥ 30 g TISSUE

Corbicula depuration time: NONE

Daily test records maintained? YES

Lab QA officer: JULIE FIORE

Protocol or Water Quality Deviations or Problems Noted: LOW LIGHT INTENSITY AS NOTED ABOVE

Other Notes: WORKING ON INCREASING LIGHT LEVELS TO TANKS w/ < 500 LUX INTENSITY

QA Auditor: PAUL DINNEL **Date:** 2/10/06

Privileged and confidential: Work product prepared in anticipation of possible litigation

Appendix 4

Comments to Northwestern Aquatic Sciences by Dinnel Marine Resources following DMR's QA Review of NAS' Bioaccumulation Testing Data Reports

DMR

Dinnel Marine Resources
1519 13th St.
Anacortes, WA 98221
360-299-8468

22 May 2006

Mr. Gerald Irissarri
Portland Harbor Bioaccumulation Bioassay Project Manager
Northwestern Aquatic Sciences
PO Box 1437
Newport, OR 97365

Dear Gerald:

I have finished my audits of your four draft reports of sediment bioaccumulation testing of Portland Harbor test sediments. As usual, your data reports were in excellent condition and reflect your lab's high degree of attention to detail. There are only a few minor edits or corrections that you might wish to consider for the final drafts. My audit findings are noted below. Please provide me with copies of any corrections made to your draft data reports.

***Corbicula fluminea* Report No. 686-27:**

1. *Corbicula* Randomization and Tissue Results table (page 26 of 51): There is an asterisk in the column labeled "Post Exposure Wet Tissue Weight*" but no footnote. I suspect that such a footnote might read: "Estimated post exposure wet weights based on average T_0 wet weights." A statement to this effect would indicate that these were not the actual wet weights since your lab did not collect those data.
2. Water Quality Data Excel spreadsheet (page 28 of 51): Data for Beaker 36 for Day 2 appears to be missing. Since this deletion is at a page break, this may be a printing artifact.
3. Water Quality Data Excel spreadsheet (page 37 of 51): Data for Beaker 36 for Day 28 also appears to be missing. Since this deletion is also at a page break, this too may be a printing artifact.
4. Water Quality Data Excel spreadsheet (page 30 of 51): There is a double entry for Beaker 32, Day 8.
5. Water Quality Data Excel spreadsheet (page 29 of 51): The temperature for Beaker 11, Day 8 should be 20.1 instead of 20.0.

***Corbicula fluminea* Report No. 686-30:**

1. Ditto, comment number 1 above, except in this case there is no asterisk in the column heading.

***Lumbriculus variegatus* Report No. 686-26:**

1. Water Quality Data Excel spreadsheet (page 82 of 108): Beaker 45, Day 3 temperature should be 23.2 instead of 22.2.
2. Water Quality Data Excel spreadsheet (page 86 of 108): Beaker 5, Day 13 temperature should be 22.9 instead of 22.8 (? – the value written on the raw data sheet is a bit vague).

***Lumbriculus variegatus* Report No. 686-29:**

1. One sample number appears to be wrong. NAS sample No. 0346G is labeled as client sample LW2-GBT006-1 on page 1 of 5 of the Toxicity Test Report and as LW2-GBT006-2 on page 27 of 125 of the bench sheets (and elsewhere in the report).
2. Water Quality Data Excel spreadsheet (page 96 of 125): Beaker 38, Day 0 pH should be 6.5 instead of 6.3.

As mentioned above, all errors in your four draft reports are quite minor and should not impair the immediate use of the data.

Once again, thank you and your staff for all of your excellent work.

Sincerely,

Paul A. Dinnel
Quality Assurance Manager

CC: Helle Andersen, Windward Environmental

PORTLAND HARBOR RI/FS

ROUND 2B BENTHIC TISSUE AND SEDIMENT DATA REPORT

APPENDIX B

DATA QUALITY SUMMARY

DRAFT

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

September 1, 2006

Prepared for

The Lower Willamette Group

Prepared by

Integral Consulting Inc.

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LIST OF ACRONYMS

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

1. INTRODUCTION

This Round 2 Benthic Tissue and Sediment Data Report summarizes the results from the November through December 2005 sample collection effort designed to supplement the Round 1 benthic invertebrate tissue chemistry data set. A detailed description of the Round 2 benthic invertebrate and sediment collection effort is included in the field sampling report (FSR; Windward and Integral 2006).

Except where noted in the FSR (Windward and Integral 2006), all Round 2 benthic invertebrate collection field activities, including navigational positioning, sample collection, sample handling and processing, and data management, followed guidelines specified in the *Portland Harbor RI/FS Field Sampling Plan: Round 2 Sampling of Benthic Invertebrate Tissue* (FSP; Windward and Integral 2005), the Round 2 Quality Assurance Project Plan (QAPP; Integral and Windward 2004), the Round 2 QAPP Addendum 2: PCB Congener Analysis in Sediment Samples (Integral 2004), and the Round 2 QAPP Addendum 6: Sampling of Benthic Invertebrate Tissue (Integral and Windward2005).

Chemical analysis of sediment samples was completed by four laboratories, Columbia Analytical Services (CAS; Kelso, WA, Redding, CA, and Houston, TX) , Alta Analytical (El Dorado Hills CA), Axys Analytical Services Ltd. (Axys; Sidney, BC, Canada) and Severn Trent Laboratories (STL; Tacoma WA), in accordance with the Round 2 QAPP and the associated Addenda 2 and 6. CAS completed the analyses for conventional constituents, metals (including mercury), butyltin compounds, petroleum hydrocarbons, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), organochlorine pesticides, polychlorinated biphenyl (PCB) Aroclors, and polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs). Alta completed PCB congener analyses, and STL performed the herbicide analyses. Axys completed the additional analyses of organochlorine pesticides as noted in Section 3.5 of the main body of this report. The laboratory methods of analysis for the sediment samples are included in Table B-1a.

Chemical analyses of all tissue samples were performed by two laboratories. CAS completed the analyses for phthalates and selected SVOCs, polycyclic aromatic hydrocarbons (PAHs), mercury, other metals, butyltin compounds, and percent moisture. Axys completed analyses of lipids, organochlorine pesticides, PCB congeners, and PCDD/Fs. The laboratory methods of analysis for the tissue samples are included in Table B-1b.All sediment and tissue samples were analyzed according to the sample preparation and analytical procedures in the Round 2 QAPP and the associated Addenda 2 and 6. Deviations from the QAPP are noted in Section 3.5 of the main body of this report.

2. DATA QUALITY AND USABILITY

Data generated in the field and at the laboratories were verified and validated according to the criteria and procedures described in the Round 2 QAPP (Integral and Windward 2004). Data quality and usability were evaluated based on the results of the data validation and the data quality objectives for the Round 2 data. The performance criteria in the Round 2 QAPP and the associated Addenda 2 and 6 included analytical goals for precision, accuracy, representativeness, completeness, and comparability (PARCC) of the Round 2 data.

The precision, accuracy, representativeness, and comparability of the data were assessed during data validation, as described in Section 2.1 below and in the Round 2 QAPP. Completeness is calculated by comparing the total number of acceptable data (nonrejected data) to the total number of data points generated. Completeness for the data is summarized by parameter group and matrix in Table B-2a for the sediment data, and in Table B-2b for the tissue data. Completeness was greater than 99% overall for all sample types, which exceeds the QAPP completeness objective of 95%.

2.1. DATA VALIDATION

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

Data validation was completed by EcoChem (Seattle, WA). Approximately 10% of the data for each laboratory method were fully validated, as described in the Round 2 QAPP. Validation for the remaining data was based on review of the summary forms for sample and QC data. The following deliverables were reviewed during Level 3 and full data validation:

- The case narrative discussing analytical problems (if any) and procedures
- Chain-of-custody documentation and laboratory sample receipt logs
- Instrument calibration results
- Method blank results

- Results for laboratory quality control samples required by the referenced method including laboratory control sample/laboratory control sample duplicate analyses, matrix spike/matrix spike duplicate analyses, surrogate recoveries, and other method specific quality control samples (e.g., serial dilutions for inductively coupled plasma analyses)
- Results for field quality control samples (i.e., equipment blanks, field duplicates, and field split samples)
- Analytical results for the tissue and sediment samples.
- Pesticide and PCB Aroclor chromatograms for all sediment and tissue samples.

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

Data qualifiers were assigned during data validation if applicable control limits were not met, in accordance with the EPA data validation guidelines (EPA 1994a, 1995, 1996, 1999b, 2002b) and the quality control requirements included in the referenced methods. The quality control limits for surrogate spikes, matrix spike/matrix spike duplicate samples, laboratory control samples, and ongoing precision and recovery for the Round 2 laboratories are summarized in Tables B-3a,b and B-4a,b. The data validation qualifiers and definitions are summarized in Table B-5. Data quality reports and a tabular summary of qualified data generated by EcoChem are included in Appendix C of the main body of this report.

2.2. DATA QUALITY

The EcoChem data validation reports (Appendix C of main body) provide detailed information on the data quality issues and data validation qualifiers for each parameter group for each laboratory data package. A summary of the qualified data by matrix and parameter group, with the reasons for qualification, is included in Table B-6a (sediment) and Table B-6b (tissue). The SCRA database files, Appendix D of the main body of this report (provided on CD), includes original laboratory qualifiers, final qualifiers applied after validation, and reason codes for the qualifiers. A table of definitions for the qualifier reason codes is also provided in Table B-5.

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

2.2.1. Reported Detection Limits

Sediment and tissue data for Round 2 of the Portland Harbor remedial investigation and feasibility study (RI/FS) were reported to the method detection limit (MDL) in most cases. Sample-specific detection limits were reported for all high resolution gas chromatography/ high resolution mass spectrometry (HRGC/HRMS) analyses (PCB congeners, PCDD/Fs and pesticides), as specified in the respective method protocols (EPA methods 1668A and 1613B; EPA 1999a, 1994b). These detection limits are based on the signal-to-noise ratio of the analytical system for each analyte and sample. In several cases, the MDLs and method reporting limits (MRLs) were elevated because of matrix interference or when results were restated as undetected during data validation because of possible sample contamination, as indicated by the presence of target analytes in an associated method blank or equipment blank.

The reported detection limit (RDL) is the collective term for the detection limit or reporting limit used to quantify nondetects, as applicable to each sample and analyte. Tables B-7a and B-7b provides the lowest MDLs included in the Round 2 QAPP Addendum 6 (Integral and Windward 2005) and the minimum and maximum RDL attained by the laboratories for each analyte. Because of the limited tissue mass was available for some analyses, elevated detection limits were expected for selected parameter groups for these tissue samples. Generally, for the results that were generated using the subsample mass identified in the QAPP, the detection limits reported by the laboratories for the tissue samples were equal to or less than the detection limit goals established in the QAPP.

2.2.2. Field Quality Control Samples

Quality control samples were prepared in the field and at the laboratories to monitor the bias and precision of the sample collection and analysis procedures. For sediment samples, field replicate samples were generated by collecting an additional sediment sample at a designated station, processing this sample separately in the same manner as the original sample, and submitting the replicate as a separate sample for analysis at the laboratory. The field duplicate and replicate sample results for sediments are summarized in Table B-8a. Two sediment equipment rinsate blanks were also collected in compliance with the FSP (Windward and Integral 2005) and QAPP (Integral and Windward 2005).

For the field-collected clam samples, clams from all targeted tows were composited at the laboratory, as detailed in Table 3-2 of the FSR (Windward and Integral 2006). Split samples were subsequently created at the analytical laboratory from the homogenized composites. Replicate clam tissue samples from two stations were created in the analytical laboratory. Due to the limited tissue volumes and the elaborate compositing scheme, no true field replicates were incorporated into the sample design. The use of composite samples addresses field variability.

For each of the laboratory clams and worms, two replicate exposures were created at the bioassay laboratory. The tissues from each of the replicate exposures were

subsequently treated as field replicates for the associated chemistry analyses. The replicate results for these tissue samples are summarized in Table B-8b. For all tissue samples (field and lab), laboratory blanks were created whenever each set of tissues was composited and/or homogenized.

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

2.2.3. Laboratory Quality Control Samples

Laboratory quality control samples were prepared in accordance with the Round 2 QAPP at the laboratories to monitor the bias and precision of the sample analysis procedures. The quality control limits for surrogate spikes, matrix spike/matrix spike duplicate samples, laboratory duplicate samples, laboratory control samples, and ongoing precision and recovery for the Round 2 laboratories are summarized in Tables B-3a,b and B-4a,b. The evaluation of the laboratory quality control samples is included as part of the data validation as described in section 2.1 above. Selected results were qualified based on results of the laboratory quality control samples, and are summarized in Table B-6a (sediment) and Table B-6b (tissue).

Axys obtained inconsistent 2,4'-DDT and 4,4'-DDT results for a laboratory duplicate for their HRGC/HRMS analysis of pesticides in sediment samples. Subsequent reanalysis of the sample indicated that the higher values were anomalous. The results initially obtained by Axys for sample LW2-GBT003 and its laboratory duplicate were 0.937 and 0.0419 µg/kg for 2,4'-DDT, and 53.4 and 0.250 µg/kg for 4,4'-DDT (Table B-9). The concentrations of the remaining pesticides showed good reproducibility between the sample and its duplicate. Sample LW2-GBT003 was reanalyzed by Axys, again in duplicate, because of the discrepant DDT results. The reanalysis confirmed the lower results that were obtained from the laboratory duplicate in the initial analysis. In addition, the results provided by CAS by gas chromatography/electron capture detection (GC/ECD) were consistent with the lower result for 4,4'-DDT; CAS reported 4,4'-DDT as undetected at 2.3 µg/kg. This detection limit is well below the anomalously high value reported by Axys for 4,4'-DDT.

In addition to sample LW2-GBT003, Axys reanalyzed samples LW2-GBT006-1 and LW2-GBT015 as additional checks on laboratory precision. Results for sample LW2-GBT006-1 replicated well, with RPD values ranging from 4.4 to 32.7. Results for sample LW2-GBT015 replicated reasonably well for most of the analytes. The RPD

values for 2,4'-DDE, 2,4'-DDT, and 4,4'-DDT were above 50 percent. The results for 2,4'-DDE and 2,4'-DDT were below the calibration range and close to the detection limit in at least one of the two analyses. Greater variability is expected at these concentrations because of the greater relative effects of instrument signal fluctuations (instrument "noise"). For 4,4'-DDT, the result for the reanalysis (25 µg/kg) was consistent with the result provided by CAS (36 µg/kg). The concentration values for the reanalysis were included in the database for all of the DDT compounds. For the remaining pesticides, the values for the initial analyses were included in the database because the laboratory duplicate results for the first analysis were acceptable.

2.2.4. Summary of Qualified Data

Selected data not meeting the data quality criteria were qualified as undetected or estimated during validation, in accordance with the QAPP. A summary of the qualified data by matrix and parameter group, including the reasons for qualification, is included in Tables B-6a (sediment) and B-6b (tissue). Data qualified as undetected are usable for all intended purposes. Data qualified as estimated are usable for all intended purposes, with the knowledge that these data may be less precise or less accurate than unqualified data. Rejected data are not usable for any purpose and have been flagged as "not reportable" in the database.

Selected semivolatile organic and phenol compounds were rejected in sediment samples primarily due to low laboratory control sample or matrix spike recoveries. Selected volatile organic compounds were rejected in sediment samples primarily due to initial or continuing calibration criteria. All acrolein and vinyl acetate sediment data and a majority of sediment data for methyl ethyl ketone were rejected due to initial and/or continuing calibration criteria. In tissue samples, selected pesticide, PCB congener and homolog data and most hexachlorobutadiene data were rejected due to poor surrogate recoveries. Most pentachlorophenol tissue data were rejected due to initial and continuing calibration criteria. The overall completeness goal of 95 percent was met for the sediment and tissue samples. Any issues related to selected rejected data will be addressed in subsequent interpretive reports.

The precision and accuracy of the sediment and tissue data was acceptable. The Round 2 benthic sediment and tissue data are usable for all project purposes. Overall, the data quality was acceptable and will meet program objectives and goals for the remedial investigation and feasibility study.

3. REFERENCES

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Table B-1a Laboratory Methods for Sediment Samples.

Analysis	Laboratory	Sample Preparation		Quantitative Analysis	
		Protocol	Procedure	Protocol	Procedure
Conventional Analyses	CAS Kelso				
Total solids		--	--	PSEP 1986	Balance
Grain size		--	--	PSEP 1986	Sieve and pipette method
Total sulfides		EPA 9030	Distillation	EPA 9030	Colorimetry
Ammonia		Plumb et al. 1981	KCl extraction	EPA 350.1	Colorimetry
Total organic carbon		Plumb et al. 1981	Acid pretreatment	Plumb et al. 1981	Combustion; coulometric titration
Metals	CAS Kelso				
Antimony, arsenic, cadmium, lead, silver,		EPA 3050	Strong acid digestion	EPA 6020	ICP/MS
Aluminum, chromium, copper, nickel, zinc		EPA 3050	Strong acid digestion	EPA 6010B	ICP/AES
Selenium		EPA 3050	Strong acid digestion	EPA 7742	AAS
		EPA 7742	Hydride generation		
Mercury		EPA 7471A	Acid digestion/oxidation	EPA 7471A	CVAA
Hexavalent chromium		EPA 3060A	Alkaline digestion	EPA 7196A	Colorimetry
Butyltins	CAS Kelso	Krone et al. 1988	Solvent extraction	Krone et al. 1988	GC/FPD
			Derivatization		
Petroleum hydrocarbons	CAS Kelso				
Gasoline-range hydrocarbons		NWTPH-Gx	Methanol extraction	NWTPH-Gx	GC/FID
			Purge and trap		
Diesel- and oil-range hydrocarbons		NWTPH-Dx	Sovent extraction	NWTPH-Dx	GC/FID
			Silica gel cleanup (as needed)		
Chlorinated herbicides	STL Tacoma	EPA 8151A	Solvent extraction	EPA 8151A	GC/MS
			Esterification		
Organochlorine Pesticides [a]	CAS Kelso	EPA 3541	Soxhlet extraction	EPA 8081A	GC/ECD
		EPA 3620B	Florisil® cleanup		
		EPA 3660B	Sulfur cleanup		
Organochlorine Pesticides	Axys	Axys Method MLA-013 Rev 05	Soxhlet extraction	Axys Method MLA-013 Rev 05	HRGC/HRMS
			Gel permeation chromatography		
			Acid/base silica column		
			1% deactivated basic Alumina		
			Florisil® chromatography		
PCB Aroclors	CAS Kelso	EPA 3541	Soxhlet extraction	EPA 8082	GC/ECD
		EPA 3665A	Sulfuric acid cleanup		
		EPA 3620B	Florisil® cleanup		
		EPA 3660B	Sulfur cleanup		

Table B-1a Laboratory Methods for Sediment Samples.

Analysis	Laboratory	Sample Preparation		Quantitative Analysis	
		Protocol	Procedure	Protocol	Procedure
Volatile organic compounds	CAS Kelso	EPA 5035	Purge and trap	EPA 8260B	GC/MS
Semivolatile organic compounds	CAS Kelso				
Tri-,tetra-, and pentachlorophenols		EPA 8151A	Solvent Extraction Esterification	EPA 8151A	GC/ECD
Polycyclic aromatic hydrocarbons		EPA 3541 EPA 3640A EPA 3630C	Automated Soxhlet Extraction Gel permeation chromatography Silica Gel cleanup	EPA 8270C	GC/MS-SIM
SVOCs (other than PAHs and tri-, tetra-, and pentchlorophenols)		EPA 3541 EPA 3640A	Automated Soxhlet Extraction Gel permeation chromatography	EPA 8270C	GC/MS-LVI
PCB Congeners[b]	Alta	EPA 1668A	Soxhlet/Dean Stark extraction Sulfuric acid cleanup Silica column cleanup	EPA 1668A	HRGC/HRMS
Chlorinated dioxins and furans	CAS Houston	EPA 1613B	Soxhlet/Dean Stark extraction Sulfuric acid cleanup Silica/carbon column cleanup	EPA 1613B	HRGC/HRMS

Notes:
[a] Toxaphene only.
[b] Analysis for all 209 PCB congeners.

AAS - Atomic absorption spectrometry
CAS - Columbia Analytical Services
CVAA - cold vapor atomic absorption spectrometry
EPA - U.S. Environmental Protection Agency
GC/ECD - gas chromatography/electron capture detection
GC/FID - gas chromatography/flame ionization detection
GC/MS - gas chromatography/mass spectrometry
HRGC/HRMS - high-resolution gas chromatography/high-resolution mass spectrometry
ICP/AES - inductively coupled plasma/atomic emission spectrometry
ICP/MS - inductively coupled plasma - mass spectrometry
LVI - large-volume injector
TPH - total petroleum hydrocarbon
PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl
PSEP - Puget Sound Estuary Program
SIM - selected ion monitoring
STL - Severn Trent Laboratories
SVOC - semivolatile organic compound

Table B-1b. Laboratory Methods of Analysis for Tissue Samples.

Analysis	Laboratory	Sample Preparation		Quantitative Analysis	
		Protocol	Procedure	Protocol	Procedure
Total Solids	CAS	CAS SOP	Freeze dry	CAS SOP	Gravimetric
Butyltin Compounds	CAS	Krone et al. 1988 Krone et al. 1988	Solvent extraction Derivatization	Krone et al. 1988	GC/FPD
Polycyclic Aromatic Hydrocarbons	CAS	EPA 3540C EPA 3640A EPA 3620B	Soxhlet extraction Gel permeation chromatography Florisil® cleanup	EPA 8270C SIM	GC/MS SIM
Semivolatile Organic Compounds	CAS	EPA 3540C EPA 3640A	Soxhlet extraction Gel permeation chromatography	EPA 8270C SIM	GC/MS SIM
Metals	CAS				
Aluminum, antimony, arsenic, cadmium, copper, lead, nickel, silver, zinc		EPA 3050B/PSEP	Acid digestion	EPA 6020	ICP/MS
Chromium		EPA 3050B/PSEP	Acid digestion	EPA 6010B	ICP/AES
Selenium		EPA 3050B/7742	Acid digestion/hydride generation	EPA 7742	AAS
Mercury		EPA 7470	Acid digestion/oxidation	EPA 7471A	CVAA
Lipids	Axys	Axys SOP MLA-013 [a]	Soxhlet extraction	Axys SOP	Gravimetric
Percent Moisture	Axys	--	--	Axys SOP	Oven/Gravimetric
Chlorinated PCDD/Fs [b]	Axys	Axys Method MLA-013 Rev 05	Soxhlet extraction Gel permeation chromatography Florisil® chromatography Carbon celite Layered silver nitrate/acid/base silica 1% deactivated basic alumina	Axys Method MLA-017/EPA 1613B	HRGC/HRMS

Table B-1b. Laboratory Methods of Analysis for Tissue Samples.

Analysis	Laboratory	Sample Preparation		Quantitative Analysis	
		Protocol	Procedure	Protocol	Procedure
PCB Congeners [c]	Axys	Axys Method MLA-013 Rev 05	Soxhlet extraction Gel permeation chromatography Florisil® chromatography Acid/base silica column 1% deactivated basic alumina	Axys Method MLA-010/EPA 1668A	HRGC/HRMS
Organochlorine Pesticides	Axys	Axys Method MLA-013 Rev 05	Soxhlet extraction Gel permeation chromatography Acid/base silica column 1% deactivated basic Alumina Florisil® chromatography	Axys Method MLA-028 Rev 01	HRGC/HRMS

Notes:

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

[b] Includes analyses for PCDD/F homologs.

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

AAS - atomic absorption spectrometry
Axys = Axyx Analytical Services Ltd.
CAS - Columbia Analytical Services
EPA - U.S. Environmental Protection Agency
HRGC/HRMS - high resolution gas chromatography/high resolution mass spectrometry
ICP/AES - inductively coupled plasma/atomic emission spectrometry
ICP/MS - inductively coupled plasma/mass spectrometry
PCB - polychlorinated biphenyl
SOP - standard operating procedure
PSEP - Puget Sound Estuary Program
SIM - selected ion monitoring
SOP - standard operating procedure

Table B-2a. Sediment Percent Completeness by Parameter Group.

Analysis	Total No. of Data Points[a]	Number of Data Points		Completeness (%)
		Accepted	Rejected	
Butyltins	148	148	0	100
Conventionals [b]	152	152	0	100
Dioxin/furan homologs	370	370	0	100
Dioxins/furans	555	555	0	100
Grainsize	481	481	0	100
Herbicides	370	370	0	100
Metals	521	521	0	100
Organochlorine pesticides	1036	1036	0	100
PAHs	629	629	0	100
PCB Aroclors	333	333	0	100
PCB congener homologs	333	333	0	100
PCB congeners	6253	6253	0	100
Petroleum	111	111	0	100
Phenols	592	587	5	99
Phthalates	222	222	0	100
SVOCs	1191	1156	35	97
VOCs	1850	1729	121	93
Benthic Sediment Sampling Project Total	**15147**	**14986**	**161**	**>98**

Notes:

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

[b] Includes ammonia, sulfide, ORP, pH, TOC, and TS.

Table B-2b. Tissue Percent Completeness by Parameter Group.

Analysis	Total # of Data Points[a]	Number of Data Points		Completeness[b] (%)
		Accepted	Rejected	
Butyltins	388	388	0	100
Conventionals [c]	204	204	0	100
Dioxin/furan homologs	1085	1010	0	93
Dioxins/furans	1515	1515	0	100
Metals	1196	1196	0	100
Organochlorine pesticides	2704	2676	2	99
PAHs	1717	1717	0	100
PCB Aroclors	728	721	0	99
PCB congener homologs	937	920	7	98
PCB congeners	16639	16450	30	99
Phenols	500	436	64	87
Phthalates	600	600	0	100
SVOCs	1051	1005	46	96
Benthic Tissue Sampling Project Total	**29264**	**28838**	**149**	**>98**

Notes:

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

[b] The completeness value includes 4 field-collected clam samples that were not analyzed for either dioxin, PCBs or pesticides as described in Section 3.5

[c] Includes lipids and total solids.

Table B-3a. Surrogate Control Limits for Benthic Sediments.

Surrogate Compunds	Percent Recovery
Semivolatile Organic Compounds	
2-Fluoro-1,1'-biphenyl	10 - 104
Nitrobenzene-d5	10 - 99
p-Terphenyl-d14	39 - 124
2,4,6-Tribromophenol	23 - 113
2-Fluorophenol	11 - 87
Phenol-d6	20 - 99
Volatile Organic Compounds	
1,2-Dichloroethane-d4	80 - 118
1-Bromo-4-fluorobenzene	74 - 116
Dibromofluoromethane	81 - 120
Toluene-d8	77 - 131
Phenols	
4-Bromo-2,6-dichlorophenol	38 - 155
Butyltins	
Tripropyltin hydride	10 - 127
PAHs	
Fluoranthene-d10	10 - 129
Fluorene-d10	10 - 122
p-Terphenyl-d14	32 - 134
Herbicides	
2,4-Dichlorophenylacetic acid	51 - 129
Petroleum	
1-Bromo-4-fluorobenzene	50 - 150
o-Terphenyl	50 - 150
Triacontane	50 - 150
PCB Aroclors	
2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	20 - 166
PCB Congeners	
^{13}C-2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	25-150
^{13}C-2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	25-150
^{13}C-2,2',3,3',4,4',5,5'-Octachlorobiphenyl	25-150
^{13}C-2,2',3,3',4,4',5-Heptachlorobiphenyl	25-150
^{13}C-2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl	25-150
^{13}C-2,2',3,3',5,5',6,6'-Octachlorobiphenyl	25-150
^{13}C-2,2',3,3',5,5',6-Heptachlorobiphenyl	25-150
^{13}C-2,2',3,4,4',5,5'-Heptachlorobiphenyl	25-150
^{13}C-2,2',3,4',5,6,6'-Heptachlorobiphenyl	25-150
^{13}C-2,2',3,5',6-Pentachlorobiphenyl	25-150
^{13}C-2,2',4,4',5,5'-Hexachlorobiphenyl	25-150
^{13}C-2,2',4,4',6,6'-Hexachlorobiphenyl	25-150
^{13}C-2,2',4,5,5'-Pentachlorobiphenyl	25-150
^{13}C-2,2',4,6,6'-Pentachlorobiphenyl	25-150
^{13}C-2,2',5,5'-Tetrachlorobiphenyl	25-150
^{13}C-2,2',6,6'-Tetrachlorobiphenyl	25-150
^{13}C-2,2',6-Trichlorobiphenyl	25-150
^{13}C-2,2'-Dichlorobiphenyl	25-150

Table B-3a. Surrogate Control Limits for Benthic Sediments.

Surrogate Compunds	Percent Recovery
^{13}C-2,3,3',4,4',5,5'-Heptachlorobiphenyl	25-150
^{13}C-2,3,3',4,4',5'-Hexachlorobiphenyl	25-150
^{13}C-2,3,3',4,4',5-Hexachlorobiphenyl	25-150
^{13}C-2,3,3',4,4'-Pentachlorobiphenyl	25-150
^{13}C-2,3',4,4',5,5'-Hexachlorobiphenyl	25-150
^{13}C-2,3',4,4',5'-Pentachlorobiphenyl	25-150
^{13}C-2,3',4,4',5-Pentachlorobiphenyl	25-150
^{13}C-2,3,4,4',5-Pentachlorobiphenyl	25-150
^{13}C-2,4,4'-Trichlorobiphenyl	25-150
^{13}C-2,4',6-Trichlorobiphenyl	25-150
^{13}C-2,5-Dichlorobiphenyl	25-150
^{13}C-2-Chlorobiphenyl	25-150
^{13}C-3,3',4,4',5,5'-Hexachlorobiphenyl	25-150
^{13}C-3,3',4,4',5-Pentachlorobiphenyl	25-150
^{13}C-3,3',4,4'-Tetrachlorobiphenyl	25-150
^{13}C-3,4,4',5-Tetrachlorobiphenyl	25-150
^{13}C-3,4,4'-Trichlorobiphenyl	25-150
^{13}C-4-Chlorobiphenyl	25-150
Organochlorine pesticides	
^{13}C-2,4'-DDE	40 - 150
^{13}C-2,4'-DDT	40 - 150
^{13}C-4,4'-DDE	40 - 150
^{13}C-4,4'-DDT	40 - 150
^{13}C-Aldrin	30 - 200
^{13}C-alpha-Endosulfan	30 - 150
^{13}C-beta-Endosulfan	30 - 150
^{13}C-beta-Hexachlorocyclohexane	30 - 150
^{13}C-cis-Nonachlor	40 - 150
^{13}C-delta-Hexachlorocyclohexane	30 - 150
^{13}C-Dieldrin	30 - 150
^{13}C-Endrin	30 - 150
^{13}C-gamma-Hexachlorocyclohexane	30 - 150
^{13}C-Heptachlor	30 - 150
^{13}C-Heptachlor epoxide	30 - 150
^{13}C-Methoxychlor	30 - 150
^{13}C-Oxychlordane	30 - 200
^{13}C-trans-Chlordane	30 - 150
^{13}C-trans-Nonachlor	30 - 150
13C-1,2,3-Trichlorobenzene	20 - 130
13C-Hexachlorobenzene	20 - 150
2,4,5,6-Tetrachloro-m-xylene	38 - 125
2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	26 - 166
Dioxin/Furans	
^{13}C-1,2,3,4,6,7,8-Heptachlorodibenzofuran	40 - 135
^{13}C-1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	40 - 135
^{13}C-1,2,3,4,7,8,9-Heptachlorodibenzofuran	40 - 135
^{13}C-1,2,3,4,7,8-Hexachlorodibenzofuran	40 - 135
^{13}C-1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	40 - 135
^{13}C-1,2,3,6,7,8-Hexachlorodibenzofuran	40 - 135

Table B-3a. Surrogate Control Limits for Benthic Sediments.

Surrogate Compunds	Percent Recovery
^{13}C-1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	40 - 135
^{13}C-1,2,3,7,8,9-Hexachlorodibenzofuran	40 - 135
^{13}C-1,2,3,7,8-Pentachlorodibenzofuran	40 - 135
^{13}C-1,2,3,7,8-Pentachlorodibenzo-p-dioxin	40 - 135
^{13}C-2,3,4,6,7,8-Hexachlorodibenzofuran	40 - 135
^{13}C-2,3,4,7,8-Pentachlorodibenzofuran	40 - 135
^{13}C-2,3,7,8-Tetrachlorodibenzofuran	40 - 135
^{13}C-2,3,7,8-Tetrachlorodibenzo-p-dioxin	40 - 135
^{13}C-Octachlorodibenzo-p-dioxin	40 - 135

Table B-3b. Surrogate Control Limits for Benthic Tissue.

Surrogate Compounds	Percent Recovery
Semivolatile Organic Compounds	
2-Fluoro-1,1'-biphenyl	10 - 146
Nitrobenzene-d5	35 - 129
2,4,6-Tribromophenol	38 - 160
Phenol-d6	10 - 144
PAHs	
Fluoranthene-d10	44 - 112
Fluorene-d10	40 - 97
p-Terphenyl-d14	49 - 137
Butyltins	
Tripropyltin hydride	10 - 160
PCB Congeners	
^{13}C-2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	25 - 150
^{13}C-2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	25 - 150
^{13}C-2,2',3,3',4,4',5-Heptachlorobiphenyl	25 - 150
^{13}C-2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl	25 - 150
^{13}C-2,2',3,3',5,5',6,6'-Octachlorobiphenyl	25 - 150
^{13}C-2,2',3,3',5,5',6-Heptachlorobiphenyl	30 - 135
^{13}C-2,2',3,4,4',5,5'-Heptachlorobiphenyl	25 - 150
^{13}C-2,2',3,4',5,6,6'-Heptachlorobiphenyl	25 - 150
^{13}C-2,2',4,4',6,6'-Hexachlorobiphenyl	25 - 150
^{13}C-2,2',4,6,6'-Pentachlorobiphenyl	25 - 150
^{13}C-2,2',6,6'-Tetrachlorobiphenyl	25 - 150
^{13}C-2,2',6-Trichlorobiphenyl	25 - 150
^{13}C-2,2'-Dichlorobiphenyl	25 - 150
^{13}C-2,3,3',4,4',5,5',6-Octachlorobiphenyl	25 - 150
^{13}C-2,3,3',4,4',5,5'-Heptachlorobiphenyl	25 - 150
^{13}C-2,3,3',4,4'-Pentachlorobiphenyl	25 - 150
^{13}C-2,3,3',5,5'-Pentachlorobiphenyl	30 - 135
^{13}C-2,3',4,4',5,5'-Hexachlorobiphenyl	25 - 150
^{13}C-2,3',4,4',5'-Pentachlorobiphenyl	25 - 150
^{13}C-2,3',4,4',5-Pentachlorobiphenyl	25 - 150
^{13}C-2,3,4,4',5-Pentachlorobiphenyl	25 - 150
^{13}C-2,4,4'-Trichlorobiphenyl	30 - 135
^{13}C-2-Chlorobiphenyl	15 - 150
^{13}C-3,3',4,4',5,5'-Hexachlorobiphenyl	25 - 150
^{13}C-3,3',4,4',5-Pentachlorobiphenyl	25 - 150
^{13}C-3,3',4,4'-Tetrachlorobiphenyl	25 - 150
^{13}C-3,4,4',5-Tetrachlorobiphenyl	25 - 150
^{13}C-3,4,4'-Trichlorobiphenyl	25 - 150

Table B-3b. Surrogate Control Limits for Benthic Tissue.

Surrogate Compounds	Percent Recovery
^{13}C-4,4'-Dichlorobiphenyl	25 - 150
^{13}C-4-Chlorobiphenyl	15 - 150
PCB156L & 157L	25 - 150
Organochlorine pesticides	
^{13}C-2,4'-DDE	40 - 150
^{13}C-2,4'-DDT	40 - 150
^{13}C-4,4'-DDE	40 - 150
^{13}C-4,4'-DDT	40 - 150
^{13}C-Aldrin	30 - 200
^{13}C-alpha-Endosulfan	30 - 150
^{13}C-beta-Endosulfan	30 - 150
^{13}C-beta-Hexachlorocyclohexane	30 - 150
^{13}C-cis-Nonachlor	40 - 150
^{13}C-delta-Hexachlorocyclohexane	30 - 150
^{13}C-Dieldrin	30 - 150
^{13}C-Endrin	30 - 150
^{13}C-gamma-Hexachlorocyclohexane	30 - 150
^{13}C-Heptachlor	30 - 150
^{13}C-Heptachlor epoxide	30 - 150
^{13}C-Methoxychlor	30 - 150
^{13}C-Oxychlordane	30 - 200
^{13}C-trans-Chlordane	30 - 150
^{13}C-trans-Nonachlor	30 - 150
13C-1,2,3-Trichlorobenzene	20 - 130
13C-Hexachlorobenzene	20 - 150
Dioxin/Furans	
^{13}C-1,2,3,4,6,7,8-Heptachlorodibenzofuran	28 - 143
^{13}C-1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	23 - 140
^{13}C-1,2,3,4,7,8,9-Heptachlorodibenzofuran	26 - 138
^{13}C-1,2,3,4,7,8-Hexachlorodibenzofuran	26 - 152
^{13}C-1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	32 - 141
^{13}C-1,2,3,6,7,8-Hexachlorodibenzofuran	26 - 123
^{13}C-1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	28 - 130
^{13}C-1,2,3,7,8,9-Hexachlorodibenzofuran	29 - 147
^{13}C-1,2,3,7,8-Pentachlorodibenzofuran	24 - 185
^{13}C-1,2,3,7,8-Pentachlorodibenzo-p-dioxin	25 - 181
^{13}C-2,3,4,6,7,8-Hexachlorodibenzofuran	28 - 136
^{13}C-2,3,4,7,8-Pentachlorodibenzofuran	21 - 178
^{13}C-2,3,7,8-Tetrachlorodibenzofuran	24 - 169
^{13}C-2,3,7,8-Tetrachlorodibenzo-p-dioxin	25 - 164
^{13}C-Octachlorodibenzo-p-dioxin	17 - 157
^{37}Cl-2,3,7,8-Tetrachlorodibenzo-p-dioxin	35 - 197

Table B-4a. Laboratory Control Limits for Benthic Sediments Matrix Spike, Laboratory Control Samples, and Ongoing Precsion and Recovery.

Analysis	Matrix Spike Recovery (percent)	Laboratory Control Sample Recovery (percent)	Type of Duplicate	Control Limit Relative Percent Difference
Metals				
Aluminum	75 - 125	4120 - 10100	LD	30
Antimony	70 - 130	0.05 - 192	LD	30
Arsenic	70 - 122	112 - 180	LD	30
Barium	--	288 - 414	--	--
Beryllium	--	45.8 - 72.8	--	--
Cadmium	77 - 122	73.9 - 112	LD	30
Chromium	57 - 145	138 - 214	LD	30
Chromium hexavalent	85 - 115	85 - 115	LD	20
Copper	59 - 144	57.5 - 82.6	LD	30
Lead	74 - 117	53.1 - 81.9	LD	30
Manganese	--	168 - 252	--	--
Mercury	61 - 129	55 - 142	LD	30
Nickel	79 - 124	65 - 99.5	LD	30
Selenium	64 - 120	55.1 - 90.8	LD	30
Silver	70 - 130	57 - 129	LD	30
Thallium	--	62.6 - 102	--	--
Zinc	51 - 148	319 - 485	LD	30
Butyltins				
Butyltin ion	10 - 64	10 - 96	MSD	50
Dibutyltin ion	10 - 141	14 - 145	MSD	50
Tetrabutyltin	10 - 132	10 - 127	MSD	50
Tributyltin ion	10 - 140	13 - 125	MSD	50
Conventionals				
Ammonia	75 - 125	--	LD	20
Sulfide (S)	60 - 130	60 - 130	LD	20
Total organic carbon	75 - 125	85 - 115	LD	40
Total solids	--	--	LD	40
Grain size	--	--	Triplicate	--
Organochlorine pesticides				
2,4'-DDD	39 - 139	64 - 131	MSD	50
2,4'-DDE	45 - 135	59 - 133	MSD	50
2,4'-DDT	40 - 136	66 - 130	MSD	50
4,4'-DDD	32 - 156	70 - 130	MSD	50
4,4'-DDE	35 - 146	70 - 130	MSD	50
4,4'-DDT	31 - 161	70 - 132	MSD	50
Aldrin	39 - 143	67 - 130	MSD	50

Table B-4a. Laboratory Control Limits for Benthic Sediments Matrix Spike, Laboratory Control Samples, and Ongoing Precsion and Recovery.

Analysis	Matrix Spike Recovery (percent)	Laboratory Control Sample Recovery (percent)	Type of Duplicate	Control Limit Relative Percent Difference
alpha-Endosulfan	10 - 141	50 - 130	MSD	50
alpha-Hexachlorocyclohexane	41 - 148	67 - 130	MSD	50
beta-Endosulfan	21 - 135	59 - 130	MSD	50
beta-Hexachlorocyclohexane	37 - 152	66 - 134	MSD	50
cis-Chlordane	40 - 140	70 - 130	MSD	50
cis-Nonachlor	70 - 130	61 - 130	MSD	50
delta-Hexachlorocyclohexane	35 - 162	60 - 139	MSD	50
Dieldrin	48 - 142	60 - 130	MSD	50
Endosulfan sulfate	39 - 148	70 - 130	MSD	50
Endrin	44 - 146	60 - 130	MSD	50
Endrin aldehyde	18 - 137	10 - 138	MSD	50
Endrin ketone	37 - 149	60 - 130	MSD	50
gamma-Hexachlorocyclohexane	45 - 153	70 - 130	MSD	50
Heptachlor	35 - 151	69 - 130	MSD	50
Heptachlor epoxide	37 - 148	60 - 130	MSD	50
Methoxychlor	35 - 158	60 - 137	MSD	50
Mirex	68 - 119	43 - 136	MSD	50
Oxychlordane	70 - 130	55 - 130	MSD	50
Toxaphene	52 - 156	52 - 142	MSD	50
trans-Chlordane	33 - 161	70 - 130	MSD	50
trans-Nonachlor	70 - 130	58 - 130	MSD	50
Herbicides				
2,4-D	46 - 136	46 - 136	MSD	30
Dalapon	16 - 74	16 - 74	MSD	30
Dicamba	48 - 123	48 - 123	MSD	30
Dinoseb	18 - 157	18 - 157	MSD	30
MCPA	50 - 150	50 - 150	MSD	30
Silvex	52 - 137	52 - 137	MSD	30
Semivolatile Organic Compounds				
1,2,4-Trichlorobenzene	10 - 128	37 - 139	MSD	40
1,2-Dichlorobenzene	10 - 127	39 - 123	MSD	40
1,3-Dichlorobenzene	10 - 128	38 - 129	MSD	40
1,4-Dichlorobenzene	10 - 129	38 - 127	MSD	40
2,4-Dinitrotoluene	28 - 126	50 - 117	MSD	40
2,6-Dinitrotoluene	28 - 122	48 - 109	MSD	40
2-Chloronaphthalene	23 - 102	37 - 102	MSD	40
2-Nitroaniline	29 - 117	44 - 105	MSD	40
3,3'-Dichlorobenzidine	10 - 80	10 - 104	MSD	40
3-Nitroaniline	10 - 97	40 - 106	MSD	40
4-Bromophenyl phenyl ether	26 - 116	47 - 103	MSD	40
4-Chloroaniline	10 - 75	21 - 86	MSD	40

Table B-4a. Laboratory Control Limits for Benthic Sediments Matrix Spike, Laboratory Control Samples, and Ongoing Precsion and Recovery.

Analysis	Matrix Spike Recovery (percent)	Laboratory Control Sample Recovery (percent)	Type of Duplicate	Control Limit Relative Percent Difference
4-Chlorophenyl phenyl ether	22 - 113	42 - 103	MSD	40
4-Nitroaniline	10 - 105	41 - 112	MSD	40
Aniline	10 - 55	10 - 65	MSD	40
Azobenzene	28 - 101	42 - 103	MSD	40
Benzoic acid	10 - 113	10 - 83	MSD	40
Benzyl alcohol	26 - 106	32 - 102	MSD	40
Bis(2-chloroethoxy) methane	24 - 101	37 - 99	MSD	40
Bis(2-chloroethyl) ether	13 - 107	35 - 100	MSD	40
Bis(2-chloroisopropyl) ether	10 - 92	30 - 101	MSD	40
Carbazole	27 - 125	53 - 115	MSD	40
Dibenzofuran	27 - 121	47 - 113	MSD	40
Hexachlorobenzene	32 - 130	36 - 130	MSD	40
Hexachlorobutadiene	10 - 130	38 - 132	MSD	40
Hexachlorocyclopentadiene	10 - 64	15 - 96	MSD	40
Hexachloroethane	10 - 130	38 - 130	MSD	40
Isophorone	22 - 119	42 - 110	MSD	40
Nitrobenzene	16 - 102	35 - 100	MSD	40
N-Nitrosodimethylamine	19 - 94	29 - 101	MSD	40
N-Nitrosodiphenylamine	18 - 135	27 - 123	MSD	40
N-Nitrosodipropylamine	22 - 115	35 - 110	MSD	40
Volatile Organic Compounds				
1,1,1,2-Tetrachloroethane	17 - 138	76 - 122	MSD	40
1,1,1-Trichloroethane	41 - 127	68 - 126	MSD	40
1,1,2,2-Tetrachloroethane	15 - 132	69 - 120	MSD	40
1,1,2-Trichloroethane	31 - 135	77 - 118	MSD	40
1,1-Dichloroethane	45 - 122	66 - 120	MSD	40
1,2,3-Trichloropropane	20 - 144	73 - 120	MSD	40
1,2-Dichloroethane	34 - 134	63 - 129	MSD	40
1,2-Dichloropropane	36 - 129	69 - 123	MSD	40
1,4-Dichloro-trans-2-butene	70 - 130	70 - 130	MSD	40
2-Chloroethyl vinyl ether	70 - 130	34 - 149	MSD	40
Acetone	20 - 127	43 - 119	MSD	40
Acrolein	70 - 130	18 - 148	MSD	40
Acrylonitrile	70 - 130	10 - 197	MSD	40
Benzene	45 - 129	78 - 124	MSD	40
Bromochloromethane	41 - 134	75 - 126	MSD	40
Bromodichloromethane	19 - 138	67 - 129	MSD	40
Bromoform	10 - 136	72 - 121	MSD	40
Bromomethane	15 - 140	37 - 145	MSD	40
Carbon disulfide	19 - 139	63 - 139	MSD	40
Carbon tetrachloride	25 - 131	69 - 128	MSD	40
Chlorobenzene	17 - 130	76 - 119	MSD	40

Table B-4a. Laboratory Control Limits for Benthic Sediments Matrix Spike, Laboratory Control Samples, and Ongoing Precsion and Recovery.

Analysis	Matrix Spike Recovery (percent)	Laboratory Control Sample Recovery (percent)	Type of Duplicate	Control Limit Relative Percent Difference
Chlorodibromomethane	10 - 137	74 - 119	MSD	40
Chloroethane	28 - 149	44 - 143	MSD	40
Chloroform	37 - 132	70 - 123	MSD	40
Chloromethane	36 - 148	51 - 147	MSD	40
cis-1,2-Dichloroethene	36 - 130	72 - 122	MSD	40
cis-1,3-Dichloropropene	11 - 135	73 - 127	MSD	40
Dichlorodifluoromethane	34 - 154	43 - 163	MSD	40
Ethylbenzene	15 - 138	75 - 126	MSD	40
Ethylene dibromide	22 - 132	76 - 120	MSD	40
Isopropylbenzene	10 - 129	62 - 125	MSD	40
m,p-Xylene	15 - 138	76 - 131	MSD	40
Methyl iodide	70 - 130	70 - 130	MSD	40
Methyl isobutyl ketone	29 - 137	55 - 136	MSD	40
Methyl N-butyl ketone	22 - 126	60 - 124	MSD	40
Methyl tert-butyl ether	37 - 132	59 - 124	MSD	40
Methylene bromide	34 - 137	74 - 124	MSD	40
Methylene chloride	41 - 131	70 - 127	MSD	40
Methylethyl ketone	10 - 143	37 - 137	MSD	40
o-Xylene	12 - 143	76 - 128	MSD	40
Styrene	10 - 138	75 - 127	MSD	40
Tetrachloroethene	10 - 139	70 - 124	MSD	40
Toluene	31 - 136	75 - 128	MSD	40
trans-1,2-Dichloroethene	33 - 128	68 - 122	MSD	40
trans-1,3-Dichloropropene	10 - 131	68 - 114	MSD	40
Trichloroethene	18 - 153	69 - 128	MSD	40
Trichlorofluoromethane	37 - 135	55 - 134	MSD	40
Vinyl acetate	70 - 130	10 - 144	MSD	40
Vinyl chloride	34 - 165	55 - 155	MSD	40
Vinylidene chloride	46 - 128	71 - 127	MSD	40
Phenols				
2,3,4,5-Tetrachlorophenol	38 - 163	54 - 116	MSD	40
2,3,5,6-Tetrachlorophenol	45 - 160	54 - 123	MSD	40
2,4,5-Trichlorophenol	60 - 135	44 - 115	MSD	40
2,4,6-Trichlorophenol	38 - 140	50 - 108	MSD	40
2,4-Dichlorophenol	21 - 109	38 - 98	MSD	40
2,4-Dimethylphenol	10 - 93	10 - 72	MSD	40
2,4-Dinitrophenol	10 - 140	21 - 120	MSD	40
2-Chlorophenol	23 - 94	34 - 99	MSD	40
2-Methylphenol	10 - 100	17 - 97	MSD	40
2-Nitrophenol	20 - 105	35 - 106	MSD	40
4,6-Dinitro-2-methylphenol	10 - 118	37 - 113	MSD	40
4-Chloro-3-methylphenol	21 - 112	35 - 102	MSD	40

Table B-4a. Laboratory Control Limits for Benthic Sediments Matrix Spike, Laboratory Control Samples, and Ongoing Precsion and Recovery.

Analysis	Matrix Spike Recovery (percent)	Laboratory Control Sample Recovery (percent)	Type of Duplicate	Control Limit Relative Percent Difference
4-Methylphenol	10 - 116	14 - 99	MSD	40
4-Nitrophenol	24 - 120	43 - 119	MSD	40
Pentachlorophenol	48 - 157	50 - 150	MSD	40
Phenol	21 - 106	30 - 107	MSD	40
Phthalate Esters				
Bis(2-ethylhexyl) phthalate	10 - 158	52 - 136	MSD	40
Butylbenzyl phthalate	23 - 136	54 - 123	MSD	40
Dibutyl phthalate	20 - 131	49 - 126	MSD	40
Diethyl phthalate	28 - 116	45 - 114	MSD	40
Dimethyl phthalate	32 - 111	44 - 107	MSD	40
Di-n-octyl phthalate	27 - 143	54 - 127	MSD	40
Polycyclic Aromatic Hydrocarbons				
2-Methylnaphthalene	23 - 116	40 - 117	MSD	40
Acenaphthene	25 - 122	48 - 110	MSD	40
Acenaphthylene	30 - 117	48 - 112	MSD	40
Anthracene	33 - 129	53 - 118	MSD	40
Benz(a)anthracene	17 - 144	51 - 122	MSD	40
Benzo(a)pyrene	19 - 147	55 - 126	MSD	40
Benzo(b)fluoranthene	19 - 145	55 - 127	MSD	40
Benzo(g,h,i)perylene	15 - 147	50 - 127	MSD	40
Benzo(k)fluoranthene	20 - 144	57 - 127	MSD	40
Chrysene	26 - 139	57 - 122	MSD	40
Dibenz(a,h)anthracene	21 - 143	43 - 133	MSD	40
Fluoranthene	22 - 145	55 - 124	MSD	40
Fluorene	28 - 125	51 - 112	MSD	40
Indeno(1,2,3-cd)pyrene	15 - 150	43 - 136	MSD	40
Naphthalene	10 - 131	43 - 134	MSD	40
Phenanthrene	20 - 136	52 - 114	MSD	40
Pyrene	18 - 146	49 - 131	MSD	40
Petroleum Hydrocarbons				
Diesel Range Hydrocarbons	--	62 - 159	LD	40
Gasoline Range Hydrocarbons	--	73 - 115	LD	40
Residual Range Hydrocarbons	--	53 - 143	LD	40
Dioxin/Furans				
Octachlorodibenzofuran	--	50 - 150	BSD	40
Octachlorodibenzo-p-dioxin	--	50 - 150	BSD	40
1,2,3,4,6,7,8-Heptachlorodibenzofuran	--	50 - 150	BSD	40
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	--	50 - 150	BSD	40
1,2,3,4,7,8,9-Heptachlorodibenzofuran	--	50 - 150	BSD	40

Table B-4a. Laboratory Control Limits for Benthic Sediments Matrix Spike, Laboratory Control Samples, and Ongoing Precsion and Recovery.

Analysis	Matrix Spike Recovery (percent)	Laboratory Control Sample Recovery (percent)	Type of Duplicate	Control Limit Relative Percent Difference
1,2,3,4,7,8-Hexachlorodibenzofuran	--	50 - 150	BSD	40
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	--	50 - 150	BSD	40
1,2,3,6,7,8-Hexachlorodibenzofuran	--	50 - 150	BSD	40
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	--	50 - 150	BSD	40
1,2,3,7,8,9-Hexachlorodibenzofuran	--	50 - 150	BSD	40
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	--	50 - 150	BSD	40
1,2,3,7,8-Pentachlorodibenzofuran	--	50 - 150	BSD	40
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	--	50 - 150	BSD	40
2,3,4,6,7,8-Hexachlorodibenzofuran	--	50 - 150	BSD	40
2,3,4,7,8-Pentachlorodibenzofuran	--	50 - 150	BSD	40
2,3,7,8-Tetrachlorodibenzofuran	--	50 - 150	BSD	40
2,3,7,8-Tetrachlorodibenzo-p-dioxin	--	50 - 150	BSD	40
PCB Aroclors				
Aroclor 1016	33 - 155	43 - 141	MSD	50
Aroclor 1260	36 - 161	45 - 145	MSD	50
PCB congeners	--	50-150	LCSD	40
2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	--	50-150	LCSD	40
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	--	50-150	LCSD	40
2,2',3,3',4,4',5,5'-Octachlorobiphenyl	--	50-150	LCSD	40
2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl	--	50-150	LCSD	40
2,2',3,3',4,4',5,6-Octachlorobiphenyl	--	50-150	LCSD	40
2,2',3,3',4,4',5-Heptachlorobiphenyl	--	50-150	LCSD	40
2,2',3,3',4,4',6,6'-Octachlorobiphenyl	--	50-150	LCSD	40
2,2',3,3',4,4',6-Heptachlorobiphenyl	--	50-150	LCSD	40
2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl	--	50-150	LCSD	40
2,2',3,3',4,5,5',6'-Octachlorobiphenyl	--	50-150	LCSD	40
2,2',3,3',4,5,5',6-Octachlorobiphenyl	--	50-150	LCSD	40
2,2',3,3',4,5,5'-Heptachlorobiphenyl	--	50-150	LCSD	40
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	--	50-150	LCSD	40
2,2',3,3',4,5,6,6'-Octachlorobiphenyl	--	50-150	LCSD	40
2,2',3,3',4,5',6'-Heptachlorobiphenyl	--	50-150	LCSD	40
2,2',3,3',4,5',6-Heptachlorobiphenyl	--	50-150	LCSD	40
2,2',3,3',4,5,6'-Heptachlorobiphenyl	--	50-150	LCSD	40
2,2',3,3',4,5,6-Heptachlorobiphenyl	--	50-150	LCSD	40
2,2',3,3',4,5'-Hexachlorobiphenyl	--	50-150	LCSD	40
2,2',3,3',4,5-Hexachlorobiphenyl	--	50-150	LCSD	40
2,2',3,3',4,6,6'-Heptachlorobiphenyl	--	50-150	LCSD	40
2,2',3,3',4,6-Hexachlorobiphenyl	--	50-150	LCSD	40
2,2',3,3',4-Pentachlorobiphenyl	--	50-150	LCSD	40
2,2',3,3',5,5',6,6'-Octachlorobiphenyl	--	50-150	LCSD	40
2,2',3,3',5,5',6-Heptachlorobiphenyl	--	50-150	LCSD	40

Table B-4a. Laboratory Control Limits for Benthic Sediments Matrix Spike, Laboratory Control Samples, and Ongoing Precsion and Recovery.

Analysis	Matrix Spike Recovery (percent)	Laboratory Control Sample Recovery (percent)	Type of Duplicate	Control Limit Relative Percent Difference
2,2',3,3',5,6,6'-Heptachlorobiphenyl	--	50-150	LCSD	40
2,2',3,3',5,6'-Hexachlorobiphenyl	--	50-150	LCSD	40
2,2',3,3',5-Pentachlorobiphenyl	--	50-150	LCSD	40
2,2',3,3',6,6'-Hexachlorobiphenyl	--	50-150	LCSD	40
2,2',3,3'-Tetrachlorobiphenyl	--	50-150	LCSD	40
2,2',3,4,4',5,5'-Heptachlorobiphenyl	--	50-150	LCSD	40
2,2',3,4,4',5,6,6'-Octachlorobiphenyl	--	50-150	LCSD	40
2,2',3,4,4',5',6-Heptachlorobiphenyl	--	50-150	LCSD	40
2,2',3,4,4',5,6-Heptachlorobiphenyl	--	50-150	LCSD	40
2,2',3,4,4',5-Hexachlorobiphenyl	--	50-150	LCSD	40
2,2',3,4,4',6,6'-Heptachlorobiphenyl	--	50-150	LCSD	40
2,2',3,4,4',6'-Hexachlorobiphenyl	--	50-150	LCSD	40
2,2',3,4,5,5',6-Heptachlorobiphenyl	--	50-150	LCSD	40
2,2',3,4,5,5'-Hexachlorobiphenyl	--	50-150	LCSD	40
2,2',3,4',5,6,6'-Heptachlorobiphenyl	--	50-150	LCSD	40
2,2',3,4,5,6,6'-Heptachlorobiphenyl	--	50-150	LCSD	40
2,2',3,4',5,6'-Hexachlorobiphenyl	--	50-150	LCSD	40
2,2',3,4',5,6-Hexachlorobiphenyl	--	50-150	LCSD	40
2,2',3,4,5',6-Hexachlorobiphenyl	--	50-150	LCSD	40
2,2',3,4',5'-Pentachlorobiphenyl	--	50-150	LCSD	40
2,2',3,4,5-Pentachlorobiphenyl	--	50-150	LCSD	40
2,2',3,4',6,6'-Hexachlorobiphenyl	--	50-150	LCSD	40
2,2',3,4,6,6'-Hexachlorobiphenyl	--	50-150	LCSD	40
2,2',3,4,6'-Pentachlorobiphenyl	--	50-150	LCSD	40
2,2',3,5,5',6-Hexachlorobiphenyl	--	50-150	LCSD	40
2,2',3,5,6,6'-Hexachlorobiphenyl	--	50-150	LCSD	40
2,2',3,5,6'-Pentachlorobiphenyl	--	50-150	LCSD	40
2,2',3,5,6-Pentachlorobiphenyl	--	50-150	LCSD	40
2,2',3,5'-Tetrachlorobiphenyl	--	50-150	LCSD	40
2,2',3,6,6'-Pentachlorobiphenyl	--	50-150	LCSD	40
2,2',3,6'-Tetrachlorobiphenyl	--	50-150	LCSD	40
2,2',3,6-Tetrachlorobiphenyl	--	50-150	LCSD	40
2,2',4,4',5,5'-Hexachlorobiphenyl	--	50-150	LCSD	40
2,2',4,4',5,6'-Hexachlorobiphenyl	--	50-150	LCSD	40
2,2',4,4',5-Pentachlorobiphenyl	--	50-150	LCSD	40
2,2',4,4',6,6'-Hexachlorobiphenyl	--	50-150	LCSD	40
2,2',4,4',6-Pentachlorobiphenyl	--	50-150	LCSD	40
2,2',4,4'-Tetrachlorobiphenyl	--	50-150	LCSD	40
2,2',4,5',6-Pentachlorobiphenyl	--	50-150	LCSD	40
2,2',4,6,6'-Pentachlorobiphenyl	--	50-150	LCSD	40
2,2',4,6'-Tetrachlorobiphenyl	--	50-150	LCSD	40
2,2',4,6-Tetrachlorobiphenyl	--	50-150	LCSD	40
2,2',4-Trichlorobiphenyl	--	50-150	LCSD	40

Table B-4a. Laboratory Control Limits for Benthic Sediments Matrix Spike, Laboratory Control Samples, and Ongoing Precsion and Recovery.

Analysis	Matrix Spike Recovery (percent)	Laboratory Control Sample Recovery (percent)	Type of Duplicate	Control Limit Relative Percent Difference
2,2',5,6'-Tetrachlorobiphenyl	--	50-150	LCSD	40
2,2',5-Trichlorobiphenyl	--	50-150	LCSD	40
2,2',6,6'-Tetrachlorobiphenyl	--	50-150	LCSD	40
2,2',6-Trichlorobiphenyl	--	50-150	LCSD	40
2,3,3',4,4',5,5',6-Octachlorobiphenyl	--	50-150	LCSD	40
2,3,3',4,4',5,5'-Heptachlorobiphenyl	--	50-150	LCSD	40
2,3,3',4,4',5',6-Heptachlorobiphenyl	--	50-150	LCSD	40
2,3,3',4,4',5,6-Heptachlorobiphenyl	--	50-150	LCSD	40
2,3,3',4,4',5'-Hexachlorobiphenyl	--	50-150	LCSD	40
2,3,3',4,4',5-Hexachlorobiphenyl	--	50-150	LCSD	40
2,3,3',4,4'-Pentachlorobiphenyl	--	50-150	LCSD	40
2,3,3',4',5,5',6-Heptachlorobiphenyl	--	50-150	LCSD	40
2,3,3',4,5,5',6-Heptachlorobiphenyl	--	50-150	LCSD	40
2,3,3',4,5,5'-Hexachlorobiphenyl	--	50-150	LCSD	40
2,3,3',4',5'-Pentachlorobiphenyl	--	50-150	LCSD	40
2,3,3',4',6-Pentachlorobiphenyl	--	50-150	LCSD	40
2,3,3',4-Tetrachlorobiphenyl	--	50-150	LCSD	40
2,3,3',5',6-Pentachlorobiphenyl	--	50-150	LCSD	40
2,3,3',5'-Tetrachlorobiphenyl	--	50-150	LCSD	40
2,3,3',5-Tetrachlorobiphenyl	--	50-150	LCSD	40
2,3',4,4',5,5'-Hexachlorobiphenyl	--	50-150	LCSD	40
2,3',4,4',5',6-Hexachlorobiphenyl	--	50-150	LCSD	40
2,3,4,4',5,6-Hexachlorobiphenyl	--	50-150	LCSD	40
2,3',4,4',5'-Pentachlorobiphenyl	--	50-150	LCSD	40
2,3,4,4',5-Pentachlorobiphenyl	--	50-150	LCSD	40
2,3',4,4',6-Pentachlorobiphenyl	--	50-150	LCSD	40
2,3',4',5,5'-Pentachlorobiphenyl	--	50-150	LCSD	40
2,3',4,5,5'-Pentachlorobiphenyl	--	50-150	LCSD	40
2,3',4,5',6-Pentachlorobiphenyl	--	50-150	LCSD	40
2,3',4,5'-Tetrachlorobiphenyl	--	50-150	LCSD	40
2,3',4,5-Tetrachlorobiphenyl	--	50-150	LCSD	40
2,3,4',5-Tetrachlorobiphenyl	--	50-150	LCSD	40
2,3,4,6-Tetrachlorobiphenyl	--	50-150	LCSD	40
2,3',4-Trichlorobiphenyl	--	50-150	LCSD	40
2,3,4'-Trichlorobiphenyl	--	50-150	LCSD	40
2,3',5',6-Tetrachlorobiphenyl	--	50-150	LCSD	40
2,3,5,6-Tetrachlorobiphenyl	--	50-150	LCSD	40
2,3',5'-Trichlorobiphenyl	--	50-150	LCSD	40
2,3',5-Trichlorobiphenyl	--	50-150	LCSD	40
2,3,5-Trichlorobiphenyl	--	50-150	LCSD	40
2,3'-Dichlorobiphenyl	--	50-150	LCSD	40
2,4,4',5-Tetrachlorobiphenyl	--	50-150	LCSD	40
2,4,4'-Trichlorobiphenyl	--	50-150	LCSD	40

Table B-4a. Laboratory Control Limits for Benthic Sediments Matrix Spike, Laboratory Control Samples, and Ongoing Precsion and Recovery.

Analysis	Matrix Spike Recovery (percent)	Laboratory Control Sample Recovery (percent)	Type of Duplicate	Control Limit Relative Percent Difference
2,4',5-Trichlorobiphenyl	--	50-150	LCSD	40
2,4,5-Trichlorobiphenyl	--	50-150	LCSD	40
2,4,6-Trichlorobiphenyl	--	50-150	LCSD	40
2-Chlorobiphenyl	--	50-150	LCSD	40
3,3',4,4',5,5'-Hexachlorobiphenyl	--	50-150	LCSD	40
3,3',4,4',5-Pentachlorobiphenyl	--	50-150	LCSD	40
3,3',4,4'-Tetrachlorobiphenyl	--	50-150	LCSD	40
3,3',4,5,5'-Pentachlorobiphenyl	--	50-150	LCSD	40
3,3',4,5'-Tetrachlorobiphenyl	--	50-150	LCSD	40
3,3',4,5-Tetrachlorobiphenyl	--	50-150	LCSD	40
3,3',4-Trichlorobiphenyl	--	50-150	LCSD	40
3,3',5,5'-Tetrachlorobiphenyl	--	50-150	LCSD	40
3,3',5-Trichlorobiphenyl	--	50-150	LCSD	40
3,3'-Dichlorobiphenyl	--	50-150	LCSD	40
3,4,4',5-Tetrachlorobiphenyl	--	50-150	LCSD	40
3,4,4'-Trichlorobiphenyl	--	50-150	LCSD	40
3,4',5-Trichlorobiphenyl	--	50-150	LCSD	40
3,4,5-Trichlorobiphenyl	--	50-150	LCSD	40
3,5-Dichlorobiphenyl	--	50-150	LCSD	40
3-Chlorobiphenyl	--	50-150	LCSD	40
4,4'-Dichlorobiphenyl	--	50-150	LCSD	40
4-Chlorobiphenyl	--	50-150	LCSD	40
PCB004 & 010	--	50-150	LCSD	40
PCB005 & 008	--	50-150	LCSD	40
PCB007 & 009	--	50-150	LCSD	40
PCB012 & 013	--	50-150	LCSD	40
PCB016 & 032	--	50-150	LCSD	40
PCB020 & 021 & 033	--	50-150	LCSD	40
PCB024 & 027	--	50-150	LCSD	40
PCB041 & 064 &071 &072	--	50-150	LCSD	40
PCB042 & 059	--	50-150	LCSD	40
PCB043 & 049	--	50-150	LCSD	40
PCB048 & 075	--	50-150	LCSD	40
PCB052 & 069	--	50-150	LCSD	40
PCB056 & 060	--	50-150	LCSD	40
PCB061 & 070	--	50-150	LCSD	40
PCB066 & 076	--	50-150	LCSD	40
PCB084 & 092	--	50-150	LCSD	40
PCB085 & 116	--	50-150	LCSD	40
PCB087 & 117 & 125	--	50-150	LCSD	40
PCB088 & 091	--	50-150	LCSD	40
PCB090 & 101	--	50-150	LCSD	40
PCB095 & 098 & 102	--	50-150	LCSD	40

Table B-4a. Laboratory Control Limits for Benthic Sediments Matrix Spike, Laboratory Control Samples, and Ongoing Precsion and Recovery.

Analysis	Matrix Spike Recovery (percent)	Laboratory Control Sample Recovery (percent)	Type of Duplicate	Control Limit Relative Percent Difference
PCB106 & 118	--	50-150	LCSD	40
PCB107 & 109	--	50-150	LCSD	40
PCB108 & 112	--	50-150	LCSD	40
PCB111 & 115	--	50-150	LCSD	40
PCB128 & 162	--	50-150	LCSD	40
PCB132 & 161	--	50-150	LCSD	40
PCB133 & 142	--	50-150	LCSD	40
PCB134 & 143	--	50-150	LCSD	40
PCB138 & 163 & 164	--	50-150	LCSD	40
PCB139 & 149	--	50-150	LCSD	40
PCB146 & 165	--	50-150	LCSD	40
PCB158 & 160	--	50-150	LCSD	40
PCB182 & 187	--	50-150	LCSD	40
PCB196 & 203	--	50-150	LCSD	40

Notes:
BSD - blank spike duplicate
LCSD - laboratory contol sample duplicate
LD - laboratory duplicate
MSD - matrix spike duplicate

Table B-4a. Laboratory Control Limits for Benthic Tissue Matrix Spike, Laboratory Control Samples, and Ongoing Precsion and Recovery.

Analysis	Matrix Spike Recovery (percent)	Laboratory Control Sample Recovery (percent)	Type of Duplicate	Control Limit Relative Percent Difference
Metals				
Aluminum	75 - 125	18.2 - 31.9	LD	30
Antimony	70 - 130	--	LD	30
Arsenic	70 - 130	7.76 - 22.9	LD	30
Cadmium	70 - 130	15 - 24	LD	30
Chromium	75 - 125	23.4 - 48.2	LD	30
Copper	70 - 130	1.74 - 38.6	LD	30
Lead	70 - 130	0.02 - 0.437	LD	30
Mercury	60 - 130	2.58 - 4.21	LD	30
Nickel	70 - 130	1.9 - 27	LD	30
Selenium	60 - 130	5.26 - 9.05	LD	30
Silver	70 - 130	0.9 - 1.52	LD	30
Zinc	75 - 125	20.3 - 107	LD	30
Butyltins				
Butyltin ion	10 - 113	10 - 123	MSD	50
Dibutyltin ion	10 - 126	10 - 130	MSD	50
Tetrabutyltin	10 - 125	10 - 117	MSD	50
Tributyltin ion	10 - 151	10 - 117	MSD	50
Conventionals				
Lipids	--	--	--	--
Total solids	--	--	LD	40
Organochlorine pesticides				
2,4'-DDD	--	70 - 130	--	--
2,4'-DDE	--	70 - 130	--	--
2,4'-DDT	--	70 - 130	--	--
4,4'-DDD	--	70 - 130	--	--
4,4'-DDE	--	70 - 130	--	--
4,4'-DDT	--	70 - 130	--	--
Aldrin	--	70 - 130	--	--
alpha-Endosulfan	--	70 - 130	--	--
alpha-Hexachlorocyclohexane	--	70 - 130	--	--
beta-Endosulfan	--	70 - 130	--	--
beta-Hexachlorocyclohexane	--	70 - 130	--	--
cis-Chlordane	--	70 - 130	--	--
cis-Nonachlor	--	70 - 130	--	--
delta-Hexachlorocyclohexane	--	60 - 130	--	--
Dieldrin	--	60 - 130	--	--

Table B-4a. Laboratory Control Limits for Benthic Tissue Matrix Spike, Laboratory Control Samples, and Ongoing Precsion and Recovery.

Analysis	Matrix Spike Recovery (percent)	Laboratory Control Sample Recovery (percent)	Type of Duplicate	Control Limit Relative Percent Difference
Endosulfan sulfate	--	70 - 130	--	--
Endrin	--	60 - 130	--	--
Endrin aldehyde	--	10 - 130	--	--
Endrin ketone	--	60 - 130	--	--
gamma-Hexachlorocyclohexane	--	70 - 130	--	--
Heptachlor	--	70 - 130	--	--
Heptachlor epoxide	--	60 - 130	--	--
Methoxychlor	--	60 - 130	--	--
Oxychlordane	--	70 - 130	--	--
trans-Chlordane	--	70 - 130	--	--
trans-Nonachlor	--	70 - 130	--	--
Semivolatile Organic Compounds				
1,2,4-Trichlorobenzene	59 - 130	10 - 114	MSD	40
1,2-Dichlorobenzene	51 - 130	41 - 130	MSD	40
1,3-Dichlorobenzene	43 - 130	41 - 130	MSD	40
1,4-Dichlorobenzene	45 - 130	41 - 130	MSD	40
Benzyl alcohol	46 - 133	30 - 130	MSD	40
Dibenzofuran	53 - 124	10 - 191	MSD	40
Hexachlorobenzene	62 - 130	59 - 130	MSD	40
Hexachlorobutadiene	43 - 130	48 - 109	MSD	40
Hexachloroethane	29 - 130	46 - 110	MSD	40
N-Nitrosodiphenylamine	57 - 144	55 - 134	MSD	40
Phenols				
2,4-Dimethylphenol	56 - 145	10 - 107	MSD	40
2-Methylphenol	66 - 130	41 - 113	MSD	40
4-Methylphenol	60 - 134	35 - 116	MSD	40
Pentachlorophenol	10 - 181	27 - 160	MSD	40
Phenol	55 - 130	52 - 118	MSD	40
Phthalate Esters				
Bis(2-ethylhexyl) phthalate	53 - 172	36 - 174	MSD	40
Butylbenzyl phthalate	39 - 171	51 - 145	MSD	40
Dibutyl phthalate	47 - 161	54 - 152	MSD	40
Diethyl phthalate	60 - 139	59 - 133	MSD	40
Dimethyl phthalate	68 - 130	54 - 124	MSD	40
Di-n-octyl phthalate	35 - 184	49 - 157	MSD	40
Polycyclic Aromatic Hydrocarbons				
2-Methylnaphthalene	39 - 126	10 - 181	MSD	40
Acenaphthene	52 - 122	44 - 120	MSD	40

Table B-4a. Laboratory Control Limits for Benthic Tissue Matrix Spike, Laboratory Control Samples, and Ongoing Precsion and Recovery.

Analysis	Matrix Spike Recovery (percent)	Laboratory Control Sample Recovery (percent)	Type of Duplicate	Control Limit Relative Percent Difference
Acenaphthylene	44 - 129	44 - 124	MSD	40
Anthracene	51 - 129	47 - 128	MSD	40
Benz(a)anthracene	49 - 133	51 - 135	MSD	40
Benzo(a)pyrene	50 - 134	49 - 144	MSD	40
Benzo(b)fluoranthene	46 - 133	54 - 138	MSD	40
Benzo(g,h,i)perylene	44 - 134	45 - 143	MSD	40
Benzo(k)fluoranthene	51 - 136	55 - 145	MSD	40
Chrysene	59 - 124	59 - 133	MSD	40
Dibenz(a,h)anthracene	42 - 144	36 - 155	MSD	40
Fluoranthene	49 - 144	47 - 139	MSD	40
Fluorene	53 - 130	49 - 121	MSD	40
Indeno(1,2,3-cd)pyrene	30 - 148	37 - 149	MSD	40
Naphthalene	30 - 119	42 - 118	MSD	40
Phenanthrene	57 - 124	49 - 122	MSD	40
Pyrene	50 - 127	49 - 135	MSD	40
Dioxin/Furans				
Octachlorodibenzofuran	--	63 - 170	--	--
Octachlorodibenzo-p-dioxin	--	78 - 144	--	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran	--	82 - 122	--	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	--	70 - 140	--	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran	--	78 - 138	--	--
1,2,3,4,7,8-Hexachlorodibenzofuran	--	72 - 134	--	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	--	70 - 164	--	--
1,2,3,6,7,8-Hexachlorodibenzofuran	--	84 - 130	--	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	--	76 - 134	--	--
1,2,3,7,8,9-Hexachlorodibenzofuran	--	78 - 130	--	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	--	64 - 162	--	--
1,2,3,7,8-Pentachlorodibenzofuran	--	80 - 134	--	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	--	70 - 142	--	--
2,3,4,6,7,8-Hexachlorodibenzofuran	--	70 - 156	--	--
2,3,4,7,8-Pentachlorodibenzofuran	--	68 - 160	--	--
2,3,7,8-Tetrachlorodibenzofuran	--	75 - 158	--	--
2,3,7,8-Tetrachlorodibenzo-p-dioxin	--	67 - 158	--	--
PCB congeners			--	--
2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	--	50 - 150	--	--
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	--	50 - 150	--	--
2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl	--	50 - 150	--	--
2,2',3,3',5,5',6,6'-Octachlorobiphenyl	--	50 - 150	--	--
2,2',3,4',5,6,6'-Heptachlorobiphenyl	--	50 - 150	--	--
2,2',4,4',6,6'-Hexachlorobiphenyl	--	50 - 150	--	--

Table B-4a. Laboratory Control Limits for Benthic Tissue Matrix Spike, Laboratory Control Samples, and Ongoing Precsion and Recovery.

Analysis	Matrix Spike Recovery (percent)	Laboratory Control Sample Recovery (percent)	Type of Duplicate	Control Limit Relative Percent Difference
2,2',4,6,6'-Pentachlorobiphenyl	--	50 - 150	--	--
2,2',6,6'-Tetrachlorobiphenyl	--	50 - 150	--	--
2,2',6-Trichlorobiphenyl	--	50 - 150	--	--
2,2'-Dichlorobiphenyl	--	50 - 150	--	--
2,3,3',4,4',5,5',6-Octachlorobiphenyl	--	50 - 150	--	--
2,3,3',4,4',5,5'-Heptachlorobiphenyl	--	50 - 150	--	--
2,3,3',4,4'-Pentachlorobiphenyl	--	50 - 150	--	--
2,3',4,4',5,5'-Hexachlorobiphenyl	--	50 - 150	--	--
2,3',4,4',5'-Pentachlorobiphenyl	--	50 - 150	--	--
2,3',4,4',5-Pentachlorobiphenyl	--	50 - 150	--	--
2,3,4,4',5-Pentachlorobiphenyl	--	50 - 150	--	--
2-Chlorobiphenyl	--	50 - 150	--	--
3,3',4,4',5,5'-Hexachlorobiphenyl	--	50 - 150	--	--
3,3',4,4',5-Pentachlorobiphenyl	--	50 - 150	--	--
3,3',4,4'-Tetrachlorobiphenyl	--	50 - 150	--	--
3,4,4',5-Tetrachlorobiphenyl	--	50 - 150	--	--
3,4,4'-Trichlorobiphenyl	--	50 - 150	--	--
4,4'-Dichlorobiphenyl	--	50 - 150	--	--
4-Chlorobiphenyl	--	50 - 150	--	--
PCB156 & 157	--	50 - 150	--	--

Notes:
LD - laboratory duplicate
MSD - matrix spike duplicate

Table B-5. Data Validation Qualifiers and Definitions.

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

Table B-6a. Summary of Qualified Data by Parameter Group for Benthic Sediment Samples.

Analyte Group	Number of Samples	Number of Data Points		Total No. of Data Points	Detection and Qualification Frequencies (percent)		Reason for Qualification
		Detected	Undetected				
Conventionals	37	144	8	152	95	detected	
					5	undetected	
					30	J	HT
Grain Size	37	481	0	481	100	detected	
					0.0	undetected	
					0.4	J	PC
Metals	37	467	54	521	90	detected	
					10	undetected	
					30	J	MS, PC, ICPSD
					7	U	LB
					3	UJ	MS
Butyltins	37	121	27	148	82	detected	
					18	undetected	
					5	J	CC, MS
					6	U	FB, LB
Herbicides *	37	0	370	370	0	detected	
					100	undetected	
					43	UJ	IS
Organochlorine Pesticides	37	633	403	1036	61	detected	
					39	undetected	
					2	J	CC, PC, SSR
					0.2	NJ	CC
					10	U	PFP
					0.4	UJ	PC, SSR, PFP
Semivolatile Organic Compounds	37	131	1025	1156	11	detected	
					89	undetected	
					3	J	HT, CC, Ci, Cc, MS, Pc, LCSR
					0.2	NJ	CC, MS, LCSR
					0.1	U	PFP
					3	UJ	HT, Chrom, Ci, Cc, LB, MS, LCSR
Volatile Organic Compounds	37	51	1678	1729	3	detected	
					97	undetected	
					0.1	J	Ci, Cc
					2	U	FB, LB
					2	UJ	Ci, Cc, FB, MS, LCSR

Table B-6a. Summary of Qualified Data by Parameter Group for Benthic Sediment Samples.

Analyte Group	Number of Samples	Number of Data Points		Total No. of Data Points	Detection and Qualification Frequencies (percent)		Reason for Qualification
		Detected	Undetected				
Phenols	37	68	519	587	12	detected	
					88	undetected	
					3	J	CC, Pc, LCSR
					1	NJ	CC
					5	UJ	HT, IS
Phthalate Esters	37	59	163	222	27	detected	
					73	undetected	
					8	J	MS, Pc
					11	U	LB
					0.5	UJ	LB, Pc
Polycyclic Aromatic Hydrocarbons	37	612	17	629	97	detected	
					3	undetected	
					3	J	MS, Pc
					1	U	LB
					1	UJ	Cc
Petroleum Hydrocarbons	37	79	32	111	71	detected	
					29	undetected	
					64	J	Chrom, Pc
					9	U	LB
PCB Aroclors	37	49	284	333	15	detected	
					85	undetected	
					6	J	CC
PCB congener homologs	37	330	3	333	99	detected	
					1	undetected	
					1	J	
PCB congeners	37	5027	1226	6253	80	detected	Pc
					20	undetected	
					0	J	Pc
					1	U	LB
Dioxin/Furan Homologs	37	358	12	370	97	detected	
					3	undetected	
					1	J	LR
					1	U	LB

Table B-6a. Summary of Qualified Data by Parameter Group for Benthic Sediment Samples.

Analyte Group	Number of Samples	Number of Data Points		Total No. of Data Points	Detection and Qualification Frequencies (percent)		Reason for Qualification
		Detected	Undetected				
Dioxin/Furans	37	413	142	555	74	detected	
					26	undetected	
					3	J	SSR
					11	U	LB, PFP

Notes:
Includes replicates and splits, excludes field blanks.

* 210 dataponits have been assigned laboratory or interpreted qualifiers as non-detected. However, no validator qualification has been assigned and consequently none has been listed avove.
Reason for Qualification:

Cc - Calibration (continuing)
CC - Compound confirmation
Chrom-Chromatographic pattern does not match pattern of calibration standard
Ci - Calibration (initial)
FB- Field Blank Contamination
HT-Holding time
IS- Internal Standard Performance
LB - Lab blank contamination
LCSR - Laboratory control sample recoveries
LR-Linear Range Exceeded
MS- Matrix Spike recoveries
Pc - Precision (all replicates)
PFP - Potential false positive
SSR - Surrogate spike recoveries

Table B-6b. Summary of Qualified Data by Parameter Group for Benthic Tissue Samples.

Analyte Group	Number of Samples	Number of Data Points		Total # of Data Points	Detection and Qualification Frequencies (percent)		Reason for Qualification
		Detected	Undetected				
Conventionals	105	204	0	204	100	detected	
					0	undetected	
Metals	100	1142	54	1196	95	detected	
					5	undetected	
					14	J	MS,Pc, ICPSD
					2	U	LB
					2	UJ	LB, MS
Butyltins	97	195	193	388	50	detected	
					50	undetected	
					4	J	CC,Pc
					1	NJ	CC
					26	U	LB
Organochlorine Pesticides	103	1823	853	2676	68	detected	
					32	undetected	
					0.5	J	HT,Pc,SSR
					14	U	LB, PFP
					0.1	UJ	SSR, PFP
Semivolatile Organic Compounds	104	305	700	1005	30	detected	
					70	undetected	
					3	J	Ci,Cc,Pc,SSR,Other
					0.2	U	PFP
					17	UJ	
Phenols	100	98	338	436	22	detected	
					78	undetected	
Phthalate Esters	100	66	534	600	11	detected	
					89	undetected	
					0.2	J	MS
					10	U	LB
					0.2	UJ	MS
Polycyclic Aromatic Hydrocarbons	101	1458	259	1717	1604	detected	
					15	undetected	
					7	U	LB

Table B-6b. Summary of Qualified Data by Parameter Group for Benthic Tissue Samples.

Analyte Group	Number of Samples	Number of Data Points		Total # of Data Points	Detection and Qualification Frequencies (percent)		Reason for Qualification
		Detected	Undetected				
PCB Aroclors	103	306	415	721	42	detected	
					58	undetected	
					42	NJ	Pc, Other
PCB congener homologs	103	920	0	920	100	detected	
					0	undetected	
					5	J	Pc,SSR
PCB congeners	103	14888	1562	16450	91	detected	
					9	undetected	
					5	J	Pc,SSR, Other
					2	U	LB, PFP
					0.4	UJ	Pc,SSR, Other, PFP
Dioxin/Furan Homologs	101	966	44	1010	96	detected	
					4	undetected	
					2	U	LB, PFP
Dioxin/Furans	101	894	621	1515	59	detected	
					41	undetected	
					27	U	LB, PFP

Notes:

Includes replicates and splits, excludes field blanks.

Reason for Qualification:

Cc - Calibration (continuing)
CC - Compound confirmation
Ci - Calibration (initial)
HT-Holding time
ICPSD-ICP Serial Dilution % Difference
LB - Lab blank contamination
LCSR - Laboratory control sample recoveries
MS- Matrix Spike recoveries
Other - defined in validation report.
Pc - Precision (all replicates)
PFP - Potential false positive
SSR - Surrogate spike recoveries

Table B-7a. Reported Detection Limits - Benthic Sediment Sampling Event.

Analyte	CAS Number	Units	Round 2 QAPP MDL[a]	Reported Detection Limits[a]		Total No. Data Points	No. Undetected Results
				Minimum	Maximum		
Metals							
Aluminum	7429-90-5	mg/kg	10.0	5.4	9.6	37	--
Antimony	7440-36-0	mg/kg	0.02	0.03	0.04	37	--
Arsenic	7440-38-2	mg/kg	0.07	0.07	0.1	37	--
Barium	7440-39-3	mg/kg	--	0.18	0.25	10	--
Beryllium	7440-41-7	mg/kg	--	0.004	0.005	10	--
Cadmium	7440-43-9	mg/kg	0.007	0.004	0.009	37	--
Chromium	7440-47-3	mg/kg	0.6	0.4	0.9	37	--
Chromium hexavalent	18540-29-9	mg/kg	0.05	0.1	1	37	16
Copper	7440-50-8	mg/kg	2.0	0.5	2.4	37	--
Lead	7439-92-1	mg/kg	0.02	0.02	0.02	37	--
Manganese	7439-96-5	mg/kg	--	0.08	0.11	10	--
Mercury	7439-97-6	mg/kg	0.008	0.008	0.009	37	--
Nickel	7440-02-0	mg/kg	3.0	0.08	0.7	37	--
Selenium	7782-49-2	mg/kg	0.2	0.03	0.29	37	37
Silver	7440-22-4	mg/kg	0.003	0.002	0.068	37	1
Thallium	7440-28-0	mg/kg	--	0.004	0.005	10	--
Zinc	7440-66-6	mg/kg	0.5	0.4	1	37	--
Butyltins							
Monobutyltin	78763-54-9	ug/kg	0.071	0.041	6.9	37	2
Dibutyltin	14488-53-0	ug/kg	0.041	0.039	33	37	3
Tributyltin	1461-25-2	ug/kg	0.16	0.096	1.5	37	18
Tetrabutyltin	36643-28-4	ug/kg	0.12	0.077	3.2	37	4
Conventionals							
Ammonia	7664-41-7	mg/kg	0.2	0.3	3.2	37	--
Sulfide (S)	18496-25-8	mg/kg	0.08	0.03	0.4	37	8
Total organic carbon	TOC	percent	0.02	0.02	0.02	37	--
Total solids	TSO	percent	0.01	--	--	80	--
Grain size							
>9 Phi clay	GS_MFCLAY	percent	0.1	--	--	37	--
8-9 Phi clay	GS_CCLAY	percent	0.1	--	--	37	--
Coarse sand	GS_CS	percent	0.1	--	--	37	--
Coarse silt	GS_CSILT	percent	0.1	--	--	37	--

Table B-7a. Reported Detection Limits - Benthic Sediment Sampling Event.

Analyte	CAS Number	Units	Round 2 QAPP MDL[a]	Reported Detection Limits[a]		Total No. Data Points	No. Undetected Results
				Minimum	Maximum		
Fine gravel	GS_FG	percent	0.1	--	--	37	--
Fine sand	GS_FS	percent	0.1	--	--	37	--
Fine silt	GS_FSILT	percent	0.1	--	--	37	--
Medium gravel	GS_MG	percent	0.1	--	--	37	--
Medium sand	GS_MS	percent	0.1	--	--	37	--
Medium silt	GS_MSILT	percent	0.1	--	--	37	--
Very coarse sand	GS_VCS	percent	0.1	--	--	37	--
Very fine sand	GS_VFS	percent	0.1	--	--	37	--
Very fine silt	GS_VFSILT	percent	0.1	--	--	37	--
Organochlorine pesticides							
2,4'-DDD	53-19-0	ug/kg	--[b]	0.0011	12	74	22
2,4'-DDE	3424-82-6	ug/kg	--	0.000884	27	74	32
2,4'-DDT	789-02-6	ug/kg	--	0.0019	13	74	20
4,4'-DDD	72-54-8	ug/kg	--	0.00164	11	74	11
4,4'-DDE	72-55-9	ug/kg	--	0.00115	5.5	74	9
4,4'-DDT	50-29-3	ug/kg	--	0.00195	18	74	10
Aldrin	309-00-2	ug/kg	--	0.0000779	4.4	74	24
alpha -Chlordane	5103-71-9	ug/kg	--	0.000651	9.4	74	33
alpha -HCH	319-84-6	ug/kg	--	0.000645	9	74	51
beta -HCH	319-85-7	ug/kg	--	0.00101	5.6	74	55
cis- Nonachlor	5103-73-1	ug/kg	--	0.00134	47	74	32
delta -HCH	319-86-8	ug/kg	--	0.000469	6.4	74	56
Dieldrin	60-57-1	ug/kg	--	0.000372	24	74	32
Endosulfan I	959-98-8	ug/kg	--	0.00522	2.9	74	56
Endosulfan II	33213-65-9	ug/kg	--	0.00432	4.9	74	43
Endosulfan sulfate	1031-07-8	ug/kg	--	0.00168	5.2	74	39
Endrin	72-20-8	ug/kg	--	0.00183	14	74	66
Endrin aldehyde	7421-93-4	ug/kg	--	0.096	20	74	67
Endrin ketone	53494-70-5	ug/kg	--	0.000905	18	74	58
gamma -Chlordane	5103-74-2	ug/kg	--	0.00058	9.4	74	25
gamma -HCH	58-89-9	ug/kg	--	0.000823	4.3	74	41
Heptachlor	76-44-8	ug/kg	--	0.000138	2.8	74	57
Heptachlor epoxide	1024-57-3	ug/kg	--	0.000212	3.9	74	38
Methoxychlor	72-43-5	ug/kg	--	0.016	9.9	74	67
Mirex	2385-85-5	ug/kg	--	0.067	9.7	37	28

Table B-7a. Reported Detection Limits - Benthic Sediment Sampling Event.

Analyte	CAS Number	Units	Round 2 QAPP MDL[a]	Reported Detection Limits[a]		Total No. Data Points	No. Undetected Results
				Minimum	Maximum		
Oxychlordane	27304-13-8	ug/kg	--	0.00195	14	74	69
Toxaphene	8001-35-2	ug/kg	0.9[c]	8.3	790	37	37
trans- Nonachlor	39765-80-5	ug/kg	--	0.000778	16	74	30
Herbicides							
2,4,5-T	93-76-5	ug/kg	0.38	0.38	0.71	37	37
2,4,5-TP	93-72-1	ug/kg	0.38	0.38	0.71	37	37
2,4-D	94-75-7	ug/kg	0.26	0.26	0.49	37	37
2,4-DB	94-82-6	ug/kg	0.53	0.39	0.72	37	37
Dalapon	75-99-0	ug/kg	0.23	0.23	0.43	37	37
Dicamba	1918-00-9	ug/kg	0.82	0.82	1.5	37	37
Dichloroprop	120-36-5	ug/kg	0.42	0.42	0.78	37	37
Dinoseb	88-85-7	ug/kg	0.39	0.53	0.98	37	37
MCPA	94-74-6	ug/kg	0.56	0.56	1	37	37
MCPP	93-65-2	ug/kg	0.51	0.51	0.95	37	37
Semivolatile Organic Compounds							
1,2,4-Trichlorobenzene	120-82-1	ug/kg	1.5	0.48	34	74	74
1,2-Dichlorobenzene	95-50-1	ug/kg	1.3	0.1	29	74	72
1,3-Dichlorobenzene	541-73-1	ug/kg	1.6	0.15	36	74	73
1,4-Dichlorobenzene	106-46-7	ug/kg	0.12[d]	0.16	42	74	73
2,4-Dinitrotoluene	121-14-2	ug/kg	2.8	3.9	62	37	37
2,6-Dinitrotoluene	606-20-2	ug/kg	2.8	3.9	62	37	37
2-Chloronaphthalene	91-58-7	ug/kg	3.6	5	80	37	37
2-Nitroaniline	88-74-4	ug/kg	2.7	3.7	60	37	37
3,3'-Dichlorobenzidine	91-94-1	ug/kg	3.7	5.1	82	33	33
3-Nitroaniline	99-09-2	ug/kg	2.6	3.6	58	37	37
4-Bromophenyl phenyl ether	101-55-3	ug/kg	1.4	2	31	37	37
4-Chloroaniline	106-47-8	ug/kg	2.1	2.9	47	37	37
4-Chlorophenyl phenyl ether	7005-72-3	ug/kg	2	2.8	45	37	37
4-Nitroaniline	100-01-6	ug/kg	3.4	4.7	75	37	37
Aniline	62-53-3	ug/kg	1.5	2.1	34	20	20
Azobenzene	103-33-3	ug/kg		3.3	53	37	37
Benzoic acid	65-85-0	ug/kg	96	140	2200	30	30
Benzyl alcohol	100-51-6	ug/kg	3.7	5.1	82	37	36
Bis(2-chloroethoxy) methane	111-91-1	ug/kg	1.3	1.8	29	37	37

Table B-7a. Reported Detection Limits - Benthic Sediment Sampling Event.

Analyte	CAS Number	Units	Round 2 QAPP MDL[a]	Reported Detection Limits[a]		Total No. Data Points	No. Undetected Results
				Minimum	Maximum		
Bis(2-chloroethyl) ether	111-44-4	ug/kg	2.4	3.3	53	37	37
Bis(2-chloroisopropyl) ether	39638-32-9	ug/kg	1.2	1.7	27	37	37
Carbazole	86-74-8	ug/kg	1.3	1.8	29	37	11
Dibenzofuran	132-64-9	ug/kg	0.17[e]	0.24	3.7	37	--
Hexachlorocyclopentadiene	77-47-4	ug/kg	15	21	340	37	37
Isophorone	78-59-1	ug/kg	1.6	2.2	36	37	37
Hexachlorobenzene	118-74-1	ug/kg	--	0.0000135	47	111	61
Hexachlorobutadiene	87-68-3	ug/kg	--	0.000697	31	138	126
Hexachloroethane	67-72-1	ug/kg	--	0.077	49	74	55
Nitrobenzene	98-95-3	ug/kg	2	2.8	45	37	37
N-Nitrosodimethylamine	62-75-9	ug/kg	6.1	8.4	140	37	37
N-Nitrosodiphenylamine	86-30-6	ug/kg	2.2	3.1	49	37	36
N-Nitrosodipropylamine	621-64-7	ug/kg	3.2	4.4	71	37	37
Volatile Organic Compounds							
1,1,1,2-Tetrachloroethane	630-20-6	ug/kg	0.031	0.042	0.11	37	36
1,1,1-Trichloroethane	71-55-6	ug/kg	0.059	0.079	0.2	37	37
1,1,2,2-Tetrachloroethane	79-34-5	ug/kg	0.096	0.13	0.32	37	37
1,1,2-Trichloroethane	79-00-5	ug/kg	0.059	0.079	0.2	37	37
1,1-Dichloroethane	75-34-3	ug/kg	0.057	0.076	0.19	37	37
1,1-Dichloroethene	75-35-4	ug/kg	0.082	0.11	0.28	37	37
1,2,3-Trichloropropane	96-18-4	ug/kg	0.082	0.15	0.37	37	37
1,2-Dichloroethane	107-06-2	ug/kg	0.11	0.042	0.11	37	37
1,2-Dichloropropane	78-87-5	ug/kg	0.051	0.047	0.12	37	37
2-Butanone	78-93-3	ug/kg	1.1	2.2	19	2	1
2-Chloroethyl vinyl ether	110-75-8	ug/kg	0.15	0.2	0.5	37	37
2-Hexanone	591-78-6	ug/kg	0.64	0.85	2.2	31	31
4-Methyl-2-Pentanone	108-10-1	ug/kg	0.24	0.32	0.8	37	37
Acetone	67-64-1	ug/kg	1.6	2.4	78	31	26
Acrylonitrile	107-13-1	ug/kg	0.23	0.31	0.77	37	37
Benzene	71-43-2	ug/kg	0.039	0.052	0.13	37	34
Bromochloromethane	74-97-5	ug/kg	0.06	0.08	0.2	37	37
Bromodichloromethane	75-27-4	ug/kg	0.068	0.091	0.23	37	37
Bromoform	75-25-2	ug/kg	0.046	0.062	0.16	37	37
Bromomethane	74-83-9	ug/kg	0.37	0.5	1.3	37	37
Carbon disulfide	75-15-0	ug/kg	0.13	0.18	0.44	37	36

Table B-7a. Reported Detection Limits - Benthic Sediment Sampling Event.

Analyte	CAS Number	Units	Round 2 QAPP MDL[a]	Reported Detection Limits[a]		Total No. Data Points	No. Undetected Results
				Minimum	Maximum		
Carbon tetrachloride	56-23-5	ug/kg	0.099	0.14	0.33	37	37
Chlorobenzene	108-90-7	ug/kg	0.07	0.093	0.24	37	37
Chlorodibromomethane	124-48-1	ug/kg	0.068	0.091	0.23	37	37
Chloroethane	75-00-3	ug/kg	0.28	0.38	0.94	37	37
Chloroform	67-66-3	ug/kg	0.056	0.075	0.19	37	36
Chloromethane	74-87-3	ug/kg	0.19	0.26	0.64	37	37
cis -1,2-Dichloroethene	156-59-2	ug/kg		0.083	0.21	37	37
cis -1,3-Dichloropropene	10061-01-5	ug/kg	0.031	0.042	0.11	37	37
Dibromomethane	74-95-3	ug/kg	0.082	0.11	0.28	37	37
Dichlorodifluoromethane	75-71-8	ug/kg	0.11	0.15	0.37	37	5
Ethylbenzene	100-41-4	ug/kg	0.071	0.095	0.24	37	37
Ethylene dibromide	106-93-4	ug/kg		0.068	0.17	37	37
Iodomethane	74-88-4	ug/kg	0.67	0.89	2.3	37	37
Isopropylbenzene	98-82-8	ug/kg	0.044	0.059	0.15	37	35
m,p -Xylene	179601-23-1	ug/kg	0.13	0.18	0.44	37	36
Methyl tert-butyl ether	1634-04-4	ug/kg	0.039	0.052	0.13	37	37
Methylene chloride	75-09-2	ug/kg	0.29	0.39	2.5	37	36
o -Xylene	95-47-6	ug/kg	0.075	0.1	0.25	37	36
Styrene	100-42-5	ug/kg	0.074	0.099	0.27	37	37
Tetrachloroethene	127-18-4	ug/kg	0.096	0.13	0.32	37	36
Toluene	108-88-3	ug/kg	0.15	0.2	1.1	37	36
trans -1,2-Dichloroethene	156-60-5	ug/kg	0.19	0.26	0.64	37	37
trans -1,3-Dichloropropene	10061-02-6	ug/kg	0.044	0.059	0.15	37	37
trans -1,4-Dichloro-2-butene	110-57-6	ug/kg	0.51	0.68	1.7	37	37
Trichloroethene	79-01-6	ug/kg	0.062	0.083	0.21	37	37
Trichlorofluoromethane	75-69-4	ug/kg	0.081	0.11	0.27	37	37
Vinyl chloride	75-01-4	ug/kg	0.085	0.12	0.29	37	37
Phenols							
2,3,4,5-Tetrachlorophenol	4901-51-3	ug/kg	0.36	0.59	43	37	35
2,3,5,6-Tetrachlorophenol[f]	935-95-5	ug/kg	0.36	0.58	8.5	37	35
2,4,5-Trichlorophenol	95-95-4	ug/kg	0.29	0.46	98	37	34
2,4,6-Trichlorophenol	88-06-2	ug/kg	0.36	0.35	5.8	37	36
2,4-Dichlorophenol	120-83-2	ug/kg	1.8	2.5	40	37	36
2,4-Dimethylphenol	105-67-9	ug/kg	5.5	7.6	130	32	32
2,4-Dinitrophenol	51-28-5	ug/kg	36	50	800	37	37

Table B-7a. Reported Detection Limits - Benthic Sediment Sampling Event.

Analyte	CAS Number	Units	Round 2 QAPP MDL[a]	Reported Detection Limits[a]		Total No. Data Points	No. Undetected Results
				Minimum	Maximum		
2-Chlorophenol	95-57-8	ug/kg	1.7	2.4	38	37	37
2-Methylphenol	95-48-7	ug/kg	3.4	4.7	75	37	37
2-Nitrophenol	88-75-5	ug/kg	2.6	3.6	58	37	37
4,6-Dinitro-2-methylphenol	534-52-1	ug/kg	1.7	2.4	38	37	37
4-Chloro-3-methylphenol	59-50-7	ug/kg	2.1	2.9	47	37	37
4-Methylphenol	106-44-5	ug/kg	2.9	4	64	37	23
4-Nitrophenol	100-02-7	ug/kg	30	0.31	670	74	74
Pentachlorophenol	87-86-5	ug/kg	0.39	0.58	10	74	54
Phenol	108-95-2	ug/kg	1.9	2.6	42	37	12
Phthalate Esters							
Bis(2-ethylhexyl) phthalate	117-81-7	ug/kg	1.7	2.4	150	37	14
Butylbenzyl phthalate	85-68-7	ug/kg	1.5	2.1	34	37	18
Dibutyl phthalate	84-74-2	ug/kg	2.6	3.6	58	37	22
Diethyl phthalate	84-66-2	ug/kg	3.5	4.8	78	37	36
Dimethyl phthalate	131-11-3	ug/kg	1.8	2.5	40	37	36
Di-n-octyl phthalate	117-84-0	ug/kg	1.2	1.7	27	37	37
Polycyclic Aromatic Hydrocarbons							
2-Methylnaphthalene	91-57-6	ug/kg	0.34	0.47	7.3	37	2
Acenaphthene	83-32-9	ug/kg	0.16	0.22	3.5	37	--
Acenaphthylene	208-96-8	ug/kg	0.22	0.31	4.8	37	--
Anthracene	120-12-7	ug/kg	0.22	0.31	4.8	37	--
Benz(a)anthracene	56-55-3	ug/kg	0.16	0.22	3.6	37	--
Benzo(a)pyrene	50-32-8	ug/kg	0.22	0.31	4.9	37	--
Benzo(b)fluoranthene	205-99-2	ug/kg	0.48	0.66	11	37	--
Benzo(g,h,i)perylene	191-24-2	ug/kg	0.23	0.32	5.1	37	--
Benzo(k)fluoranthene	207-08-9	ug/kg	0.33	0.46	7.3	37	--
Chrysene	218-01-9	ug/kg	0.41	0.56	9.1	37	--
Dibenz(a,h)anthracene	53-70-3	ug/kg	0.26	0.36	5.6	37	--
Fluoranthene	206-44-0	ug/kg	0.34	0.47	7.5	37	--
Fluorene	86-73-7	ug/kg	0.19	0.26	4.1	37	1
Indeno(1,2,3-cd)pyrene	193-39-5	ug/kg	0.24	0.33	5.3	37	--
Naphthalene	91-20-3	ug/kg	0.34	0.47	10	74	50
Phenanthrene	85-01-8	ug/kg	0.33	0.46	7.1	37	--
Pyrene	129-00-0	ug/kg	0.36	0.5	8	37	--

Table B-7a. Reported Detection Limits - Benthic Sediment Sampling Event.

Analyte	CAS Number	Units	Round 2 QAPP MDL[a]	Reported Detection Limits[a]		Total No. Data Points	No. Undetected Results
				Minimum	Maximum		
Petroleum Hydrocarbons							
Diesel Range Hydrocarbons	DRH	mg/kg	1	4.7	12	37	--
Gasoline Range Hydrocarbons	GRH	mg/kg	3.4	1.4	9.7	37	31
Residual Range Hydrocarbons	RRH	mg/kg	3.2	4.4	70	37	1
Dioxin/Furans							
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	pg/g	0.39	0.009	0.763	37	4
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	35822-46-9	pg/g	0.27	0.006	0.189	37	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	pg/g	0.42	0.012	0.458	37	6
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	pg/g	0.30	0.007	0.741	37	6
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	39227-28-6	pg/g	0.27	0.009	0.25	37	9
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	pg/g	0.37	0.007	0.367	37	2
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	57653-85-7	pg/g	0.62	0.009	0.831	37	2
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	pg/g	0.28	0.008	0.381	37	22
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	19408-74-3	pg/g	0.50	0.008	0.205	37	5
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	pg/g	0.25	0.005	0.257	37	11
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	40321-76-4	pg/g	0.36	0.007	0.216	37	15
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	pg/g	0.29	0.007	0.427	37	3
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	pg/g	0.16	0.005	0.086	37	8
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	pg/g	0.09	0.017	0.734	37	19
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746-01-6	pg/g	0.08	0.005	0.084	37	30
Heptachlorodibenzofuran homologs	38998-75-3	pg/g	--	0.009	0.367	37	--
Heptachlorodibenzo-p-dioxin homologs	37871-00-4	pg/g	--	0.006	0.189	37	--
Hexachlorodibenzofuran homologs	55684-94-1	pg/g	--	0.007	0.349	37	--
Hexachlorodibenzo-p-dioxin homologs	34465-46-8	pg/g	--	0.007	0.055	37	--
Octachlorodibenzofuran	39001-02-0	pg/g	4.04	0.018	1.842	37	2
Octachlorodibenzo-p-dioxin	3268-87-9	pg/g	1.55	0.018	0.216	37	--
Pentachlorodibenzofuran homologs	30402-15-4	pg/g	--	0.005	0.079	37	--
Pentachlorodibenzo-p-dioxin homologs	36088-22-9	pg/g	--	0.007	0.054	37	5
Tetrachlorodibenzofuran homologs	30402-14-3	pg/g	--	0.004	0.08	37	1
Tetrachlorodibenzo-p-dioxin homologs	41903-57-5	pg/g	--	0.005	0.04	37	4
PCB Aroclors							
Aroclor 1016	12674-11-2	ug/kg	0.25	1.6	95	37	37
Aroclor 1221	11104-28-2	ug/kg	0.5	1.7	34	37	37

Table B-7a. Reported Detection Limits - Benthic Sediment Sampling Event.

Analyte	CAS Number	Units	Round 2 QAPP MDL[a]	Reported Detection Limits[a]		Total No. Data Points	No. Undetected Results
				Minimum	Maximum		
Aroclor 1232	11141-16-5	ug/kg	0.25	1.7	170	37	37
Aroclor 1242	53469-21-9	ug/kg	0.25	1.7	140	37	34
Aroclor 1248	12672-29-6	ug/kg	0.25	1.6	110	37	35
Aroclor 1254	11097-69-1	ug/kg	0.25	1.6	120	37	23
Aroclor 1260	11096-82-5	ug/kg	0.25	1.6	55	37	7
Aroclor 1262	37324-23-5	ug/kg	0.25	1.6	30	37	37
Aroclor 1268	11100-14-4	ug/kg	0.25	1.6	30	37	37
PCB congeners							
2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	2051-24-3	pg/g	0.2 -29	2.45	12.6	37	--
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	40186-72-9	pg/g	0.2 -29	2.45	12.6	37	--
2,2',3,3',4,4',5,5'-Octachlorobiphenyl	35694-08-7	pg/g	0.2 -29	2.45	12.6	37	--
2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl	52663-79-3	pg/g	0.2 -29	2.45	12.6	37	2
2,2',3,3',4,4',5,6-Octachlorobiphenyl	52663-78-2	pg/g	0.2 -29	2.45	12.6	37	--
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	pg/g	0.2 -29	2.45	12.6	37	--
2,2',3,3',4,4',6,6'-Octachlorobiphenyl	33091-17-7	pg/g	0.2 -29	2.45	12.6	37	4
2,2',3,3',4,4',6-Heptachlorobiphenyl	52663-71-5	pg/g	0.2 -29	2.45	12.6	37	--
2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl	52663-77-1	pg/g	0.2 -29	2.45	12.6	37	1
2,2',3,3',4,5,5',6'-Octachlorobiphenyl	52663-75-9	pg/g	0.2 -29	2.45	12.6	37	--
2,2',3,3',4,5,5',6-Octachlorobiphenyl	68194-17-2	pg/g	0.2 -29	2.45	12.6	37	2
2,2',3,3',4,5,5'-Heptachlorobiphenyl	52663-74-8	pg/g	0.2 -29	2.45	12.6	37	--
2,2',3,3',4,5,6,6'-Octachlorobiphenyl	52663-73-7	pg/g	0.2 -29	2.45	23.2	37	2
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	40186-71-8	pg/g	0.2 -29	2.45	12.6	37	1
2,2',3,3',4,5',6'-Heptachlorobiphenyl	52663-70-4	pg/g	0.2 -29	2.45	12.6	37	--
2,2',3,3',4,5,6-Heptachlorobiphenyl	68194-16-1	pg/g	0.2 -29	2.45	12.6	37	4
2,2',3,3',4,5',6-Heptachlorobiphenyl	40186-70-7	pg/g	0.2 -29	2.45	12.6	37	1
2,2',3,3',4,5,6'-Heptachlorobiphenyl	38411-25-5	pg/g	0.2 -29	2.45	12.6	37	--
2,2',3,3',4,5'-Hexachlorobiphenyl	52663-66-8	pg/g	0.2 -29	2.45	12.6	37	--
2,2',3,3',4,5-Hexachlorobiphenyl	55215-18-4	pg/g	0.2 -29	2.45	12.6	37	1
2,2',3,3',4,6,6'-Heptachlorobiphenyl	52663-65-7	pg/g	0.2 -29	2.45	12.6	37	--
2,2',3,3',4,6-Hexachlorobiphenyl	61798-70-7	pg/g	0.2 -29	2.45	12.6	37	30
2,2',3,3',4-Pentachlorobiphenyl	52663-62-4	pg/g	0.2 -29	2.45	12.6	37	--
2,2',3,3',5,5',6,6'-Octachlorobiphenyl	2136-99-4	pg/g	0.2 -29	2.45	12.6	37	1
2,2',3,3',5,5',6-Heptachlorobiphenyl	52663-67-9	pg/g	0.2 -29	2.45	12.6	37	--
2,2',3,3',5,6,6'-Heptachlorobiphenyl	52663-64-6	pg/g	0.2 -29	2.45	12.6	37	--
2,2',3,3',5,6'-Hexachlorobiphenyl	52744-13-5	pg/g	0.2 -29	2.45	12.6	37	--

Table B-7a. Reported Detection Limits - Benthic Sediment Sampling Event.

Analyte	CAS Number	Units	Round 2 QAPP MDL[a]	Reported Detection Limits[a]		Total No. Data Points	No. Undetected Results
				Minimum	Maximum		
2,2',3,3',5-Pentachlorobiphenyl	60145-20-2	pg/g	0.2 -29	2.45	12.6	37	32
2,2',3,3',6,6'-Hexachlorobiphenyl	38411-22-2	pg/g	0.2 -29	2.45	12.6	37	--
2,2',3,3'-Tetrachlorobiphenyl	38444-93-8	pg/g	0.2 -29	2.45	12.6	37	--
2,2',3,4,4',5,5'-Heptachlorobiphenyl	35065-29-3	pg/g	0.2 -29	2.45	12.6	37	--
2,2',3,4,4',5,6,6'-Octachlorobiphenyl	74472-52-9	pg/g	0.2 -29	2.45	12.6	37	34
2,2',3,4,4',5,6-Heptachlorobiphenyl	74472-47-2	pg/g	0.2 -29	2.45	12.6	37	16
2,2',3,4,4',5',6-Heptachlorobiphenyl	52663-69-1	pg/g	0.2 -29	2.45	12.6	37	--
2,2',3,4,4',5-Hexachlorobiphenyl	35694-06-5	pg/g	0.2 -29	2.45	12.6	37	1
2,2',3,4,4',6,6'-Heptachlorobiphenyl	74472-48-3	pg/g	0.2 -29	2.45	12.6	37	30
2,2',3,4,4',6'-Hexachlorobiphenyl	59291-64-4	pg/g	0.2 -29	2.45	12.6	37	4
2,2',3,4,5,5',6-Heptachlorobiphenyl	52712-05-7	pg/g	0.2 -29	2.45	12.6	37	1
2,2',3,4,5,5'-Hexachlorobiphenyl	52712-04-6	pg/g	0.2 -29	2.45	12.6	37	--
2,2',3,4,5,6,6'-Heptachlorobiphenyl	74472-49-4	pg/g	0.2 -29	2.45	12.6	37	35
2,2',3,4',5,6,6'-Heptachlorobiphenyl	74487-85-7	pg/g	0.2 -29	2.45	12.6	37	27
2,2',3,4',5,6'-Hexachlorobiphenyl	74472-41-6	pg/g	0.2 -29	2.45	12.6	37	10
2,2',3,4',5,6-Hexachlorobiphenyl	68194-13-8	pg/g	0.2 -29	2.45	20.1	37	2
2,2',3,4,5',6-Hexachlorobiphenyl	68194-14-9	pg/g	0.2 -29	2.45	12.6	37	--
2,2',3,4',5'-Pentachlorobiphenyl	41464-51-1	pg/g	0.2 -29	2.45	12.6	37	--
2,2',3,4,5-Pentachlorobiphenyl	55312-69-1	pg/g	0.2 -29	2.45	12.6	37	15
2,2',3,4,6,6'-Hexachlorobiphenyl	74472-40-5	pg/g	0.2 -29	2.45	12.6	37	30
2,2',3,4',6,6'-Hexachlorobiphenyl	68194-08-1	pg/g	0.2 -29	2.45	12.6	37	11
2,2',3,4,6'-Pentachlorobiphenyl	73575-57-2	pg/g	0.2 -29	2.45	12.6	37	3
2,2',3,5,5',6-Hexachlorobiphenyl	52663-63-5	pg/g	0.2 -29	2.45	12.6	37	--
2,2',3,5,6,6'-Hexachlorobiphenyl	68194-09-2	pg/g	0.2 -29	2.45	12.6	37	20
2,2',3,5,6'-Pentachlorobiphenyl	73575-55-0	pg/g	0.2 -29	2.45	12.6	37	2
2,2',3,5,6-Pentachlorobiphenyl	73575-56-1	pg/g	0.2 -29	2.45	12.6	37	37
2,2',3,5'-Tetrachlorobiphenyl	41464-39-5	pg/g	0.2 -29	2.45	12.6	37	--
2,2',3,6,6'-Pentachlorobiphenyl	73575-54-9	pg/g	0.2 -29	2.45	12.6	37	3
2,2',3,6'-Tetrachlorobiphenyl	41464-47-5	pg/g	0.2 -29	2.45	12.6	37	1
2,2',3,6-Tetrachlorobiphenyl	70362-45-7	pg/g	0.2 -29	2.45	12.6	37	1
2,2',4,4',5,5'-Hexachlorobiphenyl	35065-27-1	pg/g	0.2 -29	2.45	12.6	37	--
2,2',4,4',5,6'-Hexachlorobiphenyl	60145-22-4	pg/g	0.2 -29	2.45	12.6	37	2
2,2',4,4',5-Pentachlorobiphenyl	38380-01-7	pg/g	0.2 -29	2.45	12.6	37	--
2,2',4,4',6,6'-Hexachlorobiphenyl	33979-03-2	pg/g	0.2 -29	2.45	12.6	37	31
2,2',4,4',6-Pentachlorobiphenyl	39485-83-1	pg/g	0.2 -29	2.45	12.6	37	1

Table B-7a. Reported Detection Limits - Benthic Sediment Sampling Event.

Analyte	CAS Number	Units	Round 2 QAPP MDL[a]	Reported Detection Limits[a]		Total No. Data Points	No. Undetected Results
				Minimum	Maximum		
2,2',4,4'-Tetrachlorobiphenyl	2437-79-8	pg/g	0.2 -29	2.45	12.6	37	--
2,2',4,5',6-Pentachlorobiphenyl	60145-21-3	pg/g	0.2 -29	2.45	21.1	37	2
2,2',4,6,6'-Pentachlorobiphenyl	56558-16-8	pg/g	0.2 -29	2.45	12.6	37	24
2,2',4,6'-Tetrachlorobiphenyl	68194-04-7	pg/g	0.2 -29	2.45	12.6	37	--
2,2',4,6-Tetrachlorobiphenyl	62796-65-0	pg/g	0.2 -29	2.45	12.6	37	15
2,2',4-Trichlorobiphenyl	37680-66-3	pg/g	0.2 -29	2.45	12.6	37	--
2,2',5,6'-Tetrachlorobiphenyl	41464-41-9	pg/g	0.2 -29	2.45	12.6	37	--
2,2',5-Trichlorobiphenyl	37680-65-2	pg/g	0.2 -29	2.45	12.6	37	--
2,2',6,6'-Tetrachlorobiphenyl	15968-05-5	pg/g	0.2 -29	2.45	12.6	37	5
2,2',6-Trichlorobiphenyl	38444-73-4	pg/g	0.2 -29	2.45	12.6	37	--
2,3,3',4,4',5,5',6-Octachlorobiphenyl	74472-53-0	pg/g	0.2 -29	2.45	12.6	37	4
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	pg/g	0.31	2.45	12.6	37	--
2,3,3',4,4',5,6-Heptachlorobiphenyl	41411-64-7	pg/g	0.2 -29	2.45	12.6	37	--
2,3,3',4,4',5',6-Heptachlorobiphenyl	74472-50-7	pg/g	0.2 -29	2.45	12.6	37	3
2,3,3',4,4',5'-Hexachlorobiphenyl	69782-90-7	pg/g	0.47	2.45	12.6	37	--
2,3,3',4,4',5-Hexachlorobiphenyl	38380-08-4	pg/g	0.88	2.45	12.6	37	--
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	pg/g	0.68	2.45	12.6	37	--
2,3,3',4,5,5',6-Heptachlorobiphenyl	74472-51-8	pg/g	0.2 -29	2.45	12.6	37	36
2,3,3',4',5,5',6-Heptachlorobiphenyl	69782-91-8	pg/g	0.2 -29	2.45	12.6	37	1
2,3,3',4,5,5'-Hexachlorobiphenyl	39635-35-3	pg/g	0.2 -29	2.45	12.6	37	2
2,3,3',4',5'-Pentachlorobiphenyl	76842-07-4	pg/g	0.2 -29	2.45	12.6	37	4
2,3,3',4',6-Pentachlorobiphenyl	38380-03-9	pg/g	0.2 -29	2.45	12.6	37	--
2,3,3',4-Tetrachlorobiphenyl	74338-24-2	pg/g	0.2 -29	2.45	12.6	37	8
2,3,3',5',6-Pentachlorobiphenyl	68194-10-5	pg/g	0.2 -29	2.45	12.6	37	9
2,3,3',5'-Tetrachlorobiphenyl	41464-49-7	pg/g	0.2 -29	2.45	12.6	37	20
2,3,3',5-Tetrachlorobiphenyl	70424-67-8	pg/g	0.2 -29	2.45	12.6	37	15
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	pg/g	0.25	2.45	12.6	37	--
2,3,4,4',5,6-Hexachlorobiphenyl	41411-63-6	pg/g	0.2 -29	2.45	12.6	37	13
2,3',4,4',5',6-Hexachlorobiphenyl	59291-65-5	pg/g	0.2 -29	2.45	12.6	37	19
2,3',4,4',5'-Pentachlorobiphenyl	65510-44-3	pg/g	1.00	2.45	12.6	37	--
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	pg/g	0.64	2.45	12.6	37	--
2,3',4,4',6-Pentachlorobiphenyl	56558-17-9	pg/g	0.2 -29	2.45	12.6	37	1
2,3',4,5,5'-Pentachlorobiphenyl	68194-12-7	pg/g	0.2 -29	2.45	12.6	37	13
2,3',4',5,5'-Pentachlorobiphenyl	70424-70-3	pg/g	0.2 -29	2.45	12.6	37	1
2,3',4,5',6-Pentachlorobiphenyl	56558-18-0	pg/g	0.2 -29	2.45	12.6	37	36

Table B-7a. Reported Detection Limits - Benthic Sediment Sampling Event.

Analyte	CAS Number	Units	Round 2 QAPP MDL[a]	Reported Detection Limits[a]		Total No. Data Points	No. Undetected Results
				Minimum	Maximum		
2,3',4,5'-Tetrachlorobiphenyl	73575-52-7	pg/g	0.2 -29	2.45	12.6	37	3
2,3',4,5-Tetrachlorobiphenyl	73575-53-8	pg/g	0.2 -29	2.45	12.6	37	2
2,3,4',5-Tetrachlorobiphenyl	74472-34-7	pg/g	0.2 -29	2.45	12.6	37	1
2,3,4,6-Tetrachlorobiphenyl	54230-22-7	pg/g	0.2 -29	2.45	12.6	37	35
2,3',4-Trichlorobiphenyl	55712-37-3	pg/g	0.2 -29	2.45	12.6	37	1
2,3,4'-Trichlorobiphenyl	38444-85-8	pg/g	0.2 -29	2.45	12.6	37	--
2,3,5,6-Tetrachlorobiphenyl	33284-54-7	pg/g	0.2 -29	2.45	12.6	37	35
2,3',5',6-Tetrachlorobiphenyl	74338-23-1	pg/g	0.2 -29	2.45	12.6	37	34
2,3',5'-Trichlorobiphenyl	37680-68-5	pg/g	0.2 -29	2.45	12.6	37	23
2,3,5-Trichlorobiphenyl	55720-44-0	pg/g	0.2 -29	2.45	12.6	37	33
2,3',5-Trichlorobiphenyl	38444-81-4	pg/g	0.2 -29	2.45	12.6	37	3
2,3'-Dichlorobiphenyl	25569-80-6	pg/g	0.2 -29	4.89	30.6	37	15
2,4,4',5-Tetrachlorobiphenyl	32690-93-0	pg/g	0.2 -29	2.45	12.6	37	--
2,4,4'-Trichlorobiphenyl	7012-37-5	pg/g	0.2 -29	2.45	12.6	37	--
2,4,5-Trichlorobiphenyl	15862-07-4	pg/g	0.2 -29	2.45	12.6	37	26
2,4',5-Trichlorobiphenyl	16606-02-3	pg/g	0.2 -29	2.45	12.6	37	--
2,4,6-Trichlorobiphenyl	35693-92-6	pg/g	0.2 -29	2.45	12.6	37	33
2-Chlorobiphenyl	2051-60-7	pg/g	0.2 -29	2.45	12.6	37	3
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	pg/g	0.36	0.449	3.1	37	37
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	pg/g	0.33	0.723	12.6	37	1
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	pg/g	0.94	2.45	12.6	37	--
3,3',4,5,5'-Pentachlorobiphenyl	39635-33-1	pg/g	0.2 -29	2.45	12.6	37	37
3,3',4,5'-Tetrachlorobiphenyl	41464-48-6	pg/g	0.2 -29	2.45	12.6	37	3
3,3',4,5-Tetrachlorobiphenyl	70362-49-1	pg/g	0.2 -29	2.45	12.6	37	37
3,3',4-Trichlorobiphenyl	37680-69-6	pg/g	0.2 -29	2.45	12.6	37	4
3,3',5,5'-Tetrachlorobiphenyl	33284-52-5	pg/g	0.2 -29	2.45	12.6	37	37
3,3',5-Trichlorobiphenyl	38444-87-0	pg/g	0.2 -29	2.45	12.6	37	34
3,3'-Dichlorobiphenyl	2050-67-1	pg/g	0.2 -29	4.89	42.8	37	3
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	pg/g	0.65	0.523	12.6	37	1
3,4,4'-Trichlorobiphenyl	38444-90-5	pg/g	0.2 -29	2.45	12.6	37	--
3,4,5-Trichlorobiphenyl	53555-66-1	pg/g	0.2 -29	2.45	12.6	37	10
3,4',5-Trichlorobiphenyl	38444-88-1	pg/g	0.2 -29	2.45	12.6	37	28
3,5-Dichlorobiphenyl	34883-41-5	pg/g	0.2 -29	4.89	25.1	37	37
3-Chlorobiphenyl	2051-61-8	pg/g	0.2 -29	2.45	12.6	37	4
4,4'-Dichlorobiphenyl	2050-68-2	pg/g	0.2 -29	4.89	25.1	37	1

Table B-7a. Reported Detection Limits - Benthic Sediment Sampling Event.

Analyte	CAS Number	Units	Round 2 QAPP MDL[a]	Reported Detection Limits[a]		Total No. Data Points	No. Undetected Results
				Minimum	Maximum		
4-Chlorobiphenyl	2051-62-9	pg/g	0.2 -29	2.45	12.6	37	3
Dichlorobiphenyl	25512-42-9	pg/g	0.2 -29	4.89	25.1	37	1
Heptachlorobiphenyl	28655-71-2	pg/g	0.2 -29	2.45	12.6	37	--
Hexachlorobiphenyl	26601-64-9	pg/g	0.2 -29	2.45	12.6	37	--
Monochlorobiphenyl	27323-18-8	pg/g	0.2 -29	2.45	12.6	37	2
Nonachlorobiphenyl	53742-07-7	pg/g	0.2 -29	2.45	12.6	37	--
Octachlorobiphenyl	55722-26-4	pg/g	0.2 -29	2.45	12.6	37	--
Pentachlorobiphenyl	25429-29-2	pg/g	0.2 -29	2.45	12.6	37	--
Tetrachlorobiphenyl	26914-33-0	pg/g	0.2 -29	2.45	12.6	37	--
Trichlorobiphenyl	25323-68-6	pg/g	0.2 -29	2.45	12.6	37	--
PCB004 & 010	PCB004_010	pg/g	0.2 -29	4.89	44.3	37	11
PCB005 & 008	PCB005_008	pg/g	0.2 -29	4.89	25.1	37	2
PCB007 & 009	PCB007_009	pg/g	0.2 -29	4.89	61.9	37	30
PCB012 & 013	PCB012_013	pg/g	0.2 -29	4.89	37.1	37	24
PCB016 & 032	PCB016_032	pg/g	0.2 -29	2.45	12.6	37	--
PCB020 & 021 & 033	PCB020_021_033	pg/g	0.2 -29	2.45	12.6	37	--
PCB024 & 027	PCB024_027	pg/g	0.2 -29	2.45	12.6	37	1
PCB041 & 064 &071 &072	PCB041_064_071_	pg/g	0.2 -29	2.45	12.6	37	--
PCB042 & 059	PCB042_059	pg/g	0.2 -29	2.45	12.6	37	--
PCB043 & 049	PCB043_049	pg/g	0.2 -29	2.45	12.6	37	--
PCB048 & 075	PCB048_075	pg/g	0.2 -29	2.45	12.6	37	--
PCB052 & 069	PCB052_069	pg/g	0.2 -29	2.45	12.6	37	--
PCB056 & 060	PCB056_060	pg/g	0.2 -29	2.45	12.6	37	--
PCB061 & 070	PCB061_070	pg/g	0.2 -29	2.45	12.6	37	--
PCB066 & 076	PCB066_076	pg/g	0.2 -29	2.45	12.6	37	--
PCB084 & 092	PCB084_092	pg/g	0.2 -29	2.45	12.6	37	--
PCB085 & 116	PCB085_116	pg/g	0.2 -29	2.45	12.6	37	--
PCB087 & 117 & 125	PCB087_117_125	pg/g	0.2 -29	2.45	12.6	37	--
PCB088 & 091	PCB088_091	pg/g	0.2 -29	2.45	12.6	37	--
PCB090 & 101	PCB090_101	pg/g	0.2 -29	2.45	12.6	37	--
PCB095 & 098 & 102	PCB095_098_102	pg/g	0.2 -29	2.45	12.6	37	--
PCB106 & 118	PCB106_118	pg/g	2.4	2.45	12.6	37	--
PCB107 & 109	PCB107_109	pg/g	0.2 -29	2.45	12.6	37	1
PCB108 & 112	PCB108_112	pg/g	0.2 -29	2.45	12.6	37	1
PCB111 & 115	PCB111_115	pg/g	0.2 -29	2.45	12.6	37	2

Table B-7a. Reported Detection Limits - Benthic Sediment Sampling Event.

Analyte	CAS Number	Units	Round 2 QAPP MDL[a]	Reported Detection Limits[a]		Total No. Data Points	No. Undetected Results
				Minimum	Maximum		
PCB128 & 162	PCB128_162	pg/g	0.2 -29	2.45	12.6	37	--
PCB132 & 161	PCB132_161	pg/g	0.2 -29	2.45	12.6	37	--
PCB133 & 142	PCB133_142	pg/g	0.2 -29	2.45	12.6	37	1
PCB134 & 143	PCB134_143	pg/g	0.2 -29	2.45	12.6	37	--
PCB138 & 163 & 164	PCB138_163_164	pg/g	0.2 -29	2.45	12.6	37	--
PCB139 & 149	PCB139_149	pg/g	0.2 -29	2.45	12.6	37	--
PCB146 & 165	PCB146_165	pg/g	0.2 -29	2.45	12.6	37	--
PCB158 & 160	PCB158_160	pg/g	0.2 -29	2.45	12.6	37	--
PCB182 & 187	PCB182_187	pg/g	0.2 -29	2.45	12.6	37	--
PCB196 & 203	PCB196_203	pg/g	0.2 -29	2.45	12.6	37	--
Total PCB Congeners	1336-36-3	pg/g	--	0	0	37	--

Notes:
[a] Sediment method detection limits are listed on a dry weight basis.
[b] QAPP method detection limits were listed for EPA 8081A only.
[c] Toxaphene method detection limit from EPA 8081A as per QAPP.
[d] QAPP method detection limit from EPA 8260B.
[e] QAPP method detection limit from EPA 8270-SIM.
[f] Data reported for this analyte are a co-elution of 2,3,5,6-Tetrachlorophenol and 2,3,4,6-Tetrachlorophenol, which can not be separated by this method.

Table B-7b. Reported Detection Limits - Benthic Tissue Sampling Event.

Analyte	CAS Number	Units	Round 2 QAPP MDL[a,b]	Reported Detection Limits[a]		Total No. Data Points	No. Undetected Results
				Minimum	Maximum		
Metals							
Aluminum	7429-90-5	mg/kg	0.06	0.2	1.3	100	--
Antimony	7440-36-0	mg/kg	0.0016	0.0004	0.009	100	54
Arsenic	7440-38-2	mg/kg	0.006	0.002	0.016	100	--
Cadmium	7440-43-9	mg/kg	0.0012	0.0002	0.0013	100	--
Chromium	7440-47-3	mg/kg	0.1	0.01	0.09	100	--
Copper	7440-50-8	mg/kg	0.018	0.001	0.006	100	--
Lead	7439-92-1	mg/kg	0.0014	0.001	0.006	100	--
Mercury	7439-97-6	mg/kg	0.0004	0.0005	0.002	96	--
Nickel	7440-02-0	mg/kg	0.006	0.001	0.006	100	--
Selenium	7782-49-2	mg/kg	0.2	0.002	0.02	100	--
Silver	7440-22-4	mg/kg	0.0008	0.0001	0.0006	100	--
Zinc	7440-66-6	mg/kg	0.012	0.02	0.2	100	--
Butyltins							
Monobutyltin	78763-54-9	ug/kg	0.38	0.061	31	97	26
Dibutyltin	14488-53-0	ug/kg	0.35	0.042	2.1	97	29
Tributyltin	1461-25-2	ug/kg	0.33	0.067	3.4	97	86
Tetrabutyltin	36643-28-4	ug/kg	0.38	0.027	15	97	52
Conventionals							
Lipids	66455-18-3	percent	0.1	--	--	104	--
Total solids	TSO	percent	--	--	--	100	--
Semivolatile Organic Compounds							
1,2,4-Trichlorobenzene	120-82-1	ug/kg	9.9	9.9	26	100	100
1,2-Dichlorobenzene	95-50-1	ug/kg	12	12	32	100	100
1,3-Dichlorobenzene	541-73-1	ug/kg	11	11	29	100	100
1,4-Dichlorobenzene	106-46-7	ug/kg	11	11	29	100	100
2,4-Dimethylphenol	105-67-9	ug/kg	13	13	35	100	100
2-Methylphenol	95-48-7	ug/kg	53	53	140	100	65
4-Methylphenol	106-44-5	ug/kg	15	15	40	100	65
Benzyl alcohol	100-51-6	ug/kg	6.7	6.7	140	100	10
Hexachlorobenzene	118-74-1	ug/kg	0.01	0.0000089	16	203	101
Hexachlorobutadiene	87-68-3	ug/kg	---	0.000056	23	144	130

Table B-7b. Reported Detection Limits - Benthic Tissue Sampling Event.

Analyte	CAS Number	Units	Round 2 QAPP MDL[a,b]	Reported Detection Limits[a]		Total No. Data Points	No. Undetected Results
				Minimum	Maximum		
Hexachloroethane	67-72-1	ug/kg	8.5	8.5	23	100	100
N-Nitrosodiphenylamine	86-30-6	ug/kg	9.5	9.5	25	100	96
Pentachlorophenol	87-86-5	ug/kg	31	31	31	36	36
Phenol	108-95-2	ug/kg	17	17	45	100	72
Phthalate Esters							
Bis(2-ethylhexyl) phthalate	117-81-7	ug/kg	53	53	530	100	51
Butylbenzyl phthalate	85-68-7	ug/kg	14	14	37	100	100
Diethyl phthalate	84-66-2	ug/kg	9.4	9.4	49	100	90
Dimethyl phthalate	131-11-3	ug/kg	5.1	5.1	14	100	98
Di-n-butyl-phthalate	84-74-2	ug/kg	16	16	350	100	95
Di-n-octyl phthalate	117-84-0	ug/kg	13	13	640	100	100
Polycyclic Aromatic Hydrocarbons							
2-Methylnaphthalene	91-57-6	ug/kg	0.15	0.15	1.5	101	31
Acenaphthene	83-32-9	ug/kg	0.074	0.091	0.91	101	5
Acenaphthylene	208-96-8	ug/kg	0.05	0.092	0.92	101	18
Anthracene	120-12-7	ug/kg	0.055	0.08	0.8	101	--
Benz(a)anthracene	56-55-3	ug/kg	0.054	0.12	6	101	--
Benzo(a)pyrene	50-32-8	ug/kg	0.076	0.12	6	101	2
Benzo(b)fluoranthene	205-99-2	ug/kg	0.045	0.15	7.5	101	6
Benzo(g,h,i)perylene	191-24-2	ug/kg	0.097	0.17	1.7	101	8
Benzo(k)fluoranthene	207-08-9	ug/kg	0.081	0.13	6.5	101	8
Chrysene	218-01-9	ug/kg	0.08	0.19	9.5	101	--
Dibenz(a,h)anthracene	53-70-3	ug/kg	0.079	0.11	1.1	101	57
Dibenzofuran	132-64-9	ug/kg	--	0.071	0.71	101	5
Fluoranthene	206-44-0	ug/kg	0.053	0.36	18	101	--
Fluorene	86-73-7	ug/kg	0.054	0.088	0.88	101	--
Indeno(1,2,3-cd)pyrene	193-39-5	ug/kg	0.073	0.16	1.6	101	34
Naphthalene	91-20-3	ug/kg	0.26	0.19	3.2	101	90
Phenanthrene	85-01-8	ug/kg	0.066	0.18	9	101	--
Pyrene	129-00-0	ug/kg	0.07	0.28	14	101	--
Organochlorine Pesticides							
2,4'-DDD	53-19-0	ug/kg	0.01	0.00204	0.444	103	--
2,4'-DDE	3424-82-6	ug/kg	0.01	0.00169	0.151	103	6

Table B-7b. Reported Detection Limits - Benthic Tissue Sampling Event.

Analyte	CAS Number	Units	Round 2 QAPP MDL[a,b]	Reported Detection Limits[a]		Total No. Data Points	No. Undetected Results
				Minimum	Maximum		
2,4'-DDT	789-02-6	ug/kg	0.01	0.00292	4.27	103	22
4,4'-DDD	72-54-8	ug/kg	0.01	0.00322	0.757	103	--
4,4'-DDE	72-55-9	ug/kg	0.01	0.00229	0.397	103	--
4,4'-DDT	50-29-3	ug/kg	0.01	0.00344	0.811	103	5
Aldrin	309-00-2	ug/kg	0.02	0.0000248	0.175	103	8
alpha -Chlordane	5103-71-9	ug/kg	0.01	0.0017	0.0749	103	1
alpha -HCH	319-84-6	ug/kg	0.02	0.000463	1.06	103	51
beta -HCH	319-85-7	ug/kg	0.02	0.000622	0.698	101	86
cis -Nonachlor	5103-73-1	ug/kg	0.01	0.0016	0.0465	103	--
delta -HCH	319-86-8	ug/kg	0.02	0.000634	0.304	103	89
Dieldrin	60-57-1	ug/kg	0.1	0.000193	0.0188	103	--
Endosulfan I	959-98-8	ug/kg	0.1	0.00269	0.437	103	55
Endosulfan II	33213-65-9	ug/kg	0.1	0.00221	0.622	103	50
Endosulfan sulfate	1031-07-8	ug/kg	0.1	0.00118	0.394	103	19
Endrin	72-20-8	ug/kg	0.1	0.000465	0.0536	103	70
Endrin aldehyde	7421-93-4	ug/kg	0.1	0.000692	0.319	103	103
Endrin ketone	53494-70-5	ug/kg	0.1	0.000889	0.664	103	83
gamma -Chlordane	5103-74-2	ug/kg	0.01	0.00146	0.0319	103	1
gamma -HCH	58-89-9	ug/kg	0.02	0.000541	0.511	103	31
Heptachlor	76-44-8	ug/kg	0.02	0.0000481	0.0607	103	44
Heptachlor epoxide	1024-57-3	ug/kg	0.02	0.0000921	0.0502	103	5
Methoxychlor	72-43-5	ug/kg	0.5	0.004	0.486	103	101
Oxychlordane	27304-13-8	ug/kg	0.02	0.000107	1.13	103	23
trans -Nonachlor	39765-80-5	ug/kg	0.01	0.00184	0.0377	103	--
Dioxin/Furans							
Heptachlorodibenzofuran homologs	38998-75-3	pg/g	–	0.0463	0.833	101	5
Heptachlorodibenzo-p-dioxin homologs	37871-00-4	pg/g	–	0.0463	0.833	101	--
Hexachlorodibenzofuran homologs	55684-94-1	pg/g	–	0.0463	0.833	101	--
Hexachlorodibenzo-p-dioxin homologs	34465-46-8	pg/g	–	0.0469	0.833	101	2
Octachlorodibenzofuran	39001-02-0	pg/g	0.41	0.0463	1.12	101	21
Octachlorodibenzo-p-dioxin	3268-87-9	pg/g	0.73	0.0469	1.41	101	--
Pentachlorodibenzofuran homologs	30402-15-4	pg/g	–	0.0463	0.833	101	1
Pentachlorodibenzo-p-dioxin homologs	36088-22-9	pg/g	–	0.0463	1.96	101	12
Tetrachlorodibenzofuran homologs	30402-14-3	pg/g	–	0.0469	1.65	101	--
Tetrachlorodibenzo-p-dioxin homologs	41903-57-5	pg/g	–	0.0463	0.833	101	3
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	pg/g	0.10	0.0463	1.51	101	38

Table B-7b. Reported Detection Limits - Benthic Tissue Sampling Event.

Analyte	CAS Number	Units	Round 2 QAPP MDL[a,b]	Reported Detection Limits[a]		Total No. Data Points	No. Undetected Results
				Minimum	Maximum		
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	35822-46-9	pg/g	0.16	0.0469	1.09	101	10
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	pg/g	0.12	0.0463	2.2	101	71
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	pg/g	0.09	0.0463	1.82	101	26
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	39227-28-6	pg/g	0.14	0.0469	2.77	101	44
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	pg/g	0.08	0.0463	1.57	101	56
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	57653-85-7	pg/g	0.09	0.0469	0.833	101	16
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	pg/g	0.12	0.0493	2.22	101	91
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	19408-74-3	pg/g	0.08	0.0477	0.839	101	37
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	pg/g	0.12	0.0463	2.27	101	33
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	40321-76-4	pg/g	0.10	0.0463	1.96	101	40
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	pg/g	0.10	0.0463	1.84	101	52
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	pg/g	0.09	0.0463	1.67	101	31
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	pg/g	0.03	0.0469	1.32	101	16
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746-01-6	pg/g	0.03	0.0463	1.05	101	60
PCB Aroclors							
Aroclor 1016	12674-11-2	pg/g	--[c]	0.357	94.3	103	103
Aroclor 1221	11104-28-2	pg/g	--	0.153	23.6	103	103
Aroclor 1232	11141-16-5	pg/g	--	0.206	24.9	103	103
Aroclor 1242	53469-21-9	pg/g	--	0.397	105	103	3
Aroclor 1248	12672-29-6	pg/g	--	1.31	2630	103	100
Aroclor 1254	11097-69-1	pg/g	--	1.12	915	103	3
Aroclor 1260	11096-82-5	pg/g	--	0.24	37.2	103	--
PCB congeners							
2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	2051-24-3	pg/g	0.24 - 6.68	0.0077	0.833	103	--
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	40186-72-9	pg/g	0.24 - 6.68	0.0593	18.8	103	--
2,2',3,3',4,4',5,5'-Octachlorobiphenyl	35694-08-7	pg/g	0.24 - 6.68	0.048	8.63	103	--
2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl	52663-79-3	pg/g	0.24 - 6.68	0.0494	15.2	103	--
2,2',3,3',4,4',5,6'-Octachlorobiphenyl	42740-50-1	pg/g	0.24 - 6.68	0.0182	0.833	103	--
2,2',3,3',4,4',5,6-Octachlorobiphenyl	52663-78-2	pg/g	0.24 - 6.68	0.048	9.28	103	--
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	pg/g	0.24 - 6.68	0.048	7.44	103	--
2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl	52663-77-1	pg/g	0.24 - 6.68	0.0494	17.2	103	--
2,2',3,3',4,5,5'-Heptachlorobiphenyl	52663-74-8	pg/g	0.24 - 6.68	0.048	7.47	103	--
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	40186-71-8	pg/g	0.24 - 6.68	0.0131	0.833	103	--
2,2',3,3',4,5',6'-Heptachlorobiphenyl	52663-70-4	pg/g	0.24 - 6.68	0.048	7.04	103	--

Table B-7b. Reported Detection Limits - Benthic Tissue Sampling Event.

Analyte	CAS Number	Units	Round 2 QAPP MDL[a,b]	Reported Detection Limits[a]		Total No. Data Points	No. Undetected Results
				Minimum	Maximum		
2,2',3,3',4,5',6-Heptachlorobiphenyl	40186-70-7	pg/g	0.24 - 6.68	0.048	6.54	103	--
2,2',3,3',4,5,6'-Heptachlorobiphenyl	38411-25-5	pg/g	0.24 - 6.68	0.048	6.82	103	--
2,2',3,3',4,5'-Hexachlorobiphenyl	52663-66-8	pg/g	0.24 - 6.68	0.138	304	103	--
2,2',3,3',4,6,6'-Heptachlorobiphenyl	52663-65-7	pg/g	0.24 - 6.68	0.048	4.77	103	--
2,2',3,3',4,6'-Hexachlorobiphenyl	38380-05-1	pg/g	0.24 - 6.68	0.134	1010	103	--
2,2',3,3',4,6-Hexachlorobiphenyl	61798-70-7	pg/g	0.24 - 6.68	0.129	274	103	--
2,2',3,3',4-Pentachlorobiphenyl	52663-62-4	pg/g	0.24 - 6.68	0.149	54	103	--
2,2',3,3',5,5',6,6'-Octachlorobiphenyl	2136-99-4	pg/g	0.24 - 6.68	0.0143	2.2	103	--
2,2',3,3',5,5',6-Heptachlorobiphenyl	52663-67-9	pg/g	0.24 - 6.68	0.048	6.84	103	--
2,2',3,3',5,5'-Hexachlorobiphenyl	35694-04-3	pg/g	0.24 - 6.68	0.129	276	103	--
2,2',3,3',5,6,6'-Heptachlorobiphenyl	52663-64-6	pg/g	0.24 - 6.68	0.048	4.65	103	--
2,2',3,3',6,6'-Hexachlorobiphenyl	38411-22-2	pg/g	0.24 - 6.68	0.0411	1.84	103	--
2,2',3,3',6-Pentachlorobiphenyl	52663-60-2	pg/g	0.24 - 6.68	0.149	117	103	--
2,2',3,4,4',5,5',6-Octachlorobiphenyl	52663-76-0	pg/g	0.24 - 6.68	0.0175	2.64	103	--
2,2',3,4,4',5,6,6'-Octachlorobiphenyl	74472-52-9	pg/g	0.24 - 6.68	0.0469	30	103	43
2,2',3,4,4',5,6'-Heptachlorobiphenyl	60145-23-5	pg/g	0.24 - 6.68	0.048	46.9	103	28
2,2',3,4,4',5,6-Heptachlorobiphenyl	74472-47-2	pg/g	0.24 - 6.68	0.048	6.92	103	1
2,2',3,4,4',5-Hexachlorobiphenyl	35694-06-5	pg/g	0.24 - 6.68	0.132	290	103	2
2,2',3,4,4',6,6'-Heptachlorobiphenyl	74472-48-3	pg/g	0.24 - 6.68	0.0484	11.7	103	10
2,2',3,4',5,5',6-Heptachlorobiphenyl	52663-68-0	pg/g	0.24 - 6.68	0.048	6.46	103	--
2,2',3,4,5,5'-Hexachlorobiphenyl	52712-04-6	pg/g	0.24 - 6.68	0.114	902	103	--
2,2',3,4',5,5'-Hexachlorobiphenyl	51908-16-8	pg/g	0.24 - 6.68	0.108	824	103	--
2,2',3,4,5,6,6'-Heptachlorobiphenyl	74472-49-4	pg/g	0.24 - 6.68	0.0505	11.9	103	81
2,2',3,4',5,6,6'-Heptachlorobiphenyl	74487-85-7	pg/g	0.24 - 6.68	0.0484	4.16	103	11
2,2',3,4',5,6'-Hexachlorobiphenyl	74472-41-6	pg/g	0.24 - 6.68	0.048	2.54	103	2
2,2',3,4,5,6-Hexachlorobiphenyl	41411-61-4	pg/g	0.24 - 6.68	0.351	279	103	94
2,2',3,4,5',6-Hexachlorobiphenyl	68194-14-9	pg/g	0.24 - 6.68	0.048	2.5	103	--
2,2',3,4,6,6'-Hexachlorobiphenyl	74472-40-5	pg/g	0.24 - 6.68	0.0432	18.2	103	27
2,2',3,4',6,6'-Hexachlorobiphenyl	68194-08-1	pg/g	0.24 - 6.68	0.0415	1.87	103	1
2,2',3,4,6'-Pentachlorobiphenyl	73575-57-2	pg/g	0.24 - 6.68	0.142	51	103	--
2,2',3,4'-Tetrachlorobiphenyl	36559-22-5	pg/g	0.24 - 6.68	0.048	7.6	103	--
2,2',3,5,5'-Pentachlorobiphenyl	52663-61-3	pg/g	0.24 - 6.68	0.139	109	103	--
2,2',3,5,6,6'-Hexachlorobiphenyl	68194-09-2	pg/g	0.24 - 6.68	0.0395	1.75	103	3
2,2',3,5,6'-Pentachlorobiphenyl	73575-55-0	pg/g	0.24 - 6.68	0.146	111	103	1
2,2',3,5-Tetrachlorobiphenyl	70362-46-8	pg/g	0.24 - 6.68	0.048	2.22	103	1

Table B-7b. Reported Detection Limits - Benthic Tissue Sampling Event.

Analyte	CAS Number	Units	Round 2 QAPP MDL[a,b]	Reported Detection Limits[a]		Total No. Data Points	No. Undetected Results
				Minimum	Maximum		
2,2',3,6,6'-Pentachlorobiphenyl	73575-54-9	pg/g	0.24 - 6.68	0.0469	3.22	103	1
2,2',3,6'-Tetrachlorobiphenyl	41464-47-5	pg/g	0.24 - 6.68	0.048	2.16	103	--
2,2',3-Trichlorobiphenyl	38444-78-9	pg/g	0.24 - 6.68	0.0484	3.29	103	--
2,2',4,4',6,6'-Hexachlorobiphenyl	33979-03-2	pg/g	0.24 - 6.68	0.038	4.16	103	5
2,2',4,5',6-Pentachlorobiphenyl	60145-21-3	pg/g	0.24 - 6.68	0.12	90.5	103	--
2,2',4,5-Tetrachlorobiphenyl	70362-47-9	pg/g	0.24 - 6.68	0.048	1.91	103	--
2,2',4,6,6'-Pentachlorobiphenyl	56558-16-8	pg/g	0.24 - 6.68	0.048	3.57	103	6
2,2',4-Trichlorobiphenyl	37680-66-3	pg/g	0.24 - 6.68	0.0484	6.36	103	--
2,2',5,5'-Tetrachlorobiphenyl	35693-99-3	pg/g	0.24 - 6.68	0.048	12.1	103	--
2,2',6,6'-Tetrachlorobiphenyl	15968-05-5	pg/g	0.24 - 6.68	0.048	11.2	103	1
2,2',6-Trichlorobiphenyl	38444-73-4	pg/g	0.24 - 6.68	0.0484	7.34	101	--
2,2'-Dichlorobiphenyl	13029-08-8	pg/g	0.24 - 6.68	0.177	75.2	99	--
2,3,3',4,4',5,5',6-Octachlorobiphenyl	74472-53-0	pg/g	0.24 - 6.68	0.048	6.78	103	--
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	pg/g	0.33	0.0539	5.42	103	8
2,3,3',4,4',5,6-Heptachlorobiphenyl	41411-64-7	pg/g	0.24 - 6.68	0.048	5.52	103	--
2,3,3',4,4',5',6-Heptachlorobiphenyl	74472-50-7	pg/g	0.24 - 6.68	0.048	5.33	103	--
2,3,3',4,4',6-Hexachlorobiphenyl	74472-42-7	pg/g	0.24 - 6.68	0.0847	668	103	--
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	pg/g	0.36	0.278	345	103	--
2,3,3',4,5,5',6-Heptachlorobiphenyl	74472-51-8	pg/g	0.24 - 6.68	1.39	27.6	103	103
2,3,3',4,5,5'-Hexachlorobiphenyl	39635-35-3	pg/g	0.24 - 6.68	0.0936	210	103	13
2,3,3',4',5,5'-Hexachlorobiphenyl	39635-34-2	pg/g	0.24 - 6.68	0.0963	215	103	3
2,3,3',4,5',6-Hexachlorobiphenyl	74472-43-8	pg/g	0.24 - 6.68	0.633	195	103	103
2,3,3',4',5',6-Hexachlorobiphenyl	74472-45-0	pg/g	0.24 - 6.68	0.0907	709	103	--
2,3,3',4',5'-Pentachlorobiphenyl	76842-07-4	pg/g	0.24 - 6.68	0.305	48.5	103	5
2,3,3',4,5-Pentachlorobiphenyl	70424-69-0	pg/g	0.24 - 6.68	0.683	43.5	103	100
2,3,3',4,6-Pentachlorobiphenyl	74472-35-8	pg/g	0.24 - 6.68	0.252	43.4	103	--
2,3,3',4'-Tetrachlorobiphenyl	41464-43-1	pg/g	0.24 - 6.68	0.243	444	103	--
2,3,3',4-Tetrachlorobiphenyl	74338-24-2	pg/g	0.24 - 6.68	0.265	67.5	103	49
2,3,3',5,5',6-Hexachlorobiphenyl	74472-46-1	pg/g	0.24 - 6.68	0.103	228	103	30
2,3,3',5,5'-Pentachlorobiphenyl	39635-32-0	pg/g	0.24 - 6.68	0.101	37.7	103	15
2,3,3',5,6-Pentachlorobiphenyl	74472-36-9	pg/g	0.24 - 6.68	0.598	78.4	103	100
2,3,3',5'-Tetrachlorobiphenyl	41464-49-7	pg/g	0.24 - 6.68	0.261	67.8	103	30
2,3,3',5-Tetrachlorobiphenyl	70424-67-8	pg/g	0.24 - 6.68	0.225	64.7	103	9
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	pg/g	0.29	0.0916	199	103	--
2,3',4,4',5'-Pentachlorobiphenyl	65510-44-3	pg/g	0.68	0.292	48.6	103	1

Table B-7b. Reported Detection Limits - Benthic Tissue Sampling Event.

Analyte	CAS Number	Units	Round 2 QAPP MDL[a,b]	Reported Detection Limits[a]		Total No. Data Points	No. Undetected Results
				Minimum	Maximum		
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	pg/g	0.33	0.274	44.6	103	--
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	pg/g	0.40	0.267	289	103	--
2,3,4,4'-Tetrachlorobiphenyl	33025-41-1	pg/g	0.24 - 6.68	0.242	470	103	--
2,3',4,4'-Tetrachlorobiphenyl	32598-10-0	pg/g	0.24 - 6.68	0.215	431	103	--
2,3',4,5,5'-Pentachlorobiphenyl	68194-12-7	pg/g	0.24 - 6.68	0.0976	35.9	103	--
2,3',4,5',6-Pentachlorobiphenyl	56558-18-0	pg/g	0.24 - 6.68	0.103	36.5	103	16
2,3',4,5'-Tetrachlorobiphenyl	73575-52-7	pg/g	0.24 - 6.68	0.207	66.4	103	2
2,3',4,5-Tetrachlorobiphenyl	73575-53-8	pg/g	0.24 - 6.68	0.201	57.7	103	--
2,3,4',5-Tetrachlorobiphenyl	74472-34-7	pg/g	0.24 - 6.68	0.22	62.8	103	--
2,3,4',6-Tetrachlorobiphenyl	52663-58-8	pg/g	0.24 - 6.68	0.048	5.38	103	--
2,3',4-Trichlorobiphenyl	55712-37-3	pg/g	0.24 - 6.68	0.0726	12.1	103	--
2,3,4'-Trichlorobiphenyl	38444-85-8	pg/g	0.24 - 6.68	0.0862	14.8	103	--
2,3',5,5'-Tetrachlorobiphenyl	41464-42-0	pg/g	0.24 - 6.68	0.209	65.4	103	1
2,3',5',6-Tetrachlorobiphenyl	74338-23-1	pg/g	0.24 - 6.68	0.0491	30.5	103	48
2,3',5'-Trichlorobiphenyl	37680-68-5	pg/g	0.24 - 6.68	0.0837	14.3	103	2
2,3,5-Trichlorobiphenyl	55720-44-0	pg/g	0.24 - 6.68	0.0858	14.3	103	21
2,3,6-Trichlorobiphenyl	55702-45-9	pg/g	0.24 - 6.68	0.0435	4.2	103	21
2,3',6-Trichlorobiphenyl	38444-76-7	pg/g	0.24 - 6.68	0.041	4.55	103	--
2,3'-Dichlorobiphenyl	25569-80-6	pg/g	0.24 - 6.68	0.107	17.4	103	--
2,3-Dichlorobiphenyl	16605-91-7	pg/g	0.24 - 6.68	0.117	19.2	103	7
2,4',5-Trichlorobiphenyl	16606-02-3	pg/g	0.24 - 6.68	0.0768	31	103	--
2,4',6-Trichlorobiphenyl	38444-77-8	pg/g	0.24 - 6.68	0.0834	65.9	103	--
2,4'-Dichlorobiphenyl	34883-43-7	pg/g	0.24 - 6.68	0.101	16.8	103	--
2,4-Dichlorobiphenyl	33284-50-3	pg/g	0.24 - 6.68	0.108	17.6	103	1
2,5-Dichlorobiphenyl	34883-39-1	pg/g	0.24 - 6.68	0.105	17	103	--
2,6-Dichlorobiphenyl	33146-45-1	pg/g	0.24 - 6.68	0.107	17.6	103	--
2-Chlorobiphenyl	2051-60-7	pg/g	0.24 - 6.68	0.0513	4.08	93	--
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	pg/g	0.37	0.155	234	103	101
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	pg/g	0.45	0.306	77.7	103	9
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	pg/g	0.38	0.221	66.3	103	--
3,3',4,5,5'-Pentachlorobiphenyl	39635-33-1	pg/g	0.24 - 6.68	0.281	48.3	103	41
3,3',4,5'-Tetrachlorobiphenyl	41464-48-6	pg/g	0.24 - 6.68	0.202	54.1	103	--
3,3',4,5-Tetrachlorobiphenyl	70362-49-1	pg/g	0.24 - 6.68	1.14	65	103	103
3,3',4-Trichlorobiphenyl	37680-69-6	pg/g	0.24 - 6.68	0.0842	44.1	103	1
3,3',5,5'-Tetrachlorobiphenyl	33284-52-5	pg/g	0.24 - 6.68	0.226	58.5	103	86

Table B-7b. Reported Detection Limits - Benthic Tissue Sampling Event.

Analyte	CAS Number	Units	Round 2 QAPP MDL[a,b]	Reported Detection Limits[a]		Total No. Data Points	No. Undetected Results
				Minimum	Maximum		
3,3',5-Trichlorobiphenyl	38444-87-0	pg/g	0.24 - 6.68	0.0765	13.6	103	20
3,3'-Dichlorobiphenyl	2050-67-1	pg/g	0.24 - 6.68	0.114	19.9	103	--
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	pg/g	0.34	0.248	63.8	103	33
3,4,4'-Trichlorobiphenyl	38444-90-5	pg/g	0.24 - 6.68	0.0727	14.6	103	--
3,4,5-Trichlorobiphenyl	53555-66-1	pg/g	0.24 - 6.68	0.0766	13.8	103	47
3,4',5-Trichlorobiphenyl	38444-88-1	pg/g	0.24 - 6.68	0.0787	13.9	103	13
3,5-Dichlorobiphenyl	34883-41-5	pg/g	0.24 - 6.68	0.109	18.4	103	81
3-Chlorobiphenyl	2051-61-8	pg/g	0.24 - 6.68	0.0579	4.98	96	1
4,4'-Dichlorobiphenyl	2050-68-2	pg/g	0.24 - 6.68	0.121	20.1	103	--
4-Chlorobiphenyl	2051-62-9	pg/g	0.24 - 6.68	0.0681	639	96	19
Dichlorobiphenyl	25512-42-9	pg/g	--	--	--	103	--
Heptachlorobiphenyl	28655-71-2	pg/g	--	--	--	103	--
Hexachlorobiphenyl	26601-64-9	pg/g	--	--	--	103	--
Monochlorobiphenyl	27323-18-8	pg/g	--	--	--	96	--
Nonachlorobiphenyl	53742-07-7	pg/g	--	--	--	103	--
Octachlorobiphenyl	55722-26-4	pg/g	--	--	--	103	--
Pentachlorobiphenyl	25429-29-2	pg/g	--	--	--	103	--
Tetrachlorobiphenyl	26914-33-0	pg/g	--	--	--	103	--
Trichlorobiphenyl	25323-68-6	pg/g	--	--	--	103	--
PCB012 & 013	PCB012_013	pg/g	0.24 - 6.68	0.113	19.3	103	--
PCB018 & 030	PCB018_030	pg/g	0.24 - 6.68	0.048	7.34	103	--
PCB020 & 028	PCB020_028	pg/g	0.24 - 6.68	0.0789	34.9	103	--
PCB021 & 033	PCB021_033	pg/g	0.24 - 6.68	0.077	33	103	--
PCB026 & 029	PCB026_029	pg/g	0.24 - 6.68	0.0803	13.6	103	--
PCB040 & 041 & 071	PCB040_041_071	pg/g	0.24 - 6.68	0.048	13.2	103	--
PCB044 & 047 & 065	PCB044_047_065	pg/g	0.24 - 6.68	0.048	11.7	103	--
PCB045 & 051	PCB045_051	pg/g	0.24 - 6.68	0.048	13	103	--
PCB049 & 069	PCB049_069	pg/g	0.24 - 6.68	0.048	11	103	--
PCB050 & 053	PCB050_053	pg/g	0.24 - 6.68	0.048	12.8	103	--
PCB059 & 062 & 075	PCB059_062_075	pg/g	0.24 - 6.68	0.048	9.87	103	--
PCB061 & 070 & 074 & 076	PCB061_070_074_	pg/g	0.24 - 6.68	0.226	418	103	--
PCB083 & 099	PCB083_099	pg/g	0.24 - 6.68	0.14	114	103	--
PCB085 & 116 & 117	PCB085_116_117	pg/g	0.24 - 6.68	0.112	44.4	103	--
PCB086 & 087 & 097 & 108 & 119 & 125	PCB086_087_097_	pg/g	0.24 - 6.68	0.115	95.8	103	--
PCB088 & 091	PCB088_091	pg/g	0.24 - 6.68	0.136	104	103	--

Table B-7b. Reported Detection Limits - Benthic Tissue Sampling Event.

Analyte	CAS Number	Units	Round 2 QAPP MDL[a,b]	Reported Detection Limits[a]		Total No. Data Points	No. Undetected Results
				Minimum	Maximum		
PCB090 & 101 & 113	PCB090_101_113	pg/g	0.24 - 6.68	0.118	94.7	103	--
PCB093 & 095 & 098 & 100 & 102	PCB093_095_098_	pg/g	0.24 - 6.68	0.131	101	103	--
PCB107 & 124	PCB107_124	pg/g	0.24 - 6.68	0.29	46	103	--
PCB110 & 115	PCB110_115	pg/g	0.24 - 6.68	0.101	86	103	--
PCB128 & 166	PCB128_166	pg/g	0.24 - 6.68	0.111	247	103	--
PCB129 & 138 & 160 & 163	PCB129_138_160_	pg/g	0.24 - 6.68	0.107	840	103	--
PCB134 & 143	PCB134_143	pg/g	0.24 - 6.68	0.134	279	103	--
PCB135 & 151 & 154	PCB135_151_154	pg/g	0.24 - 6.68	0.048	2.42	103	--
PCB139 & 140	PCB139_140	pg/g	0.24 - 6.68	0.118	250	103	--
PCB147 & 149	PCB147_149	pg/g	0.24 - 6.68	0.113	857	103	--
PCB153 & 168	PCB153_168	pg/g	0.24 - 6.68	0.0954	731	103	--
PCB156 & 157	PCB156_157	pg/g	0.42	0.117	260	103	--
PCB171 & 173	PCB171_173	pg/g	0.24 - 6.68	0.048	7.36	103	--
PCB180 & 193	PCB180_193	pg/g	0.24 - 6.68	0.048	5.82	103	--
PCB183 & 185	PCB183_185	pg/g	0.24 - 6.68	0.048	6.62	103	--
PCB197 & 200	PCB197_200	pg/g	0.24 - 6.68	0.0134	7.14	103	1
PCB198 & 199	PCB198_199	pg/g	0.24 - 6.68	0.0185	2.9	103	--
Total PCB Congeners	1336-36-3	pg/g	0.24 - 6.68	--	--	103	--

Notes:

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

[b] QAPP method detection limits listed are based on optimum tissue amounts of 10 grams for each of the organic analyses and 5 grams for metals and mercury.

[c] QAPP method detection limits were listed for EPA 8082 only.

Table B-8a. Field Precision for Sediment Samples.

	Location:	BT006					BT027				
	Sample ID:	LW2-GBT006-1	LW2-GBT006-3	RPD[a]	LW2-GBT006-2	RPD[b]	LW2-GBT027-1	LW2-GBT027-3	RPD[a]	LW2-GBT027-2	RPD[b]
	Sample type:	Parent sample	Field duplicate	(percent)	Field replicate	(percent)	Parent sample	Field duplicate		Field replicate	
	Sample Date:	12/16/2005	12/16/2005		12/16/2005		12/6/2005	12/7/2005		12/7/2005	
Analyte	**Units**										
Butyltins											
Dibutyltin ion	µg/kg	5.4	7.1	27.2	8.1	40.0	8.6	11	24.5	13	40.7
Tetrabutyltin	µg/kg	0.47 *J*	0.42 *J*	11.2	0.41 *J*	13.6	1.8 *J*	2.9 *J*	46.8	1.4 *J*	25.0
Tributyltin ion	µg/kg	11	14	24.0	16	37.0	30	32	6.5	29	3.4
Butyltin ion	µg/kg	0.87 *J*	2.2	86.6	2	78.7	1.3 *J*	2 *J*	42.4	2.1	47.1
Conventionals											
Sulfide (S)	mg/kg	1.9	0.4 *J*	130.4	0.08 *U*	NA	1.6 *J*	1.1 *J*	37.0	1.5 *J*	6.5
Ammonia	mg/kg	25.3 *J*	33.1 *J*	26.7	35.4 *J*	33.3	49.1 *J*	51.2 *J*	4.2	52.2 *J*	6.1
Total organic carbon	percent	0.41	0.67	48.1	0.84	68.8	1.94	1.9	2.1	2.07	6.5
Total solids	percent	74.6	71.2	4.7	72.1	3.4	50.9	57.2	11.7	55.3	8.3
Total solids	percent	68.1	65.6	3.7	64.3	5.7	52.7	50.6	4.1	49.9	5.5
Dioxin/furan homologs											
Tetrachlorodibenzofuran homologs	pg/g	1.319	0.37	112.4	0.133	163.4	0.08 *U*	3.466	NA	3.086	NA
Pentachlorodibenzofuran homologs	pg/g	2.097	0.578	113.6	1.052	66.4	1.113	6.365	140.5	4.287	117.6
Octachlorodibenzo-p-dioxin	pg/g	112.439	79.514	34.3	35.056	104.9	84.38	182.96	73.7	224.807	90.8
Hexachlorodibenzo-p-dioxin homologs	pg/g	3.825	2.773	31.9	1.343	96.1	2.599	8.383	105.3	7.883	100.8
Pentachlorodibenzo-p-dioxin homologs	pg/g	0.186	0.164	12.6	0.02 *U*	NA	0.2	0.953	130.6	1.157	141.0
Heptachlorodibenzo-p-dioxin homologs	pg/g	32.261	25.51	23.4	10.051	105.0	24.306	63.03	88.7	53.708	75.4
Heptachlorodibenzofuran homologs	pg/g	6.439	4.814	28.9	2.97	73.7	4.19	11.813	95.3	16.994	120.9
Octachlorodibenzofuran	pg/g	5.613	6.681	17.4	2.688	70.5	3.211 *J*	9.493	98.9	18.414	140.6
Tetrachlorodibenzo-p-dioxin homologs	pg/g	0.306	0.013 *U*	NA	0.015 *U*	NA	0.296	0.78	90.0	1.172	119.3
Hexachlorodibenzofuran homologs	pg/g	3.791	1.662	78.1	2.022	60.9	2.775	7.127	87.9	8.327	100.0
Dioxins/furans											
2,3,7,8-Tetrachlorodibenzo-p-dioxin	pg/g	0.032 *U*	0.013 *U*	NA	0.015 *U*	NA	0.04 *U*	0.03 *U*	NA	0.047 *U*	NA
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	pg/g	0.319 *J*	0.214 *J*	39.4	0.152 *U*	NA	0.229 *J*	0.458 *J*	66.7	0.603 *J*	89.9
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxi	pg/g	13.951	10.563	27.6	4.525	102.0	9.483	29.677	103.1	24.772	89.3
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	pg/g	0.096 *U*	0.055 *J*	NA	0.04 *U*	NA	0.055 *U*	0.222 *J*	NA	0.191 *J*	NA
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	pg/g	0.084 *U*	0.053 *U*	NA	0.042 *U*	NA	0.054 *U*	0.147 *J*	NA	0.145 *J*	NA
2,3,7,8-Tetrachlorodibenzofuran	pg/g	0.186 *J*	0.174 *U*	NA	0.018 *U*	NA	0.08 *U*	0.154 *J*	NA	0.257 *U*	NA
1,2,3,4,7,8,9-Heptachlorodibenzofuran	pg/g	0.136 *J*	0.044 *U*	NA	0.043 *U*	NA	0.058 *U*	0.216 *J*	NA	0.397 *J*	NA
2,3,4,7,8-Pentachlorodibenzofuran	pg/g	0.124 *J*	0.06 *U*	NA	0.086 *U*	NA	0.045 *U*	0.151 *J*	NA	0.167 *J*	NA
1,2,3,7,8-Pentachlorodibenzofuran	pg/g	0.112 *U*	0.055 *U*	NA	0.063 *U*	NA	0.039 *U*	0.083 *J*	NA	0.094 *J*	NA
1,2,3,6,7,8-Hexachlorodibenzofuran	pg/g	0.144 *J*	0.074 *U*	NA	0.07 *U*	NA	0.125 *J*	0.248 *J*	66.0	0.25 *J*	66.7
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	pg/g	0.543 *J*	0.296 *J*	58.9	0.264 *J*	69.1	0.38 *J*	1.679 *J*	126.2	1.115 *J*	98.3
2,3,4,6,7,8-Hexachlorodibenzofuran	pg/g	0.172 *J*	0.115 *U*	NA	0.149 *J*	14.3	0.167 *J*	0.395 *J*	81.1	0.363 *J*	74.0
1,2,3,4,6,7,8-Heptachlorodibenzofuran	pg/g	1.954	1.585	20.9	1.023 *J*	62.5	1.459 *J*	3.798	89.0	4.735	105.8
1,2,3,4,7,8-Hexachlorodibenzofuran	pg/g	0.311 *J*	0.186 *U*	NA	0.146 *J*	72.2	0.286 *J*	0.434 *J*	41.1	0.614 *J*	72.9
1,2,3,7,8,9-Hexachlorodibenzofuran	pg/g	0.026 *U*	0.019 *U*	NA	0.037 *U*	NA	0.064 *U*	0.024 *J*	NA	0.017 *U*	NA
Grainsize											
8-9 Phi clay	percent	0.73	1.53	70.8	0	200.0	1.29	0.94	31.4	1.22	5.6
Coarse sand	percent	23.2	16.5	33.8	13.3	54.2	3.97	2.81	34.2	3.03	26.9
Coarse silt	percent	3.33	11.1	107.7	11.7	111.4	12.8	17.6	31.6	17.5	31.0
Fine gravel	percent	0.14	1.38	163.2	0.67	130.9	1.2	0.57	71.2	1.01	17.2
Fine sand	percent	19.3	20	3.6	21.2	9.4	20.1	16	22.7	18.6	7.8
Fine silt	percent	3.12	3.85	20.9	5.15	49.1	3.14	3.42	8.5	3.52	11.4
>9 Phi clay	percent	0.7	3.42	132.0	0.98	33.3	1.69	2.19	25.8	1.93	13.3
Medium gravel	percent	0.12	0.61	134.2	0	200.0	0.62	1.86	100.0	0.4	43.1

Table B-8a. Field Precision for Sediment Samples.

	Location:	BT006					BT027				
	Sample ID:	LW2-GBT006-1	LW2-GBT006-3	RPD[a]	LW2-GBT006-2	RPD[b]	LW2-GBT027-1	LW2-GBT027-3	RPD[a]	LW2-GBT027-2	RPD[b]
	Sample type:	Parent sample	Field duplicate	(percent)	Field replicate	(percent)	Parent sample	Field duplicate		Field replicate	
	Sample Date:	12/16/2005	12/16/2005		12/16/2005		12/6/2005	12/7/2005		12/7/2005	
Analyte	**Units**										
Medium sand	percent	32.1	24.6	26.5	27.9	14.0	13.9	9.91	33.5	11.1	22.4
Medium silt	percent	4.58	6.22	30.4	7.68	50.6	5.67	5.94	4.7	6.5	13.6
Very coarse sand	percent	2.07	2.2	6.1	1.49	32.6	1.32	0.96	31.6	1.14	14.6
Very fine sand	percent	4.84	6.75	33.0	6.8	33.7	29.2	30.3	3.7	30.7	5.0
Very fine silt	percent	1.82	3.43	61.3	3.48	62.6	2.42	2.06	16.1	2.24	7.7
Herbicides											
Dichloroprop	µg/kg	0.43 *UJ*	0.45 *UJ*	NA	0.45 *UJ*	NA	0.48 *U*	0.5 *U*	NA	0.48 *U*	NA
Dicamba	µg/kg	0.85 *UJ*	0.88 *UJ*	NA	0.9 *UJ*	NA	0.94 *U*	0.99 *U*	NA	0.95 *U*	NA
Dalapon	µg/kg	0.24 *UJ*	0.25 *UJ*	NA	0.25 *UJ*	NA	0.26 *U*	0.28 *U*	NA	0.26 *U*	NA
Dinoseb	µg/kg	0.54 *UJ*	0.56 *UJ*	NA	0.57 *UJ*	NA	0.6 *U*	0.63 *U*	NA	0.61 *U*	NA
MCPP	µg/kg	0.52 *UJ*	0.54 *UJ*	NA	0.55 *UJ*	NA	0.58 *U*	0.61 *U*	NA	0.58 *U*	NA
Silvex	µg/kg	0.39 *UJ*	0.41 *UJ*	NA	0.42 *UJ*	NA	0.44 *U*	0.46 *U*	NA	0.44 *U*	NA
2,4,5-T	µg/kg	0.39 *UJ*	0.41 *UJ*	NA	0.42 *UJ*	NA	0.44 *U*	0.46 *U*	NA	0.44 *U*	NA
MCPA	µg/kg	0.57 *UJ*	0.59 *UJ*	NA	0.6 *UJ*	NA	0.63 *U*	0.67 *U*	NA	0.64 *U*	NA
2,4-D	µg/kg	0.27 *UJ*	0.28 *UJ*	NA	0.28 *UJ*	NA	0.3 *U*	0.31 *U*	NA	0.3 *U*	NA
2,4-DB	µg/kg	0.4 *UJ*	0.41 *UJ*	NA	0.42 *UJ*	NA	0.44 *U*	0.46 *U*	NA	0.44 *U*	NA
Metals											
Aluminum	mg/kg	13100	16300	21.8	12800	2.3	23000	31100	29.9	18100	23.8
Antimony	mg/kg	0.23 *J*	0.26 *J*	12.2	0.29 *J*	23.1	0.11 *J*	0.15 *J*	30.8	0.1 *J*	9.5
Arsenic	mg/kg	3.63	3.8	4.6	3.2	12.6	3.12	3.39	8.3	3.22	3.2
Barium	mg/kg						149	175	16.0	131	12.9
Beryllium	mg/kg						0.54 *J*	0.583 *J*	7.7	0.525 *J*	2.8
Cadmium	mg/kg	0.225	0.277	20.7	0.28	21.8	0.24	0.254	5.7	0.256	6.5
Chromium	mg/kg	24.5	29.6	18.9	27.8	12.6	32.8	39.3	18.0	27	19.4
Chromium hexavalent	mg/kg	0.2 *UJ*	0.2 *UJ*	NA	0.9 *J*	NA	0.2 *UJ*	0.2 *UJ*	NA	0.2 *UJ*	NA
Copper	mg/kg	23.4	29.3	22.4	29.2	22.1	36.6	44.4	19.3	31.1	16.2
Lead	mg/kg	14.1	16.9	18.1	18.4	26.5	16.9	16.9	0.0	14.7	13.9
Manganese	mg/kg						593	655	9.9	515	14.1
Mercury	mg/kg	0.115 *J*	0.085 *J*	30.0	0.074 *J*	43.4	0.055	0.058	5.3	0.067	19.7
Nickel	mg/kg	20.7 *J*	22 *J*	6.1	20.3 *J*	2.0	20.2 *J*	22.3 *J*	9.9	20.9 *J*	3.4
Selenium	mg/kg	0.19 *U*	0.15 *U*	NA	0.19 *U*	NA	0.13 *U*	0.13 *U*	NA	0.14 *U*	NA
Silver	mg/kg	0.068 *U*	0.092	NA	1.2	NA	0.133 *J*	0.149 *J*	11.3	0.117 *J*	12.8
Thallium	mg/kg						0.095	0.099	4.1	0.098	3.1
Zinc	mg/kg	111	125	11.9	122	9.4	121	134	10.2	103	16.1
Organochlorine pesticides											
Heptachlor epoxide	µg/kg	0.00191 *U*	0.00161 *J*	NA	0.00161 *J*	NA	0.0207 *J*	0.00492 *J*	123.2	0.00668 *J*	102.4
Endosulfan sulfate	µg/kg	0.0337 *U*	0.0369 *J*	NA	0.0347 *J*	NA	0.328	0.0676 *J*	131.6	0.0996 *J*	106.8
Oxychlordane	µg/kg	0.0628 *U*	0.0644 *U*	NA	0.0613 *U*	NA	0.00782 *U*	0.00635 *U*	NA	0.00296 *U*	NA
Aldrin	µg/kg	0.0156 *U*	0.031 *J*	NA	0.0309 *J*	NA	0.0411 *J*	0.0374 *J*	9.4	0.0413 *J*	0.5
alpha-Hexachlorocyclohexane	µg/kg	0.00467 *J*	0.00352 *J*	28.1	0.00357 *J*	26.7	0.00638 *J*	0.00968 *J*	41.1	0.00598 *U*	NA
beta-Hexachlorocyclohexane	µg/kg	0.00359 *J*	0.00196 *J*	58.7	0.00219 *U*	NA	0.0521 *U*	0.0104 *J*	NA	0.0105 *J*	NA
delta-Hexachlorocyclohexane	µg/kg	0.00125 *U*	0.00109 *U*	NA	0.0018 *J*	NA	0.00152 *U*	0.00966 *J*	NA	0.00544 *J*	NA
beta-Endosulfan	µg/kg	0.0615 *J*	0.0374 *U*	NA	0.0323 *J*	62.3	0.101 *J*	0.0487 *U*	NA	0.0533 *J*	61.8
2,4'-DDE	µg/kg	0.0405 *J*	0.06 *J*	38.8	0.0682 *J*	51.0	0.125 *J*	0.0442 *J*	95.5	0.0473 *J*	90.2
trans-Nonachlor	µg/kg	0.0529 *J*	0.0596 *J*	11.9	0.063 *J*	17.4	0.147 *J*	0.11 *J*	28.8	0.125 *J*	16.2
4,4'-DDT	µg/kg	0.301	0.314	4.2	0.619	69.1	0.455	0.308	38.5	0.317	35.8
cis-Chlordane	µg/kg	0.0584 *J*	0.0654 *J*	11.3	0.0684 *J*	15.8	0.163 *J*	0.149 *J*	9.0	0.171 *J*	4.8
cis-Nonachlor	µg/kg	0.0219 *J*	0.0221 *J*	0.9	0.0229 *J*	4.5	0.0642 *J*	0.0578 *J*	10.5	0.0578 *J*	10.5

Table B-8a. Field Precision for Sediment Samples.

	Location:	BT006					BT027				
	Sample ID:	LW2-GBT006-1	LW2-GBT006-3	RPD[a]	LW2-GBT006-2	RPD[b]	LW2-GBT027-1	LW2-GBT027-3	RPD[a]	LW2-GBT027-2	RPD[b]
	Sample type:	Parent sample	Field duplicate	(percent)	Field replicate	(percent)	Parent sample	Field duplicate		Field replicate	
	Sample Date:	12/16/2005	12/16/2005		12/16/2005		12/6/2005	12/7/2005		12/7/2005	
Analyte	**Units**										
trans-Chlordane	µg/kg	0.0718 *J*	0.0848 *J*	16.6	0.0902 *J*	22.7	0.185 *J*	0.139 *J*	28.4	0.161 *J*	13.9
2,4'-DDD	µg/kg	0.222	0.313	34.0	0.377	51.8	0.427	0.819	62.9	0.365	15.7
Endrin ketone	µg/kg	0.11 *U*	0.112 *U*	NA	0.107 *U*	NA	0.122 *U*	0.119 *U*	NA	0.118 *U*	NA
gamma-Hexachlorocyclohexane	µg/kg	0.0031 *J*	0.00324 *J*	4.4	0.00668 *U*	NA	0.009 *U*	0.00554 *J*	NA	0.0158 *J*	NA
Dieldrin	µg/kg	0.0399 *J*	0.0321 *J*	21.7	0.0373 *J*	6.7	0.0939 *J*	0.0567 *J*	49.4	0.0688 *J*	30.9
Endrin	µg/kg	0.0175 *U*	0.018 *U*	NA	0.0171 *U*	NA	0.0195 *U*	0.0189 *U*	NA	0.0188 *U*	NA
Methoxychlor	µg/kg	0.0254 *U*	0.026 *U*	NA	0.0248 *U*	NA	0.0283 *U*	0.0275 *U*	NA	0.0273 *U*	NA
4,4'-DDD	µg/kg	1	1.44	36.1	1.87	60.6	1.77	2.14	18.9	1.72	2.9
4,4'-DDE	µg/kg	0.517	0.82	45.3	0.848	48.5	1.49	1.31	12.9	1.35	9.9
Endrin aldehyde	µg/kg	0.0718 *U*	0.0737 *U*	NA	0.0702 *U*	NA	0.0802 *U*	0.0777 *U*	NA	0.0771 *U*	NA
Heptachlor	µg/kg	0.0069 *U*	0.00253 *U*	NA	0.0201 *U*	NA	0.0229 *U*	0.0222 *U*	NA	0.0221 *U*	NA
2,4'-DDT	µg/kg	0.0542 *J*	0.0878 *J*	47.3	0.0669 *J*	21.0	0.383	0.0745 *J*	134.9	0.0778 *J*	132.5
alpha-Endosulfan	µg/kg	0.24	0.0183 *J*	171.7	0.018 *U*	NA	0.0451 *J*	0.0271 *U*	NA	0.0268 *U*	NA
Mirex	µg/kg	0.1 *J*	0.16 *NJ*	46.2	0.18 *J*	57.1	0.76 *U*	0.089 *U*	NA	0.2 *U*	NA
Toxaphene	µg/kg	46 *U*	70 *U*	NA	67 *U*	NA	44 *U*	19 *U*	NA	22 *U*	NA
PAHs											
Anthracene	µg/kg	9.3	8.3	11.4	6.8	31.1	3.4	6.3	59.8	3.6	5.7
Pyrene	µg/kg	58	74	24.2	83	35.5	46	43	6.7	57	21.4
Benzo(g,h,i)perylene	µg/kg	34	41	18.7	37	8.5	27	20	29.8	19	34.8
Indeno(1,2,3-cd)pyrene	µg/kg	33	38	14.1	34	3.0	25	21	17.4	19	27.3
Benzo(b)fluoranthene	µg/kg	36	40	10.5	37	2.7	29	21	32.0	25	14.8
Fluoranthene	µg/kg	46	53	14.1	61	28.0	32	36	11.8	62	63.8
Benzo(k)fluoranthene	µg/kg	26	33	23.7	28	7.4	21	20	4.9	18	15.4
Acenaphthylene	µg/kg	0.8 *J*	1.3 *J*	47.6	1.2 *J*	40.0	3.7	2.3 *J*	46.7	1.5 *J*	84.6
Chrysene	µg/kg	38	46	19.0	46	19.0	29	29	0.0	31	6.7
Benzo(a)pyrene	µg/kg	37	40	7.8	38	2.7	31	25	21.4	22	34.0
Dibenz(a,h)anthracene	µg/kg	5.4	6.6	20.0	5.2	3.8	4.1	3	31.0	2.6	44.8
Benz(a)anthracene	µg/kg	28	30	6.9	31	10.2	22	20	9.5	16	31.6
Acenaphthene	µg/kg	3.8	2.8	30.3	2.7	33.8	2 *J*	2.4 *J*	18.2	2.2 *J*	9.5
Phenanthrene	µg/kg	31	22	34.0	28	10.2	14	24	52.6	24	52.6
Fluorene	µg/kg	4	2.7	38.8	2.8	35.3	2.5	3.8	41.3	2.7	7.7
Naphthalene	µg/kg	7.4	0.54 *U*	NA	0.55 *U*	NA	0.67 *UJ*	0.7 *UJ*	NA	0.71 *UJ*	NA
2-Methylnaphthalene	µg/kg	3.8	1.5 *J*	86.8	1.7 *J*	76.4	1.9 *J*	2.7 *U*	NA	4.3	77.4
PCB Aroclors											
Aroclor 1260	µg/kg	20	32	46.2	40	66.7	26 *J*	15 *J*	53.7	15 *J*	53.7
Aroclor 1254	µg/kg	34 *J*	54	45.5	59	53.8	27 *J*	2.2 *U*	NA	6.3 *U*	NA
Aroclor 1268	µg/kg	1.7 *U*	1.7 *U*	NA	1.8 *U*	NA	16 *U*	2.2 *U*	NA	2.3 *U*	NA
Aroclor 1221	µg/kg	1.7 *U*	1.7 *U*	NA	1.8 *U*	NA	16 *U*	2.2 *U*	NA	2.3 *U*	NA
Aroclor 1232	µg/kg	1.7 *U*	1.7 *U*	NA	1.8 *U*	NA	16 *U*	2.2 *U*	NA	2.3 *U*	NA
Aroclor 1248	µg/kg	1.7 *U*	1.7 *U*	NA	1.8 *U*	NA	16 *U*	2.2 *U*	NA	2.3 *U*	NA
Aroclor 1016	µg/kg	1.7 *U*	1.7 *U*	NA	1.8 *U*	NA	16 *U*	2.2 *U*	NA	2.3 *U*	NA
Aroclor 1262	µg/kg	1.7 *U*	1.7 *U*	NA	1.8 *U*	NA	16 *U*	2.2 *U*	NA	2.3 *U*	NA
Aroclor 1242	µg/kg	1.7 *U*	1.7 *U*	NA	1.8 *U*	NA	16 *U*	2.2 *U*	NA	2.3 *U*	NA
PCB congener homologs											
Trichlorobiphenyl	pg/g	2080	4040	64.1	4110	65.6	767	761	0.8	923	18.5
Pentachlorobiphenyl	pg/g	18900	31000	48.5	34400	58.2	6730	4020	50.4	5870	13.7
Dichlorobiphenyl	pg/g	469	998	72.1	1010	73.2	306	279	9.2	307	0.3
Hexachlorobiphenyl	pg/g	13200	24500	59.9	24800	61.1	18600	6850	92.3	15400	18.8

Table B-8a. Field Precision for Sediment Samples.

	Location:	BT006					BT027				
	Sample ID:	LW2-GBT006-1	LW2-GBT006-3	RPD[a]	LW2-GBT006-2	RPD[b]	LW2-GBT027-1	LW2-GBT027-3	RPD[a]	LW2-GBT027-2	RPD[b]
	Sample type:	Parent sample	Field duplicate	(percent)	Field replicate	(percent)	Parent sample	Field duplicate		Field replicate	
	Sample Date:	12/16/2005	12/16/2005		12/16/2005		12/6/2005	12/7/2005		12/7/2005	
Analyte	**Units**										
Tetrachlorobiphenyl	pg/g	7330	12900	55.1	13700	60.6	3110	2740	12.6	3040	2.3
Monochlorobiphenyl	pg/g	32.3	97.6	100.5	76.1	80.8	26.6	25.8	3.1	23	14.5
Heptachlorobiphenyl	pg/g	5010	19500 *J*	118.2	9120	58.2	12800	4910	89.1	26700	70.4
Nonachlorobiphenyl	pg/g	225	1140 *J*	134.1	455	67.6	300	151	66.1	787	89.6
Octachlorobiphenyl	pg/g	1380	9030 *J*	147.0	2380	53.2	2900	1260	78.8	11400	118.9
PCB congeners											
Polychlorinated biphenyls	pg/g	48600	103000	71.8	90200	59.9	45600	21100	73.5	64600	34.5
2,4,5-Trichlorobiphenyl	pg/g	0 *U*	0 *U*	NA	5.59	NA	0 *U*	0 *U*	NA	0 *U*	NA
2,2',6,6'-Tetrachlorobiphenyl	pg/g	0 *U*	0 *U*	NA	8	NA	25.4	32.2	23.6	43.6	52.8
2,4',5-Trichlorobiphenyl	pg/g	319	658	69.4	691	73.7	102	104	1.9	97.5	4.5
3,3'-Dichlorobiphenyl	pg/g	0 *U*	41.9	NA	46.2	NA	94.3	117	21.5	108	13.5
4,4'-Dichlorobiphenyl	pg/g	229	433	61.6	445	64.1	33.4	40.9	20.2	35.7	6.7
2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	pg/g	54.8	114	70.1	207	116.3	105	84.2	22.0	105	0.0
2-Chlorobiphenyl	pg/g	16.7	43.6	89.2	34.6	69.8	9.36	7.39	23.5	5.89	45.5
3-Chlorobiphenyl	pg/g	0 *U*	9.89	NA	8.55	NA	12.2	13.3	8.6	11.2	8.5
4-Chlorobiphenyl	pg/g	15.6	44.1	95.5	33	71.6	5.07	5.11	0.8	5.9	15.1
2,2',3,3',5,5',6,6'-Octachlorobiphenyl	pg/g	68.6	372 *J*	137.7	122	56.0	148	58.7	86.4	470	104.2
2,2',4,4'-Tetrachlorobiphenyl	pg/g	243	445	58.7	449	59.5	330	330	0.0	344	4.2
2,3'-Dichlorobiphenyl	pg/g	34.1	61.6	57.5	74.8	74.7	0 *U*	0 *U*	NA	0 *U*	NA
3,3',4,4'-Tetrachlorobiphenyl	pg/g	54.7	96	54.8	101	59.5	19.3	21.5	10.8	19.2	0.5
2,3,3',4,4'-Pentachlorobiphenyl	pg/g	816	1270	43.5	1470	57.2	187	124	40.5	216	14.4
2,4,4',5-Tetrachlorobiphenyl	pg/g	284	501	55.3	537	61.6	74.6	73	2.2	81.2	8.5
3,3',4,4',5,5'-Hexachlorobiphenyl	pg/g	1.24 *U*	1.59 *U*	NA	1.54 *U*	NA	0.843 *U*	0.766 *U*	NA	0.772 *U*	NA
2,2',3,3',4,4',6,6'-Octachlorobiphenyl	pg/g	11.3	56.9 *J*	133.7	19	50.8	27.7	12	79.1	111	120.1
3,3',5,5'-Tetrachlorobiphenyl	pg/g	0 *U*	0 *U*	NA	0 *U*	NA	0 *U*	0 *U*	NA	0 *U*	NA
2,3,5,6-Tetrachlorobiphenyl	pg/g	0 *U*	0 *U*	NA	0 *U*	NA	0 *U*	0 *U*	NA	0 *U*	NA
2,2',4,4',6,6'-Hexachlorobiphenyl	pg/g	0 *U*	0 *U*	NA	0 *U*	NA	0 *U*	0 *U*	NA	5.8	NA
3,5-Dichlorobiphenyl	pg/g	0 *U*	0 *U*	NA	0 *U*	NA	0 *U*	0 *U*	NA	0 *U*	NA
2,2',4,4',5,5'-Hexachlorobiphenyl	pg/g	2340	4840	69.6	4480	62.8	3730	1510	84.7	3730	0.0
2,2',3,4,4',5,5'-Heptachlorobiphenyl	pg/g	1340	5940 *J*	126.4	2420	57.4	3190	1300	84.2	7120	76.2
2,2',3,3',4,4',5-Heptachlorobiphenyl	pg/g	567	1860 *J*	106.6	1040	58.9	1220	515	81.3	2540	70.2
2,4,6-Trichlorobiphenyl	pg/g	0 *U*	0 *U*	NA	0 *U*	NA	0 *U*	0 *U*	NA	0 *U*	NA
2,2',3,4,4',5-Hexachlorobiphenyl	pg/g	170	283	49.9	352	69.7	50.8	24.5	69.9	66.9	27.4
2,2',3,3',4,4',5,5'-Octachlorobiphenyl	pg/g	304	2310 *J*	153.5	547	57.1	624	258	83.0	2740	125.8
2,2',5-Trichlorobiphenyl	pg/g	235	476	67.8	503	72.6	64.6	66.1	2.3	65	0.6
2,2',4-Trichlorobiphenyl	pg/g	95.9	191	66.3	199	69.9	63.5	68.7	7.9	105	49.3
2,3',5'-Trichlorobiphenyl	pg/g	0 *U*	0 *U*	NA	0 *U*	NA	0 *U*	0 *U*	NA	0 *U*	NA
3,3',4-Trichlorobiphenyl	pg/g	9.99	18.3	58.7	18.7	60.7	3.98	4.29	7.5	3.4	15.7
2,2',4,4',5-Pentachlorobiphenyl	pg/g	1170	1920	48.5	2130	58.2	443	312	34.7	476	7.2
2,3,3',4',6-Pentachlorobiphenyl	pg/g	3620	5880	47.6	6660	59.1	1170	613	62.5	870	29.4
2,3,3',4,4',5-Hexachlorobiphenyl	pg/g	282	489	53.7	543	63.3	132	77.4	52.1	162	20.4
2,2',3,3',6,6'-Hexachlorobiphenyl	pg/g	370	649	54.8	700	61.7	762	237	105.1	383	66.2
2,2',3,3',4,5,6'-Heptachlorobiphenyl	pg/g	588	2430 *J*	122.1	1080	59.0	1540	552	94.5	2130	32.2
2,2',6-Trichlorobiphenyl	pg/g	44.1	81.2	59.2	87.9	66.4	121	120	0.8	266	74.9
2,3',5-Trichlorobiphenyl	pg/g	65.6	114	53.9	123	60.9	35.2	29.5	17.6	29.9	16.3
2,3,4'-Trichlorobiphenyl	pg/g	158	286	57.7	287	58.0	38.3	40.5	5.6	36.8	4.0
3,3',5-Trichlorobiphenyl	pg/g	0 *U*	0 *U*	NA	0 *U*	NA	0 *U*	0 *U*	NA	0 *U*	NA
3,4',5-Trichlorobiphenyl	pg/g	0 *U*	0 *U*	NA	0 *U*	NA	0 *U*	0 *U*	NA	0 *U*	NA

Table B-8a. Field Precision for Sediment Samples.

	Location:	BT006					BT027				
	Sample ID:	LW2-GBT006-1	LW2-GBT006-3	RPD[a]	LW2-GBT006-2	RPD[b]	LW2-GBT027-1	LW2-GBT027-3	RPD[a]	LW2-GBT027-2	RPD[b]
	Sample type:	Parent sample	Field duplicate	(percent)	Field replicate	(percent)	Parent sample	Field duplicate		Field replicate	
	Sample Date:	12/16/2005	12/16/2005		12/16/2005		12/6/2005	12/7/2005		12/7/2005	
Analyte	**Units**										
3,4,4'-Trichlorobiphenyl	pg/g	192	373	64.1	376	64.8	44.8	44.8	0.0	37.3	18.3
2,2',3,3'-Tetrachlorobiphenyl	pg/g	134	239	56.3	264	65.3	27.4	25	9.2	25.9	5.6
2,2',4,4',6-Pentachlorobiphenyl	pg/g	13.2	22	50.0	23.7	56.9	45.7	50.2	9.4	88.4	63.7
2,3,3',4,4',5,5'-Heptachlorobiphenyl	pg/g	21.8	58.5	91.4	46.4	72.1	42.5	19	76.4	123	97.3
3,3',4,5,5'-Pentachlorobiphenyl	pg/g	0 *U*	0 *U*	NA	0 *U*	NA	0 *U*	0 *U*	NA	0 *U*	NA
2,3,3',4,5,5'-Hexachlorobiphenyl	pg/g	17.8	77.6 *J*	125.4	33.8	62.0	48.5	21.3	77.9	133	93.1
2,2',3,3',4,5',6-Heptachlorobiphenyl	pg/g	30.1	87.4 *J*	97.5	51.3	52.1	74.6	26.2	96.0	109	37.5
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	pg/g	43.7	238 *J*	137.9	75.5	53.4	97.3	40.7	82.0	358	114.5
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	pg/g	168	899 *J*	137.0	331	65.3	221	109	67.9	605	93.0
2,3,4,4',5,6-Hexachlorobiphenyl	pg/g	12.7	23.5	59.7	26.9	71.7	3.04	0 *U*	NA	3.29	7.9
2,3,3',4,4',5,6-Heptachlorobiphenyl	pg/g	117	418 *J*	112.5	202	53.3	245	103	81.6	557	77.8
2,2',3,5'-Tetrachlorobiphenyl	pg/g	987	1730	54.7	1890	62.8	204	178	13.6	189	7.6
2,2',5,6'-Tetrachlorobiphenyl	pg/g	127	230	57.7	240	61.6	161	168	4.3	183	12.8
2,2',3,6'-Tetrachlorobiphenyl	pg/g	50	92.1	59.3	104	70.1	15.7	15.2	3.2	16.6	5.6
3,3',4,5'-Tetrachlorobiphenyl	pg/g	22.4	37	49.2	43	63.0	9.14	8.02	13.1	10.8	16.6
2,3,3',5'-Tetrachlorobiphenyl	pg/g	0 *U*	0 *U*	NA	0 *U*	NA	0 *U*	0 *U*	NA	0 *U*	NA
2,2',3,4',5'-Pentachlorobiphenyl	pg/g	895	1480	49.3	1670	60.4	172	110	44.0	157	9.1
2,2',3,3',4-Pentachlorobiphenyl	pg/g	332	550	49.4	597	57.1	61.8	40.1	42.6	58.8	5.0
2,2',3,5,5',6-Hexachlorobiphenyl	pg/g	539	1090	67.6	1010	60.8	1410	419	108.4	937	40.3
2,2',3,3',5,6,6'-Heptachlorobiphenyl	pg/g	265	948 *J*	112.6	478	57.3	912	284	105.0	1740	62.4
2,2',3,3',4,6,6'-Heptachlorobiphenyl	pg/g	78.7	236 *J*	100.0	140	56.1	250	77.6	105.3	276	9.9
2,2',3,3',4,5'-Hexachlorobiphenyl	pg/g	222	354	45.8	383	53.2	152	74.8	68.1	124	20.3
2,2',3,3',5,5',6-Heptachlorobiphenyl	pg/g	122	433 *J*	112.1	215	55.2	334	132	86.7	1110	107.5
2,2',3,4,4',5',6-Heptachlorobiphenyl	pg/g	367	1250 *J*	109.2	656	56.5	991	356	94.3	1470	38.9
2,2',3,3',4,5',6'-Heptachlorobiphenyl	pg/g	336	1250 *J*	115.3	622	59.7	882	342	88.2	2040	79.3
2,2',3,3',4,4',6-Heptachlorobiphenyl	pg/g	150	455 *J*	100.8	291	63.9	376	143	89.8	581	42.8
2,3',4,4',5,5'-Hexachlorobiphenyl	pg/g	115	197	52.6	228	65.9	87.8	39	77.0	70.2	22.3
2,2',3,3',4,5,6,6'-Octachlorobiphenyl	pg/g	44.2	257 *J*	141.3	74.4	50.9	105	39.7	90.3	327	102.8
2,2',3,3',4,5,5'-Heptachlorobiphenyl	pg/g	94.8	325 *J*	109.7	174	58.9	204	85.1	82.3	485	81.6
2,2',3,3',4,5,5',6'-Octachlorobiphenyl	pg/g	365	2410 *J*	147.4	619	51.6	741	332	76.2	2830	117.0
2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl	pg/g	39.3	152 *J*	117.8	85.2	73.7	53.1	30.3	54.7	99.3	60.6
2,2',3,3',4,4',5,6-Octachlorobiphenyl	pg/g	120	783 *J*	146.8	203	51.4	246	111	75.6	1030	122.9
2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl	pg/g	18.2	93.2 *J*	134.6	39	72.7	25.7	12.3	70.5	83.1	105.5
2,2',3,4,5,5'-Hexachlorobiphenyl	pg/g	539	1080	66.8	999	59.8	834	277	100.3	283	98.7
2,2',3,4,5,5',6-Heptachlorobiphenyl	pg/g	66.9	291 *J*	125.2	121	57.6	179	61.7	97.5	219	20.1
2,2',3,3',5,6'-Hexachlorobiphenyl	pg/g	364	651	56.6	681	60.7	674	233	97.2	636	5.8
3,4,5-Trichlorobiphenyl	pg/g	0 *U*	8.27	NA	8.61	NA	5.78	6.71	14.9	6.49	11.6
2,3,4,6-Tetrachlorobiphenyl	pg/g	0 *U*	0 *U*	NA	0 *U*	NA	0 *U*	0 *U*	NA	0 *U*	NA
2,2',3,3',4,5-Hexachlorobiphenyl	pg/g	171	272	45.6	303	55.7	69.5	29.7	80.2	37.5	59.8
2,2',3,4,5-Pentachlorobiphenyl	pg/g	12.5	18.8	40.3	21.9	54.7	0 *U*	0 *U*	NA	0 *U*	NA
2,3',4-Trichlorobiphenyl	pg/g	39.6	76.5	63.6	75.1	61.9	19	16	17.1	16	17.1
2,3,5-Trichlorobiphenyl	pg/g	0 *U*	0 *U*	NA	0 *U*	NA	0 *U*	0 *U*	NA	0 *U*	NA
2,2',4,6,6'-Pentachlorobiphenyl	pg/g	0 *U*	0 *U*	NA	0 *U*	NA	3.54	4.02	12.7	5.55	44.2
2,3',4,4',6-Pentachlorobiphenyl	pg/g	53.8	86.1	46.2	91.7	52.1	61.3	41.8	37.8	95.5	43.6
2,3',4,5',6-Pentachlorobiphenyl	pg/g	0 *U*	0 *U*	NA	0 *U*	NA	0 *U*	0 *U*	NA	0 *U*	NA
3,3',4,4',5-Pentachlorobiphenyl	pg/g	11.5	20.9	58.0	18.7	47.7	5.45	3.79	35.9	3.57	41.7
2,2',3,4,4',6'-Hexachlorobiphenyl	pg/g	15.5	27.2	54.8	30.2	64.3	26.5	15.8	50.6	104	118.8
2,3',4,4',5',6-Hexachlorobiphenyl	pg/g	0 *U*	6.96	NA	8.32	NA	4.44	3.46	24.8	21.3	131.0

Table B-8a. Field Precision for Sediment Samples.

	Location:	BT006					BT027				
	Sample ID:	LW2-GBT006-1	LW2-GBT006-3	RPD[a]	LW2-GBT006-2	RPD[b]	LW2-GBT027-1	LW2-GBT027-3	RPD[a]	LW2-GBT027-2	RPD[b]
	Sample type:	Parent sample	Field duplicate	(percent)	Field replicate	(percent)	Parent sample	Field duplicate		Field replicate	
	Sample Date:	12/16/2005	12/16/2005		12/16/2005		12/6/2005	12/7/2005		12/7/2005	
Analyte	**Units**										
2,2',3,3',5-Pentachlorobiphenyl	pg/g	0 *U*	0 *U*	NA	0 *U*	NA	0 *U*	0 *U*	NA	0 *U*	NA
2,2',4,5',6-Pentachlorobiphenyl	pg/g	21.7	35	46.9	36.1	49.8	57.9	53.3	8.3	98.1	51.5
2,2',4,4',5,6'-Hexachlorobiphenyl	pg/g	31.3	47.9	41.9	60.2	63.2	82.4	56.3	37.6	474	140.8
2,2',3,3',4,6-Hexachlorobiphenyl	pg/g	0 *U*	0 *U*	NA	0 *U*	NA	0 *U*	0 *U*	NA	0 *U*	NA
2,2',4,6-Tetrachlorobiphenyl	pg/g	0 *U*	0 *U*	NA	0 *U*	NA	7.05	6.78	3.9	9.83	32.9
2,3',4,4',5'-Pentachlorobiphenyl	pg/g	39.8	60.8	41.7	73.1	59.0	9.59	6.58	37.2	11	13.7
2,2',4,6'-Tetrachlorobiphenyl	pg/g	48.2	85.8	56.1	89.6	60.1	109	130	17.6	149	31.0
2,2',3,4',6,6'-Hexachlorobiphenyl	pg/g	0 *U*	5.68	NA	7.4	NA	17.1	12.9	28.0	81.7	130.8
2,2',3,5,6,6'-Hexachlorobiphenyl	pg/g	0 *U*	0 *U*	NA	6.6	NA	3.31	3.36	1.5	11	107.5
2,3,3',5',6-Pentachlorobiphenyl	pg/g	0 *U*	9.35	NA	8.05	NA	11	8.06	30.8	14.3	26.1
2,3',4,5,5'-Pentachlorobiphenyl	pg/g	0 *U*	8.2	NA	6.75	NA	6.94	6.88	0.9	14.4	69.9
2,2',3,4',5,6-Hexachlorobiphenyl	pg/g	82.9	123	39.0	159	62.9	69.1	51.5	29.2	459	147.7
2,2',3,4,5',6-Hexachlorobiphenyl	pg/g	127	234	59.3	255	67.0	252	64.2	118.8	61	122.0
2,2',3,3',4,5,6-Heptachlorobiphenyl	pg/g	15.8	40.3	87.3	27.6	54.4	32.7	11.8	93.9	38.9	17.3
2,2',3,3',4,5,5',6-Octachlorobiphenyl	pg/g	18	102 *J*	140.0	29	46.8	41.5	15.9	89.2	145	111.0
2,3,3',4,4',5'-Hexachlorobiphenyl	pg/g	69	115	50.0	131	62.0	22.1	12.9	52.6	27.6	22.1
2,3,3',4',5,5',6-Heptachlorobiphenyl	pg/g	57.4	255 *J*	126.5	109	62.0	144	61.3	80.6	441	101.5
2,4,4'-Trichlorobiphenyl	pg/g	459	883	63.2	852	60.0	133	127	4.6	117	12.8
2,2',3,6-Tetrachlorobiphenyl	pg/g	106	191	57.2	215	67.9	20.3	18.3	10.4	22.6	10.7
3,3',4,5-Tetrachlorobiphenyl	pg/g	0 *U*	0 *U*	NA	0 *U*	NA	0 *U*	0 *U*	NA	0 *U*	NA
3,4,4',5-Tetrachlorobiphenyl	pg/g	9.91	7.63 *J*	26.0	18.1	58.5	1.81 *J*	0.684 *J*	90.3	2.32 *J*	24.7
2,3,3',5-Tetrachlorobiphenyl	pg/g	0 *U*	6.55	NA	7.25	NA	2.53	2.65	4.6	3.2	23.4
2,3',4',5,5'-Pentachlorobiphenyl	pg/g	103	169	48.5	201	64.5	7.93	18.4	79.5	28.7	113.4
2,3',4,5'-Tetrachlorobiphenyl	pg/g	7.6	14.1	59.9	14.5	62.4	10.2	11.3	10.2	13.6	28.6
2,3',4,5-Tetrachlorobiphenyl	pg/g	20	36.5	58.4	37.1	59.9	6.56	6.29	4.2	6.3	4.0
2,2',3,6,6'-Pentachlorobiphenyl	pg/g	21.2	34	46.4	39.2	59.6	20.2	19.2	5.1	35.4	54.7
2,2',3,5,6'-Pentachlorobiphenyl	pg/g	14.1	23.3	49.2	25.1	56.1	16.4	13.9	16.5	24	37.6
2,2',3,5,6-Pentachlorobiphenyl	pg/g	0 *U*	0 *U*	NA	0 *U*	NA	0 *U*	0 *U*	NA	0 *U*	NA
2,2',3,4,6'-Pentachlorobiphenyl	pg/g	25.1	42	50.4	45.5	57.8	5.31	3.56	39.5	5.91	10.7
2,3',5',6-Tetrachlorobiphenyl	pg/g	0 *U*	0 *U*	NA	0 *U*	NA	0 *U*	0 *U*	NA	0 *U*	NA
2,3,3',4-Tetrachlorobiphenyl	pg/g	15	26	53.7	30.2	67.3	6.03	5.43	10.5	8.5	34.0
2,3,4',5-Tetrachlorobiphenyl	pg/g	20.8	37.2	56.6	38.8	60.4	7.04	7.04	0.0	7.48	6.1
2,3,4,4',5-Pentachlorobiphenyl	pg/g	47.2	66.9	34.5	79.8	51.3	9.15	6.68	31.2	12	27.0
2,2',3,4,6,6'-Hexachlorobiphenyl	pg/g	0 *U*	0 *U*	NA	0 *U*	NA	0 *U*	0 *U*	NA	0 *U*	NA
2,2',3,4',5,6'-Hexachlorobiphenyl	pg/g	0 *U*	0 *U*	NA	5.76	NA	15.7	12.3	24.3	96.5	144.0
2,2',3,4,4',5,6-Heptachlorobiphenyl	pg/g	0 *U*	9.15	NA	10.9	NA	4.59	2.17 *J*	71.6	8.68	61.6
2,2',3,4,4',6,6'-Heptachlorobiphenyl	pg/g	0 *U*	0 *U*	NA	0 *U*	NA	0 *U*	0 *U*	NA	4.34	NA
2,2',3,4,5,6,6'-Heptachlorobiphenyl	pg/g	0 *U*	0 *U*	NA	0 *U*	NA	0 *U*	0 *U*	NA	0 *U*	NA
2,3,3',4,4',5',6-Heptachlorobiphenyl	pg/g	22.3	69.9 *J*	103.3	38.3	52.8	48.6	20.6	80.9	109	76.6
2,3,3',4,5,5',6-Heptachlorobiphenyl	pg/g	0 *U*	0 *U*	NA	0 *U*	NA	0 *U*	0 *U*	NA	0 *U*	NA
2,2',3,4,4',5,6,6'-Octachlorobiphenyl	pg/g	0 *U*	0 *U*	NA	0 *U*	NA	0 *U*	0 *U*	NA	0 *U*	NA
2,3,3',4,4',5,5',6-Octachlorobiphenyl	pg/g	13.3	90.9 *J*	148.9	24.8	60.4	28.6	12.4	79.0	126	126.0
2,2',3,4',5,6,6'-Heptachlorobiphenyl	pg/g	0 *U*	0 *U*	NA	0 *U*	NA	3.22	2.67	18.7	46.6	174.1
2,3,3',4',5'-Pentachlorobiphenyl	pg/g	29.2	43.6	39.6	52.4	56.9	6.44	4.56	34.2	7.17	10.7
PCB004 & 010	pg/g	51.6	112	73.8	111	73.1	142	85.3	49.9	131	8.1
PCB005 & 008	pg/g	155	305	65.2	328	71.6	36.2	35.7	1.4	32.5	10.8
PCB007 & 009	pg/g	0 *U*	0 *U*	NA	0 *U*	NA	0 *U*	0 *U*	NA	0 *U*	NA
PCB012 & 013	pg/g	0 *U*	44.1	NA	0 *U*	NA	0 *U*	0 *U*	NA	0 *U*	NA

Table B-8a. Field Precision for Sediment Samples.

	Location:	BT006					BT027				
	Sample ID:	LW2-GBT006-1	LW2-GBT006-3	RPD[a]	LW2-GBT006-2	RPD[b]	LW2-GBT027-1	LW2-GBT027-3	RPD[a]	LW2-GBT027-2	RPD[b]
	Sample type:	Parent sample	Field duplicate	(percent)	Field replicate	(percent)	Parent sample	Field duplicate		Field replicate	
	Sample Date:	12/16/2005	12/16/2005		12/16/2005		12/6/2005	12/7/2005		12/7/2005	
Analyte	**Units**										
PCB016 & 032	pg/g	192	376	64.8	393	68.7	56.8	58.9	3.6	62.8	10.0
PCB020 & 021 & 033	pg/g	238	438	59.2	427	56.8	58.8	56.3	4.3	52.1	12.1
PCB024 & 027	pg/g	31.9	59.5	60.4	62.5	64.8	19.5	17.6	10.2	27.6	34.4
PCB041 & 064 &071 &072	pg/g	742	1310	55.4	1390	60.8	214	185	14.5	199	7.3
PCB042 & 059	pg/g	248	443	56.4	484	64.5	66.4	54.6	19.5	55.8	17.3
PCB043 & 049	pg/g	708	1260	56.1	1280	57.5	567	419	30.0	483	16.0
PCB048 & 075	pg/g	126	221	54.8	250	66.0	33.3	33.9	1.8	35	5.0
PCB052 & 069	pg/g	1630	2770	51.8	2910	56.4	710	535	28.1	615	14.3
PCB056 & 060	pg/g	310	566	58.4	595	63.0	87.5	86.3	1.4	95.1	8.3
PCB061 & 070	pg/g	925	1610	54.0	1710	59.6	225	214	5.0	249	10.1
PCB066 & 076	pg/g	511	917	56.9	970	62.0	171	172	0.6	176	2.9
PCB084 & 092	pg/g	1290	2140	49.6	2350	58.2	472	288	48.4	368	24.8
PCB085 & 116	pg/g	440	734	50.1	821	60.4	99.6	60.3	49.2	92.2	7.7
PCB087 & 117 & 125	pg/g	1160	1930	49.8	2200	61.9	245	156	44.4	221	10.3
PCB088 & 091	pg/g	421	683	47.5	727	53.3	220	167	27.4	308	33.3
PCB090 & 101	pg/g	3010	5020	50.1	5580	59.8	1350	757	56.3	988	31.0
PCB095 & 098 & 102	pg/g	2490	4030	47.2	4360	54.6	1350	695	64.1	887	41.4
PCB106 & 118	pg/g	2460	4080	49.5	4460	57.8	599	390	42.3	665	10.4
PCB107 & 109	pg/g	178	284	45.9	311	54.4	56.9	42.2	29.7	79.7	33.4
PCB108 & 112	pg/g	141	225	45.9	257	58.3	31.8	20.2	44.6	28.2	12.0
PCB111 & 115	pg/g	56.3	89	45.0	104	59.5	10.1	7.13	34.5	13.1	25.9
PCB128 & 162	pg/g	493	841	52.2	947	63.1	273	121	77.2	158	53.4
PCB132 & 161	pg/g	849	1530	57.3	1610	61.9	1010	353	96.4	442	78.2
PCB133 & 142	pg/g	83.9	142	51.4	158	61.3	86.9	49.4	55.0	226	88.9
PCB134 & 143	pg/g	165	293	55.9	326	65.6	153	61.5	85.3	103	39.1
PCB138 & 163 & 164	pg/g	3120	5540	55.9	5710	58.7	3360	1340	86.0	2400	33.3
PCB139 & 149	pg/g	2290	4240	59.7	4290	60.8	4390	1340	106.5	2620	50.5
PCB146 & 165	pg/g	358	671	60.8	674	61.2	551	290	62.1	1390	86.5
PCB158 & 160	pg/g	372	617	49.5	682	58.8	301	117	88.0	143	71.2
PCB182 & 187	pg/g	773	3120 *J*	120.6	1400	57.7	2120	818	88.6	5600	90.2
PCB196 & 203	pg/g	393	2410 *J*	143.9	663	51.1	836	376	75.9	3290	119.0
Petroleum											
Diesel Range Hydrocarbons	mg/kg	37 *J*	60 *J*	47.4	62 *J*	50.5	76 *J*	80 *J*	5.1	76 *J*	0.0
Gasoline Range Hydrocarbons	mg/kg	1.5 *U*	1.6 *U*	NA	1.6 *U*	NA	13 *J*	2 *U*	NA	3.7 *U*	NA
Residual Range Hydrocarbons	mg/kg	180 *J*	300 *J*	50.0	310 *J*	53.1	390 *J*	490 *J*	22.7	490 *J*	22.7
Phenols											
4-Nitrophenol	µg/kg	0.32 *UJ*	0.33 *UJ*	NA	0.34 *UJ*	NA	0.35 *U*	0.37 *U*	NA	0.36 *U*	NA
2,4-Dimethylphenol	µg/kg	15 *U*	16 *U*	NA	16 *U*	NA	11 *U*	*R*		*R*	
4-Methylphenol	µg/kg	4.3 *U*	4.5 *U*	NA	4.6 *U*	NA	5.6 *U*	10	NA	7 *J*	NA
Phenol	µg/kg	2.8 *U*	7 *J*	NA	7.9 *J*	NA	29 *U*	8.4 *J*	NA	11 *J*	NA
2,4-Dichlorophenol	µg/kg	2.7 *U*	2.8 *U*	NA	2.8 *U*	NA	3.5 *U*	3.6 *U*	NA	11 *U*	NA
2,3,4,5-Tetrachlorophenol	µg/kg	0.64 *U*	0.66 *U*	NA	0.67 *U*	NA	0.82 *U*	8.5 *U*	NA	110 *U*	NA
2,4-Dinitrophenol	µg/kg	150 *U*	160 *U*	NA	160 *U*	NA	190 *U*	200 *U*	NA	210 *U*	NA
4,6-Dinitro-2-methylphenol	µg/kg	2.5 *U*	2.6 *U*	NA	2.7 *U*	NA	3.3 *U*	3.4 *U*	NA	110 *U*	NA
4-Chloro-3-methylphenol	µg/kg	3.1 *U*	3.3 *U*	NA	3.3 *U*	NA	4 *U*	4.2 *U*	NA	11 *U*	NA
Pentachlorophenol	µg/kg	0.6 *UJ*	1.1 *J*	NA	1.5 *J*	NA	0.66 *U*	0.69 *U*	NA	0.67 *U*	NA
2,4,6-Trichlorophenol	µg/kg	0.37 *U*	0.39 *U*	NA	0.39 *U*	NA	0.74 *U*	5 *U*	NA	110 *U*	NA
2-Nitrophenol	µg/kg	3.9 *U*	4 *U*	NA	4.1 *U*	NA	5 *U*	5.2 *U*	NA	11 *U*	NA

Table B-8a. Field Precision for Sediment Samples.

	Location:	BT006					BT027				
	Sample ID:	LW2-GBT006-1	LW2-GBT006-3	RPD[a]	LW2-GBT006-2	RPD[b]	LW2-GBT027-1	LW2-GBT027-3	RPD[a]	LW2-GBT027-2	RPD[b]
	Sample type:	Parent sample	Field duplicate	(percent)	Field replicate	(percent)	Parent sample	Field duplicate		Field replicate	
	Sample Date:	12/16/2005	12/16/2005		12/16/2005		12/6/2005	12/7/2005		12/7/2005	
Analyte	**Units**										
2,3,5,6-Tetrachlorophenol	µg/kg	0.62 *U*	0.65 *U*	NA	0.66 *U*	NA	0.8 *U*	8.4 *U*	NA	110 *U*	NA
2-Methylphenol	µg/kg	5 *U*	5.2 *U*	NA	5.3 *U*	NA	6.5 *U*	6.8 *U*	NA	11 *U*	NA
2-Chlorophenol	µg/kg	2.5 *U*	2.6 *U*	NA	2.7 *U*	NA	3.3 *U*	3.4 *U*	NA	11 *U*	NA
2,4,5-Trichlorophenol	µg/kg	2.6 *U*	7.4 *U*	NA	7.7 *U*	NA	3.5 *U*	98 *U*	NA	110 *U*	NA
Phthalates											
Bis(2-ethylhexyl) phthalate	µg/kg	51 *U*	78	NA	140	NA	95 *U*	410	NA	73	NA
Di-n-octyl phthalate	µg/kg	1.8 *U*	1.9 *U*	NA	1.9 *U*	NA	2.3 *U*	2.4 *U*	NA	11 *U*	NA
Dimethyl phthalate	µg/kg	2.7 *U*	2.8 *U*	NA	2.8 *U*	NA	3.5 *U*	3.6 *U*	NA	11 *U*	NA
Diethyl phthalate	µg/kg	18	5.4 *U*	NA	5.5 *U*	NA	6.7 *U*	7 *U*	NA	11 *U*	NA
Dibutyl phthalate	µg/kg	6.5 *U*	8.2 *U*	NA	14 *U*	NA	8 *J*	11 *U*	NA	8.9 *U*	NA
Butylbenzyl phthalate	µg/kg	6.1 *J*	6.2 *J*	1.6	12	65.2	5.8 *J*	34	141.7	11 *U*	NA
SVOCs											
4-Nitroaniline	µg/kg	15 *U*	16 *U*	NA	16 *U*	NA	19 *U*	20 *U*	NA	21 *U*	NA
Benzyl alcohol	µg/kg	5.5 *U*	5.7 *U*	NA	5.8 *U*	NA	7.3 *J*	7.4 *U*	NA	11 *U*	NA
4-Bromophenyl phenyl ether	µg/kg	2.1 *U*	2.2 *U*	NA	2.2 *U*	NA	2.7 *U*	2.8 *U*	NA	11 *U*	NA
Azobenzene	µg/kg	3.6 *U*	3.7 *U*	NA	3.8 *U*	NA	4.6 *U*	4.8 *U*	NA	11 *U*	NA
1,4-Dichlorobenzene	µg/kg	0.18 *U*	0.19 *U*	NA	0.19 *U*	NA	0.23 *U*	0.24 *U*	NA	0.25 *U*	NA
4-Chloroaniline	µg/kg	3.1 *U*	3.3 *U*	NA	3.3 *U*	NA	4 *U*	4.2 *U*	NA	11 *U*	NA
Bis(2-chloroethyl) ether	µg/kg	3.6 *U*	3.7 *U*	NA	3.8 *U*	NA	4.6 *U*	4.8 *U*	NA	11 *U*	NA
Bis(2-chloroethoxy) methane	µg/kg	2 *U*	2 *U*	NA	2.1 *U*	NA	2.5 *U*	2.6 *U*	NA	11 *U*	NA
Hexachlorobenzene	µg/kg	0.0629 *J*	0.0777 *J*	21.1	0.0785 *J*	22.1	0.209	0.165 *J*	23.5	0.202	3.4
1,2,4-Trichlorobenzene	µg/kg	0.53 *U*	0.55 *U*	NA	0.56 *U*	NA	0.69 *U*	0.72 *U*	NA	0.73 *U*	NA
2,4-Dinitrotoluene	µg/kg	4.2 *U*	4.3 *U*	NA	4.4 *U*	NA	5.4 *U*	5.6 *U*	NA	11 *U*	NA
Dibenzofuran	µg/kg	1.7 *J*	1.3 *J*	26.7	1.4 *J*	19.4	1.4 *J*	1.3 *J*	7.4	1.7 *J*	19.4
Bis(2-chloroisopropyl) ether	µg/kg	1.8 *U*	1.9 *U*	NA	1.9 *U*	NA	2.3 *U*	2.4 *U*	NA	11 *U*	NA
1,3-Dichlorobenzene	µg/kg	0.17 *U*	0.17 *U*	NA	0.18 *U*	NA	0.21 *U*	0.22 *U*	NA	0.23 *U*	NA
2,6-Dinitrotoluene	µg/kg	4.2 *U*	4.3 *U*	NA	4.4 *U*	NA	5.4 *U*	5.6 *U*	NA	11 *U*	NA
N-Nitrosodipropylamine	µg/kg	4.7 *UJ*	4.9 *U*	NA	5 *U*	NA	6.1 *U*	6.4 *U*	NA	11 *U*	NA
Aniline	µg/kg	15 *U*	16 *U*	NA	16 *U*	NA	19 *U*	*R*		*R*	
N-Nitrosodimethylamine	µg/kg	37 *U*	39 *U*	NA	39 *U*	NA	12 *U*	13 *U*	NA	13 *U*	NA
Benzoic acid	µg/kg	150 *U*	150 *U*	NA	150 *U*	NA	*R*	*R*		*R*	
Hexachloroethane	µg/kg	0.077 *UJ*	0.59 *J*	NA	0.62 *NJ*	NA	0.2 *UJ*	0.3 *J*	NA	0.2 *U*	NA
4-Chlorophenyl phenyl ether	µg/kg	3 *U*	3.1 *U*	NA	3.2 *U*	NA	3.8 *U*	4 *U*	NA	11 *U*	NA
Hexachlorocyclopentadiene	µg/kg	23 *U*	23 *U*	NA	24 *U*	NA	29 *U*	30 *U*	NA	31 *U*	NA
Isophorone	µg/kg	2.4 *U*	2.5 *U*	NA	2.5 *U*	NA	3.1 *U*	3.2 *U*	NA	11 *U*	NA
N-Nitrosodiphenylamine	µg/kg	3.3 *U*	3.4 *U*	NA	3.5 *U*	NA	4.2 *U*	4.4 *U*	NA	11 *U*	NA
Carbazole	µg/kg	3.4 *J*	3.4 *J*	0.0	3.3 *J*	3.0	2.5 *U*	2.6 *U*	NA	3.9 *J*	NA
Hexachlorobutadiene	µg/kg	0.25 *U*	0.114 *J*	NA	0.27 *U*	NA	0.33 *U*	0.00315 *U*	NA	0.00179 *UJ*	NA
2-Nitroaniline	µg/kg	15 *U*	16 *U*	NA	16 *U*	NA	19 *U*	20 *U*	NA	21 *U*	NA
2-Chloronaphthalene	µg/kg	5.3 *U*	5.5 *U*	NA	5.6 *U*	NA	6.9 *U*	7.2 *U*	NA	11 *U*	NA
3,3'-Dichlorobenzidine	µg/kg	5.5 *U*	5.7 *U*	NA	5.8 *U*	NA	7.1 *U*	7.4 *U*	NA	110 *U*	NA
1,2-Dichlorobenzene	µg/kg	0.16 *J*	0.12 *U*	NA	0.12 *U*	NA	0.15 *U*	0.15 *U*	NA	0.16 *U*	NA
Nitrobenzene	µg/kg	3 *U*	3.1 *U*	NA	3.2 *U*	NA	3.8 *U*	4 *U*	NA	11 *U*	NA
3-Nitroaniline	µg/kg	15 *U*	16 *U*	NA	16 *U*	NA	19 *U*	20 *U*	NA	21 *U*	NA
Volatile Organic Compounds											
Ethylbenzene	µg/kg	0.11 *U*	0.11 *U*	NA	0.12 *U*	NA	0.14 *U*	0.15 *U*	NA	0.15 *U*	NA
Styrene	µg/kg	0.11 *U*	0.12 *U*	NA	0.12 *U*	NA	0.15 *U*	0.15 *U*	NA	0.17 *U*	NA
cis-1,3-Dichloropropene	µg/kg	0.046 *U*	0.048 *U*	NA	0.049 *U*	NA	0.059 *U*	0.062 *U*	NA	0.063 *U*	NA

Table B-8a. Field Precision for Sediment Samples.

	Location:	BT006					BT027				
	Sample ID:	LW2-GBT006-1	LW2-GBT006-3	RPD[a]	LW2-GBT006-2	RPD[b]	LW2-GBT027-1	LW2-GBT027-3	RPD[a]	LW2-GBT027-2	RPD[b]
	Sample type:	Parent sample	Field duplicate	(percent)	Field replicate	(percent)	Parent sample	Field duplicate		Field replicate	
	Sample Date:	12/16/2005	12/16/2005		12/16/2005		12/6/2005	12/7/2005		12/7/2005	
Analyte	**Units**										
trans-1,3-Dichloropropene	µg/kg	0.065 *U*	0.068 *U*	NA	0.069 *U*	NA	0.084 *U*	0.087 *U*	NA	0.089 *U*	NA
Ethylene dibromide	µg/kg	0.075 *U*	0.078 *U*	NA	0.08 *U*	NA	0.097 *U*	0.11 *U*	NA	0.11 *U*	NA
1,2-Dichloroethane	µg/kg	0.046 *U*	0.048 *U*	NA	0.049 *U*	NA	0.059 *U*	0.062 *U*	NA	0.063 *U*	NA
Acrylonitrile	µg/kg	0.34 *U*	0.36 *U*	NA	0.36 *U*	NA	0.44 *U*	0.46 *U*	NA	0.47 *U*	NA
Methyl isobutyl ketone	µg/kg	0.36 *U*	0.37 *U*	NA	0.38 *U*	NA	0.46 *U*	0.48 *U*	NA	0.49 *U*	NA
Toluene	µg/kg	0.23 *U*	0.23 *U*	NA	0.24 *U*	NA	0.29 *U*	0.3 *U*	NA	0.31 *U*	NA
Chlorobenzene	µg/kg	0.11 *U*	0.11 *U*	NA	0.11 *U*	NA	0.14 *U*	0.14 *U*	NA	0.15 *U*	NA
1,4-Dichloro-trans-2-butene	µg/kg	0.75 *U*	0.78 *U*	NA	0.8 *U*	NA	0.97 *U*	1.1 *U*	NA	1.1 *U*	NA
2-Chloroethyl vinyl ether	µg/kg	0.23 *U*	0.23 *U*	NA	0.24 *U*	NA	0.29 *U*	0.3 *U*	NA	0.31 *U*	NA
Chlorodibromomethane	µg/kg	0.1 *U*	0.11 *U*	NA	0.11 *U*	NA	0.13 *U*	0.14 *U*	NA	0.14 *U*	NA
Tetrachloroethene	µg/kg	0.15 *U*	0.15 *U*	NA	0.15 *U*	NA	0.19 *U*	0.19 *U*	NA	0.2 *U*	NA
cis-1,2-Dichloroethene	µg/kg	0.092 *U*	0.095 *U*	NA	0.097 *U*	NA	0.12 *U*	0.13 *U*	NA	0.13 *U*	NA
trans-1,2-Dichloroethene	µg/kg	0.28 *U*	0.29 *U*	NA	0.3 *U*	NA	0.37 *U*	0.38 *U*	NA	0.39 *U*	NA
Methyl tert-butyl ether	µg/kg	0.058 *U*	0.06 *U*	NA	0.061 *U*	NA	0.075 *U*	0.078 *U*	NA	0.079 *U*	NA
m,p-Xylene	µg/kg	0.2 *U*	0.2 *U*	NA	0.21 *U*	NA	0.25 *U*	0.26 *U*	NA	0.27 *U*	NA
Carbon tetrachloride	µg/kg	0.15 *U*	0.16 *U*	NA	0.16 *U*	NA	0.19 *U*	0.2 *U*	NA	0.2 *U*	NA
Methyl N-butyl ketone	µg/kg	0.94 *U*	0.98 *U*	NA	1 *U*	NA	1.3 *U*	1.3 *U*	NA	1.3 *U*	NA
1,1,1,2-Tetrachloroethane	µg/kg	0.046 *U*	0.048 *U*	NA	0.049 *U*	NA	0.059 *U*	0.062 *U*	NA	0.063 *U*	NA
Acetone	µg/kg	3.4 *J*	2.5 *U*	NA	6.6 *J*	64.0	3.1 *U*	3.2 *U*	NA	6.2 *U*	NA
Chloroform	µg/kg	0.083 *U*	0.086 *U*	NA	0.088 *U*	NA	0.19 *J*	0.12 *U*	NA	0.12 *U*	NA
Benzene	µg/kg	0.058 *U*	0.06 *U*	NA	0.061 *U*	NA	0.075 *U*	0.078 *U*	NA	0.079 *U*	NA
1,1,1-Trichloroethane	µg/kg	0.087 *U*	0.09 *U*	NA	0.092 *U*	NA	0.12 *U*	0.12 *U*	NA	0.12 *U*	NA
Bromomethane	µg/kg	0.55 *U*	0.57 *U*	NA	0.58 *U*	NA	0.71 *U*	0.74 *U*	NA	0.75 *U*	NA
Chloromethane	µg/kg	0.28 *U*	0.29 *U*	NA	0.3 *U*	NA	0.37 *U*	0.38 *U*	NA	0.39 *U*	NA
Methyl iodide	µg/kg	0.99 *U*	1.1 *U*	NA	1.1 *U*	NA	1.3 *UJ*	1.4 *UJ*	NA	1.4 *UJ*	NA
Methylene bromide	µg/kg	0.13 *U*	0.13 *U*	NA	0.13 *U*	NA	0.16 *U*	0.17 *U*	NA	0.17 *U*	NA
Bromochloromethane	µg/kg	0.089 *U*	0.092 *U*	NA	0.094 *U*	NA	0.12 *U*	0.12 *U*	NA	0.13 *U*	NA
Chloroethane	µg/kg	0.42 *U*	0.43 *U*	NA	0.44 *U*	NA	0.54 *U*	0.56 *U*	NA	0.57 *U*	NA
Vinyl chloride	µg/kg	0.13 *U*	0.13 *U*	NA	0.14 *U*	NA	0.17 *U*	0.17 *U*	NA	0.18 *U*	NA
Methylene chloride	µg/kg	0.43 *U*	0.45 *U*	NA	0.46 *U*	NA	1.5 *U*	0.76 *U*	NA	1.3 *U*	NA
Carbon disulfide	µg/kg	0.2 *U*	0.2 *U*	NA	0.21 *U*	NA	0.25 *U*	0.26 *U*	NA	0.27 *U*	NA
Bromoform	µg/kg	0.068 *U*	0.071 *U*	NA	0.072 *U*	NA	0.088 *U*	0.091 *U*	NA	0.093 *U*	NA
Bromodichloromethane	µg/kg	0.1 *U*	0.11 *U*	NA	0.11 *U*	NA	0.13 *U*	0.14 *U*	NA	0.14 *U*	NA
1,1-Dichloroethane	µg/kg	0.084 *U*	0.087 *U*	NA	0.089 *U*	NA	0.11 *U*	0.12 *U*	NA	0.12 *U*	NA
Vinylidene chloride	µg/kg	0.13 *U*	0.13 *U*	NA	0.13 *U*	NA	0.16 *U*	0.17 *U*	NA	0.17 *U*	NA
Trichlorofluoromethane	µg/kg	0.12 *U*	0.13 *U*	NA	0.13 *U*	NA	0.16 *U*	0.17 *U*	NA	0.17 *U*	NA
Dichlorodifluoromethane	µg/kg	20	8.8	77.8	6.2	105.3	0.34 *J*	0.22 *U*	NA	1.5	126.1
1,2-Dichloropropane	µg/kg	0.052 *U*	0.054 *U*	NA	0.055 *U*	NA	0.067 *U*	0.07 *U*	NA	0.071 *U*	NA
1,1,2-Trichloroethane	µg/kg	0.087 *U*	0.09 *U*	NA	0.092 *U*	NA	0.12 *U*	0.12 *U*	NA	0.12 *U*	NA
Trichloroethene	µg/kg	0.092 *U*	0.095 *U*	NA	0.097 *U*	NA	0.12 *U*	0.13 *U*	NA	0.13 *U*	NA
1,1,2,2-Tetrachloroethane	µg/kg	0.15 *U*	0.15 *U*	NA	0.15 *U*	NA	0.19 *U*	0.19 *U*	NA	0.2 *U*	NA
o-Xylene	µg/kg	0.12 *U*	0.12 *U*	NA	0.12 *U*	NA	0.15 *U*	0.15 *U*	NA	0.16 *U*	NA
1,2,3-Trichloropropane	µg/kg	0.17 *U*	0.17 *U*	NA	0.18 *U*	NA	0.21 *U*	0.22 *U*	NA	0.23 *U*	NA
Isopropylbenzene	µg/kg	0.065 *U*	0.068 *U*	NA	0.069 *U*	NA	0.084 *U*	0.087 *U*	NA	0.089 *U*	NA

Notes:

[a] Relative percent difference between the parent sample and the field duplicate (split sample).

[b] Relative percent difference between the parent sample and the field replicate (co-located sample).

Table B-8b. Field Precision for Tissue Samples.

Location (Tissue Type):		BT006 (Field-Collected Clams)			BT027 (Field-Collected Clams)			BT006 (Bioaccumulation Clams)			BT027 (Bioaccumulation Clams)			BT006 (Bioaccumulation Worms)			BT027 (Bioaccumulation Worms)		
Sample ID:		LW2-BTFC006	LW2-BTFC006	RPD	LW2-BTFC027	LW2-BTFC027	RPD	LW2-BTLC006-1	LW2-BTLC006-2	RPD	LW2-BTLC027-1	LW2-BTLC027-2	RPD	LW2-BTLW006-1	LW2-BTLW006-2	RPD	LW2-BTLW027-1	LW2-BTLW027-2	RPD
		Rep 1	Rep 2		Rep 1	Rep 2													
Sample Date:		12/12/2005	12/12/2005		11/30/2005	11/30/2005		2/24/2006	2/24/2006		1/19/2006	1/19/2006		3/2/2006	3/3/2006		1/11/2006	1/12/2006	
Analyte	**Units**																		
Butyltins																			
Dibutyltin ion	µg/kg	14	9.5	38.3	2.2	1.9	14.6	0.55 *U*	0.55 *U*	NA	1.1	0.99 *J*	11	3.9 *J*	6	42.4	14	12	15.4
Tetrabutyltin	µg/kg	0.067 *U*	0.067 *U*	NA	0.067 *U*	0.067 *U*	NA	0.067 *U*	0.067 *U*	NA	0.067 *U*	0.067 *U*	NA	1 *U*	2	NA	2.4 *NJ*	0.87 *U*	NA
Tributyltin ion	µg/kg	7.6	6	23.5	3.3	3.7	11.4	2.7 *U*	2.7 *U*	NA	4.6	3.2	36	2.3	2.8	19.6	7.3	5.7	24.6
Butyltin ion	µg/kg	4.3	3	35.6	2.5	0.71 *U*	NA	0.18 *U*	0.21 *U*	NA	0.54 *J*	0.24 *J*	77	9.9 *NJ*	51	135.0	61 *J*	44	32.4
Conventionals																			
Lipids	percent	1.48	1.93	26.4	1.68	2.49	38.8	0.847	0.813	4.1	0.958	0.935	2	2.37	2.74	14.5	2.84	1.35	71.1
Total solids	percent	10.2	11.3	10.2	11.1	12.5	11.9	6.8	6.5	4.5	6.78	6.65	2	15.2	15.4	1.3	15.3	15.1	1.3
Dioxin/furan homologs																			
Tetrachlorodibenzofuran homologs	pg/g	15.7	23.1	38.1	4.41	6.64	40.4	1.89	1.7	10.6	1.67	1.11	40	19.4	25	25.2	11.8	8.27	35.2
Pentachlorodibenzofuran homologs	pg/g	7.29	7.67	5.1	1.69	2.69	45.7	0.875	0.873	0.2	0.792	0.566	33	12.2	14.7	18.6	7.73	6.01	25.0
Octachlorodibenzo-p-dioxin	pg/g	15.1	14.8	2.0	9.47	15.7	49.5	3.34	4.4	27.4	3.59	3.71	3	13.3	13.6	2.2	16.5	10.7	42.6
Hexachlorodibenzo-p-dioxin homologs	pg/g	2.17	2.93	29.8	1.51	2.24	38.9	0.159 *U*	0.117	NA	0.355	0.211	51	5.27	5.76	8.9	4.67	3.67	24.0
Pentachlorodibenzo-p-dioxin homologs	pg/g	1.03	1.74	51.3	0.611	1.03	51.1	0.128	0.051	86.0	0.117 *U*	0.118 *U*	NA	2.53	3.35	27.9	2.69	2.13	23.2
Heptachlorodibenzo-p-dioxin homologs	pg/g	5.65	5.66	0.2	3.11	5.24	51.0	0.98	1.13	14.2	0.44	1.03	80	8.87	8.92	0.6	9.26	6.25	38.8
Heptachlorodibenzofuran homologs	pg/g	1.78	1.63	8.8	0.962	1.6	49.8	0.193	0.338	54.6	0.16	0.183	13	2.34	3.63	43.2	2.45	2.46	0.4
Octachlorodibenzofuran	pg/g	0.821 *U*	0.774 *J*	NA	0.551 *J*	1.05 *J*	62.3	0.206 *J*	0.253 *J*	20.5	0.205 *U*	0.313 *U*	NA	1.29 *J*	1.43 *J*	10.3	1.77 *J*	0.97 *J*	58.4
Tetrachlorodibenzo-p-dioxin homologs	pg/g	4.08	5.87	36.0	3.64	6.39	54.8	0.572	0.527	8.2	0.652	0.519	23	6.66	8.59	25.3	12.2	8.97	30.5
Hexachlorodibenzofuran homologs	pg/g	3.06	3.18	3.8	1.16	1.7	37.8	0.419	0.461	9.5	0.383	0.259	39	5.38	6	10.9	4.59	3.6	24.2
Dioxins/furans																			
2,3,7,8-Tetrachlorodibenzo-p-dioxin	pg/g	0.168 *U*	0.199 *U*	NA	0.116 *U*	0.202 *U*	NA	0.088 *U*	0.068 *U*	NA	0.078 *U*	0.098 *U*	NA	0.363	0.351	3.4	0.744 *U*	0.286 *U*	NA
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	pg/g	0.154 *J*	0.183 *J*	17.2	0.138 *J*	0.17 *U*	NA	0.074 *U*	0.055 *U*	NA	0.0949 *U*	0.089 *J*	NA	0.445 *J*	0.438 *J*	1.6	0.389 *J*	0.311 *J*	22.3
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	pg/g	2.84	2.89	1.7	1.51	2.48	48.6	0.414 *U*	0.5 *U*	NA	0.382 *U*	0.417 *J*	NA	4.45	4.7	5.5	4.45	3.37	27.6
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	pg/g	0.114 *U*	0.096 *J*	NA	0.061 *J*	0.111 *J*	58.1	0.159 *U*	0.156 *U*	NA	0.166 *U*	0.167 *U*	NA	0.227 *J*	0.238 *J*	4.7	0.238 *U*	0.201 *J*	NA
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	pg/g	0.182 *U*	0.204 *J*	NA	0.128 *J*	0.193 *J*	40.5	0.061 *J*	0.051 *J*	17.9	0.07 *U*	0.065 *U*	NA	0.542 *J*	0.65 *J*	18.1	0.6 *J*	0.441 *J*	30.5
2,3,7,8-Tetrachlorodibenzofuran	pg/g	1.41	2.21	44.2	0.488	0.674	32.0	0.246 *U*	0.193 *J*	NA	0.271 *U*	0.242	NA	2.14	2.5	15.5	0.966	0.652	38.8
1,2,3,4,7,8,9-Heptachlorodibenzofuran	pg/g	0.131 *U*	0.13 *U*	NA	0.133 *U*	0.133 *U*	NA	0.127 *U*	0.125 *U*	NA	0.132 *U*	0.061 *U*	NA	0.132 *U*	0.057 *U*	NA	0.078 *U*	0.057 *U*	NA
2,3,4,7,8-Pentachlorodibenzofuran	pg/g	0.494 *U*	0.522 *J*	NA	0.144 *J*	0.169 *J*	16.0	0.11 *U*	0.091 *U*	NA	0.095 *J*	0.109 *J*	14	0.939 *J*	1.08 *J*	14.0	0.508 *J*	0.374 *J*	30.4
1,2,3,7,8-Pentachlorodibenzofuran	pg/g	0.22 *J*	0.209 *J*	5.1	0.058 *U*	0.07 *U*	NA	0.077 *U*	0.06 *U*	NA	0.051 *J*	0.081 *U*	NA	0.624 *J*	0.659 *J*	5.5	0.268 *J*	0.213 *J*	22.9
1,2,3,6,7,8-Hexachlorodibenzofuran	pg/g	0.071 *U*	0.064 *J*	NA	0.0942 *U*	0.0945 *U*	NA	0.0899 *U*	0.0884 *U*	NA	0.0936 *U*	0.0945 *U*	NA	0.205 *J*	0.211 *J*	2.9	0.196 *U*	0.166 *J*	NA
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	pg/g	0.586 *U*	0.6 *J*	NA	0.273 *J*	0.466 *J*	52.2	0.088 *U*	0.117 *J*	NA	0.113 *J*	0.121 *J*	7	1.32	1.48	11.4	1.24	1.07 *J*	14.7
2,3,4,6,7,8-Hexachlorodibenzofuran	pg/g	0.123 *U*	0.116 *J*	NA	0.067 *J*	0.105 *J*	44.2	0.082 *J*	0.066 *J*	21.6	0.084 *J*	0.075 *U*	NA	0.219 *J*	0.227 *U*	NA	0.237 *U*	0.133 *U*	NA
1,2,3,4,6,7,8-Heptachlorodibenzofuran	pg/g	0.613 *U*	0.502 *J*	NA	0.319 *J*	0.544 *J*	52.1	0.181 *U*	0.12 *J*	NA	0.108 *U*	0.166 *U*	NA	1.13 *U*	1.16	NA	1.12 *J*	0.801 *J*	33.2
1,2,3,4,7,8-Hexachlorodibenzofuran	pg/g	0.145 *J*	0.198 *J*	30.9	0.066 *J*	0.091 *U*	NA	0.056 *U*	0.056 *U*	NA	0.05 *J*	0.071 *U*	NA	0.417 *J*	0.515 *J*	21.0	0.333 *J*	0.257 *J*	25.8
1,2,3,7,8,9-Hexachlorodibenzofuran	pg/g	0.132 *U*	0.131 *U*	NA	0.133 *U*	0.134 *U*	NA	0.052 *U*	0.125 *U*	NA	0.133 *U*	0.081 *J*	NA	0.133 *U*	0.133 *U*	NA	0.054 *U*	0.141 *U*	NA
Metals																			
Aluminum	mg/kg	22.4 *J*	42.2 *J*	61.3	63.8 *J*	89.1 *J*	33.1	27.4	41.9	41.8	22.8	34.7	41	235	193	19.6	389	391	0.5
Lead	mg/kg	0.071	0.079	10.7	0.054	0.054	0.0	0.069	0.063	9.1	0.04	0.041	2	0.258	0.256	0.8	0.21	0.373	55.9
Mercury	mg/kg	0.005 *J*	0.005 *J*	0.0	0.008 *J*	0.008 *J*	0.0	0.0098	0.0095	3.1	0.0078	0.0088	12	0.0036	0.0035	2.8			NA
Nickel	mg/kg	0.288	0.321	10.8	0.344	0.282 *J*	19.8	0.188 *J*	0.154 *J*	19.9	0.152	0.148	3	0.377	0.318	17.0	0.479	0.404	17.0
Silver	mg/kg	0.0255	0.0243	4.8	0.0734	0.0849	14.5	0.0109	0.01	8.6	0.0115	0.0138	18	0.0065	0.0053	20.3	0.0064	0.0054	16.9
Antimony	mg/kg	0.004 *J*	0.001 *J*	120.0	0.001 *J*	0.001 *J*	0.0	0.0009 *U*	0.001 *U*	NA	0.0007	0.0007	0	0.002 *UJ*	0.002 *UJ*	NA	0.002 *J*	0.002 *UJ*	NA
Arsenic	mg/kg	0.875 *J*	0.816 *J*	7.0	0.828 *J*	0.908	9.2	0.424	0.414	2.4	0.423 *J*	0.379 *J*	11	0.391	0.598	41.9	1.2	1.39	14.7
Cadmium	mg/kg	0.17 *J*	0.171 *J*	0.6	0.0623 *J*	0.062	0.5	0.049	0.0484	1.2	0.0504	0.0447	12	0.115 *J*	0.0919 *J*	22.3	0.0404	0.0405	0.2
Chromium	mg/kg	1.08	1.01	6.7	0.76	0.66	14.1	0.18	0.19	5.4	0.24	0.26	8	0.41	0.32	24.7	0.78	0.57	31.1
Copper	mg/kg	9.87	9.65	2.3	8.59	8.25	4.0	4.16 *J*	3.85 *J*	7.7	3.92	3.17	21	3.29	2.98	9.9	2.06	2.66	25.4
Zinc	mg/kg	40.4	44.4	9.4	31	33.7	8.3	12.5	11.7	6.6	14.6	14.1	3	24.4	26.3	7.5	24.3	23.5	3.3
Selenium	mg/kg	0.07	0.082	15.8	0.08 *J*	0.119 *J*	39.2	0.173	0.165	4.7	0.095	0.085	11	0.26	0.28	7.4	0.11	0.21 *J*	62.5
Organochlorine pesticides																			
Heptachlor epoxide	µg/kg	0.0402 *J*	0.0474 *J*	16.4	0.0388 *J*	0.0503 *J*	25.8	0.0208 *J*	0.0173 *J*	18.4	0.0342 *J*	0.0264 *J*	26	0.0255 *J*	0.0227 *J*	11.6	0.0131 *J*	0.00928 *U*	NA
Endosulfan sulfate	µg/kg	0.43	0.542	23.0	0.491	0.654	28.5	0.0287 *U*	0.0302 *U*	NA	0.0467 *J*	0.0416 *U*	NA	0.393	0.382	2.8	0.42	0.343	20.2
Oxychlordane	µg/kg	0.04 *J*	0.0494 *J*	21.0	0.0456 *J*	0.0648 *J*	34.8	0.0476 *J*	0.0393 *J*	19.1	0.0609 *J*	0.0478 *U*	NA	0.03 *J*	0.033 *J*	9.5	0.0357 *J*	0.0309 *J*	14.4
Aldrin	µg/kg	0.121 *J*	0.131 *J*	7.9	0.111 *J*	0.159 *J*	35.6	0.0176 *J*	0.0164 *J*	7.1	0.0197 *J*	0.0175 *U*	NA	0.177 *J*	0.223 *J*	23.0	0.448 *J*	0.38 *J*	16.4
alpha-Hexachlorocyclohexane	µg/kg	0.00847 *U*	0.00569 *J*	NA	0.00682 *J*	0.00976 *U*	NA	0.0136 *J*	0.00889 *J*	41.9	0.00607 *J*	0.01 *U*	NA	0.011 *J*	0.01 *J*	9.5	0.00714 *U*	0.00769 *J*	NA
beta-Hexachlorocyclohexane	µg/kg	0.0414 *U*	0.0411 *U*	NA	0.0419 *U*	0.0427 *U*	NA	0.00629 *J*	0.00268 *J*	80.5	0.00156 *U*	0.00179 *U*	NA	0.0526 *U*	0.0526 *U*	NA	0.00389 *J*	0.00359 *U*	NA
delta-Hexachlorocyclohexane	µg/kg	0.00183 *U*	0.00106 *J*	NA	0.00102 *J*	0.00112 *U*	NA	0.00377 *UJ*	0.00212 *U*	NA	0.0182 *U*	0.0183 *U*	NA	0.00106 *U*	0.00127 *U*	NA	0.0181 *U*	0.0193 *U*	NA
beta-Endosulfan	µg/kg	0.118 *J*	0.138 *J*	15.6	0.119 *J*	0.167 *J*	33.6	0.059 *U*	0.0205 *U*	NA	0.0614 *U*	0.0619 *U*	NA	0.0788 *J*	0.0989 *J*	22.6	0.113 *J*	0.0753 *U*	NA
2,4'-DDE	µg/kg	0.511	0.574	11.6	0.103 *U*	0.141 *J*	NA	0.0204 *J*	0.0224 *J*	9.3	0.0158 *J*	0.0139 *J*	13	0.439	0.57	26.0	0.264	0.226 *J*	15.5
trans-Nonachlor	µg/kg	0.816	0.934	13.5	0.769	1.06	31.8	0.884	0.798	10.2	0.993	0.933	6	0.643	0.667	3.7	0.656	0.517	23.7
4,4'-DDT	µg/kg	1.32	1.75	28.0	0.55	0.718	26.5	0.0888 *J*	0.0802 *J*	10.2	0.0967 *J*	0.121 *J*	22	0.472	0.286 *J*	49.1	0.126 *J*	0.119 *J*	5.7

Table B-8b. Field Precision for Tissue Samples.

	Location (Tissue Type):	BT006 (Field-Collected Clams)			BT027 (Field-Collected Clams)			BT006 (Bioaccumulation Clams)			BT027 (Bioaccumulation Clams)			BT006 (Bioaccumulation Worms)			BT027 (Bioaccumulation Worms)		
	Sample ID:	LW2-BTFC006	LW2-BTFC006	RPD	LW2-BTFC027	LW2-BTFC027	RPD	LW2-BTLC006-1	LW2-BTLC006-2	RPD	LW2-BTLC027-1	LW2-BTLC027-2	RPD	LW2-BTLW006-1	LW2-BTLW006-2	RPD	LW2-BTLW027-1	LW2-BTLW027-2	RPD
		Rep 1	Rep 2		Rep 1	Rep 2													
	Sample Date:	12/12/2005	12/12/2005		11/30/2005	11/30/2005		2/24/2006	2/24/2006		1/19/2006	1/19/2006		3/2/2006	3/3/2006		1/11/2006	1/12/2006	
Analyte	**Units**																		
cis-Chlordane	µg/kg	0.732	0.863	16.4	0.609	0.772	23.6	0.621	0.529	16.0	0.533	0.549	3	1.06	1.04	1.9	1.09	0.947	14.0
cis-Nonachlor	µg/kg	0.279 *J*	0.349 *J*	22.3	0.281 *J*	0.356 *J*	23.5	0.319 *J*	0.277 *J*	14.1	0.328 *J*	0.281 *J*	15	0.301 *J*	0.327 *J*	8.3	0.343 *J*	0.288 *J*	17.4
trans-Chlordane	µg/kg	0.57	0.665	15.4	0.426 *J*	0.544	24.3	0.36 *J*	0.328 *J*	9.3	0.339 *J*	0.364 *J*	7	0.807	0.923	13.4	0.775	0.646	18.2
2,4'-DDD	µg/kg	1.84	2.61	34.6	0.392	0.578	38.4	0.208 *J*	0.226	8.3	0.165 *J*	0.121 *J*	31	2.06	2.69	26.5	1.31	1.26	3.9
Endrin ketone	µg/kg	0.00267 *U*	0.00304 *J*	NA	0.00201 *J*	0.00165 *J*	19.7	0.0382 *U*	0.0375 *U*	NA	0.0397 *U*	0.0401 *U*	NA	0.00107 *J*	0.04 *U*	NA	0.0396 *U*	0.0421 *U*	NA
gamma-Hexachlorocyclohexane	µg/kg	0.0406 *J*	0.0414 *J*	2.0	0.0495 *J*	0.0693 *U*	NA	0.0576 *J*	0.0529 *J*	8.5	0.051 *J*	0.0519 *J*	2	0.019 *J*	0.016 *J*	17.1	0.00879 *U*	0.00666 *J*	NA
Dieldrin	µg/kg	0.575	0.691	18.3	0.521	0.712	31.0	0.179	0.169 *J*	5.7	0.222	0.189	16	0.473	0.45	5.0	0.27	0.216	22.2
Endrin	µg/kg	0.0054 *U*	0.0101 *J*	NA	0.00518 *J*	0.00772 *J*	39.4	0.0244 *U*	0.024 *U*	NA	0.00289 *U*	0.00368 *U*	NA	0.00727 *J*	0.0256 *U*	NA	0.00457 *U*	0.0269 *U*	NA
Methoxychlor	µg/kg	0.0221 *U*	0.0222 *U*	NA	0.0186 *U*	0.0258 *U*	NA	0.0183 *U*	0.018 *U*	NA	0.019 *U*	0.0192 *U*	NA	0.019 *U*	0.0191 *U*	NA	0.019 *U*	0.0202 *U*	NA
4,4'-DDD	µg/kg	8.08	10.4	25.1	1.81	2.64	37.3	0.624	0.751	18.5	0.615	0.484	24	13.3	16.9	23.8	7.5	6.53	13.8
4,4'-DDE	µg/kg	8.84	10	12.3	5.19	7.07	30.7	0.612	0.601	1.8	0.832	0.731	13	12.2	14	13.7	13.9	11.5	18.9
Endrin aldehyde	µg/kg	0.0189 *U*	0.0188 *U*	NA	0.0192 *U*	0.0192 *U*	NA	0.0183 *U*	0.018 *U*	NA	0.0191 *U*	0.0192 *U*	NA	0.0191 *U*	0.0192 *U*	NA	0.019 *U*	0.0202 *U*	NA
Heptachlor	µg/kg	0.0129 *J*	0.0185 *U*	NA	0.00927 *J*	0.0114 *U*	NA	0.0196 *U*	0.0199 *J*	NA	0.0205 *J*	0.0211 *J*	3	0.013 *J*	0.012 *J*	8.0	0.00507 *J*	0.00589 *J*	15.0
2,4'-DDT	µg/kg	0.395	0.55	32.8	0.16 *J*	0.194 *J*	19.2	0.0274 *J*	0.0275 *J*	0.4	0.0261 *J*	0.0388 *J*	39	0.067 *J*	0.067 *J*	0.0	0.0232 *J*	0.0342 *J*	38.3
alpha-Endosulfan	µg/kg	0.122 *J*	0.131 *J*	7.1	0.101 *J*	0.126 *J*	22.0	0.0229 *U*	0.0225 *U*	NA	0.0139 *U*	0.0195 *U*	NA	0.0483 *J*	0.0496 *J*	2.7	0.0219 *J*	0.0267 *J*	19.8
PAHs																			
Anthracene	µg/kg	9	9.5	5.4	1.1	1.4	24.0	0.93	0.85	9.0	1.9	1	62	5	7.7	42.5	3.7	2.9	24.2
Pyrene	µg/kg	140	150	6.9	6	7.8	26.1	13	12	8.0	6.7	5.9	13	160	210	27.0	38	35	8.2
Benzo(g,h,i)perylene	µg/kg	10	9.2	8.3	0.4 *J*	0.57	35.1	0.37 *J*	0.35 *J*	5.6	0.17 *U*	0.17 *U*	NA	20	25	22.2	4.4	4.2	4.7
Indeno(1,2,3-cd)pyrene	µg/kg	5.3	6.1	14.0	0.16 *U*	0.16 *U*	NA	0.16 *U*	0.16 *U*	NA	0.16 *U*	0.16 *U*	NA	13	17	26.7	2.3	2.2	4.4
Benzo(b)fluoranthene	µg/kg	39	38	2.6	0.91	1	9.4	0.99	1	1.0	0.3 *J*	0.15 *U*	NA	82	110	29.2	12	11	8.7
Fluoranthene	µg/kg	86	94	8.9	6.7	9	29.3	7.3	7	4.2	8.1	6.7	19	90	130	36.4	41	37	10.3
Benzo(k)fluoranthene	µg/kg	15	15	0.0	0.42 *J*	0.52	21.3	0.46 *J*	0.36 *J*	24.4	0.13 *U*	0.13 *U*	NA	45	57	23.5	7.3	6.7	8.6
Acenaphthylene	µg/kg	0.81	0.84	3.6	0.28 *J*	0.092 *U*	NA	0.31 *J*	0.19 *J*	48.0	0.092 *U*	0.092 *U*	NA	2.3	1.3	55.6	2.8	4.2	40.0
Chrysene	µg/kg	110	110	0.0	4.5	5.7	23.5	3.9	3.8	2.6	1.9	1.7	11	130	170	26.7	26	25	3.9
Benzo(a)pyrene	µg/kg	15	15	0.0	1.2	1.6	28.6	0.64	0.67	4.6	0.57	0.12 *U*	NA	17	25	38.1	3.5	3.5	0.0
Dibenz(a,h)anthracene	µg/kg	2.4	3.2	28.6	0.11 *U*	0.11 *U*	NA	0.11 *U*	0.11 *U*	NA	0.11 *U*	0.11 *U*	NA	3.6	4.3	17.7	0.11 *U*	0.22 *U*	NA
Benz(a)anthracene	µg/kg	56	56	0.0	2.3	3.6	44.1	1.1	1.1	0.0	0.81	0.65	22	40	56	33.3	11	11	0.0
Acenaphthene	µg/kg	1.2	1.2	0.0	0.22 *J*	0.091 *U*	NA	0.29 *J*	0.2 *J*	36.7	0.22 *J*	0.22 *J*	0	2.1	3.3	44.4	3.1	3.5	12.1
Phenanthrene	µg/kg	25	27	7.7	3.4	4.8	34.1	4.4	4	9.5	5.1	4	24	11	15	30.8	14	9.7	36.3
Fluorene	µg/kg	3.9	4.3	9.8	0.83	1.1	28.0	0.68	0.64	6.1	0.63	0.66	5	2	3.6	57.1	4	3.2	22.2
Naphthalene	µg/kg	2.1 *U*	2 *U*	NA	0.97 *U*	1.1 *U*	NA	1 *U*	0.64 *U*	NA	0.57 *U*	0.63 *U*	NA	0.94 *U*	0.94 *U*	NA	1.4 *U*	1.1 *U*	NA
2-Methylnaphthalene	µg/kg	1.5	1.5	0.0	0.69 *U*	1.3	NA	0.87 *U*	0.52 *U*	NA	0.62 *U*	0.75 *U*	NA	0.91 *J*	1.1	18.9	0.15 *U*	1.7 *J*	NA
PCB Aroclors																			
Aroclor 1260	pg/g	62300 *NJ*	68100 *NJ*	8.9	11400 *NJ*	17400 *NJ*	41.7	3540 *NJ*	3310 *NJ*	6.7	4890 *NJ*	3220 *NJ*	41	49300 *NJ*	59900 *NJ*	19.4	20600 *NJ*	22300 *NJ*	7.9
Aroclor 1254	pg/g	256000 *NJ*	275000 *NJ*	7.2	17600 *NJ*	31600 *NJ*	56.9	10400 *NJ*	11200 *NJ*	7.4	8490 *NJ*	7560 *NJ*	12	304000 *NJ*	368000 *NJ*	19.0	44500 *NJ*	34300 *NJ*	25.9
Aroclor 1221	pg/g	0.876 *U*	0.717 *U*	NA	0.421 *U*	0.882 *U*	NA	0.633 *U*	0.688 *U*	NA	0.262 *U*	0.398 *U*	NA	0.274 *U*	0.412 *U*	NA	1.31 *U*	1.4 *U*	NA
Aroclor 1232	pg/g	0.576 *U*	0.394 *U*	NA	0.206 *U*	0.338 *U*	NA	0.549 *U*	0.721 *U*	NA	0.253 *U*	0.396 *U*	NA	0.374 *U*	0.478 *U*	NA	1.75 *U*	0.704 *U*	NA
Aroclor 1248	pg/g	118 *U*	25.3 *U*	NA	5.17 *U*	3.13 *U*	NA	3.29 *U*	5.44 *U*	NA	3.16 *U*	3.73 *U*	NA	150 *U*	171 *U*	NA	15.4 *U*	6.4 *U*	NA
Aroclor 1016	pg/g	2.15 *U*	2.34 *U*	NA	0.811 *U*	1.7 *U*	NA	1.22 *U*	1.33 *U*	NA	0.505 *U*	0.767 *U*	NA	9.51 *U*	9.9 *U*	NA	2.52 *U*	2.7 *U*	NA
Aroclor 1242	pg/g	52000 *NJ*	71400 *NJ*	31.4	2100 *NJ*	4380 *NJ*	70.4	8850 *NJ*	9430 *NJ*	6.3	10100 *NJ*	9830 *NJ*	3	41600 *NJ*	57400 *NJ*	31.9	3770 *NJ*	2800 *NJ*	29.5
PCB congener homologs																			
Trichlorobiphenyl	pg/g	32400	44300	31.0	1990 *J*	19000 *J*	162.1	3470	3750	7.8	3450	3340	3	24900	34300	31.8	3240	2440 *J*	28.2
Pentachlorobiphenyl	pg/g	174000	185000	6.1	12100 *J*	22900 *J*	61.7	7510	7960	5.8	5890	5340	10	200000	244000	19.8	29100	22500	25.6
Dichlorobiphenyl	pg/g	3800	5100	29.2	1090 *J*	16400 *J*	175.1	3140	3150	0.3	3890	3730	4	2250	2940	26.6	998	602 *J*	49.5
Hexachlorobiphenyl	pg/g	148000	162000	9.0	18700	30900	49.2	8890	8710	2.0	9420	7700	20	155000	187000	18.7	46500	41200	12.1
Tetrachlorobiphenyl	pg/g	81900	106000	25.7	6540 *J*	21200 *J*	105.7	3310	3890	16.1	2470	2120	15	91100	126000	32.2	15300	12800	17.8
Monochlorobiphenyl	pg/g	28.4	36.9	26.0	3.91 *J*	20.4 *J*	135.7	175	159	9.6	228	161	34	24.4	39.1	46.3			NA
Heptachlorobiphenyl	pg/g	34300	36500	6.2	6230 *J*	10600 *J*	51.9	1640	1560	5.0	2800	1540	58	43600	50600	14.9	18400	18400	0.0
Nonachlorobiphenyl	pg/g	471	466	1.1	57.5 *J*	96.2 *J*	50.4	120	114	5.1	136	117	15	1110	1230	10.3	246	233	5.4
Octachlorobiphenyl	pg/g	5100	5600	9.3	833 *J*	1460 *J*	54.7	341	332	2.7	617	326	62	8630	10100	15.7	2960	2990	1.0
PCB congeners																			
2,2'-Dichlorobiphenyl	pg/g	1280	1790	33.2	621 *J*	15500 *J*	184.6	787 *J*	754 *J*	4.3	933	845	10	249	347	32.9	544	255 *J*	72.3
Polychlorinated biphenyls	pg/g	480000	546000	12.9	47700 *J*	123000 *J*	88.2	28700	29700	3.4	29000	24500	17	527000	656000	21.8	117000	101000	14.7
2,2',6,6'-Tetrachlorobiphenyl	pg/g	67.9	76.7	12.2	28.5 *J*	702 *J*	184.4	3.73	4.54	19.6	10.6	10.7	1	69.3	81.9	16.7	192	179	7.0
2,3-Dichlorobiphenyl	pg/g	21.4	32.6	41.5	0.769	0.436 *U*	NA	28.7 *J*	30 *J*	4.4	38.2	36.8	4	9.58	15.8	49.0	2.04 *J*	1.17 *J*	54.2
2,4',5-Trichlorobiphenyl	pg/g	5190	7020	30.0	145 *J*	268 *J*	59.6	538	569	5.6	473	478	1	4480	6270	33.3	380	303 *J*	22.5
3,3'-Dichlorobiphenyl	pg/g	171	190	10.5	385	470	19.9	276 *J*	281 *J*	1.8	284	309	8	189	182	3.8	223	185 *J*	18.6
4,4'-Dichlorobiphenyl	pg/g	804	1040	25.6	19.1	24.2	23.6	425	386	9.6	395	401	2	876	1070	19.9	56.5	41 *J*	31.8
2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	pg/g	62.5	61.3	1.9	23.8	34	35.3	71.9	67.1	6.9	73.2	72.1	2	135	139	2.9	85.2	65.4	26.3

Table B-8b. Field Precision for Tissue Samples.

	Location (Tissue Type):	BT006 (Field-Collected Clams)			BT027 (Field-Collected Clams)			BT006 (Bioaccumulation Clams)			BT027 (Bioaccumulation Clams)			BT006 (Bioaccumulation Worms)			BT027 (Bioaccumulation Worms)		
	Sample ID:	LW2-BTFC006	LW2-BTFC006	RPD	LW2-BTFC027	LW2-BTFC027	RPD	LW2-BTLC006-1	LW2-BTLC006-2	RPD	LW2-BTLC027-1	LW2-BTLC027-2	RPD	LW2-BTLW006-1	LW2-BTLW006-2	RPD	LW2-BTLW027-1	LW2-BTLW027-2	RPD
	Sample Date:	Rep 1 12/12/2005	Rep 2 12/12/2005		Rep 1 11/30/2005	Rep 2 11/30/2005		2/24/2006	2/24/2006		1/19/2006	1/19/2006		3/2/2006	3/3/2006		1/11/2006	1/12/2006	
Analyte	Units																		
2-Chlorobiphenyl	pg/g	18.5	24.2	26.7	2.47 *J*	18.6 *J*	153.1	126	116 *J*	8.3	163	117	33	13	21.9	51.0			NA
3-Chlorobiphenyl	pg/g	2.59	2.95	13.0	1.44	1.79	21.7	9.14	9.19 *J*	0.5	12	8.55	34	3.23	4.97	42.4			NA
4-Chlorobiphenyl	pg/g	7.27	9.73	28.9	1.42 *U*	1.47 *U*	NA	39.5	34.4 *J*	13.8	53	35.5	40	8.13	12.1	39.2			NA
2,2',3,3',5,5',6,6'-Octachlorobiphenyl	pg/g	831	913	9.4	157 *J*	286 *J*	58.2	79.4	74.8	6.0	103	81.1	24	673	747	10.4	224	194	14.4
2,3'-Dichlorobiphenyl	pg/g	276	397	36.0	19.4 *J*	86.4 *J*	126.7	246 *J*	245 *J*	0.4	329	320	3	122	188	42.6	25	17.9 *J*	33.1
2,3',4,4',5-Pentachlorobiphenyl	pg/g	31300	34000	8.3	2000	2720	30.5	2030	1950	4.0	1900	1790	6	22000	27300	21.5	2540	2020	22.8
2,3',4,4'-Tetrachlorobiphenyl	pg/g	7170	8260	14.1	489	768	44.4	334	393	16.2	231	203	13	7850	11600	38.6	1040	898	14.7
3,3',4,4'-Tetrachlorobiphenyl	pg/g	551	667	19.0	44.7 *J*	67.3	40.4	34.5	37.7	8.9	28.5	24.9	13	727	892	20.4	69.9	61.5	12.8
2,3,3',4,4'-Pentachlorobiphenyl	pg/g	6980	7400	5.8	452	652	36.2	375	392	4.4	308	295	4	7510	9520	23.6	745	613	19.4
3,3',4,4',5,5'-Hexachlorobiphenyl	pg/g	0.529 *U*	0.53 *U*	NA	0.539 *U*	0.54 *U*	NA	0.512 *U*	0.505 *U*	NA	0.537 *U*	0.54 *U*	NA	0.538 *U*	0.542 *U*	NA	10.5 *U*	0.565 *U*	NA
2,3,4,4'-Tetrachlorobiphenyl	pg/g	1280	1510	16.5	80.2	118	38.1	61.8	75.4	19.8	44.2	38.4	14	1760	2130	19.0	151	125	18.8
2,6-Dichlorobiphenyl	pg/g	20.9 *J*	38.4 *J*	59.0	5.99 *J*	175 *J*	186.8	22 *J*	20.9 *J*	5.1	26.9	25	7	15	24.5	48.1	8.23	4.61 *J*	56.4
2,4-Dichlorobiphenyl	pg/g	34.1	46.9	31.6	0.818 *J*	5.6 *J*	149.0	46.4 *J*	43.8 *J*	5.8	65.3	58.6	11	28	43.3	42.9	7.06	3.87 *J*	58.4
3,3',5,5'-Tetrachlorobiphenyl	pg/g	0.57 *U*	0.571 *U*	NA	0.581 *U*	1.46	NA	0.552 *U*	0.544 *U*	NA	0.578 *U*	0.582 *U*	NA	0.58 *U*	0.584 *U*	NA	16.7 *U*	2.78	NA
2,2',4,4',6,6'-Hexachlorobiphenyl	pg/g	4.29	4.62	7.4	4.21	19.2 *J*	128.1	0.736	0.643	13.5	1.3	1.13	14	3.62	3.75	3.5	11.8	9.75	19.0
2,5-Dichlorobiphenyl	pg/g	54	72.3	29.0	0.985 *J*	5.98 *J*	143.4	58.2 *J*	56.7 *J*	2.6	77.5	72.7	6	35.6	58	47.9	7.9	4.52 *J*	54.4
3,5-Dichlorobiphenyl	pg/g	0.57 *U*	0.571 *U*	NA	0.581 *U*	0.582 *U*	NA	0.552 *UJ*	0.544 *UJ*	NA	0.578 *U*	0.582 *U*	NA	0.306 *J*	0.428 *J*	33.2	4.57 *U*	0.609 *UJ*	NA
2,4'-Dichlorobiphenyl	pg/g	1040	1370	27.4	31.7 *J*	107 *J*	108.6	1180 *J*	1260 *J*	6.6	1680	1600	5	643	909	34.3	112	77.8 *J*	36.0
2,2',3,3',4,4',5-Heptachlorobiphenyl	pg/g	1300	1400	7.4	178 *J*	304 *J*	52.3	47.2	50.9	7.5	100	37.9	90	3970	4540	13.4	1470	1350	8.5
2,2',5,5'-Tetrachlorobiphenyl	pg/g	11800	16200	31.4	922 *J*	2870 *J*	102.7	492	580	16.4	335	272	21	17900	24800	32.3	2930	2540	14.3
2,2',3,3',5,5'-Hexachlorobiphenyl	pg/g	434	515	17.1	95.6 *J*	270 *J*	95.4	23.2	23.5	1.3	59.2	21.7	93	491	579	16.4	320	317	0.9
2,2',3,4,4',5-Hexachlorobiphenyl	pg/g	693	902	26.2	43	53.9	22.5	60.6	62	2.3	46.7	49.3	5	555	873	44.5	76	86.9	13.4
2,2',3,3',4,4',5,5'-Octachlorobiphenyl	pg/g	165	197	17.7	23.6 *J*	45.7 *J*	63.8	7.66	8.64	12.0	26.6	6.23	124	931	1190	24.4	376	473	22.9
2,2',3,4'-Tetrachlorobiphenyl	pg/g	4150	5810	33.3	306	471	42.5	202	221	9.0	164	148	10	2930	3860	27.4	251	204	20.7
2,2',4-Trichlorobiphenyl	pg/g	2070	3010	37.0	286 *J*	4730 *J*	177.2	277	303	9.0	355	332	7	1020	1640	46.6	417	278 *J*	40.0
2,3',5'-Trichlorobiphenyl	pg/g	20.8	27	25.9	0.995 *J*	2.88 *J*	97.3	1.85	1.67	10.2	1.89	1.74	8	19.4	29.9	42.6	4.57 *J*	3.62 *J*	23.2
3,3',4-Trichlorobiphenyl	pg/g	108	109	0.9	5.77	9.4	47.9	10.5	11.8	11.7	7.02	8.2	16	98.5	105	6.4	10.1	8.75 *J*	14.3
2,2',3,3',4,6'-Hexachlorobiphenyl	pg/g	7280	8280	12.9	659	1080	48.4	274	308	11.7	197	146	30	10800	12000	10.5	2040	1580	25.4
2,2',3,3',6,6'-Hexachlorobiphenyl	pg/g	2660	2610	1.9	391 *J*	897 *J*	78.6	83.9	99.3	16.8	83.1	51.6	47	3860	4430	13.8	1510	1130	28.8
2,2',3,3',4,5,6'-Heptachlorobiphenyl	pg/g	1540	1660	7.5	246	356	36.5	63.7	66.3	4.0	124	43.7	96	3690	4550	20.9	1600	1560	2.5
2,2',6-Trichlorobiphenyl	pg/g	654	819	22.4	327 *J*	9650 *J*	186.9	116	115	0.9	141	119	17	551	657	17.5	724	526 *J*	31.7
2,3',6-Trichlorobiphenyl	pg/g	857	1230	35.7	157 *J*	1840 *J*	168.6	53	61.3	14.5	55.1	52.3	5	330	484	37.8	84.3	64.3 *J*	26.9
2,4',6-Trichlorobiphenyl	pg/g	1200	1700	34.5	62.4 *J*	429 *J*	149.2	161	174	7.8	154	142	8	1340	1850	32.0	154	118 *J*	26.5
2,2',3-Trichlorobiphenyl	pg/g	2140	3280	42.1	138	177	24.8	258	278	7.5	303	287	5	744	1130	41.2	76.7	51.1 *J*	40.1
2,3,4'-Trichlorobiphenyl	pg/g	2670	3240	19.3	118	170	36.1	258	299	14.7	228	219	4	1980	2470	22.0	126	105 *J*	18.2
3,3',5-Trichlorobiphenyl	pg/g	2.18 *J*	0.571 *UJ*	NA	1.94	2.14	9.8	1.77	1.88	6.0	1.32	1.51	13	3.08 *U*	2.21 *U*	NA	3.85 *J*	3.31 *J*	15.1
3,4',5-Trichlorobiphenyl	pg/g	66.2	91	31.6	3.62	6.02	49.8	3.54	4.07	13.9	2.05	2.05	0	0.574 *U*	0.578 *U*	NA	8.35	8.05 *J*	3.7
3,4,4'-Trichlorobiphenyl	pg/g	1620	2060	23.9	53.3	81.9	42.3	93.7	109	15.1	57.1	56.3	1	1860	2290	20.7	96.2	78.5	20.3
2,3,3',4,4',5,5'-Heptachlorobiphenyl	pg/g	44.9	48.4	7.5	5.57 *J*	10.1 *J*	57.8	1.81	1.89	4.3	4.23	1.38	102	178	202	12.6	66.4	59.4	11.1
2,3,3',5,5'-Pentachlorobiphenyl	pg/g	16.4	14.4 *U*	NA	4.68 *UJ*	16.9 *J*	NA	0.618 *U*	0.497 *J*	NA	2.29	0.788	98	15.1 *U*	16.5	NA	20.1	19.5	3.0
3,3',4,5,5'-Pentachlorobiphenyl	pg/g	21.4	24.6	13.9	0.581 *U*	0.582 *U*	NA	0.552 *U*	0.544 *U*	NA	1.72	1.68	2	0.58 *U*	0.584 *U*	NA	3.92 *J*	3.84	2.1
2,3,3',4',5,5'-Hexachlorobiphenyl	pg/g	65.8	84.3	24.7	5.25 *J*	9.41 *J*	56.8	3.77	3.97	5.2	3.24	3.49	7	104	131	23.0	20.2	16.3	21.4
2,3,3',4,5,5'-Hexachlorobiphenyl	pg/g	60.7	81.9	29.7	10.7	15.1	34.1	2.43	2.71	10.9	5.11	1.83	95	151	185	20.2	80.5	74.5	7.7
2,2',3,3',4,5',6-Heptachlorobiphenyl	pg/g	290	300	3.4	41.8	68.6	48.6	8.37	8.25	1.4	12	7.63	45	182	212	15.2	81.4	65	22.4
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	pg/g	400	418	4.4	64.2 *J*	120 *J*	60.6	20.9	18.9	10.1	34.4	20.1	52	368	410	10.8	146	104	33.6
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	pg/g	293	289	1.4	33.9 *J*	58.3 *J*	52.9	64.6	61.9	4.3	76.5	64	18	664 *J*	741 *J*	11.0	148	147	0.7
2,2',3,4,5,6-Hexachlorobiphenyl	pg/g	4.51 *J*	0.571 *UJ*	NA	0.581 *U*	0.582 *U*	NA	0.552 *U*	0.544 *U*	NA	0.578 *U*	0.582 *U*	NA	0.58 *U*	0.584 *U*	NA	4.57 *U*	0.609 *U*	NA
2,3,3',4,4',5,6-Heptachlorobiphenyl	pg/g	949	1090	13.8	179	283	45.0	58.8	56.6	3.8	84.8	56.2	41	1160	1290	10.6	362	360	0.6
2,3',5,5'-Tetrachlorobiphenyl	pg/g	160	179	11.2	11 *J*	44 *J*	120.0	4.72	5.47	14.7	3.4	2.88	17	188	259	31.8	54.1	58.6	8.0
2,3,3',4'-Tetrachlorobiphenyl	pg/g	3020	3500	14.7	191	272	35.0	130	163	22.5	90.4	78.2	14	4040	5050	22.2	368	325	12.4
2,2',3,6'-Tetrachlorobiphenyl	pg/g	353	464	27.2	16 *J*	55.7 *J*	110.7	25.8	29.6	13.7	12.7	11	14	582	763	26.9	64.8	40.9	45.2
3,3',4,5'-Tetrachlorobiphenyl	pg/g	327	457	33.2	30.5	45.5	39.5	26.1	27	3.4	16.8	15	11	353	403	13.2	43.1	43.4	0.7
2,3,3',5'-Tetrachlorobiphenyl	pg/g	30	49.5	49.1	0.581 *U*	0.582 *U*	NA	1.29	1.31	1.5	0.601	0.582 *U*	NA	44.4	56.4	23.8	8.65	7.7	11.6
2,2',3,3',4,4',5,6'-Octachlorobiphenyl	pg/g	402	441	9.3	60.1 *J*	108 *J*	57.0	18.8	19.9	5.7	51.3	15.7	106	478	593	21.5	189	222	16.1
2,2',3,4',5,5'-Hexachlorobiphenyl	pg/g	4560	5250	14.1	755 *J*	1460 *J*	63.7	287	279	2.8	525	251	71	5390	6290	15.4	2360	2410	2.1
2,3,4',6-Tetrachlorobiphenyl	pg/g	3600	4400	20.0	154	234	41.2	160	192	18.2	87	78.1	11	5840	7350	22.9	411	320	24.9
2,2',3,3',6-Pentachlorobiphenyl	pg/g	4930	4730	4.1	225 *J*	379 *J*	51.0	208	240	14.3	56.9	53.8	6	6040	6930	13.7	567	356	45.7
2,2',3,5,5'-Pentachlorobiphenyl	pg/g	5360	5180	3.4	372 *J*	777 *J*	70.5	154	175	12.8	140	96.7	37	5860	8280	34.2	1440	1080	28.6
2,2',3,3',4-Pentachlorobiphenyl	pg/g	1960	1890	3.6	88.4	128	36.6	71.7	88.6	21.1	23.1	21.5	7	2890	3260	12.0	225	169	28.4
2,2',3,3',5,6,6'-Heptachlorobiphenyl	pg/g	2500	2580	3.1	478 *J*	888 *J*	60.0	80.9	90.1	10.8	171	74.1	79	2800	3090	9.8	1260	1070	16.3

Table B-8b. Field Precision for Tissue Samples.

	Location (Tissue Type):	BT006 (Field-Collected Clams)			BT027 (Field-Collected Clams)			BT006 (Bioaccumulation Clams)			BT027 (Bioaccumulation Clams)			BT006 (Bioaccumulation Worms)			BT027 (Bioaccumulation Worms)		
	Sample ID:	LW2-BTFC006	LW2-BTFC006	RPD	LW2-BTFC027	LW2-BTFC027	RPD	LW2-BTLC006-1	LW2-BTLC006-2	RPD	LW2-BTLC027-1	LW2-BTLC027-2	RPD	LW2-BTLW006-1	LW2-BTLW006-2	RPD	LW2-BTLW027-1	LW2-BTLW027-2	RPD
	Sample Date:	Rep 1 12/12/2005	Rep 2 12/12/2005		Rep 1 11/30/2005	Rep 2 11/30/2005		2/24/2006	2/24/2006		1/19/2006	1/19/2006		3/2/2006	3/3/2006		1/11/2006	1/12/2006	
Analyte	Units																		
2,2',3,3',4,6,6'-Heptachlorobiphenyl	pg/g	783	808	3.1	131	211	46.8	20.1	22.7	12.1	35.4	19.2	59	823	936	12.8	322	293	9.4
2,2',3,3',4,5'-Hexachlorobiphenyl	pg/g	1630	2000	20.4	156	256	48.5	86.2	91.5	6.0	84.8	71.3	17	2140	2520	16.3	396	389	1.8
2,2',3,3',5,5',6-Heptachlorobiphenyl	pg/g	1470	1610	9.1	327 *J*	650 *J*	66.1	67.5	62.7	7.4	148	70.2	71	1330	1460	9.3	702	594	16.7
2,2',3,4',5,5',6-Heptachlorobiphenyl	pg/g	9120	9340	2.4	1620 *J*	3000 *J*	59.7	414	385	7.3	792	422	61	17700	20600	15.1	7650	8010	4.6
2,2',3,3',4,5',6'-Heptachlorobiphenyl	pg/g	3110	3320	6.5	594 *J*	1060 *J*	56.3	140	130	7.4	316	131	83	3560	3840	7.6	1390	1160	18.0
2,3',4,4',5,5'-Hexachlorobiphenyl	pg/g	2220	2310	4.0	256	312	19.7	207	193	7.0	202	192	5	1200	1440	18.2	204	184	10.3
2,2',3,3',4,5,5'-Heptachlorobiphenyl	pg/g	174	184	5.6	22.7 *J*	38.3 *J*	51.1	6.89	7.52	8.7	16.6	5.72	97	679	791	15.2	289	264	9.0
2,2',3,4,4',5,5',6-Octachlorobiphenyl	pg/g	1650	1800	8.7	258 *J*	436 *J*	51.3	124	116	6.7	183	119	42	1770	2040	14.2	545	548	0.5
2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl	pg/g	128	127	0.8	16.4	25.3	42.7	45.2	42.7	5.7	47.5	42.7	11	261	286	9.1	73.3	63.7	14.0
2,2',3,3',4,4',5,6-Octachlorobiphenyl	pg/g	519	566	8.7	91.6	173	61.5	25.6	26.8	4.6	67.2	23.3	97	701	789	11.8	261	245	6.3
2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl	pg/g	50.8	50.9	0.2	7.24 *J*	12.6 *J*	54.0	10.2	9.32	9.0	11.6	9.78	17	187 *J*	204 *J*	8.7	24.4	21.8	11.3
2,2',3,4,5,5'-Hexachlorobiphenyl	pg/g	891	1180	27.9	115	163	34.5	68.8	75.9	9.8	37.5	31.9	16	1540	2480	46.8	634	847	28.8
3,4,5-Trichlorobiphenyl	pg/g	12.9	17.3	29.1	0.949	1.18	21.7	0.367 *U*	0.544 *U*	NA	0.287 *J*	0.201 *U*	NA	10.5 *U*	10.9	NA	2.41 *J*	1.21 *J*	66.3
2,3,6-Trichlorobiphenyl	pg/g	44.5 *J*	0.571 *U*	NA	0.581 *U*	0.582 *U*	NA	6.66	7.44	11.1	8.24	8.33	1	37.9	62.2	48.6	3.14 *J*	1.93 *J*	47.7
2,3',4-Trichlorobiphenyl	pg/g	573	754	27.3	44.1 *J*	220 *J*	133.2	50.8	55.5	8.8	48.2	47.1	2	504	713	34.3	79.5	70.7 *J*	11.7
2,3,5-Trichlorobiphenyl	pg/g	6.5	8.49	26.6	0.581 *U*	0.582 *U*	NA	0.819	0.887	8.0	0.925 *U*	0.834	NA	4.28	6.89	46.7	4.57 *U*	0.609 *UJ*	NA
2,2',4,6,6'-Pentachlorobiphenyl	pg/g	14.5	19.4	28.9	9.78 *J*	74.4 *J*	153.5	0.334 *U*	0.462 *J*	NA	1.36	1.05	26	11.9	14.1	16.9	38.6	33.4	14.4
2,3',4,5',6-Pentachlorobiphenyl	pg/g	10.2	10.7	4.8	9.36 *J*	57 *J*	143.6	0.552 *U*	0.301 *U*	NA	1.62	0.767	71	0.58 *U*	7.78	NA	33.7	24.8	30.4
3,3',4,4',5-Pentachlorobiphenyl	pg/g	38.4	39.3	2.3	3.84	5.67	38.5	3	3	0.0	2.92	3.15	8	51.3	63.6	21.4	9.86 *U*	7.48	NA
2,2',4,5',6-Pentachlorobiphenyl	pg/g	223	250	11.4	93.6 *J*	438 *J*	129.6	6.35	6.66	4.8	16.7	10.1	49	266	331	21.8	412	302	30.8
2,2',3,4,4',5,6'-Heptachlorobiphenyl	pg/g	15.9 *J*	0.571 *UJ*	NA	0.581 *UJ*	8.32 *J*	NA	0.552 *U*	1.56 *U*	NA	5.44	0.936	141	0.58 *U*	0.584 *U*	NA	8.73	18.9	73.6
2,2',3,3',4,6-Hexachlorobiphenyl	pg/g	484	600	21.4	28.2	40.3	35.3	14.1	14.8	4.8	8.14	7.72	5	331	386	15.3	39.4	29.7	28.1
2,3',4,4',5'-Pentachlorobiphenyl	pg/g	473	497	4.9	39.2	42.9	9.0	42.8	40.9	4.5	39.1	36.7	6	445	497	11.0	39.4 *U*	28.8	NA
2,2',3,4',6,6'-Hexachlorobiphenyl	pg/g	42.2	42.1	0.2	26.5 *J*	129 *J*	131.8	1.11	1.32	17.3	9.05	2.17	123	52.9	61.6	15.2	116	99.8	15.0
2,2',3,5,6,6'-Hexachlorobiphenyl	pg/g	26.2	27.8	5.9	7.03 *J*	27 *J*	117.4	0.835	0.896	7.0	1.5	0.739	68	31	36.4	16.0	25.1	15.8	45.5
2,3',4,5,5'-Pentachlorobiphenyl	pg/g	103	98.4	4.6	20.1 *J*	51.1 *J*	87.1	5.59	5.31	5.1	10.7	5.79	60	87.9	98.7	11.6	70.2	70.3	0.1
2,2',3,4,5',6-Hexachlorobiphenyl	pg/g	1260	1260	0.0	136	198	37.1	41.2	43.6	5.7	24.5	24	2	1230	1550	23.0	309	288	7.0
2,2',3,5-Tetrachlorobiphenyl	pg/g	302	445	38.3	12.5 *J*	0.582 *UJ*	NA	13.1	15.3	15.5	8.24	7.53	9	410	605	38.4	31.8	24.4	26.3
2,2',4,5-Tetrachlorobiphenyl	pg/g	1970	2810	35.1	116	188	47.4	85.1	96.4	12.5	68.8	59.6	14	1670	2480	39.0	144	117	20.7
3,3',4,5-Tetrachlorobiphenyl	pg/g	0.57 *U*	0.571 *U*	NA	0.581 *U*	0.582 *U*	NA	0.552 *U*	0.544 *U*	NA	0.578 *U*	0.582 *U*	NA	0.58 *U*	0.584 *U*	NA	4.57 *U*	0.609 *U*	NA
3,4,4',5-Tetrachlorobiphenyl	pg/g	20.5	28.9 *U*	NA	1.53 *U*	2.96 *UJ*	NA	1.06	1.13 *U*	NA	1.45 *U*	1.11 *U*	NA	22.6	30.4	29.4	3.87 *U*	2.46	NA
2,3,3',5-Tetrachlorobiphenyl	pg/g	53.8	66.6	21.3	2.5 *J*	5.51 *J*	75.2	1.51	1.59	5.2	0.907	0.582 *U*	NA	56.6	83.2	38.1	7.31	6.63	9.8
2,3,3',4,5-Pentachlorobiphenyl	pg/g	0.57 *U*	0.571 *U*	NA	0.581 *U*	0.582 *U*	NA	0.552 *U*	0.544 *U*	NA	0.578 *U*	0.582 *U*	NA	0.58 *U*	0.584 *U*	NA	4.57 *U*	0.609 *U*	NA
2,3',4,5'-Tetrachlorobiphenyl	pg/g	90.1	101	11.4	12.2 *J*	58.6 *J*	131.1	3.48	3.78	8.3	3.96	3.55	11	128	171	28.8	61.9	67.4	8.5
2,3',4,5-Tetrachlorobiphenyl	pg/g	366	503	31.5	21.8 *J*	47.1 *J*	73.4	12.5	15.1	18.8	8.47	7.09	18	371	501	29.8	43.1	39.6	8.5
2,2',3,6,6'-Pentachlorobiphenyl	pg/g	106	116	9.0	20.9 *J*	135 *J*	146.4	4.28	4.55	6.1	4.73	3.19	39	149	176	16.6	86.6	49	55.5
2,2',3,5,6'-Pentachlorobiphenyl	pg/g	127	146	13.9	25.3 *J*	151 *J*	142.6	4.11	4.44	7.7	6.94	3.71	61	157	193	20.6	149	94.1	45.2
2,2',3,4,6'-Pentachlorobiphenyl	pg/g	169	165	2.4	9.11	13.8	40.9	6.96	8.5	19.9	2.79	2.31	19	213	248	15.2	21.8	13	50.6
2,3',5',6-Tetrachlorobiphenyl	pg/g	0.57 *U*	0.571 *U*	NA	12.1 *J*	120 *J*	163.4	0.552 *U*	0.544 *U*	NA	2.29	1.96	16	0.58 *U*	0.584 *U*	NA	58.7	56.1	4.5
2,3,3',4-Tetrachlorobiphenyl	pg/g	94.6 *J*	0.571 *UJ*	NA	0.581 *U*	0.582 *U*	NA	0.552 *U*	0.544 *U*	NA	2.35	2.34	0	167	239	35.5	8.05	16.6	69.4
2,3,4',5-Tetrachlorobiphenyl	pg/g	330	401	19.4	19.8 *J*	34.8 *J*	54.9	13.2	15.5	16.0	10.3	8.41	20	403	554	31.6	56.2	46.9	18.0
2,3,3',4,6-Pentachlorobiphenyl	pg/g	1560	1900	19.7	118 *J*	225 *J*	62.4	71	73.5	3.5	76.5	62	21	1870	2250	18.4	282	247	13.2
2,3,3',5,6-Pentachlorobiphenyl	pg/g	0.57 *U*	0.571 *U*	NA	0.581 *U*	0.582 *U*	NA	0.552 *U*	0.544 *U*	NA	0.578 *U*	0.582 *U*	NA	0.58 *U*	0.584 *U*	NA	4.57 *U*	0.609 *U*	NA
2,3,4,4',5-Pentachlorobiphenyl	pg/g	368	397	7.6	26.1	37.8	36.6	19.2	20.2	5.1	18	17.1	5	457	564	21.0	45.5	36.6	21.7
2,2',3,4,6,6'-Hexachlorobiphenyl	pg/g	8.04	7.3	9.6	0.581 *U*	1.07 *U*	NA	0.389 *J*	0.463 *U*	NA	0.193 *U*	0.134 *U*	NA	11.1	12.7	13.4	1.59 *J*	1.08	38.2
2,2',3,4',5,6'-Hexachlorobiphenyl	pg/g	57.9	60.8	4.9	29.2 *J*	127 *J*	125.2	1.68	1.72	2.4	12.1	2.51	131	50.8	57.4	12.2	102	93.5	8.7
2,3,3',4,4',6-Hexachlorobiphenyl	pg/g	2800	3410	19.6	264	387	37.8	147	145	1.4	127	120	6	2640	3250	20.7	496	479	3.5
2,3,3',4,5',6-Hexachlorobiphenyl	pg/g	0.57 *U*	0.571 *U*	NA	0.581 *U*	0.582 *U*	NA	0.552 *U*	0.544 *U*	NA	0.578 *U*	0.582 *U*	NA	0.58 *U*	0.584 *U*	NA	4.57 *U*	0.609 *U*	NA
2,3,3',4',5',6-Hexachlorobiphenyl	pg/g	1270	1590	22.4	132	218	49.1	60.4	64.8	7.0	67.6	40.5	50	2480	2990	18.6	640	595	7.3
2,3,3',5,5',6-Hexachlorobiphenyl	pg/g	14.9	18.6	22.1	8.35 *J*	37.8 *J*	127.6	0.413 *U*	0.407 *U*	NA	3.65	0.828	126	0.433 *U*	0.436 *U*	NA	34.8	31.2	10.9
2,2',3,4,4',5,6-Heptachlorobiphenyl	pg/g	43.4	45.8	5.4	4.17	6.88	49.0	3.17	2.83	11.3	3.18	2.74	15	54.2	57.8	6.4	11.9	8.76	30.4
2,2',3,4,4',6,6'-Heptachlorobiphenyl	pg/g	4.88	5.32	8.6	2.31 *J*	4.83 *J*	70.6	0.809	0.717 *U*	NA	1.25	1.15	8	4.95	5.14	3.8	3.47 *U*	3.06	NA
2,2',3,4,5,6,6'-Heptachlorobiphenyl	pg/g	0.677	0.571 *U*	NA	0.581 *U*	0.582 *U*	NA	0.552 *U*	0.544 *U*	NA	0.578 *U*	0.582 *U*	NA	0.58 *U*	0.584 *U*	NA	4.57 *U*	0.609 *U*	NA
2,3,3',4,4',5',6-Heptachlorobiphenyl	pg/g	157	173	9.7	25	41.5	49.6	7.18	7.07	1.5	11.2	5.45	69	106	136	24.8	44.3	51.7	15.4
2,3,3',4,5,5',6-Heptachlorobiphenyl	pg/g	0.57 *U*	0.571 *U*	NA	0.581 *U*	0.582 *U*	NA	0.552 *U*	0.544 *U*	NA	0.578 *U*	0.582 *U*	NA	0.58 *U*	0.584 *U*	NA	11.8 *U*	0.609 *U*	NA
2,2',3,4,4',5,6,6'-Octachlorobiphenyl	pg/g	0.656	0.663 *U*	NA	0.171 *U*	0.285 *J*	NA	0.143 *J*	0.135 *J*	5.8	0.226 *U*	0.152 *U*	NA	0.747 *U*	0.954 *U*	NA	0.374 *U*	0.37 *J*	NA
2,3,3',4,4',5,5',6-Octachlorobiphenyl	pg/g	77	82	6.3	13.6 *J*	25.3 *J*	60.2	4.66	4.63	0.6	10.9	4.14	90	104	119	13.5	40.9	35.7	13.6
2,2',3,4',5,6,6'-Heptachlorobiphenyl	pg/g	13.1	15.8	18.7	6.91 *J*	32.5 *J*	129.9	0.791	0.828 *U*	NA	3.03	0.966	103	14.3	15.1	5.4	21.8	19.9	9.1
2,3,3',4',5'-Pentachlorobiphenyl	pg/g	221	240	8.2	13.3	16.6	22.1	10.7	11.9	10.6	5.35	6.11	13	346	432	22.1	27	24.8	8.5
PCB012 & 013	pg/g	102	133	26.4	8.48 *J*	32.1 *J*	116.4	66.7 *J*	64.9 *J*	2.7	66.4	66.5	0	81.2	97.2	17.9	11.4	10.9 *J*	4.5

Table B-8b. Field Precision for Tissue Samples.

	Location (Tissue Type):	BT006 (Field-Collected Clams)			BT027 (Field-Collected Clams)			BT006 (Bioaccumulation Clams)			BT027 (Bioaccumulation Clams)			BT006 (Bioaccumulation Worms)			BT027 (Bioaccumulation Worms)		
	Sample ID:	LW2-BTFC006 Rep 1	LW2-BTFC006 Rep 2	RPD	LW2-BTFC027 Rep 1	LW2-BTFC027 Rep 2	RPD	LW2-BTLC006-1	LW2-BTLC006-2	RPD	LW2-BTLC027-1	LW2-BTLC027-2	RPD	LW2-BTLW006-1	LW2-BTLW006-2	RPD	LW2-BTLW027-1	LW2-BTLW027-2	RPD
	Sample Date:	12/12/2005	12/12/2005		11/30/2005	11/30/2005		2/24/2006	2/24/2006		1/19/2006	1/19/2006		3/2/2006	3/3/2006		1/11/2006	1/12/2006	
Analyte	**Units**																		
PCB018 & 030	pg/g	4290	6630	42.9	312 *J*	727 *J*	79.9	525	561	6.6	615	586	5	1850	2990	47.1	229	143 *J*	46.2
PCB020 & 028	pg/g	6820	8790	25.2	211 *J*	358 *J*	51.7	702	749	6.5	616	615	0	6890	8950	26.0	534	409 *J*	26.5
PCB021 & 033	pg/g	2910	3920	29.6	78.4 *J*	169 *J*	73.2	317	347	9.0	297	294	1	2310	3300	35.3	193	167 *J*	14.4
PCB026 & 029	pg/g	1180	1560	27.7	45.7 *J*	134 *J*	98.3	98.9	106	6.9	87.9	86	2	887	1300	37.8	113	94.5 *J*	17.8
PCB040 & 041 & 071	pg/g	4860	6520	29.2	338 *J*	950 *J*	95.0	207	251	19.2	121	106	13	5810	7660	27.5	661	557	17.1
PCB044 & 047 & 065	pg/g	16600	21300	24.8	1410 *J*	4260 *J*	100.5	541	605	11.2	492	428	14	11900	15700	27.5	2680	2300	15.3
PCB045 & 051	pg/g	1570	2180	32.5	221 *J*	2040 *J*	160.9	83.7	94.5	12.1	75.3	64.2	16	1920	2640	31.6	837	625	29.0
PCB049 & 069	pg/g	5530	7360	28.4	534 *J*	2450 *J*	128.4	216	259	18.1	187	157	17	7920	10800	30.8	2090	1760	17.1
PCB050 & 053	pg/g	2110	2860	30.2	652 *J*	3980 *J*	143.7	83.4	91.1	8.8	94	70.9	28	1580	2230	34.1	975	628	43.3
PCB059 & 062 & 075	pg/g	1220	1690	32.3	72.4 *J*	152 *J*	70.9	51	56	9.3	30.2	27.2	10	1220	1630	28.8	121	109	10.4
PCB061 & 070 & 074 & 076	pg/g	14300	18200	24.0	835	1300	43.6	524	659	22.8	343	296	15	15200	23400	42.5	1920	1680	13.3
PCB083 & 099	pg/g	14400	15600	8.0	1110 *J*	2130 *J*	63.0	570	617	7.9	522	442	17	18700	22500	18.4	3430	2710	23.5
PCB085 & 116 & 117	pg/g	3480	3270	6.2	216	350	47.3	168	185	9.6	115	112	3	4780	5600	15.8	533	390	31.0
PCB086 & 087 & 097 & 108 & 119 & 125	pg/g	17600	18900	7.1	1080 *J*	1830 *J*	51.5	725	788	8.3	540	503	7	19300	23500	19.6	2130	1580	29.6
PCB088 & 091	pg/g	2860	2930	2.4	322 *J*	1430 *J*	126.5	114	125	9.2	77.9	64	20	4220	5010	17.1	1230	903	30.7
PCB090 & 101 & 113	pg/g	27100	30100	10.5	2010 *J*	3590 *J*	56.4	921	1060	14.0	790	697	13	34600	42800	21.2	5440	4460	19.8
PCB093 & 095 & 098 & 100 & 102	pg/g	26400	27400	3.7	2250 *J*	5060 *J*	76.9	806	826	2.5	539	457	16	29200	36100	21.1	5180	3840	29.7
PCB107 & 124	pg/g	859	937	8.7	43.2	64.1	39.0	38	40.8	7.1	28.3	26.4	7	1090	1290	16.8	103	84.3	20.0
PCB110 & 115	pg/g	27200	29100	6.7	1590	2510	44.9	1160	1300	11.4	655	624	5	40000	46800	15.7	4300	3360	24.5
PCB128 & 166	pg/g	3310	3740	12.2	261	388	39.1	211	208	1.4	156	159	2	4960	5320	7.0	604	479	23.1
PCB129 & 138 & 160 & 163	pg/g	31600	35000	10.2	3360	5140	41.9	2000	1980	1.0	2050	1790	14	35700	44400	21.7	9240	9530	3.1
PCB134 & 143	pg/g	1420	1700	17.9	137 *J*	236 *J*	53.1	58	61.2	5.4	42	28.7	38	1360	1630	18.1	285	238	18.0
PCB135 & 151 & 154	pg/g	10100	10400	2.9	1500 *J*	2960 *J*	65.5	343	375	8.9	492	239	69	14500	17500	18.8	5930	279	182.0
PCB139 & 140	pg/g	453	552	19.7	47.6 *J*	105 *J*	75.2	21.2	21.5	1.4	36.2	15.3	81	552	638	14.5	147	145	1.4
PCB147 & 149	pg/g	23100	24400	5.5	2850 *J*	5300 *J*	60.1	981	982	0.1	976	692	34	32400	39500	19.7	10900	10900	0.0
PCB153 & 168	pg/g	49100	53800	9.1	7300	10800	38.7	3760	3530	6.3	4030	3630	10	29200	34200	15.8	9520	10600	10.7
PCB156 & 157	pg/g	2230	2480	10.6	173	252	37.2	156	154	1.3	142	131	8	3340	4040	19.0	474	402	16.4
PCB171 & 173	pg/g	1650	1720	4.2	257	427	49.7	63.1	60.8	3.7	93.4	57.5	48	1430	1530	6.8	490	395	21.5
PCB180 & 193	pg/g	6970	7680	9.7	1450	2120	37.5	500	464	7.5	663	458	37	2420	3360	32.5	1270	1790	34.0
PCB183 & 185	pg/g	4190	4550	8.2	662	1060	46.2	161	148	8.4	216	148	37	3480	4080	15.9	1380	1320	4.4
PCB197 & 200	pg/g	237	250	5.3	36.2 *J*	63.3 *J*	54.5	9.9	9.48	4.3	22.1	8.56	88	425	480	12.2	143	123	15.0
PCB198 & 199	pg/g	817	933	13.3	129	204	45.0	50.3	53.3	5.8	118	47.2	86	3180	3730	15.9	1040	1050	1.0
Phenols																			
2,4-Dimethylphenol	µg/kg	13 *U*	13 *U*	NA	13 *U*	13 *U*	NA	13 *U*	13 *U*	NA	13 *U*	13 *U*	NA	13 *U*	13 *U*	NA	13 *U*	160 *U*	NA
4-Methylphenol	µg/kg	15 *U*	15 *U*	NA	15 *U*	15 *U*	NA	15 *U*	15 *U*	NA	15 *U*	15 *U*	NA	31 *J*	36 *J*	14.9	290	130 *J*	76.2
Phenol	µg/kg	100 *U*	100 *U*	NA	100 *U*	100 *U*	NA	100 *U*	100 *U*	NA	100 *U*	100 *U*	NA	19 *J*	20 *J*	5.1	32 *J*	200 *U*	NA
Pentachlorophenol	µg/kg	-- *R*	-- *R*		-- *R*	-- *R*		31 *U*	31 *U*	NA	*R*	*R*		31 *U*	31 *U*	NA	-- *R*	-- *R*	NA
2-Methylphenol	µg/kg	53 *U*	53 *U*	NA	53 *U*	53 *U*	NA	53 *U*	53 *U*	NA	53 *U*	53 *U*	NA	230	190	19.0	140	110 *U*	NA
Phthalates																			
Bis(2-ethylhexyl) phthalate	µg/kg	500 *U*	500 *U*	NA	500 *U*	500 *U*	NA	130 *J*	100 *J*	26.1	500 *U*	71 *J*	NA	120 *J*	160 *J*	28.6	500 *U*	1000 *U*	NA
Di-n-octyl phthalate	µg/kg	13 *U*	13 *U*	NA	13 *U*	13 *U*	NA	13 *U*	13 *U*	NA	13 *U*	13 *U*	NA	13 *U*	13 *U*	NA	13 *U*	26 *U*	NA
Dimethyl phthalate	µg/kg	40 *U*	40 *U*	NA	40 *U*	40 *U*	NA	40 *U*	40 *U*	NA	40 *U*	40 *U*	NA	40 *U*	40 *U*	NA	40 *U*	11 *U*	NA
Diethyl phthalate	µg/kg	15 *U*	15 *U*	NA	11 *U*	13 *U*	NA	80 *U*	80 *U*	NA	12 *J*	13 *J*	8	80 *U*	80 *U*	NA	14 *U*	28 *U*	NA
Dibutyl phthalate	µg/kg	16 *U*	16 *U*	NA	16 *U*	16 *U*	NA	180 *U*	180 *U*	NA	16 *U*	16 *U*	NA	16 *U*	16 *U*	NA	280 *U*	110	NA
Butylbenzyl phthalate	µg/kg	14 *U*	14 *U*	NA	14 *U*	14 *U*	NA	14 *U*	14 *U*	NA	14 *U*	14 *U*	NA	14 *U*	14 *U*	NA	14 *U*	28 *U*	NA
SVOCs																			
Benzyl alcohol	µg/kg	16 *J*	18 *J*	11.8	15 *J*	12 *J*	22.2	8.6 *J*	40 *U*	NA	7.3 *J*	6.8 *J*	7	450	460	2.2	3200	4200 *J*	27.0
1,4-Dichlorobenzene	µg/kg	11 *U*	11 *U*	NA	11 *U*	11 *UJ*	NA	11 *U*	11 *U*	NA	11 *UJ*	11 *UJ*	NA	11 *U*	11 *U*	NA	11 *U*	22 *UJ*	NA
Hexachlorobenzene	µg/kg	0.428	0.489	13.3	0.356	0.516	36.7	0.0428 *J*	0.044 *J*	2.8	0.0695 *J*	0.0649 *J*	7	0.527	0.58	9.6	0.985	0.749	27.2
1,2,4-Trichlorobenzene	µg/kg	40 *U*	40 *U*	NA	40 *U*	40 *U*	NA	40 *U*	40 *U*	NA	40 *U*	40 *U*	NA	40 *U*	40 *U*	NA	40 *U*	20 *U*	NA
Dibenzofuran	µg/kg	1.4	1.4	0.0	0.45 *J*	0.55	20.0	0.34 *J*	0.3 *J*	12.5	0.32 *J*	0.39 *J*	20	0.84	1.3	43.0	1.8	0.91 *J*	65.7
1,3-Dichlorobenzene	µg/kg	11 *U*	11 *U*	NA	11 *U*	11 *UJ*	NA	11 *U*	11 *U*	NA	11 *UJ*	11 *UJ*	NA	11 *U*	11 *U*	NA	11 *U*	22 *UJ*	NA
Hexachloroethane	µg/kg	40 *U*	40 *U*	NA	40 *U*	40 *U*	NA	40 *U*	40 *U*	NA	40 *U*	40 *U*	NA	40 *U*	40 *U*	NA	40 *U*	17 *U*	NA
N-Nitrosodiphenylamine	µg/kg	40 *U*	40 *U*	NA	40 *U*	40 *U*	NA	40 *U*	40 *U*	NA	40 *U*	40 *U*	NA	40 *U*	40 *U*	NA	40 *U*	19 *U*	NA
Hexachlorobutadiene	µg/kg	40 *U*	40 *U*	NA	40 *U*	40 *U*	NA	40 *U*	40 *U*	NA	0.00796 *UJ*	0.00757 *UJ*	NA	40 *U*	0.005 *UJ*	NA	40 *U*	17 *U*	NA
1,2-Dichlorobenzene	µg/kg	12 *U*	12 *U*	NA	12 *U*	12 *UJ*	NA	12 *U*	12 *U*	NA	12 *UJ*	12 *UJ*	NA	12 *U*	12 *U*	NA	12 *U*	24 *UJ*	NA

Table B-9. Laboratory Data for DDT, DDD, and DDE in Reanalyzed Sediment Samples.

	Laboratory:	**Axys**		**Axys (reanalysis)**		**CAS**	**Axys**	**Axys (reanalysis)**	**Axys**	**Axys (reanalysis)**
	Sample ID:	**LW2-GBT003**	**LW2-GBT003D**	**LW2-GBT003**	**LW2-GBT003D**	**LW2-GBT003**	**LW2-GBT006-1**	**LW2-GBT006-1**	**LW2-GBT015**	**LW2-GBT015**
	Sample Type:	**Normal sample**	**Lab Duplicate**	**Normal sample**	**Lab Duplicate**	**Normal sample**	**Normal sample**	**Normal sample**	**Normal sample**	**Normal sample**
	Lab Sample ID:	**L8798-14 (A)**	**WG18873-104**	**L8798-14R (A)**	**WG19127-104**	**K0506744-014**	**L8798-15**	**L8798-15R2**	**L8798-25**	**L8798-25R**
Chemical Name	**Units**									
2,4'-DDD	ug/kg	1.08 NV	1.15 NV	1.12	0.979	0.97 NJ	0.201 NV	0.222	7.18 NV	9.71
2,4'-DDE	ug/kg	0.0655 NV	0.0739 NV	0.0606 J	0.065 J	0.9 U	0.0426 NV	0.0405 J	0.522 NV	0.13 J
2,4'-DDT	ug/kg	0.937 NV	0.0419 NV	0.0599 J	0.0455 J	0.81 U	0.0754 NV	0.0542 J	0.388 NV	1.07
4,4'-DDD	ug/kg	4.93 NV	4.01 NV	3.85	3.14	1.8	0.911 NV	1	30.8 NV	36.5
4,4'-DDE	ug/kg	0.798 NV	0.798 NV	0.7	0.663	0.79 U	0.54 NV	0.517	4.59 NV	5.29
4,4'-DDT	ug/kg	53.4 NV	0.25 NV	0.432	0.293	2.3 U	0.367 NV	0.301	9.48 NV	25.1

Notes:
All results provided by Axys are included above. CAS results for sample LW2-GBT003 are also included for reference. None of the CAS results and none of the NV-qualified results were used in the database. Laboratory duplicates were averaged in the SCRA database.

NV - do not report (this result was not included in the final database)
J - estimated value
N - tentatively identified analyte
U - The analyte was not detected in the sample; the associated value is the detection limit

EcoChem, Inc.

Environmental Data Quality

DATA QUALITY EVALUATION

PORTLAND HARBOR

BENTHIC SEDIMENT SAMPLING, FALL 2005

Volatile Organic Compounds (VOC) - Method SW8260B
Semivolatile Organic Compounds (SVOC) - Method SW8270C
Polycyclic Aromatic Hydrocarbons (PAH) - Method SW8270-SIM
Chlorinated Phenols - Method SW8151A
Chlorinated Pesticides - Method SW8081A
Polychlorinated Biphenyls (PCB) – Method SW8082
Organotins - Krone Method
Fuels – NWTPH-Gx and NWTPH-Dx Methods
Dioxin/Furan Compounds – Method E1613B
Herbicides – Method SW8151
Polychlorinated Biphenyl (PCB) Congeners – Method E1668A
Metals - Methods SW6010/6020, SW7470/7471A, & SW7742
Hexavalent Chromium – SW7196A
Total Organic Carbon – PSEP Method
Grain Size, Specific Gravity, Percent Solids, Total Sulfide, and Ammonia

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April 14, 2006

Approved for Release:

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Project Manager/Technical Director
EcoChem, Inc.

DATA QUALITY EVALUATION

BASIS OF DATA EVALUATION

The data were validated using guidance and quality control (QC) criteria documented in the analytical methods; *Guidance on Environmental Data Verification and Validation* (EPA 2002c); *Portland Harbor RI/FS, Round 2, Quality Assurance Project Plan* (QAPP) (Integral 2004)*; Addendum 6: Benthic Invertebrate Tissue* (Integral 2005), and *National Functional Guidelines for Organic and/or Inorganic Data Review* (USEPA 1994, 1999 & 2002). Additional guidance for polychlorinated biphenyl (PCB) congener data validation was from the *EPA Region 10 SOP for the Validation of Method 1668 Toxic, Dioxin-like PCB Data* (USEPA 1995) and for the dioxin/furan data, *EPA Region 10 SOP for the Validation of Polychlorinated Dibenzodioxin (PCDD) and Polychlorinated Dibenzofuran (PCDF) Data* (EPA 1996).

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

PROCESS FOR DATA VALIDATION

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

Ninety percent (90%) of the data received a Level III validation, which included evaluation (as appropriate for each method) of:

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

All other data packages received full (Level IV) data validation, which includes evaluation of compound identification and quantitation (transcription and calculation checks).

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

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

SUMMARY OF DATA VALIDATION: VOLATILE ORGANIC COMPOUNDS

A total of 37 sediment samples were analyzed for volatile organic compounds (VOC) for the Portland Harbor Phase 2 RI/FS Benthic Sediments Sampling event. The sediment samples included two (2) field replicates and two (2) field split samples. Two (2) rinsate blanks and six (6) trip blanks were collected to monitor the field collection process. Columbia Analytical Services, Kelso, Washington completed the VOC analyses.

The VOC data for the sediment samples were generally acceptable. A total of 121 data points (5.8% of all sediment VOC results) were of unacceptable quality and were rejected. A total of 42 data points were estimated because control limits were exceeded in one or more laboratory QC samples or procedures. Qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose. Note that many of the data points were estimated for more than one reason, so the numbers cited below add up to more than 42 data points.

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

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were greater than 94% complete for the sediment VOC analyses.

The table below summarizes the sediment results that were rejected during data validation and the associated QC item. Note that most data points were rejected for more than one QC violation.

Number of Rejected Results	Reason for Rejection
121	Initial Calibration
73	Continuing Calibration
8	MS/MSD %Recovery

Holding Times and Sample Preservation

The initial sample preservation requirement (cooler temperature of 4°C ±2°) was not met for all samples. The majority of the sample coolers were received at the laboratory with temperatures less than the advisory lower control limit of 2°C, with a low of –0.3ºC. These temperature outliers did not impact data quality and no action was taken.

Sample LW2-GBT006-1 was re-extracted due to suspected carry-over for naphthalene. The re-extraction occurred 18 days outside of the holding time limit. The associated naphthalene result was estimated (J) to indicate a potential low bias.

Instrument Performance

Initial and continuing calibrations were completed for all target analytes and met the criteria for frequency of analysis. The initial calibrations met the linearity (percent relative standard deviation or correlation coefficient) control limits.

The relative response factor (RRF) values were less than the 0.05 minimum acceptance limit for several compounds (acetone, methylethyl ketone, acrolein, acrylonitrile, vinyl acetate, methyl n-butyl ketone, and methyl isobutyl ketone) in most of the initial and continuing calibration analyses. Due to the potential significant low bias, the validation guidelines require that the associated positive results are estimated (J) and the reporting limits are rejected (R). Methylethyl ketone and acetone were detected in several samples; these results are estimated (J). The reporting limits for the remaining acetone and methylethyl ketone and other analytes associated with RRF value outliers were rejected (R). This constitutes the majority of rejected data points (121) for the sediment VOC analyses.

Overall the continuing calibration percent difference (%D) values indicate acceptable instrument stability. When %D outliers were present, the potential bias was determined. If the %D outlier indicated a low bias, associated positive results and detection limits were estimated (J or UJ). If the %D outlier indicated a high bias, only associated positive results were estimated (J). One (1) positive result and a total of 30 reporting limits were estimated (J or UJ). Overall, 1.5% of the sediment VOC results were estimated based on calibration outliers.

Method Blank Analyses

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times (5x) the concentration detected in the blank for most compounds and ten times (10x) for phthalates. If a contaminant is detected in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U). If the result is also less than the reporting limit, then the result is elevated to the reporting limit. No action is taken if the sample result is greater than the action level, or for non-detected results.

Various target analytes were detected in the method blanks. A total of 34 results (1.6% of all sediment VOC results) were qualified as not detected (U) based on method blank contamination. The qualifiers were issued to methylene chloride (10 results), acetone (20 results), naphthalene (1 result), and styrene (3 results).

Accuracy

Surrogate Compound Recoveries

Surrogate compounds were added to all samples. The surrogate recoveries reported by the laboratory typically met the criteria for acceptable performance; however, surrogate recovery outliers were present in four samples. As there was only one percent recovery (%R) value outlier out of four surrogates, the associated field data were not significantly affected, and no further action was taken.

Matrix Spike Recoveries

Matrix and duplicate matrix spike analyses (MS/MSD) met the criteria for frequency of analysis. Several of the recoveries reported by the laboratory for MS/MSD analyses did not meet the criteria for acceptable performance, with most outliers indicating a potential low bias. Twelve (12) sediment results (0.58% overall) were estimated (J or UJ) during the quality assurance review because the control limits for MS/MSD recovery were not met. Eight sediment results (0.39% overall) were rejected (R). Results were rejected when the %R value was less than 10%, indicating an extremely low bias.

Laboratory Control Sample Recoveries

Laboratory control sample/laboratory control sample duplicate (LCS/LCSD) analyses were performed at the proper frequency. Several of the recoveries reported by the laboratory did not meet the criteria for acceptable performance. One recovery value was less than the lower control limit. The affected compound (methyl iodide) was not detected in the associated samples; the reporting limits were estimated (UJ). Six (6) reporting limits (0.29% overall) were estimated based on LCS/LCSD outliers. As the other outliers indicate a potential high bias and the affected compounds were not detected, no additional action was taken based on LCS/LCSD outliers.

Precision

MS/MSD and LCS/LCSD analyses were evaluated for laboratory precision. Several of the relative percent difference (RPD) values for the MS/MSD analyses did not meet the criteria for acceptable performance. For laboratory precision outliers, qualifiers were issued only if the affected compound was detected in the parent sample or was also qualified due to recovery outliers. No data were qualified based on laboratory precision.

Method Detection Limits and Method Reporting Limits

To try to meet the project analytical concentration goals (ACG), the laboratory reported non-detects at the method detection limits (MDLs), adjusted for sample size, percent moisture, and any dilution factor. Only two target analytes (1,4-dichlorobenzene and naphthalene) have established ACG and the laboratory met these goals.

The method reporting limits (MRLs) ranged from 0.042 µg/Kg to 5.4 µg/Kg for the non-detected results. All MRLs were less than 6 µg/Kg, and were acceptable.

Field Quality Control Samples

Field QC samples collected for the benthic sediment sampling event included field blank, trip blank, and field replicate samples. The results for the field QC samples are discussed in the following sections.

Field Blanks

After qualifiers based on method blank contamination were applied, very few of the analytes present in the field and trip blanks were also present in the field samples. The contaminants present in each blank are documented in the data validation worksheets. When a field or trip blank contaminant was present in the associated samples, action levels were established and used to assess the field samples.

In most cases, these analytes were either not detected or were present at concentrations greater than the action levels in the associated samples. Two (2) results (one methylethyl ketone result and one toluene result) were qualified as not detected based on rinsate blank contamination.

Field Replicate Samples

One of the RPD values for field replicate analyses did not meet the criteria for acceptable precision. The field replicate precision outliers are discussed in greater detail in the data validation reports. No data were qualified based on field precision; however, users of the data should consider the potential impact of precision outliers on the reported results.

SUMMARY OF DATA VALIDATION: SEMIVOLATILE ORGANIC COMPOUNDS

A total of 37 sediment samples were analyzed for semivolatile organic compounds (SVOC) for the Portland Harbor Phase 2 RI/FS Benthic Sediments Sampling event. The sediment samples included two (2) field replicates and two (2) field split samples. Two (2) rinsate blanks were collected to monitor the field collection process. Columbia Analytical Services, Kelso, Washington completed the SVOC analyses.

The SVOC data for the sediment samples were generally acceptable. A total of 33 data points (1.9% of all sediment SVOC results) were of unacceptable quality and were rejected. Forty-seven (47) data points were estimated because control limits were exceeded in one or more laboratory QC samples or procedures. Qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose.

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

Completeness of Data Set

Completeness is defined as the total number of usable results (results that were not rejected during data validation) divided by the total results reported by the laboratory. The results reported by the laboratory were greater than 98% complete for the sediment SVOC analyses.

The table below summarizes the sediment results that were rejected during data validation and the associated QC item. Two data points were rejected for two reasons.

Number of Rejected Results	Reason for Rejection
26	LCS/LCSD % Recovery
9	MS/MSD % Recovery

Holding Times and Sample Preservation

The initial sample preservation requirement (cooler temperature of 4°C ±2°) was not met for all samples. The majority of the sample coolers were received at the laboratory with temperatures less than the advisory lower control limit of 2°C, with a low of –0.3ºC. These temperature outliers did not impact data quality and no action was taken.

Instrument Performance

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

The continuing calibration percent difference (%D) values were reviewed to evaluate instrument stability. When %D outliers were present, the potential bias was determined. If the %D outlier indicated a low bias, associated positive results and detection limits were estimated (J or UJ). If the %D outlier indicated a high bias, only associated positive results were estimated (J). A total of two (2) detection limits were estimated (UJ). Overall, 0.11% of the sediment SVOC results were estimated based on calibration outliers.

Method Blank Analyses

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times (5x) the concentration detected in the blank for most compounds and ten times (10x) for phthalates. If a contaminant is detected in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U). If the result is also less than the reporting limit, then the result is elevated to the reporting limit. No action is taken if the sample result is greater than the action level, or for non-detected results.

Various target analytes were detected in the method blanks. A total of 26 results (1.5% of all sediment SVOC results) were qualified as not detected (U) based on method blank contamination. The qualifiers were issued to bis(2-ethylhexyl)phthalate (14 results) and di-n-butyl phthalate (12 results).

Accuracy

Surrogate Compound Recoveries

Surrogate compounds were added to all samples. The surrogate recoveries reported by the laboratory typically met the criteria for acceptable performance; however, surrogate recovery outliers were present in several samples. As there was only one percent recovery (%R) value outlier per fraction (acid or base-neutral), the associated field data were not impacted, and no further action was taken.

Matrix Spike Recoveries

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed at the proper frequency. Several of the recoveries reported by the laboratory for MS/MSD analyses did not meet the criteria for acceptable performance. A total of two (2) sediment SVOC results (0.11% overall) were estimated (J or UJ) because the control limits for MS/MSD recovery were not met. Nine (9) results (0.51% overall) were rejected (R). Results were rejected when the %R value was less than 10%, indicating an extremely low bias.

Laboratory Control Sample Recoveries

Laboratory control sample/laboratory control sample duplicate (LCS/LCSD) analyses were performed at the proper frequency. Several of the recoveries reported by the laboratory did not meet the criteria for acceptable performance. Three (3) sediment SVOC results (0.17% overall) were estimated (J or UJ) because the control limits for LCS/LCSD recovery were not met. A total of 26 results (1.5% overall) were rejected (R). Results were rejected when the %R value was less than 10%, indicating an extremely low bias.

Precision

MS/MSD and LCS/LCSD analyses were evaluated for laboratory precision. Several of the relative percent difference (RPD) values for the MS/MSD and LCS/LCSD analyses did not meet the criteria for acceptable performance. For laboratory precision outliers, qualifiers were issued only if the affected compound was detected in the parent sample or was also qualified due to recovery outliers. Forty (40) data points (2.25%) were estimated (J) during the quality assurance review because control limits for RPD values were not met.

Method Detection Limits and Method Reporting Limits

To try to meet the project analytical concentration goals (ACG), the laboratory reported non-detects at the method detection limits (MDLs), adjusted for sample size, percent moisture, and any dilution factor. These method reporting limits (MRLs) ranged from 1.7 µg/Kg to 2,200 µg/Kg for the non-detected results, with roughly 32% of the MRL values greater than 10 µg/Kg. The ACG were not met for several of the SVOC compounds.

Field Quality Control Samples

Field QC samples collected for the benthic sediment sampling event included field blank and field replicate samples. The results for the field QC samples are discussed in the following sections.

Field Blanks

Seven field blanks were associated with the sediment samples. Various target analytes were detected in the field blanks. The contaminants present in each field blank are documented in the data validation worksheets.

In most cases, these analytes were either not detected or were present at concentrations greater than the action levels in the associated samples. No data were qualified based on rinsate blank contamination.

Field Replicate Samples

One of the RPD values for field replicate analyses did not meet the criteria for acceptable precision. The field replicate precision outliers are discussed in greater detail in the data validation reports. No data were qualified based on field precision; however, users of the data should consider the potential impact of precision outliers on the reported results.

SUMMARY OF DATA VALIDATION: POLYCYCLIC AROMATIC HYDROCARBONS

A total of 37 sediment samples were analyzed for polycyclic aromatic hydrocarbon compounds (PAH) for the Portland Harbor Phase 2 RI/FS Benthic Sediments Sampling event. The sediment samples included two (2) field replicates and two (2) field split samples. Columbia Analytical Services, Kelso, Washington completed the PAH analyses.

The PAH data for the sediment samples were generally acceptable. No data were rejected for any reason. Eighteen (18) data points were estimated, and seventeen (17) data points (2.6% of all sediment PAH results) were qualified based on blank contamination. These qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose.

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

Completeness of Data Set

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

Holding Times and Sample Preservation

The initial sample preservation requirement (cooler temperature of 4°C ±2°) was not met for all samples. The majority of the sample coolers were received at the laboratory with temperatures less than the advisory lower control limit of 2°C, with a low of –0.3ºC. These temperature outliers did not impact data quality and no action was taken.

Instrument Performance

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

Method Blank Analyses

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

Various target analytes were detected in the method blanks. A total of 17 results (2.6% of all sediment PAH results) were qualified as not detected (U) based on method blank contamination. The qualifiers were issued to naphthalene (14 results), 2-methylnaphthalene (2 results), and fluorene (1 result).

Accuracy

Surrogate Compound Recoveries

Surrogate compounds were added to all samples. The surrogate recoveries reported by the laboratory typically met the criteria for acceptable performance; however, a surrogate recovery outlier was present in one sample. As there was only one percent recovery (%R) value outlier, the associated field data were not impacted, and no further action was taken.

Matrix Spike Recoveries

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed at the proper frequency. Several of the recoveries reported by the laboratory for MS/MSD analyses did not meet the criteria for acceptable performance. A total of six (6) sediment PAH results (0.9% overall) were estimated (J or UJ) because the control limits for MS/MSD recovery were not met.

Laboratory Control Sample Recoveries

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

Precision

MS/MSD and LCS/LCSD analyses were evaluated for laboratory precision. Several of the relative percent difference (RPD) values for the MS/MSD analyses did not meet the criteria for acceptable performance. For laboratory precision outliers, qualifiers were issued only if the affected compound was detected in the parent sample or was also qualified due to recovery outliers. Twelve (12) data points (1.8%) were estimated (J) during the quality assurance review because control limits for RPD values were not met.

Method Detection Limits and Method Reporting Limits

The laboratory reported non-detects at the method detection limits (MDLs), adjusted for sample size and any dilution factor. These method reporting limits (MRLs) ranged from 0.38 to 1.2 μg/Kg for the non-detected results.

Field Quality Control Samples

Field QC samples collected for the benthic sediment sampling event included rinsate blanks and field replicate samples. The results for the field QC samples are discussed in the following sections.

Field Blanks

The rinsate blanks were analyzed with the standard SVOC analyses, and are summarized in the SVOC validation report. Several PAH compounds were detected in the rinsate blanks. The PAH compounds were either not detected or were present in the associated samples at concentrations greater than the action levels. No data were qualified based on rinsate blank contamination.

Field Replicate Samples

Three of the RPD values for field replicate analyses did not meet the criteria for acceptable precision. The field replicate precision outliers are discussed in greater detail in the data validation reports. No data were qualified based on field precision; however, users of the data should consider the potential impact of precision outliers on the reported results.

SUMMARY OF DATA VALIDATION: CHLORINATED PHENOLS

A total of 37 sediment samples were analyzed for chlorinated phenolic compounds for the Portland Harbor Phase 2 RI/FS Benthic Sediments Sampling event. The sediment samples included two (2) field replicates and two (2) field split samples. Two (2) rinsate blanks were collected to monitor the field collection process. Columbia Analytical Services, Kelso, Washington completed the phenols analyses.

The phenols data for the sediment samples were generally acceptable. No data were rejected for any reason. A total of 18 data points (9.7% of all sediment phenols results) were estimated because control limits were exceeded in one or more laboratory quality control (QC) samples or procedures. These qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose.

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

Completeness of Data Set

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

Holding Times and Sample Preservation

The initial sample preservation requirement (cooler temperature of 4°C ±2°) was not met for all samples. The majority of the sample coolers were received at the laboratory with temperatures less than the advisory lower control limit of 2°C, with a low of –0.3ºC. These temperature outliers did not impact data quality and no action was taken.

Sample LW2-GBT006-1 was re-extracted due to a spiking error. The re-extraction occurred 12 days outside of the holding time limit. The associated results were estimated (UJ) to indicate a potential low bias. Five results (2.7% of the phenol results) were estimated based on holding time outliers.

Instrument Performance

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

Method Blank Analyses

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times (5x) the concentration detected in the blank for most compounds and ten times (10x) for phthalates. If a contaminant is detected in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U). If the result is also less than the reporting limit, then the result is elevated to the reporting limit. No action is taken if the sample result is greater than the action level, or for non-detected results.

Various target analytes were detected in the method blanks. A total of two (2) results (1.1% of all sediment phenol results) were qualified as not detected (U) based on method blank contamination. The qualifiers were issued to pentachlorophenol (2 results).

Accuracy

Surrogate Compound Recoveries

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

Matrix Spike Recoveries

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed at the proper frequency. Several of the recoveries reported by the laboratory for MS/MSD analyses did not meet the criteria for acceptable performance. As the outliers indicated a potential high bias and the affected compounds were not detected in the parent sample, no action was taken.

Laboratory Control Sample Recoveries

Laboratory control sample (LCS) analyses met the criteria for frequency of analysis. Several of the recoveries reported by the laboratory for the LCS analyses did not meet the criteria for acceptable performance. A total of two (2) sediment phenol results (1.1% overall) were estimated (J) because the control limits for LCS recovery were not met.

Precision

Due to a spiking error, no laboratory replicate analyses were analyzed. The laboratory precision relative percent difference (RPD) values could not be assessed.

Method Detection Limits and Method Reporting Limits

The laboratory reported non-detects at the method detection limits (MDL), adjusted for sample size and any dilution factor. These method reporting limits (MRL) ranged from 0.35 to 98 µg/Kg for the non-detected results, with the majority (92%) less than 10 µg/Kg. These generally met the MRL values from the QAPP.

Compound Identification

The results from the two analytical columns were compared for agreement. In cases where the RPD value between the two columns was greater than 40% the reported result was “P” flagged by the laboratory. As the elevated RPD value may indicate the presence of an interferent that may result in a high bias, when the RPD was between 40% and 60% the results were estimated (J). Where the RPD value was greater than 60% the results were tentatively identified (NJ). Five data points (2.7% of all sediment phenols results) were estimated (J) and six results (3.2%) were tentatively identified.

Field Quality Control Samples

Field QC samples collected for the benthic sediments sampling event included rinsate blanks and field replicate samples. The results for the field QC samples are discussed in the following sections.

Field Blanks

Two rinsate blanks were analyzed with the phenols analyses. No target compounds were detected in any field blank. No action was necessary.

Field Replicate Samples

All of the RPD values for field replicate analyses were acceptable.

SUMMARY OF DATA VALIDATION: PESTICIDE COMPOUNDS

A total of 37 sediment samples were analyzed for pesticide compounds for the Portland Harbor Phase 2 RI/FS Benthic Sediments Sampling event. The sediment samples included two (2) field replicates and two (2) field split samples. Two (2) rinsate blanks were collected to monitor the field collection process. Columbia Analytical Services, Kelso, Washington performed the pesticides analyses.

The pesticide data for the sediment samples were generally acceptable. No data were rejected for any reason. A total of 225 data points (19.6% of all sediment pesticide results) were estimated because control limits were exceeded in one or more laboratory quality control (QC) samples or procedures. These qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose.

The laboratory data were evaluated in terms of completeness, holding times, instrument performance, bias, and precision. The results of the QC procedures used during sample analyses are discussed below. Note that many of the data points were estimated for more than one reason, so the numbers cited below add up to more than 225 data points.

Completeness of Data Set

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

Holding Times and Sample Preservation

The initial sample preservation requirement (cooler temperature of 4°C ±2°) was not met for all samples. The majority of the sample coolers were received at the laboratory with temperatures less than the advisory lower control limit of 2°C, with a low of –0.3ºC. These temperature outliers did not impact data quality and no action was taken.

Instrument Performance

Calibrations

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

The continuing calibration (CCAL) percent difference (%D) values were used to evaluate instrument stability. The %D value for toxaphene was outside the control limits in one of the CCAL. As the %D outlier indicated a high bias and toxaphene was not detected in the associated samples, no action was necessary.

Endrin/DDT Breakdown

Performance evaluation mixtures (PEM) were analyzed at the proper frequency to measure percent breakdown of 4,4'-DDT and endrin. All breakdown values were acceptable.

Method Blank Analyses

Method blanks were analyzed at the appropriate frequency. No target analytes were detected in any of the method blanks.

Accuracy

Surrogate Compound Recoveries

Surrogate compounds were added to all samples. The surrogate recoveries reported by the laboratory typically met the criteria for acceptable performance; however, surrogate recovery outliers were present in several samples. Since only one surrogate outlier was present, or since the outliers were due to required dilution factors, the data were not affected and no action was taken.

Matrix Spike Recoveries

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed at the proper frequency. Several of the recoveries reported by the laboratory for MS/MSD analyses did not meet the criteria for acceptable performance. Six (6) sediment pesticides results (0.5% overall) were estimated (J or UJ) because the control limits for MS/MSD recovery were not met.

Laboratory Control Sample Recoveries

Laboratory control sample (LCS) analyses met the criteria for frequency of analysis. Several of the recoveries reported by the laboratory for LCS analyses did not meet the criteria for acceptable performance. Since the majority of the LCS outliers indicated a potential low bias, associated positive results and reporting limits were affected. A total of 60 results were estimated (J or UJ) based on LCS recovery outliers. This represents 5.2% of all sediment pesticide results.

Precision

MS/MSD and LCS/LCSD analyses were evaluated for laboratory precision. All laboratory precision relative percent difference (RPD) values were acceptable for the sediment samples.

Method Detection Limits and Method Reporting Limits

To try to meet the project analytical concentration goals (ACG), the laboratory reported non-detects at the method detection limits (MDLs), adjusted for sample size and any dilution factor. The reporting limits for non-detected results ranged from 0.046 μg/Kg to 27 μg/Kg (with toxaphene non-detects extending up to 790 μg/Kg) for the non-detected results. The ACG were not met for several of the pesticides. No action was taken.

Compound Identification

The results from the two analytical columns were compared for agreement. In cases where the RPD value between the two columns was greater than 40% the reported result was “P” flagged by the laboratory. As the elevated RPD value may indicate the presence of an interferent that may result in a high bias, the associated results were estimated (J). If the RPD value was greater than 60%, the result was qualified as a tentative identification (NJ). A total of 120 data points (10.5% of all sediment pesticide data points, and 39.3% of all positive results for pesticides) were estimated (J) and 85 data points (7.4% of all pesticide results, and 27.9% of all detected pesticide results) were qualified as tentative identifications (NJ). Overall, 67% of the detected pesticide results are affected by interference.

Field Quality Control Samples

Field QC samples collected for the benthic sediments sampling event included rinsate blanks and field replicate samples. The results for the field QC samples are discussed in the following sections.

Field Blanks

Seven (7) field blanks were analyzed with the pesticides analyses. The target compound 4,4′-DDT was detected in one field blank. This compound was present in the associated samples at concentrations greater than the action levels. No action was taken.

Field Replicate Samples

Six of the RPD values for field replicate analyses did not meet the criteria for acceptable precision. The field replicate precision outliers are discussed in greater detail in the data validation reports. No data were qualified based on field precision; however, users of the data should consider the potential impact of precision outliers on the reported results.

SUMMARY OF DATA VALIDATION: POLYCHLORINATED BIPHENYL (PCB) COMPOUNDS

A total of 37 sediment samples were analyzed for PCB compounds for the Portland Harbor Phase 2 RI/FS Benthic Sediments Sampling event. The sediment samples included two (2) field replicates and two (2) field split samples. Two (2) rinsate blanks were collected to monitor the field collection process. Columbia Analytical Services, Kelso, Washington completed the pesticides analyses.

The PCB data for the sediment samples were generally acceptable. No data were rejected for any reason. A total of 21 data points (6.3% of all sediment PCB results) were estimated because control limits were exceeded in one or more laboratory quality control (QC) samples or procedures. These qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose.

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

Completeness of Data Set

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

Holding Times and Sample Preservation

The initial sample preservation requirement (cooler temperature of 4°C ±2°) was not met for all samples. The majority of the sample coolers were received at the laboratory with temperatures less than the advisory lower control limit of 2°C, with a low of –0.3ºC. These temperature outliers did not impact data quality and no action was taken.

Instrument Performance

Calibrations

Initial and continuing calibrations were completed for all reported analytes at the proper frequency. All initial and continuing calibrations met all acceptance criteria.

Method Blank Analyses

Method blanks were analyzed at the appropriate frequency. No target analytes were detected in any method blank.

Accuracy

Surrogate Compound Recoveries

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

Matrix Spike Recoveries

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed at the proper frequency. Two of the recoveries reported by the laboratory for one MS/MSD set did not meet the criteria for acceptable performance. As recoveries indicated a potential high bias and the analytes were not detected in the parent sample, no action was taken.

Laboratory Control Sample Recoveries

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

Precision

MS/MSD and LCS/LCSD analyses were evaluated for laboratory precision. Two of the MS/MSD relative percent difference (RPD) values reported by the laboratory did not meet the criteria for acceptable performance. As the analytes were not detected in the parent sample, no action was taken.

Method Detection Limits and Method Reporting Limits

To meet the project analytical concentration goals (ACG), the laboratory reported non-detects at the method detection limits (MDLs), adjusted for sample size, percent moisture, and any dilution factor. These method reporting limits (MRLs) ranged from 1.6 µg/Kg to 170 µg/Kg for the non-detected results.

The ACG of 0.004 µg/Kg was not met, and the QAPP MRL of 4 µg/Kg was not met for 200 of the reported PCB non-detects. In some cases, the laboratory elevated the detection limit and flagged the result ("Ui") due to background interference. No action was taken.

Compound Identification

The results from the two analytical columns were compared for agreement. In cases where the RPD value between the two columns was greater than 40% the reported result was "P" flagged by the laboratory. As the elevated RPD value may indicate the presence of an interferent that may result in a high bias, the associated results were estimated (J). If the RPD value was greater than 60%, the result was qualified as a tentative identification (NJ). A total of 21 data points (6.3% of all sediment PCB data points, and 57% of all positive results for PCB compounds) were estimated (J).

Field Quality Control Samples

Field QC samples collected for the benthic sediment sampling event included rinsate blanks and field replicate samples. The results for the field QC samples are discussed in the following sections.

Field Blanks

Two field blanks were analyzed with the PCB analyses. No target analytes were detected in any field blank.

Field Replicate Samples

Three of the RPD values for field replicate analyses did not meet the criteria for acceptable precision. The field replicate precision outliers are discussed in greater detail in the data validation reports. No data were qualified based on field precision; however, users of the data should consider the potential impact of precision outliers on the reported results.

SUMMARY OF DATA VALIDATION: PCB CONGENERS

Thirty-seven (37) sediment samples were analyzed for polychlorinated biphenyl (PCB) congeners for the Portland Harbor Phase 2 RI/FS Benthic Sediments sampling event. The sediment samples included two (2) field replicates and two (2) field split samples. Two (2) rinsate blanks were collected to monitor the field collection process. Samples were analyzed by Alta Analytical Laboratories, El Dorado Hills, California.

The PCB congener data for the archived sediment samples were generally acceptable. No data were rejected for any reason. Sixty-eight (68) data points (1.0% of all sediment PCB congener results) were estimated because control limits were exceeded in one or more laboratory quality control (QC) samples or procedures. These qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose.

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

Completeness of Data Set

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

Holding Times and Sample Preservation

The initial sample preservation requirement (cooler temperature of 4°C ±2°) was not met for all samples. The majority of the sample coolers were received at the laboratory with temperatures less than the advisory lower control limit of 2°C, with a low of –0.3ºC. These temperature outliers did not impact data quality and no action was taken.

Instrument Performance

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

All other instrument performance criteria were met by the laboratory.

Method Blank Analyses

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

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

Method blanks were analyzed at the appropriate frequency. A total of thirty-seven (37) results (0.56% of all sediment PCB congener results) were qualified as not detected (U) based on method blank contamination. PCB congener PCB169 was the only congener qualified based on method blank contamination – 100% of PCB169 results were restated as not detected..

Accuracy

Labeled Compound Recoveries

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

Matrix Spike Recoveries

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

Ongoing Precision and Recovery Sample Recoveries

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

Precision

Laboratory duplicate analyses were evaluated for laboratory precision. Several of the relative percent difference (RPD) values for the duplicate analyses did not meet the criteria for acceptable performance. For laboratory duplicate precision outliers, qualifiers were issued only if the affected compound was detected in the parent sample. Sixty-eight (68) data points (1.0% of all sediment PCB congener results) were estimated (J) during the quality assurance review because control limits for RPD values were not met.

Method Detection Limits and Method Reporting Limits

Analytical concentration goals (ACG) were specified in the QAPP for specific toxic PCB (PCB77, PCB81, PCB105, PCB106/118, PCB114, PCB123, PCB126, PCB156, PCB157, PCB167, PCB169, and PCB189). To try to meet the project ACG, the laboratory reported non-detects at the method detection limits (MDLs), adjusted for sample size, percent moisture, and any dilution factor. For several of the most toxic coplanar congeners (such as PCB77 and PCB169), the laboratory also concentrated the extracts, performed additional cleanups, and then reanalyzed the extract to get the lowest possible detection limits.

The ACG were met for most of the samples, in that the compound was either detected, or the detection limit was less than the stated ACG. When the ACG and MRL were not met, it was due to the need to extract smaller sample aliquots and/or perform dilutions due to the elevated concentrations of target analytes present in the samples.

PCB169 was detected at low levels in all of the samples and in the associated method blanks. After qualifiers based on method blank contamination were issued, all of the PCB169 results were restated as not detected, with elevated detection limits. All of these restated detection limits were greater than the PCB169 ACG of 0.01 pg/g (dry weight).

Field Quality Control Samples

Field QC samples collected for the Phase 2 RI/FS benthic sediments sampling event included rinsate blanks and field replicate samples. The results for the field QC samples are discussed in the following sections.

Equipment Rinsate Blanks

All results in the equipment blanks were significantly less than the results in the sediment samples, even after the action levels were established. No action was necessary.

Field Replicate Samples

Most of the RPD values in the field replicate analyses did not meet the criteria for acceptable precision. The field replicate precision outliers are discussed in greater detail in the data validation reports. No data were qualified based on field precision; however, users of the data should consider the potential impact of precision outliers on the reported results

SUMMARY OF DATA VALIDATION: HERBICIDES

A total of 37 sediment samples were analyzed for herbicides for the Portland Harbor Phase 2 RI/FS benthic sediments sampling event. The sediment samples included two (2) field replicates and two (2) field split samples. Two (2) rinsate blanks were collected to monitor the field collection process. Severn Trent Laboratories in Fife, Washington completed all herbicides analyses.

The herbicides data for the sediment samples were generally acceptable. No data were rejected for any reason. A total of 192 data points (43.2% of all sediment herbicides results) were estimated because control limits were exceeded in one or more laboratory QC samples or procedures. These qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose.

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

Completeness of Data Set

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

Holding Times and Sample Preservation

The laboratory received the majority of the sample coolers with temperatures below the advisory control limits, with a low of -20ºC. Since the sediment samples were immediately preserved by freezing, at or below -20 ºC, it was determined that these outliers did not impact data quality and no action was taken.

Instrument Performance

Initial and continuing calibrations were completed for all target analytes and met the criteria for frequency of analysis. The initial calibrations (ICAL) met the linearity (percent relative standard deviation or correlation coefficient) control limits.

The laboratory used a modified method, incorporating gas chromatography with mass spectrometry detection (GC/MS). GC/MS continuing calibrations (CCAL) are required at the beginning of each 12-hour sequence and have a percent difference (%D) limit of ±25%. These criteria were more applicable to this data than the default Method 8151A criteria. All CCAL %D values were within the control limit of ±25%, and all CCAL were acceptable

Method Blank Analyses

Method blanks were analyzed at the required frequency. No herbicides were detected in any blank.

Accuracy

The accuracy of the analytical results is evaluated in the following sections in terms of analytical bias (surrogate compound, matrix spike [MS], and laboratory control sample [LCS] recoveries) and precision (duplicate MS and duplicate LCS analyses).

Surrogate Compound Recoveries

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

Matrix Spike Recoveries

Matrix and duplicate matrix spike analyses (MS/MSD) met the criteria for frequency of analysis. All MS/MSD recovery values were acceptable.

Laboratory Control Sample Recoveries

LCS and LCS duplicate (LCSD) analyses met the criteria for frequency of analysis. All LCS/LCSD recovery values were acceptable.

GCMS Internal Standards

The areas of the internal standards were outside the control limits in several samples. If the internal standard area was greater than the upper control limit, no action was taken unless there were positive results associated with the internal standard. For internal standard areas less than the lower control limits, all target analytes associated with the internal standard were estimated (J or UJ) with potential low bias. A total of 192 herbicide reporting limits (43.2% of all sediment herbicide results) were estimated (UJ) based on internal standard area outliers.

Precision

MS/MSD and LCS/LCSD analyses were evaluated for laboratory precision. One MS/MSD relative percent difference (RPD) values was outside the control limit. The affected compound was not detected in the parent sample; no action was taken.

Method Detection Limits and Method Reporting Limits

To meet the project analytical concentration goals (ACG), the laboratory reported non-detects down to the method detection limits (MDLs), adjusted for sample size, percent moisture, and any dilution factor. These method reporting limits (MRLs) ranged from 0.17 µg/Kg to 1.5 µg/Kg for the non-detected results. The ACG were not met for the pentachlorophenol results.

Field Quality Control Samples

Field QC samples collected for the Phase 2 RI/FS benthic sediments sampling event included rinsate blanks and field replicate samples. The results for the field QC samples are discussed in the following sections.

Field Blanks

Two rinsate blanks were submitted. No herbicides were detected.

Field Replicate Samples

All of the RPD values for field replicate analyses were acceptable.

SUMMARY OF DATA VALIDATION: ORGANOTINS

Thirty-seven (37) sediment samples were analyzed for organotin compounds for the Portland Harbor Phase 2 RI/FS Benthic Sediments Sampling event. The sediment samples included two (2) field replicates and two (2) field split samples. Two (2) rinsate blanks were collected to monitor the field collection process. Columbia Analytical Services, Kelso, Washington completed the organotin analyses.

The organotin data for the sediment samples were generally acceptable. Eight (8) data points (5.4% of all sediment organotin results) were estimated because control limits were exceeded in one or more laboratory quality control (QC) samples or procedures. These qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose.

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

Completeness of Data Set

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

Holding Times and Sample Preservation

The initial sample preservation requirement (cooler temperature of 4°C ±2°) was not met for all samples. The majority of the sample coolers were received at the laboratory with temperatures less than the advisory lower control limit of 2°C, with a low of –0.3ºC. These temperature outliers did not impact data quality and no action was taken.

Instrument Performance

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

Method Blank Analyses

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

Various target analytes were detected in the method blanks. Five (5) results (3.4% of all sediment organotin results) were qualified as not detected (U) based on method blank contamination. The qualifiers were issued to dibutyltin (one result) and tributyltin (four results).

Accuracy

Surrogate Compound Recoveries

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

Matrix Spike Recoveries

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed at the proper frequency. Several of the recoveries reported by the laboratory for MS/MSD analyses did not meet the criteria for acceptable performance. One (1) result (0.68% overall) was estimated (J).

Laboratory Control Sample Recoveries

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

Precision

MS/MSD and LCS/LCSD analyses were evaluated for laboratory precision. All of the relative percent difference (RPD) values were acceptable.

Method Detection Limits and Method Reporting Limits

The laboratory reported non-detects at the method detection limits (MDL), adjusted for sample size and any dilution factor. These method reporting limits (MRL) ranged from 0.041 to 1.5 µg/Kg for the non-detected results. These generally met the MRL values from the QAPP.

Compound Identification

The results from the two analytical columns were compared for agreement. In cases where the RPD value between the two columns was greater than 40% the reported result was "P" flagged by the laboratory. As the elevated RPD value may indicate the presence of an interferent that may result in a high bias, the associated results were estimated (J). Seven (7) data points (4.7% of all sediment organotin data points) were estimated (J).

Field Quality Control Samples

Field QC samples collected for the benthic sediment sampling event included rinsate blanks and field replicate samples. The results for the field QC samples are discussed in the following sections.

Field Blanks

Two rinsate blanks were analyzed with the organotin analyses. One or more target analytes were detected in each rinsate blank. Four results were qualified as not detected (U) in the associated samples based on rinsate blank contamination.

Field Replicate Samples

Two of the RPD values for field replicate analyses did not meet the criteria for acceptable precision. The field replicate precision outliers are discussed in greater detail in the data validation reports. No data were qualified based on field precision; however, users of the data should consider the potential impact of precision outliers on the reported results.

SUMMARY OF DATA VALIDATION: FUELS

A total of 37 sediment samples were analyzed for gasoline range organics (GRO) diesel range organics (DRO), and residual range organics (RRO) as part of the Portland Harbor Phase 2 RI/FS Benthic Sediments sampling event. The samples included two field replicates and two field splits. Two field rinsate blanks were analyzed to monitor the field collection. Six trip blanks were analyzed for GRO to monitor the shipping process. Columbia Analytical Services, Kelso, Washington completed the fuels analyses.

The fuels data for the sediment samples were generally acceptable. No data were rejected for any reason. A total of 74 data points (66.7% of all sediment fuels results) were estimated because control limits were exceeded in one or more laboratory quality control (QC) samples or procedures. These qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose.

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

Completeness of Data Set

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

Holding Times and Sample Preservation

The initial sample preservation requirement (cooler temperature of 4°C ±2°) was not met for all samples. The majority of the sample coolers were received at the laboratory with temperatures less than the advisory lower control limit of 2°C, with a low of –0.3ºC. These temperature outliers did not impact data quality and no action was taken.

Instrument Performance

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

Method Blank Analyses

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

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

reported in several of the method blanks. Ten (10) data points (9.0% of all sediment fuels results) were qualified as not detected (U) based on method blank contamination. The qualifiers were issued to nine (9) GRO results and one RRO result.

Accuracy

Surrogate Compound Recoveries

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

Matrix Spike Recoveries

Matrix spike/matrix spike duplicate (MS/MSD) analyses are not performed with fuels analyses.

Laboratory Control Sample Recoveries

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

Precision

Laboratory duplicate analyses were evaluated for laboratory precision. Several relative percent difference (RPD) values were outside the acceptance limits. The GRO result in one sediment sample was estimated (J) based on laboratory precision outliers.

Method Detection Limits and Method Reporting Limits

To meet the project method reporting limit (MRL) goals of 10 mg/Kg for GRO, 25 mg/Kg for DRO, and 100 mg/Kg for RRO, the laboratory reported non-detects at the method detection limits (MDLs), adjusted for sample size, percent moisture, and any dilution factor. The MRLs ranged from 1.4 mg/Kg to 3.4 mg/Kg for the GRO and 4.7 mg/Kg for the RRO non-detected results. DRO was detected in every sample.

Compound Identification

Several different flags were used by the laboratory to provide information about the reported results. These flags indicated that the pattern in the sample did not match the calibration standard. During validation, the data were estimated (J) to indicate that the reported result may not accurately reflect the concentration of fuels present in the sample. A total of 70 data points (63% of all sediment fuels data points) were estimated.

Field Quality Control Samples

Field QC samples collected for the benthic sediments sampling event included rinsate blanks and field replicate samples. Trip blanks were also analyzed with the GRO samples. The results for the field QC samples are discussed in the following sections.

Field Blanks

Two rinsate blanks and six trip blanks were analyzed with the GRO analyses. GRO was detected in Rinsate Blank 1. GRO was either not detected or was present at concentrations greater than the action level in the associated samples. GRO was not detected in the other rinsate blank or any of the trip blanks. No data were qualified based on field blank contamination.

Two rinsate blanks were associated with the DRO and RRO analyses. DRO and RRO were detected in several of the field blanks. The DRO and RRO results in the associated samples were greater than the action levels. No further action was necessary.

Field Replicate Samples

All of the RPD values for the fuels in the field replicate analyses met the criteria for acceptable precision..

SUMMARY OF DATA VALIDATION: DIOXIN/FURAN COMPOUNDS

Thirty-seven (37) sediment samples were analyzed for dioxin and furan compounds for the Portland Harbor Phase 2 RI/FS Benthic Sediments sampling event. The samples included two field replicates and two field splits. Two field rinsate blanks were analyzed to monitor the field collection process. Columbia Analytical Services, Houston, Texas completed the analyses.

The dioxin/furan data for the sediment samples were generally acceptable. No data were rejected for any reason. A total of twenty-two (22) data points (2.4% of all sediment dioxin/furan results) were estimated because control limits were exceeded in one or more laboratory quality control (QC) samples or procedures. These qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose.

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

Completeness of Data Set

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

Holding Times and Sample Preservation

The initial sample preservation requirement (cooler temperature of 4°C ±2°) was not met for all samples. The majority of the sample coolers were received at the laboratory with temperatures less than the advisory lower control limit of 2°C, with a low of –0.3ºC. These temperature outliers did not impact data quality and no action was taken.

Instrument Performance

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

Method Blank Analyses

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

Various target analytes were detected in the method blanks. Eleven (11) results (1.2% of all sediment dioxin/furan results) were qualified as not detected (U) based on method blank contamination. The qualifiers were issued to 1,2,3,4,6,7,8-heptachlorodibenzofuran (four results), 1,2,3,4,7,8-hexachlorodibenzofuran (five results) and OCDF (two results).

Accuracy

Labeled Compound Recoveries

Labeled compounds were added to all field and QC samples. The labeled compound recoveries reported by the laboratory typically met the criteria for acceptable performance; however, recovery outliers were present in several samples. All of the labeled compound percent recovery (%R) outliers indicated a potential high bias, positive results for associated target analytes were estimated (J). A total of twelve (12) dioxin/furan results (1.3% of all sediment results) were estimated based on labeled compound recovery outliers.

Matrix Spike Recoveries

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

Ongoing Precision and Recovery Sample Recoveries

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

Precision

Laboratory duplicate OPR analyses were evaluated for laboratory precision. All of the relative percent difference (RPD) values f met the criteria for acceptable performance.

Method Detection Limits and Method Reporting Limits

To try to meet the project analytical concentration goals (ACG), the laboratory reported non-detects at the method detection limits (MDLs), adjusted for sample size, percent moisture, and any dilution factor. These method reporting limits (MRLs) ranged from 0.005 pg/g to 0.317 pg/g for the non-detected results. However, the ACG were not met for many of the dioxin/furan congeners. No action was taken.

Compound Identification and Quantitation

Flags were used by the laboratory to provide information about the reported results. A “K” flag indicates that a peak was detected at the correct retention time for the target analyte; however, the ion abundance ratio criteria were not met. The reported result is an EMPC (estimated maximum possible concentration) value, which is essentially an elevated detection limit. Data flagged “K” by the laboratory were qualified as not detected (U) to make this relationship clear to the data user. Fifty-one (51) data points (5.5% of all sediment dioxin/furan data points) were qualified as not detected because the ion abundance ratio criteria were not met.

A laboratory “E” flag indicates that the reported result is greater than the upper calibration range established by the initial calibration. If no dilution analysis was performed, the “E” flagged data were estimated (J). Four (4) data points (0.43% of all sediment dioxin/furan data points) were estimated based on calibration range exceedance.

Field Quality Control Samples

Field QC samples collected for the benthic sediments sampling event included rinsate blanks and field replicate samples. The results for the field QC samples are discussed in the following sections.

Field Blanks

Two rinsate blanks were analyzed with the dioxin/furan analyses. After qualifiers based on method blank contamination were issued, two target analytes were present in Rinsate Blank 2. These analytes were detected in the associated samples at concentrations greater than the action levels. No data were qualified based on rinsate blank contamination.

Field Replicate Samples

Many of the RPD values for field replicate analyses did not meet the criteria for acceptable precision. The field replicate precision outliers are discussed in greater detail in the data validation reports. No data were qualified based on field precision; however, users of the data should consider the potential impact of precision outliers on the reported results.

SUMMARY OF DATA VALIDATION: METALS

A total of 37 sediment samples were analyzed for total metals for the Portland Harbor Phase 2 RI/FS Benthic Sediments sampling event. The sediment samples included two (2) field replicates and two (2) field split samples. Two (2) rinsate blanks were collected to monitor the field collection process. Columbia Analytical Services, Kelso, Washington completed all analyses. The following analytical methods were used:

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

The metals data for the sediment samples were generally acceptable. No data were rejected for any reason. A total of 142 data points (29.3% of all sediment metals results) were estimated because control limits were exceeded in one or more laboratory quality control (QC) samples or procedures. These qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose.

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

Completeness of Data Set

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

Holding Times and Sample Preservation

The initial sample preservation requirement (cooler temperature of 4°C ±2°) was not met for all samples. The majority of the sample coolers were received at the laboratory with temperatures less than the advisory lower control limit of 2°C, with a low of –0.3ºC. These temperature outliers did not impact data quality and no action was taken.

Instrument Performance

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

Method Blank Analyses

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

Method and instrument blanks were analyzed at the appropriate frequency. Various target analytes were detected in the method and/or instrument blanks. A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets. A total of 41 metals results (8.5% of all sediment metals results) were qualified as not detected (U) based on blank contamination. The qualifiers issued were to cadmium (3 results), selenium (36 results), and silver (2 results).

In addition, some analytes were found at levels less than the negative method detection limit (MDL) in some instrument blanks. For negative blanks, action levels of five times the absolute value of the blank concentrations were established. All of the results in the associated samples were greater than the action levels; no data were qualified.

Accuracy

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

Matrix Spike Recoveries

MS analyses met the criteria for frequency of analysis. All of the recoveries reported by the laboratory for the antimony analyses did not meet the criteria for acceptable performance, with all outliers indicating a potential low bias. Two chromium results indicated a potential high bias. A total of 55 metals results (11.4% overall) were estimated (J) during the quality assurance review because the control limits for MS recovery were not met.

Laboratory Control Sample Recoveries

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

Contract Required Detection Limit Standard Analyses

CRDL standards were analyzed at the beginning of each analytical sequence. For recoveries greater than the 130% upper control limit, the associated positive results less than two times the CRDL are estimated (J) to indicate a potential high bias. For recoveries less than the 70% lower control limit, positive results less than twice the CRDL and non-detects are estimated (J/UJ) to indicate a potential low bias. The target analytes associated with high bias CRDL outliers were either not detected or were at concentrations greater than twice the CRDL. Target analytes associated with low bias CRDL outliers were present at concentrations greater than twice the CRDL. No data were qualified.

Interference Check Samples

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

Serial Dilution Analyses

Serial dilution analyses were performed at the proper frequency. Serial dilution %D values greater than 10% for sample results greater than 50 times the MDL may indicate the presence of matrix interference, resulting in potential bias. For serial dilution outliers, all associated sample results

were qualified. A total of 75 metals results (15.5% of all sediment metals results) were estimated (J/UJ) based on serial dilution outliers.

Precision

Laboratory duplicate analyses were evaluated for laboratory precision. Several relative percent difference (RPD) values were outside the acceptance limits. Twenty-eight (28) results (5.8% of all sediment metals results) were estimated (J) based on laboratory precision outliers.

Method Detection Limits and Method Reporting Limits

The laboratory reported non-detects at the MDLs, adjusted for sample size and any dilution factor. With the exception of two silver results (MDL 0.002 mg/Kg), 37 mercury results (MDL 0.008 to 0.009 mg/Kg) and 37 selenium results (MDL 0.02 to 0.04 mg/Kg), all metals were detected in all samples.

Field Quality Control Samples

Field QC samples collected for the benthic sediments sampling event included rinsate blanks and field replicate samples. The results for the field QC samples are discussed in the following sections.

Field Blanks

Two rinsate blanks were associated with the metals analyses. Various target analytes were detected in several of the field blanks. The results in the associated samples were greater than the action levels. No further action was necessary.

Field Replicate Samples

One of the RPD values in the field replicate analyses did not meet the criteria for acceptable precision. The field replicate precision outliers are discussed in greater detail in the data validation reports. No data were qualified based on field precision; however, users of the data should consider the potential impact of precision outliers on the reported results.

SUMMARY OF DATA VALIDATION: CONVENTIONAL PARAMETERS

A total of 37 sediment samples were analyzed for some or all of the following parameters for the Portland Harbor Phase 2 RI/FS Benthic Sediments sampling event. The sediment samples included two (2) field replicates and two (2) field split samples. Two (2) rinsate blanks were collected to monitor the field collection process (for sulfides and ammonia only). Columbia Analytical Services, Kelso, Washington, completed all analyses. The following analytical methods were used:

Parameter	Method Number
Total Solids (TS)	EPA 160.3
Grain Size (GS)	PSEP 1986
Specific Gravity (SG)	ASTM D-854
Total Organic Carbon (TOC)	PSEP 1986
Hexavalent Chromium	SW7196A
Total Sulfides	SW9030M
Ammonia (as nitrogen)	350.1/Plumb

Overall, the conventional parameters data for the sediment samples were acceptable. No data were rejected for any reason. Eighty-four (84) data points of 676 total data points were estimated because control limits were exceeded in one or more laboratory QC samples or procedures. These qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose.

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

Completeness of Data Set

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

Holding Times and Sample Preservation

The initial sample preservation requirement (cooler temperature of 4°C ±2°) was not met for all samples. The majority of the sample coolers were received at the laboratory with temperatures less than the advisory lower control limit of 2°C, with a low of –0.3ºC. These temperature outliers did not impact data quality and no action was taken.

All of the ammonia and many of the sulfide analyses were performed after the seven day holding time criterion had elapsed. All ammonia and sulfide results were estimated (J) due to the potential low bias. A total of 45 data points (6.6% of all conventional parameter results) were estimated based on holding time exceedance.

Instrument Performance

Initial and continuing calibrations were completed for the TOC, ammonia, sulfide, and hexavalent chromium analyses and met the criteria for frequency of analysis. The initial calibrations met the linearity (percent relative standard deviation or correlation coefficient) control limits.

Method Blank Analyses

Two types of laboratory blanks were evaluated for possible contamination effects. These blanks were: initial and continuing calibration blanks (ICB and CCB) and method blanks (MB). The required frequency of one at the beginning and one every ten samples for calibration blank analysis was met. The laboratory analyzed one MB for every 20 samples digested or one per batch, for each digestion procedure, as required.

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times (5x) the concentration detected in the blank. Various target analytes were detected at values greater than the method detection limit (MDL) in several laboratory blanks. All field sample results for these analytes were at concentrations greater than the action levels; no data were qualified.

Accuracy

The accuracy of the analytical results is evaluated in the following sections in terms of analytical bias (matrix spike [MS] and laboratory control sample [LCS] recoveries) and precision (sample or matrix spike duplicate [MSD] analyses).

Matrix Spike Recoveries

MS analyses were completed for the TOC, ammonia, sulfide, and hexavalent chromium analyses and met the criteria for frequency of analysis. The hexavalent chromium recovery value was less than the control limit in all of the MS analyses. The hexavalent chromium results in the associated samples were estimated (J/UJ). A total of 37 results (100% of the hexavalent chromium results, and 5.5% of all conventional parameters results) were estimated based on MS recovery outliers.

Laboratory Control Sample Recoveries

An LCS was analyzed for the TOC and hexavalent chromium analyses. All LCS recovery values were acceptable.

Precision

Laboratory duplicate and triplicate analyses (for grain size) were evaluated for laboratory precision. Two of the percent relative standard deviation (%RSD) values for grain size did not meet the criteria for acceptable performance. Two grain size results were estimated (J) during the quality assurance review because control limits for relative percent difference (RPD) and %RSD were not met.

Method Reporting Limits

The project method reporting limit goals were met for all conventional parameters.

Field Quality Control Samples

Field QC samples collected for the Phase 2 RI/FS included field replicate samples and two rinsate blanks (for ammonia and sulfides only). The results for the field QC samples are discussed in the following sections.

Field Blanks

Two rinsate blanks were analyzed. Ammonia and sulfides were not detected in the field blank.

Field Replicate Samples

One of the RPD values in the field replicate analyses did not meet the criteria for acceptable precision. The field replicate precision outliers are discussed in greater detail in the data validation reports. No data were qualified based on field precision; however, users of the data should consider the potential impact of precision outliers on the reported results.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Benthic Sediments, Fall 2005
Volatile Organic Compounds by EPA Method 8260B
Columbia Analytical Services - Kelso

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

SDG	No. Samples	Validation Level
K0506421	2 Sediment	Full
K0506520	5 Sediment	Summary
K0506554	3 Sediment	Summary
K0506644	6 Sediment, 1 Trip Blank & 1 Field Blank	Summary
K0506744	6 Sediment & 2 Trip Blanks	Summary
K0506813	12 Sediment & 2 Trip Blanks	Summary
K0506873	3 Sediment, 1 Trip Blank & 1 Field Blank	Full

I. DATA PACKAGE COMPLETENESS

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

II. EDD TO HARDCOPY VERIFICATION

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

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

2 Holding Times and Sample Receipt
GC/MS Instrument Performance Check
2 Initial Calibration (ICAL)
2 Continuing Calibration (CCAL)
2 Blanks (Method)
2 Blanks (Field)
1 Surrogate Compounds
2 Matrix Spike/Matrix Spike Duplicates (MS/MSD)
2 Laboratory Control Samples (LCS/LCSD)
1 Field Replicates
Internal Standards
Target Analyte List
Reporting Limits (MDL and MRL)
Compound Identification (Full validation only)
1 Calculation Verification (Full validation only)

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

Holding Times and Sample Receipt

The validation guidance documents state that the cooler temperatures should be within an advisory temperature range of 2° to 6°C.

The laboratory received the majority of the sample coolers with temperatures below the advisory control limits, with a low of -0.3ºC. Since the sediment samples were immediately preserved by freezing, at or below -20 ºC, it was determined that these outliers did not impact data quality and no action was taken.

The QAPP-required holding time criterion for frozen sediment samples is 1 year and water samples is 7 days from date of sampling to date of extraction. The QAPP-required holding time criterion for extracts is 40 days from extraction to analysis. All extracts were analyzed within the holding time criterion, with the following exception.

SDG K0506813: Sample LW2-GBT006-1 was re-analyzed 18 days out of holding time due to suspected carry-over. Only the result for naphthalene was reported from this re-analysis and was qualified as estimated (UJ-1).

Initial Calibration

All percent relative standard deviation (%RSD) values were within the ±30% control limit. All relative response factor (RRF) values were greater than the 0.05 minimum control limit with the exceptions noted below. Positive results associated with RRF value outliers were estimated (J-5A). Due to the loss of instrument sensitivity, reporting limits associated with low RRF values were rejected (R-5A).

The RRF values for acrolein, 2-butanone, and vinyl acetate were less than the 0.05 minimum control limit in many of the ICAL. Acrolein and vinyl acetate were not detected in any field sample. All reporting limits associated with RRF value outliers were rejected (R-5A). Positive results for acetone and 2-butanone were estimated and the reporting limits rejected (J/R-5A). Other RRF value or %D outliers are noted below as appropriate.

SDGs K0506644, K0506744, K0506813, and K0506873: The acetone and 2-hexanone RRF values from the ICAL analyzed on 11/25/05 (Instrument MS18) were less than the minimum control limit. Results and reporting limits for these compounds were qualified (J/R-5A) in the associated samples.

Continuing Calibration (CCAL)

All percent difference (%D) values for CCALs were within the ±25% control limit, and all RRF values were greater than the 0.05 minimum control limit with the following exceptions. Positive results in samples associated with %D outliers were qualified as estimated (J-5B). Reporting limits in samples associated with low-bias %D outliers were estimated (UJ-5B). Positive results and reporting limits in samples associated with RRF outliers were qualified as estimated (J/R-5B). A complete list of RRF and %D outliers is provided in the data validation worksheets.

The RRF values for acrolein, 2-butanone, and vinyl acetate were less than the 0.05 minimum control limit in most of the CCAL. Acrolein and vinyl acetate were typically not detected in the field

samples. All reporting limits associated with RRF value outliers were rejected (R-5B). Positive results for 2-butanone were estimated and the reporting limits rejected (J/R-5B).

Percent difference outliers (indicated by bias) and other RRF outliers were as follows:

SDGs K0506421 & K0506520: iodomethane and naphthalene (low bias) in the CCAL analyzed 12/15/05 (Instrument MS 04)

SDG K0506554: vinyl acetate (high bias) in the CCAL analyzed 12/16/05 (Instrument MS 04)

SDG K0506644: vinyl acetate (high bias) and methylene chloride (low bias) in the CCAL analyzed 12/18/05 (Instrument MS 18)

- carbon disulfide and vinyl acetate (high bias) in the CCAL analyzed 12/26/05 (Instrument MS 18)
- chloromethane and vinyl acetate (high bias) in the CCAL analyzed 12/27/05 (Instrument MS 18)
- bromomethane, 2-chloroethyl vinyl ether, and iodomethane (low bias); RRF value outliers for acetone and 2-hexanone in the CCAL analyzed 12/26/05 and 12/27/05 (Instrument MS 18)

SDG K0506744: RRF value outliers for acetone and 2-hexanone in the CCAL analyzed 12/28/05 (Instrument MS 18).

- methyl tert butyl ether, trichlorofluoromethane, and vinyl acetate (high bias) and iodomethane (low bias) in the CCAL analyzed 12/28/05 (Instrument MS 04)

SDG K0506813: RRF value outliers for acetone, acrylonitrile, 2-hexanone, and 4-methyl-2-pentanone; bromomethane, 2-chloroethyl vinyl ether and iodomethane (low bias), and chloromethane (high bias) in the CCAL analyzed 12/29/05 (Instrument MS 18)

- RRF value outliers for acetone and 2-hexanone in the CCAL analyzed 12/30/05 (Instrument MS 18)
- carbon tetrachloride, 2-chloroethyl vinyl ether, methyl tert butyl ether, 1,1,1-trichloroethane, and vinyl acetate (high bias) in the CCAL analyzed 12/30/06 (Instrument MS 04)
- methyl tert butyl ether (high bias) in the CCAL analyzed 1/2/06 (Instrument MS 04)
- 2-chloroethyl vinyl ether, methyl tert butyl ether, trans-1,3-dichloropropene, and vinyl acetate (high bias) in the CCAL analyzed 1/3/06 (Instrument MS 04)

SDG K0506873: RRF value outliers for acetone and 2-hexanone; vinyl acetate and 2-chloroethyl vinyl ether (low bias) in the CCAL analyzed 12/30/05 (Instrument MS 18)

- methyl tert butyl ether (high bias) in the CCAL analyzed 1/2/06 (Instrument MS 04)
- 2-chloroethyl vinyl ether, iodomethane, methyl tert butyl ether and vinyl acetate (high bias) in the CCAL analyzed 1/3/06 (Instrument MS 04)

Blanks (Method)

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times (5x) the concentration detected in the blank (10x for methylene chloride, acetone, and 2-butanone). If a contaminant is detected in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U-7). If the result is

also less than the reporting limit, then the result is elevated to the reporting limit. No action is taken if the sample result is greater than the action level, or for non-detected results.

Method blanks were analyzed at the appropriate frequency. A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets. Various target analytes were detected in the method blanks. However, only the following analytes were qualified as not detected in one or more samples in the associated laboratory data sets:

SDG K0506421: Methylene chloride (2 results) and styrene (1 result)

SDG K0506520: Acetone (4 results), methylene chloride (5 results) and styrene (2 results)

SDG K0506554: Acetone (3 results) and methylene chloride (3 results)

SDG K0506644: Acetone (3 results) and chloromethane (2 results)

SDG K0506744: Acetone (5 results)

SDG K0506813: Acetone (3 results), chloromethane (2 results), and naphthalene (1 result)

SDG K0506873: No method blank was analyzed with the sediment samples due to analyst error. Assessment of method blanks from immediately before and after this date showed that detected analytes and contamination levels were quite consistent. Therefore, the method blank from the following day (containing acetone, methylene chloride and naphthalene) was used to assess contamination for the samples in this SDG. Other common contaminants, such as chloromethane and styrene, were not detected in the affected samples. Two acetone results were qualified as not detected (U-7).

Blanks (Field)

After method blanks are used to evaluate all associated samples, including trip blanks and field blanks, any remaining positive results in the trip blanks are used to evaluate all associated samples, including field blanks. Finally, any remaining positive results in the field blanks are used to evaluate all associated samples. Any results designated as not detected because of field blank contamination were qualified (U-18 for trip blank contamination; U-6 for field blank contamination). A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets. Various target analytes were detected in the field and trip blanks. However, only the following analytes were qualified as not detected in one or more samples in the associated laboratory data sets:

SDG K0506644: Positive results for several analytes were reported in Rinsate Blank 1. One result for toluene was qualified as not detected (U-6). No positive results were reported in Trip_20051213.

SDG K0506744: Positive results for chloromethane were detected in both trip blanks, Trip_20051214 and Trip_20051215. Chloromethane was not detected in the associated samples, so no qualifiers were required.

SDG K0506813: Trip blanks, Trip_20051216 and Trip_20051219 had no positive results detected.

SDG K0506873: Positive results for several analytes were reported in Rinsate Blank 2. One result for 2-butanone was qualified as not detected (U-6). No positive results were reported in the trip blank, Trip_20051220.

Surrogates

The percent recovery (%R) values for the surrogates were within the specified control limits of with the exceptions noted below. Qualifiers were not assigned when only one %R value is outside the control limits. If the outliers indicated a potential high bias, only the associated positive results were estimated (J-13). If the outliers indicated a potential low bias, positive results and reporting limits were estimated (J/UJ-13).

SDG K0506421: The %R value for 1,2-dichloroethane-d4 was less than the lower control limit in Sample LW2-GBT-020.

SDG K0506644: The %R value for 1,2-dichloroethane-d4 was less than the lower control limit in Sample LW2-GBT025.

SDG K0506744: The %R value for 1,2-dichloroethane-d4 was less than the lower control limit in Sample LW2-GBT011.

SDG K0506813: The %R value for 1,2-dichloroethane-d4 was less than the lower control limit in Sample LW2-GBT018.

Matrix Spike/Matrix Spike Duplicates

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed at an acceptable frequency. All %R values were within the 70% to 130% control limits, with the exceptions noted below. When outliers were present, only the associated compounds in the parent sample were qualified. If the outliers indicated a potential high bias, only the associated positive results were estimated (J-8). If the outliers indicated a potential low bias, positive results and reporting limits were estimated (J/UJ-8). If the recovery value was less than 10%, the reporting limits were rejected (R-8). No action was taken if an outlier was present in only one of the analyses (MS or MSD) and the laboratory control sample (LCS) recoveries were acceptable. No action was taken for outliers in batched QC sets. A summary of outliers is provided in the data validation worksheets.

All MS/MSD relative percent difference (RPD) values were within the specified control limits, with the exceptions noted below. For RPD outliers, positive results for the affected compounds were estimated (J-9) in the parent sample. No action was taken for outliers in batched QC sets.

RPD and %R value outliers (with bias, when appropriate) are listed below. Data were qualified as discussed above.

SDG K0506421: Batched QC set – iodomethane (low bias), acrolein (not recovered), vinyl acetate (<10% recovery), trans-1,4-dichloro-2-butene (low bias-MSD only)

SDG K0506520: LWG2-BT032 - acrolein and vinyl acetate (<10% recovery), 2-chloroethyl vinyl ether and iodomethane (low bias), trans-1,4-dichloro-2-butene (low bias-MSD only)

SDG K0506554: LWG2-BT030 - acrolein (low bias), iodomethane (low bias-MS only)

SDG K0506644: LW2-GBT021 - acrylonitrile, 2-chloroethyl vinyl ether, iodomethane, and trans-1,4-dichloro-2-butene (low bias), acrolein and vinyl acetate (not recovered)

- Batched QC set - trans-1,4-dichloro-2-butene (low bias), chloromethane (high bias), 2-chloroethyl vinyl ether (<10% recovery and RPD outlier)

SDG K0506744: LW2-GBT003 - acrylonitrile, 2-chloroethyl vinyl ether, and trans-1,4-dichloro-2-butene (low bias), acrolein and vinyl acetate (not recovered), trans-1,4-dichloro-2-butene (RPD outlier)

SDG K0506813: Batched QC set (sediment) - vinyl acetate (not recovered), acrolein (<10% recovery), 2-chloroethyl vinyl ether and trans-1,4-dichloro-2-butene (low bias)

- Batched QC set (aqueous) - 2-chloroethyl vinyl ether (not recovered)

SDG K0506873: LW2-GBT023 - vinyl acetate and acrolein (<10% recovery), 2-chloroethyl vinyl ether and trans-1,4-dichloro-2-butene (low bias)

- Batched QC set - 2-chloroethyl vinyl ether (<10% recovery), 1,1,2-trichloroethane (high bias)

Laboratory Spike/Laboratory Spike Duplicates

All %R values were within the specified control limits and all RPD values were less than the control limit of 40% in the LCS/LCSD analyses, with the exceptions noted below.

SDG K0506644: The %R value for chloromethane was greater than the upper control limit in one LCS from 12/27/05. This analyte was not detected in the associated sample, so no qualifiers were assigned.

SDG K0506744: The LCS/LCSD %R values for iodomethane were less than the lower control limit; reporting limits were estimated (UJ-10). The %R values for vinyl acetate was greater than the upper control limit. This analyte was previously rejected (R-5B) based on CCAL outliers, and no further qualifiers were assigned.

SDG K0506813: The %R values for iodomethane were greater than the upper control limit in the LCS/LCSD pairs from 1/2/06 and 1/17/06 and the LCSD from 12/31/05. The %R values for trans-1,4-dichloro-2-butene were greater than the upper control limit in the LCS/LCSD pair from 1/17/06. No qualifiers were assigned, these analytes were not detected.

SDG K0506873: The %R values for iodomethane were greater than the upper control limit in the sediment LCS/LCSD. No qualifiers were assigned, iodomethane was not detected.

Field Replicates

Replicate sample pairs were listed below. The following acceptance criteria were applied: the RPD control limit is 50% for results greater than 5x the reporting limit (RL). For results less than 5x the RL, the absolute difference between the sample and replicate must be less than 2x the RL. No data were qualified based on field replicate precision outliers. Users of the data should consider the impact of field precision outliers on the reported results.

SDGs K0506421 & K0506520: One pair of samples, LW2-BT027-1 & LW2-BT027-2, was submitted as field replicates. All results met the acceptance criteria.

SDG K0506813: One pair of samples, LW2-GBT006-1 & LW2-GBT006-2, was submitted as field replicates. The results for dichlorodifluoromethane exceeded the acceptance criteria.

Calculation Verification

SDGs K0506421 & K0506873: Full validation, including calculation verifications, was performed on these SDGs. No calculation errors were found.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the surrogate, MS/MSD, and LCS/LCSD %R values, with the exceptions noted above. Precision was also acceptable as demonstrated by the field duplicate, MS/MSD, and LCS/LCSD RPD values, with the exceptions as noted.

Data were estimated because of a holding time outlier, initial and continuing calibration %D and RRF outliers, MS/MSD %R outliers, and precision outliers. Data were also qualified as not detected based on contamination in the associated blanks. Field replicate outliers were noted, although no qualifiers were applied.

Data were rejected because of calibration RRF and MS/MSD %R outliers. Data that have been rejected should not be used for any reason.

All other data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Benthic Sediments, Fall 2005
Semivolatile Organic Compounds by EPA Method 8270C
Columbia Analytical Services - Kelso

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

SDG	No. Samples	Validation Level
K0506421	2 Sediment	Full
K0506520	5 Sediment	Summary
K0506554	3 Sediment	Summary
K0506644	6 Sediment & 1 Field Blank	Summary
K0506744	6 Sediment	Summary
K0506813	12 Sediment	Summary
K0506873	3 Sediment & 1 Field Blank	Full

I. DATA PACKAGE COMPLETENESS

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

II. EDD TO HARDCOPY VERIFICATION

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

III TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

2 Holding Times and Sample Receipt
GC/MS Instrument Performance Check
Initial Calibration (ICAL)
2 Continuing Calibration (CCAL)
2 Laboratory Blanks
1 Field Blanks
1 Surrogate Compounds
2 Matrix Spikes/Matrix Spike Duplicates (MS/MSD)
2 Laboratory Control Samples (LCS/LCSD)
1 Field Duplicates
Internal Standards
1 Target Analyte List
1 Reporting Limits (MDL and MRL)
Compound Identification
1 Calculation Verification (Full validation only)

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

Holding Times and Sample Receipt

The validation guidance documents state that the cooler temperatures should be within an advisory temperature range of 2° to 6°C.

The laboratory received the majority of the sample coolers with temperatures below the advisory control limits, with a low of -0.3ºC. Since the sediment samples were immediately preserved by freezing, at or below -20 ºC, it was determined that these outliers did not impact data quality and no action was taken.

The QAPP-required holding time criterion for frozen sediment samples is 1 year and water samples is 7 days from date of sampling to date of extraction. The QAPP-required holding time criterion for extracts is 40 days from extraction to analysis. All extracts were analyzed within the holding time criterion, with the following exception.

SDG K0506644: Sample Rinsate Blank 1 was re-extracted and re-analyzed due to a loss of the original method blank and LCS. The re-extraction was performed beyond the holding time limit. Positive results and reporting limits were estimated (J/UJ-1) in this sample.

Continuing Calibration

All relative response factor (RRF) values were greater than the 0.05 minimum control limit. All percent difference (%D) values were within the ±25% control limit for all continuing calibrations (CCAL), with the exceptions noted below. When the %D outlier indicates a potential high bias, and there were no positive results for these compounds, no qualifiers were required.

SDG K0506813: N-nitrosodimethylamine (low bias)

Laboratory Blanks

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times (5x) the concentration detected in the blank. If a contaminant is detected in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U-7). If the result is also less than the reporting limit, then the result is elevated to the reporting limit. No action is taken if the sample result is greater than the action level, or for non-detected results.

Method blanks were analyzed at the appropriate frequency. A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets. Various target analytes were detected in the method blanks. However, only the following analytes were qualified as not detected in one or more samples in the associated laboratory data sets:

SDG K0506421: Bis (2-ethylhexyl) phthalate (2 results)

SDG K0506520: Bis (2-ethylhexyl) phthalate (1 result) and di-n-butyl phthalate (4 results)

SDG K0506554: Bis (2-ethylhexyl) phthalate (2 results)

SDG K0506644: Bis (2-ethylhexyl) phthalate (2 results), butyl benzyl phthalate (1 result), carbazole (1 result), di-n-butyl phthalate (1 result)

SDG K0506813: Bis (2-ethylhexyl) phthalate (7 results) and di-n-butyl phthalate (8 results)

SDG K0506873: Chrysene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)-fluoranthene, benzo(g,h,i)perylene, dibenz(a,h)anthracene, di-n-butyl phthalate, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, pyrene (1 result each)

Field Blanks

After method blanks are used to evaluate all associated samples, including field blanks, any remaining positive results in the field blanks are used to evaluate all associated samples. Any results designated as not detected because of field blank contamination were qualified (U-6). A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets. Various target analytes were detected in the field blanks. However, the compounds were either not detected in the associated samples, or were previously qualified as not detected based on method blank contamination, or were present at concentrations greater than the action level. No data were qualified based on field blank contamination.

SDG K0506644: Positive results for bis (2-ethylhexyl) phthalate and diethyl phthalate were reported in field blank Rinsate Blank 1.

SDG K0506873: Positive results for naphthalene, 2-methylnaphthalene, acenaphthene, fluorene, azobenzene, bis(2-ethylhexyl)phthalate, and diethyl phthalate were reported in Rinsate Blank 2.

Surrogates

The percent recovery (%R) values for the surrogates were within the specified control limits of with the exceptions noted below. Qualifiers were only assigned when more than one %R value per fraction (acid or base-neutral) is outside the control limits. If the outliers indicated a potential high bias, only the associated positive results were estimated (J-13). If the outliers indicated a potential low bias, positive results and reporting limits were estimated (J/UJ-13).

SDG K0506520: terphenyl-d14 (low bias) in Sample LWG2-BT022

SDG K0506554: terphenyl-d14 (low bias) in Samples LWG2-BT029, LWG2-BT030, and LWG2-BT031

SDG K0506644:

- terphenyl-d14 (low bias) Samples LW2-GBT021 and LW2-GBT024
- 2,4,6-tribromophenol (low bias, acid fraction) in Sample LW2-GBT024

SDG K0506744: terphenyl-d14 (low bias) in Sample LW2-GBT008.

Matrix Spike/Matrix Spike Duplicates

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed at an acceptable frequency. All %R values were within the 70% to 130% control limits, with the exceptions noted below. When outliers were present, only the associated compounds in the parent sample were qualified. If the outliers indicated a potential high bias, only the associated positive results were estimated (J-8). If the outliers indicated a potential low bias, positive results and reporting limits were estimated (J/UJ-8). No action was taken if an outlier was present in only one of the analyses (MS or MSD) and the laboratory

control sample (LCS) recoveries were acceptable. No action was taken for outliers in batched QC sets. A summary of outliers is provided in the data validation worksheets.

All MS/MSD relative percent difference (RPD) values were within the specified control limits, with the exceptions noted below. For RPD outliers, positive results for the affected compounds were estimated (J-9) in the parent sample.

RPD and %R value outliers (with bias, when appropriate) are listed below. Data were qualified as discussed above.

SDG K0506421: No MS/MSD analyses were submitted with this SDG. Accuracy and precision were assessed using an LCS/LCSD.

SDG K0506520: LWG2-BT032 - azobenzene and 2,4-dinitrotoluene (high bias), aniline and 3,3'-dichlorobenzidine (<10% recovery), and an RPD outlier for di-n-butyl phthalate. There was also a high bias for bis (2-ethylhexyl) phthalate in the MSD only.

SDG K0506554: Batched QC set - aniline and 3,3'-dichlorobenzidine (<10% recovery).

SDG K0506644: LW2-GBT013 - aniline and 3,3'-dichlorobenzidine (<10% recovery).

SDG K0506744: LW2-GBT004 - aniline (<10% recovery), 2,4-dimethylphenol (<10% recovery in the MSD only), and RPD outliers for benzoic acid, 2,4-dimethylphenol, and 2-methyl-4,6-dinitrophenol.

SDG K0506813: LW2-GBT002 - aniline and 3,3'-dichlorobenzidine (<10% recovery), 4-chloro-aniline and 3-nitroaniline (<10% recovery in the MS only), hexachlorocyclopentadiene (<10% %recovery in the MSD only), and RPD outliers for benzoic acid, bis (2-ethylhexyl) phthalate, 4-chloroaniline, hexachlorocyclopentadiene, 3-nitroaniline, and 4-nitroaniline.

SDG K0506873: LW2-GBT023 - aniline and 3,3’-dichlorobenzidine (<10% recovery), 4-chloro-aniline (<10% recovery in the MSD only), and RPD outliers for benzoic acid, 2,4-nitrophenol, 4-chloroaniline, and 2-methyl-4,6-dinitrophenol.

Laboratory Control Sample/Laboratory Control Sample Duplicates

The %R values for aniline were less than the initial lower control limit. However, the narrative indicated that these initial control limits were default limits that were only used until more data points were collected to calculate statistical control limits. The %R values for aniline were within the revised control limits unless stated below.

SDG K0506421: Benzoic acid was not recovered from the LCS/LCSD analyses; reporting limits were rejected (R-10) in the associated samples.

SDG K0506520: The %R values for aniline, benzoic acid, and 2,4-dimethylphenol were less than 10%; reporting limits for these analytes were rejected (R-10) in the associated samples. The RPD values for benzoic acid and 2,4-dimethylphenol exceeded the control limit. These analytes were not detected in associated samples, no qualifiers were applied.

SDGs K0506554, K0506644: The LCS %R value for aniline was less than 10%; reporting limits were rejected (R-10). The RPD values were outside control limits for all analytes except benzoic acid and 2,4-dinitrophenol. Associated positive results were estimated (J-9).

SDG K0506744: The LCSD %R values for 4-nitrophenol and 4-nitroaniline were less than lower control limits. No action was taken based on acceptable recoveries in the MS, MSD, and LCS analyses.

SDG K0506813: The LCS %R values for 1,3-dichlorobenzene and 1,4-dichlorobenzene were less than the lower control limits. No action was taken, based on acceptable recoveries in the MS, MSD, and LCSD analyses. The RPD value for 2,4-dimethylphenol exceeded the control limit, no qualifiers were applied as this analyte was not detected.

SDG K0506873: The LCSD %R value for benzoic acid was less than 10% and the RPD value was outside control limits; reporting limits were estimated (UJ-10) in the associated samples. The RPD value for 2,4-dimethylphenol was outside control limits, no qualifiers were applied, this analyte was not detected.

Field Replicates

Replicate sample pairs were listed below. The following acceptance criteria were applied: the RPD control limit is 50% for results greater than 5x the reporting limit (RL). For results less than 5x the RL, the absolute difference between the sample and replicate must be less than 2x the RL. No data were qualified based on field replicate precision outliers. Users of the data should consider the impact of field precision outliers on the reported results.

SDGs K0506421 & K0506554: One pair of samples, LW2-BT027-1 & LW2-BT027-2, was submitted as field replicates. The field precision met the acceptance criteria.

SDG K0506831: One pair of samples, LW2-GBT006-1 & LW2-GBT006-2, was submitted as field replicates. The results for bis (2-ethylhexyl) phthalate exceeded the acceptance criteria.

Target Analyte List

Dibenzofuran was reported from a separate analysis (EPA 8270C-SIM) with the PAH compounds.

Compound Identification

It was noted by the laboratory that 3-methylphenol could not be separated from 4-methylphenol. Also, 1,2-diphenylhydrazine was reported as azobenzene.

Reporting Limits (Method Detection Limit and Method Reporting Limit)

SDGs K0506520, K0506644, K0506744: The method detection limits (MDL) for several compounds were slightly greater than the QAPP MDL. No action was taken since the QAPP method reporting limits (MRL) were met. Several samples were diluted due to matrix interference. Reporting limits were elevated accordingly.

Calculation Verification

SDGs K0506421 & K0506873: Full validation, including calculation verifications, was performed on these SDGs. No calculation errors were found.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the surrogate, MS/MSD, and LCS/LCSD %R values, with the exceptions noted above. Precision was also acceptable as demonstrated by the field replicate, MS/MSD, and LCS/LCSD RPD values, with the exceptions as noted.

Data were qualified as estimated because of holding time, LCS/LCSD and MS/MSD recovery and precision outliers, and calibration outliers. Data were also qualified as not detected based on contamination in the associated method and field blanks. Field replicate precision outliers were also noted.

Data were rejected because of LCS/LCSD and MS/MSD recovery outliers. Data that has been rejected should not be used for any purpose.

All other data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Benthic Sediments, Fall 2005
Polyaromatic Hydrocarbons (PAH) by EPA Method 8270C-SIM
Columbia Analytical Services – Kelso

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

SDG	No. Samples	Validation Level
K0506421	2 Sediment	Full
K0506520	5 Sediment	Summary
K0506554	3 Sediment	Summary
K0506644	6 Sediment	Summary
K0506744	6 Sediment	Summary
K0506813	12 Sediment	Summary
K0506873	3 Sediment	Full

I. DATA PACKAGE COMPLETENESS

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

II. EDD TO HARDCOPY VERIFICATION

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

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

1 Holding Times and Sample Receipt
GC/MS Instrument Performance Check
Initial Calibration (ICAL)
Continuing Calibration (CCAL)
2 Laboratory Blanks
1 Field Blanks
1 Surrogate Compounds
2 Matrix Spikes/Matrix Spike Duplicates (MS/MSD)
Laboratory Control Samples (LCS/LCSD)
1 Field Duplicates
Internal Standards
1 Target Analyte List
1 Reporting Limits (MDL and MRL)
Compound Identification (Full validation only)
1 Calculation Verification (Full validation only)

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

Holding Times and Sample Receipt

The validation guidance documents state that the cooler temperatures should be within an advisory temperature range of 2° to 6°C.

The laboratory received the majority of the sample coolers with temperatures below the advisory control limits, with a low of -0.3ºC. Since the sediment samples were immediately preserved by freezing, at or below -20 ºC, it was determined that these outliers did not impact data quality and no action was taken.

The QAPP-required holding time criterion for frozen sediment samples is 1 year and water samples is 7 days from date of sampling to date of extraction. The QAPP-required holding time criterion for extracts is 40 days from extraction to analysis. All samples were prepared and analyzed within the holding time criteria.

Laboratory Blanks

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times the concentration detected in the blank. If a contaminant is detected in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U-7). If the result is also less than the reporting limit, then the result is elevated to the reporting limit. No action is taken if the sample result is greater than the action level, or for non-detected results.

Method blanks were analyzed at the appropriate frequency. A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets. Various target analytes were detected in the method blanks. However, only the following analytes were qualified as not detected in one or more samples in the associated laboratory data sets:

SDG K0506421: Naphthalene (one result)

SDG K0506520: 2-Methylnaphthalene (two results) and naphthalene (five results)

SDG K0506554: Fluorene (one result)

SDG K0506744: Naphthalene (two results)

SDG K0506831: Naphthalene (four results)

SDG K0506873: Naphthalene (two results)

SDG K0506644: The water method blank associated with Rinsate Blank 1 was submitted with the SVOC package. Nine of 18 analytes were qualified as not detected in the field blank.

Field Blanks

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

SDG K0506644: Positive results for 2-methylnaphthalene and naphthalene were reported in field blank Rinsate Blank 1, which was submitted with the SVOC package. No qualifiers were applied; all results were greater than the action level.

SDG K0506873: Positive results for acenaphthene, fluorene, 2-methylnaphthalene and naphthalene were reported in field blank Rinsate Blank 2, which was submitted with the SVOC package. No qualifiers were applied; all results were greater than the action level.

Surrogates

SDG K0506644: The percent recovery (%R) value for terphenyl-d14 was less than the lower control limit in Sample LW2-GBT024. No action was taken for a single outlier.

Matrix Spike/Matrix Spike Duplicates

SDG K0506520: The matrix spike/matrix spike duplicate (MS/MSD) analysis was performed on Sample LWG2-BT032. The relative percent difference (RPD) values for acenaphthene, dibenzofuran, fluorene, and phenanthrene were greater than the control limits. Positive results for these compounds were estimated (J-9) in the parent sample.

SDGs K0506554 & K0506644: Sample LW2-GBT013 was used for the MS/MSD analysis. The RPD values for fluoroanthene, benz(a)anthracene, chrysene, pyrene, benzo(b)fluoroanthene, benzo(k)fluoranthene, and benzo(a)pyrene were greater than the control limits, and the MS percent recovery (%R) values were greater than upper control limits for fluoranthene and pyrene. Results for these analytes were estimated (J-9) in the parent sample. The MS %R values for fluoranthene and pyrene exceeded upper control limits; no qualifiers were applied based on acceptable recoveries in the MSD, laboratory control sample (LCS), and LCS duplicate (LCSD).

SDG K0506744: The MS/MSD analysis was performed on Sample LW2-GBT004. The %R values for pyrene, benzo(b)fluoroanthene, benzo(k)fluoroanthene, benz(a)anthracene, chrysene, and benzo(a)pyrene were less than the lower control limits. Positive results were estimated (J-8) in the parent sample.

SDG K0506813: The MS/MSD analysis was performed on Sample LW2-GBT002. The RPD value for fluoranthene exceeded the control limit. The positive result was estimated (J-9) in the parent sample.

Field Replicates

Replicate sample pairs were listed below. The following acceptance criteria were applied: the RPD control limit is 50% for results greater than five times (5x) the reporting limit (RL). For results less than 5x the RL, the absolute difference between the sample and replicate must be less than 2x the RL. No data were qualified based on field replicate precision outliers. Users of the data should consider the impact of field precision outliers on the reported results.

SDGs K0506421 & K0506554: One pair of samples, LW2-BT027-1 & LW2-BT027-2, was submitted as field replicates. Results for naphthalene, fluoroanthene and phenanthrene exceeded the acceptance criteria.

SDG K0506831: One pair of samples, LW2-GBT006-1 & LW2-GBT006-2, was submitted as field replicates. All RPD and absolute difference values were acceptable.

Target Analyte List

Dibenzofuran was listed among the semivolatile analytes in the QAPP. However, it was analyzed and reported with the PAH analysis.

Calculation Verification

SDGs K0506421 & K0506873: Calculation verifications were performed on these SDGs only. No anomalies were found.

Reporting Limits (Method Detection Limits and Method Reporting Limits)

The method detection limits (MDL) for benzo(g,h,i)perylene and dibenzofuran were greater than the QAPP MDL. No action was taken since the QAPP method reporting limits (MRL) were met. Several samples were diluted to bring target concentrations within range. Reporting limits were elevated accordingly.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the surrogate, MS/MSD, and LCS/LCSD %R values, with the exceptions noted above. Precision was also acceptable as demonstrated by the field duplicate, MS/MSD, and LCS/LCSD RPD values, with the exceptions as noted.

Data were qualified as estimated because of MS/MSD %R and precision outliers. Data were qualified as not detected based on method blank contamination. Field replicate outliers were noted, although no qualifiers were applied.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Benthic Sediments, Fall 2005
Chlorophenols by EPA Method 8151A
Columbia Analytical Services - Kelso

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

SDG	No. Samples	Validation Level
K0506421	2 Sediment	Full
K0506520	5 Sediment	Summary
K0506554	3 Sediment	Summary
K0506644	6 Sediment & 1 Field Blank	Summary
K0506744	6 Sediment	Summary
K0506813	12 Sediment	Summary
K0506873	3 Sediment & 1 Field Blank	Full

I. DATA PACKAGE COMPLETENESS

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

II. EDD TO HARDCOPY VERIFICATION

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

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

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

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

Holding Times and Sample Receipt

The validation guidance documents state that the cooler temperatures should be within an advisory temperature range of 2° to 6°C.

The laboratory received the majority of the sample coolers with temperatures below the advisory control limits, with a low of -0.3ºC. Since the sediment samples were immediately preserved by freezing, at or below -20 ºC, it was determined that these outliers did not impact data quality and no action was taken.

The QAPP-required holding time criterion for frozen sediment samples is 1 year and water samples is 7 days from date of sampling to date of extraction. The QAPP-required holding time criterion for extracts is 40 days from extraction to analysis. All extracts were analyzed within the holding time criterion, with the following exception.

SDG K0506554: Sample LWG2-BT030 was re-extracted 12 days outside of holding time, as the original extract was compromised by a spiking error. All results and reporting limits were reported from the re-extraction and were qualified as estimated (UJ-1).

Blanks (Method)

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times the concentration detected in the blank. If a contaminant is detected in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U-7). If the result is also less than the reporting limit, then the result is elevated to the reporting limit. No action is taken if the sample result is greater than the action level, or for non-detected results.

Method blanks were analyzed at the appropriate frequency. A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets. Various target analytes were detected in the method blanks. However, only the following analytes were qualified as not detected in one or more samples in the associated laboratory data sets:

SDG K0506520: Pentachlorophenol (2 results)

Blanks (Field)

After method blanks are used to evaluate all associated samples, including field blanks, any remaining positive results in the field blanks are used to evaluate all associated samples. Any results designated as not detected because of field blank contamination were qualified (U-6).

SDG K0506644: No positive results were detected in the field blank Rinsate Blank 1.

SDG K0506873: No positive results were detected in the field blank Rinsate Blank 2.

Matrix Spike/Matrix Spike Duplicates

SDG K0506520: Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed using batch QC Samples KWG0521169-1,2. The percent recovery (%R) values several analytes were

greater than the upper control limits. Since the parent sample was not taken from this SDG, no action was taken.

SDGs K0506554 & K0506644: Due to a spiking error no MSD analysis was submitted with these SDGs. Recoveries from the laboratory control sample (LCS) and MS analyses were within control limits. However, precision could not be assessed.

Laboratory Control Sample/Laboratory Control Sample Duplicates

SDG K0506873: The %R values for pentachlorophenol and 2,4,6-trichlorophenol exceeded the upper control limit in the aqueous LCS. No qualifiers were applied, these analytes were not detected in the associated samples.

The %R value for pentachlorophenol exceeded the upper control limit in the sediment LCS. Results for pentachlorophenol were estimated (J-10) in two samples.

Field Replicates

The following acceptance criteria were applied: the relative percent difference (RPD) control limit is 50% for results greater than five times (5x) the reporting limit (RL). For results less than 5x the RL, the absolute difference between the sample and replicate must be less than 2x the RL. No qualifiers were applied based on field replicate precision outliers. However, any outliers were noted below. Data users should take field precision into account when interpreting sample data.

SDGs K0506421 & K0506554: One pair of samples, LW2-BT027-1 & LW2-BT027-2, was submitted as field replicates. No target analytes were detected. Field precision was acceptable.

SDG K0506813: One pair of samples, LW2-GBT006-1 & LW2-GBT006-2, was submitted as field replicates. All RPD and absolute difference values were acceptable.

Reporting Limits (Method Detection Limit and Method Reporting Limit)

The reporting limits were elevated for several analytes in most samples due to non-target background components or where dilution was required. These limits exceeded the QAPP limits for several compounds.

Compound Identification

The laboratory that 2,3,5,6-tetrachlorophenol could not be separated from 2,3,4,6-tetrachlorophenol.

The results from the two analytical columns were compared for agreement. In cases where the percent difference (%D) value between the two columns was greater than 40%, the laboratory flagged the results with a “P”. Where the %D was between 40% and 60% the results were estimated (J-3). Where the %D was greater than 60% the results were tentatively identified (NJ-3).

SDG K0506520: In Sample LWG2-BT022 2,3,4,5-tetrachlorophenol was estimated (J-3).

SDG K0506554: In Sample LWG2-BT031 pentachlorophenol was estimated (J-3).

SDG K0506644: Two results for pentachlorophenol and one result for 2,4,5-trichlorophenol were tentatively identified (NJ-3).

SDG K0506744: One result for each 2,3,4,5-tetrachlorophenol and 2,4,5-trichlorophenol were estimated (J-3).

SDG K0506813: For pentachlorophenol one result was estimated (J-3) and three results were tentatively identified (NJ-3).

Calculation Verification

SDGs K0506421, K0506873: Calculation verification was performed on these SDGs. No calculation errors were found.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the surrogate, MS/MSD, and LCS/LCSD %R values, with the exceptions noted above. Precision was also acceptable as demonstrated by the field duplicate, MS/MSD, and LCS/LCSD RPD values, with the exceptions as noted.

Data were estimated based on a holding time outlier and an LCS %R outlier. Data were qualified as estimated or tentatively identified based on differences between the results from the two analytical columns. Data were also qualified as not detected based on contamination in the associated method blanks.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Benthic Sediments, Fall 2005
Chlorinated Pesticides by EPA Method 8081A
Columbia Analytical Services – Kelso

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

SDG	No. Samples	Validation Level
K0506421	2 Sediments	Full
K0506520	5 Sediments	Summary
K0506554	3 Sediments	Summary
K0506644	6 Sediments & 1 Field Blank	Summary
K0506744	6 Sediments	Summary
K0506813	12 Sediments	Summary
K0506873	3 Sediments & 1 Field Blank	Summary

I. DATA PACKAGE COMPLETENESS

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

II. EDD TO HARDCOPY VERIFICATION

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

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

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

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

Holding Times and Sample Receipt

The validation guidance documents state that the cooler temperatures should be within an advisory temperature range of 2° to 6°C.

The laboratory received the majority of the sample coolers with temperatures below the advisory control limits, with a low of 0.1ºC. Since the sediment samples were immediately preserved by freezing, at or below -20 ºC, it was determined that these outliers did not impact data quality and no action was taken.

The QAPP-required holding time criterion for frozen sediment samples is 1 year and water samples is 7 days from date of sampling to date of extraction. The QAPP-required holding time criterion for extracts is 40 days from extraction to analysis. All samples were prepared and analyzed within the holding time criteria.

Continuing Calibration (CCAL)

SDGs K0506813 and K0506873: The percent difference (%D) value for toxaphene exceeded the 25% control limit due to increased response. Toxaphene was not detected, so no action was required.

Field Blanks

After method blanks are used to evaluate all associated samples, including field blanks, any remaining positive results in the field blanks are used to evaluate all associated samples. Any results designated as not detected because of field blank contamination were qualified (U-6).

SDG K0506644: One field blank, Rinsate Blank 1, was included with this SDG. No positive results for target analytes were reported in this blank.

SDG K0506873: One field blank, Rinsate Blank 2, was submitted. A positive result for 4,4′-DDT was reported. Associated field sample results were greater than the action level, no action was taken.

Surrogates

SDG K0506644: The percent recovery (%R) value for tetrachloro-m-xylene was greater than the upper control limit in Sample LW2-GBT017. No action was taken as the outlier was due to matrix interference and dilution (10x).

Matrix Spikes/Matrix Spike Duplicates

Matrix spike/matrix spike duplicate (MS/MSD) were analyzed at the appropriate frequency. For the analytical batches noted below, one or more target analytes were reported outside control limits. A summary of outliers is provided in the data validation worksheets.

SDG K0506421: The %R values for hexachlorobenzene, 2,4'-DDE, 4,4'-DDE, endrin, 4,4'-DDD, 4,4'-DDT, endrin aldehyde, toxaphene, hexachloroethane and hexachlorobutadiene were outside the control limits in the MS/MSD set performed on the Batch QC Sample associated with this SDG. No action was taken as the parent sample was not from this SDG.

SDG K0506644: The %R values for hexachlorobenzene, hexachloroethane and hexachlorobutadiene were less than the lower control limit in the MS/MSD set prepared using Sample LW2-GBT013. The results for these analytes were estimated (J-8) in the parent sample.

SDGs K0506520, K0506554 & K0506744: The %R values for hexachlorobenzene, hexachloroethane and hexachlorobutadiene were less than the lower control limits in the MS/MSD set performed on the Batch QC Sample associated with these SDGs. No action was taken as the parent sample was not from these SDGs.

SDGs K0506813, K0506873: For Sample LW2-GBT006-1 MS/MSD, the %R values for hexachlorobenzene were less than the lower control limit. The result for this analyte in the parent sample was estimated (UJ-8) to indicate a possible low bias.

For LW2-GBT006-2 MS/MSD, the %R values for hexachloroethane and hexachlorobutadiene were less than the lower control limit. The results for these analytes in the parent sample were estimated (J/UJ-8) to indicate a possible low bias. The %R value for mirex was less than the lower control limit from the MSD only. No qualifier was applied since %R values from the MS and LCS were within control.

Laboratory Control Samples

All %R values were within the control limits of 70% to 130% and all RPD values were less than the control limit of 20% in the laboratory control samples/laboratory control sample duplicate (LCS/LCSD) analyses, with the exceptions noted below. A complete list of all %R outliers is present in the validation worksheets.

SDG K0506421: The %R values for 15 analytes were less than the lower control limits. Positive results and reporting limits for these analytes were estimated (J/UJ-10) in the associated samples.

SDG K0506813: The %R values for hexachloroethane and hexachlorobutadiene were less than the lower control limit in the LCS. The associated results and reporting limits were estimated (J/UJ-10).

SDG K0506873: The relative percent difference (RPD) values for hexachloroethane and hexachlorobutadiene exceeded the control limit in the LCS/LCSD set prepared with the field blank. No positive results were identified in the field blank, so no qualifiers were required. The %R values for hexachloroethane and hexachlorobutadiene were less than the lower control limit in the sediment LCS. The associated results and reporting limits were estimated (J/UJ-10).

Field Replicates

Replicate sample pairs were listed below. The following acceptance criteria were applied: the relative percent difference (RPD) control limit is 50% for results greater than five times (5x) the reporting limit (RL). For results less than 5x the RL, the absolute difference between the sample and replicate must be less than 2x the RL. No data were qualified based on field replicate precision outliers. Users of the data should consider the impact of field precision outliers on the reported results.

SDGs K0506421 & K0506520: One pair of samples, LW2-BT027-1 & LW2- BT027-2, was submitted as field replicates. Results for dieldrin, 2,4'-DDD, 4,4'-DDD, methoxychlor, and cis-nonachlor exceeded the acceptance criteria for field precision.

SDG K0506813: One pair of samples, LW2-GBT006-1 & LW2-GBT006-2, was submitted as field replicates. Results for 4,4'-DDT and 2,4'-DDT exceeded the acceptance criteria for field precision.

Compound Identification

The results from the two analytical columns were compared for agreement. In cases where the RPD value between the two columns was greater than 40% the reported result was "P" flagged by the laboratory. As the elevated RPD value may indicate the presence of an interferent that may result in a high bias, when the RPD value was greater than 25% but less than 60% the reported value was estimated (J-3). If the RPD value was greater than 60%, the result was qualified as a tentative identification (NJ). Refer to the data validation worksheets for a detailed list of these outliers.

SDG K0506421: Twelve results were estimated (J-3) and four were tentatively identified (NJ-3).

SDG K0506520: Eighteen results were estimated (J-3) and 16 were tentatively identified (NJ-3).

SDG K0506554: Twelve results were estimated (J-3) and 8 were tentatively identified (NJ-3).

SDG K0506644: Thirty results were estimated (J-3) and 19 were tentatively identified (NJ-3).

SDG K0506744: Nine results were estimated (J-3) and 10 were tentatively identified (NJ-3).

SDG K0506813: Thirty results were estimated (J-3) and 20 were tentatively identified (NJ-3).

SDG K0506873: The 4,4′-DDT result in Sample Rinsate Blank 2 was estimated (J-3). Among sediment samples, ten results were estimated (J-3) and seven were tentatively identified (NJ-3).

Reporting Limits (Method Detection Limit and Method Reporting Limit)

The laboratory elevated the reporting limits for some analytes in most samples due to background interferences. Also, several samples were analyzed at dilution and reporting limits were elevated accordingly.

Calculation Verification

SDG K0506873: A full (Level IV) validation was performed on this SDG. No anomalies were identified.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the surrogate, MS/MSD, and LCS/LCSD %R values, with the exceptions noted above. Precision was also acceptable as demonstrated by the field duplicate, MS/MSD, and LCS/LCSD RPD values, with the exceptions as noted.

Data were estimated due to LCS and MS/MSD accuracy outliers and poor agreement between the analytical columns. Field replicate outliers were noted, although no qualifiers were applied.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Benthic Sediments, Fall 2005
PCB – Aroclors by EPA Method 8082
Columbia Analytical Services - Kelso

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

SDG	No. Samples	Validation Level
K0506421	2 Sediments	Full
K0506520	5 Sediments	Summary
K0506554	3 Sediments	Summary
K0506644	6 Sediments & 1 Field Blank	Summary
K0506744	6 Sediments	Summary
K0506813	12 Sediments	Summary
K0506873	3 Sediments & 1 Field Blank	Full

I. DATA PACKAGE COMPLETENESS

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

II. EDD TO HARDCOPY VERIFICATION

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

III. TECHNICAL DATA VALIDATION

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

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

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

Holding Times and Sample Receipt

The validation guidance documents state that the cooler temperatures should be within an advisory temperature range of 2° to 6°C.

The laboratory received the majority of the sample coolers with temperatures below the advisory control limits, with a low of -0.3ºC. Since the sediment samples were immediately preserved by freezing, at or below -20 ºC, it was determined that these outliers did not impact data quality and no action was taken.

The QAPP-required holding time criterion for frozen sediment samples is 1 year and water samples is 7 days from date of sampling to date of extraction. The QAPP-required holding time criterion for extracts is 40 days from extraction to analysis. All samples were prepared and analyzed within the holding time criteria.

Field Blanks

After method blanks are used to evaluate all associated samples, including field blanks, any remaining positive results in the field blanks are used to evaluate all associated samples. Any results designated as not detected because of field blank contamination were qualified (U-6). A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets. No target analytes were detected in the field blanks.

SDG K0506644: One field blank, Rinsate Blank 1, was submitted with this SDG.

SDG K0506873: One field blank, Rinsate Blank 2, was submitted with this SDG.

Matrix Spike/Matrix Spike Duplicate

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed at an acceptable frequency. All %R values were within the 70% to 130% control limits, with the exceptions noted below. When outliers were present, only the associated compounds in the parent sample were qualified. If the outliers indicated a potential high bias, only the associated positive results were estimated (J-8). If the outliers indicated a potential low bias, positive results and reporting limits were estimated (J/UJ-8).

All MS/MSD relative percent difference (RPD) values were within the specified control limits, with the exceptions noted below. For RPD outliers, positive results for the affected compounds were estimated (J-9) in the parent sample.

RPD and %R value outliers (with bias, when appropriate) are listed below. Data were qualified as discussed above.

SDG K0506813: LW2-GBT002 - Aroclor 1016 (high bias); Aroclor 1260 (high bias – MSD & RPD value outlier)

SDG K0506873: Batch QC sample - Aroclor 1016 (high bias); Aroclor 1260 (high bias – MSD & RPD value outlier)

Field Replicates

Replicate sample pairs were listed below. The following acceptance criteria were applied: the RPD control limit is 50% for results greater than five times (5x) the reporting limit (RL). For results less than 5x the RL, the absolute difference between the sample and replicate must be less than 2x the RL. No data were qualified based on field replicate precision outliers. Users of the data should consider the impact of field precision outliers on the reported results.

SDGs K0506421 & K0506520: One pair of samples, LW2-BT027-1 & LW2-BT027-2, was submitted as field replicates. Aroclor 1254 results exceeded the acceptance criteria for field precision.

SDG K0506813: One pair of samples, LW2-GBT006-1 & LW2-GBT006-2, was submitted as field replicates. Aroclor 1254 and Aroclor 1260 results exceeded the acceptance criteria for field precision.

Compound Identification

The results from the two analytical columns were compared for agreement. In cases where the RPD value between the two columns was greater than 40% the reported result was "P" flagged by the laboratory. As the elevated RPD value may indicate the presence of an interferent that may result in a high bias, when the RPD value was greater than 25% but less than 60% the reported value was estimated (J-3). If the RPD value was greater than 60%, the result was qualified as a tentative identification (NJ). Refer to the data validation worksheets for a detailed list of these outliers.

SDG K0506421: In Sample LW2-GBT-027-1 Aroclor 1254 and Aroclor 1260 were estimated (J-3).

SDG K0506520: Two results for Aroclor 1260 were estimated (J-3) and one result for Aroclor 1242 was estimated (J-3).

SDG K0506554: In Sample LWG2-BT030 Aroclor 1254 was estimated (J-3) and in Sample LWG2-BT029 Aroclor 1260 was estimated (J-3).

SDG K0506644: In Sample LW2-GBT024 Aroclor 1254 was estimated (J-3) and in Sample LW2-GBT025 Aroclor 1260 was estimated (J-3).

SDG K0506744: In Sample LWG2-GBT008 Aroclor 1254 was estimated (J-3) and in Sample LWG2-GBT009 Aroclor 1260 was estimated (J-3).

SDG K0506813: Three results for Aroclor 1254 and Aroclor 1260 were qualified as estimated (J-3).

SDG K0506873: Three results for Aroclor 1260 and one result for Aroclor 1254 were qualified as estimated (J-3).

Reporting Limits (Method Detection Limit and Method Reporting Limit)

The laboratory elevated the reporting limits for some analytes in most samples due to background interferences. Also, several samples were analyzed at dilution and reporting limits were elevated accordingly.

Calculation Verification (Full validation only)

SDGs K0506421& K0506873: Calculation verifications were performed on these SDGs. No transcription or calculation errors were found.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the surrogate, laboratory control sample, and MS/MSD %R values, with the exceptions noted above. Precision was acceptable as demonstrated by the RPD values for the MS/MSD and field duplicate analyses, with the exceptions as noted.

Data were estimated due to poor agreement between the two analytical columns. Field precision outliers were noted, although no qualifiers were applied.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Benthic Sediments, Fall 2005
PCB Congeners by EPA Method 1668
Alta Analytical Laboratory – El Dorado Hills

This report documents the review of analytical data from the analyses of sediment samples and the associated laboratory quality control (QC) samples. Alta Analytical Laboratory, Inc., El Dorado Hills, California, analyzed the samples.

SDG	No. Samples	Validation Level
27062	13 Sediments & 1 Field Blank	Full
27100	24 Sediments	Summary
27101	1 Field Blank	Compliance

I. DATA PACKAGE COMPLETENESS

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

II. EDD TO HARDCOPY VERIFICATION

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

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

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

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

Holding Times and Sample Receipt

The validation guidance documents state that the cooler temperatures should be within an advisory temperature range of 2° to 6°C.

The laboratory received the majority of the sample coolers with temperatures below the advisory control limits, with a low of 0.3ºC. Since the sediment samples were immediately preserved by freezing, at or below -20 ºC, it was determined that these outliers did not impact data quality and no action was taken.

The QAPP-required holding time criterion for frozen sediment samples is 1 year and water samples is 7 days from date of sampling to date of extraction. The QAPP-required holding time criterion for extracts is 40 days from extraction to analysis. All extracts were analyzed within the holding time criterion, with the following exceptions.

SDG 27062: Samples LWG2-BT027-2, LWG2-BT031, LWG2-BT024, and LWG2-BT027-3 were received with broken jars. Samples LWG2-BT028 and LWG2-BT025 were received with cracked caps and Sample LWG2-BT022 was received with the cap separated from the jar. The laboratory contacted Integral Consulting and was instructed to continue with the analysis. No action was taken.

Laboratory Blanks

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times the concentration detected in the blank. If a contaminant is detected in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U-7). If the result is also less than the reporting limit, then the result is elevated to the reporting limit. No action is taken if the sample result is greater than the action level, or for non-detected results.

Method blanks were analyzed at the appropriate frequency. A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets. Various target analytes were detected in the method blanks. With the exception of PCB169, the analytes were either not detected in the associated samples, or were present at concentrations greater than the action level. The following data were qualified as not detected:

SDG 27062: PCB169 (14 results)

SDG 27100: PCB169 (26 results)

Field Blanks

After method blanks are used to evaluate all associated samples, including field blanks, any remaining positive results in the field blanks are used to evaluate all associated samples. Any results designated as not detected because of field blank contamination were qualified (U-6). A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets. Various target analytes were detected in the field blanks. The analytes were either not detected in the associated samples, or were present at concentrations greater than the action levels.

SDG 27062: One field blank, Rinsate Blank 1, was submitted with this SDG.

SDG 27101: One field blank, Rinsate Blank 2, was submitted with this SDG.

Labeled Compound Recovery

SDG 27062: The percent recovery (%R) value for $^{13}C_{12}$-PCB1 was less than the 25% lower control limit (at 18.6%) in the sediment method blank. Qualifiers are not assigned to QC samples.

Matrix Spikes/Matrix Spike Duplicates

SDGs 27062, 27100, & 27101: No matrix spikes/matrix spike duplicates (MS/MSD) were analyzed with these SDGs.

Laboratory Duplicate

Laboratory duplicates were analyzed at the proper frequency. The following acceptance criteria were applied: the relative percent difference (RPD) control limit is 50% for results greater than five times (5x) the reporting limit (RL). For results less than 5x the RL, the absolute difference between the sample and duplicate must be less than 2x the RL. For RPD values exceeding the control limits, associated positive results and non-detects were qualified as estimated (J/UJ-9).

SDG 27062: Laboratory duplicate analysis was performed on Sample LWG2-BT029. The laboratory precision met the acceptance criteria.

SDG 27100: Two sets of laboratory duplicate analyses were performed. All RPD values were acceptable in the laboratory duplicate performed on Sample LW2-GBT023. The RPD values for 31 congeners and three homologue groups exceeded the control limit in the laboratory duplicate performed on Sample LW2-GBT006-3. The results for these analytes were estimated (J-9) in Sample LW2-GBT006-3 and its laboratory duplicate.

SDG 27101: No duplicate analysis was performed with this SDG.

Field Replicates

Replicate sample pairs are listed below. The following acceptance criteria were applied: the RPD control limit is 50% for results greater than 5x the reporting limit (RL). For results less than 5x the RL, the absolute difference between the sample and replicate must be less than 2x the RL. No data were qualified based on field replicate precision outliers. Users of the data should consider the impact of field precision outliers on the reported results.

SDG 27062: One pair of samples, LWG2-GBT-027-1 and LWG2-BT027-2, was submitted for field replicate analysis. The RPD values for 51 congeners and three homologue groups were greater than the control limit. See validation worksheets for specific analytes.

SDG 27100: One pair of samples, LW2-GBT006-1 and LW2-GBT006-2, was submitted for field replicate analysis. The RPD values for most analytes exceeded the control limit. See validation worksheets for specific analytes.

Reporting Limits (Method Detection Limit and Method Reporting Limit)

Analytical concentration goals (ACG) were specified in the QAPP for specific toxic PCB (PCB77, PCB81, PCB105, PCB106/118, PCB114, PCB123, PCB126, PCB156, PCB157, PCB167, PCB169, and PCB189). To try to meet the project ACG, the laboratory reported non-detects at the method

detection limits (MDLs), adjusted for sample size, percent moisture, and any dilution factor. For several of the most toxic coplanar congeners (such as PCB77 and PCB169), the laboratory also concentrated the extracts, performed additional cleanups, and then reanalyzed the extract to get the lowest possible detection limits.

The ACG were met for most of the samples, in that the compound was either detected, or the detection limit was less than the stated ACG. When the ACG and method reporting limits (MRL) were not met, it was due to the need to extract smaller sample aliquots and/or perform dilutions due to the elevated concentrations of target analytes present in the samples.

PCB169 was detected at low levels in all of the samples and in the associated method blanks. After qualifiers based on method blank contamination were issued, all of the PCB169 results were restated as not detected, with elevated detection limits. All of these restated detection limits were greater than the PCB169 ACG of 0.01 pg/g (dry weight).

Samples affected by the need to extract smaller sample aliquots and/or perform dilutions due to the elevated concentrations of target analytes present in the samples are discussed below.

SDG 27062: Samples LWG2-BT026 and LWG2-BT028 were analyzed at dilution (5x) and reporting limits were elevated accordingly. In addition, the laboratory elevated some reporting limits due to interferences.

SDG 27100: The laboratory elevated some reporting limits due to interferences.

Calculation Verification

SDG 27062: Full validation, including calculation verifications, was performed on this SDG only. No anomalies were found.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the labeled compound and OPR %R values, with the exception noted above. Precision was acceptable as demonstrated by the laboratory and field duplicate RPD values, with the exceptions noted above.

Data were estimated due to laboratory duplicate precision outliers. Data were qualified as not detected due to contamination in the associated laboratory blanks. Field replicate outliers were noted, although no qualifiers were applied.

All data, as estimated, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Benthic Sediments, Fall 2005
Herbicides by EPA Method 8151A
Severn Trent Laboratories - Seattle

This report documents the review of analytical data from the analyses of sediment samples and the associated laboratory and field quality control (QC) samples. Severn Trent Laboratories of Seattle, Washington, analyzed the samples.

SDG	No. Samples	Validation Level
580-906-1	13 Sediments & 1 Field Blank	Full
580-1026-1	24 Sediments & 1 Field Blank	Summary

I. DATA PACKAGE COMPLETENESS

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

II. EDD TO HARDCOPY VERIFICATION

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

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

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

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

Holding Times and Sample Receipt

The validation guidance documents state that the cooler temperatures should be within an advisory temperature range of 2° to 6°C.

The laboratory received the majority of the sample coolers with temperatures below the advisory control limits, with a low of -20ºC. Since the sediment samples were immediately preserved by

freezing, at or below -20 ºC, it was determined that these outliers did not impact data quality and no action was taken.

The QAPP-required holding time criterion for frozen sediment samples is 1 year and water samples is 14 days from date of sampling to date of extraction. The QAPP-required holding time criterion for extracts is 40 days from extraction to analysis. All extracts were analyzed within the holding time criterion, with the following exceptions.

SDG 580-906-1: The field blank, Rinsate Blank 1, was extracted 1 day past the holding time limit. No herbicides were detected in the blank; reporting limits were estimated (UJ-1).

SDG 580-1026-1: The field blank, Rinsate Blank 2, was extracted 1 day past the holding time limit. No herbicides were detected in the blank; reporting limits were estimated (UJ-1).

Field Blanks

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

SDG 580-906-1: No target analytes were detected in the field blank (Rinsate Blank 1).

SDG 580-1026-1: No target analytes were detected in the field blank (Rinsate Blank 2).

Matrix Spike/Matrix Spike Duplicates

SDG 580-1026-1: Two sets of matrix spike/matrix spike duplicate (MS/MSD) analyses were prepared with the samples in this SDG. For the MS/MSD set performed using Sample LWG-GBT033, the relative percent difference (RPD) value for dalapon exceeded the upper control limit. This analyte was not detected in the parent sample; no action was taken.

Field Replicates

Replicate sample pairs were listed below. The following acceptance criteria were applied: the RPD control limit is 50% for results greater than five times (5x) the reporting limit (RL). For results less than 5x the RL, the absolute difference between the sample and replicate must be less than 2x the RL. No data were qualified based on field replicate precision outliers. Users of the data should consider the impact of field precision outliers on the reported results.

SDG 580-906-1: One pair of samples, LW2-BT027-1 & LW2-BT027-2, was submitted as field replicates. No target analytes were detected in these samples. Precision criteria were met.

SDG 580-1026-1: One pair of samples, LW2-GBT006-1 & LW2-GBT006-2, was submitted as field replicates. No target analytes were detected in these samples. Precision criteria were met.

Internal Standards

SDG 580-906-1: The percent recovery (%R) values for acenaphthene-d10 and phenanthrene-d10 were less than the lower control limit in Sample LW2-BT028. No herbicides were detected in this sample. All reporting limits were qualified as estimated (UJ-19) due to a potential low bias.

SGG 580-1026-1: The %R values for acenaphthene-d10 and phenanthrene-d10 were less than the lower control limits in 15 samples. Refer to the data validation worksheets for a complete listing of these samples. No target analytes were detected in these samples. All reporting limits were estimated (UJ-19) to indicate a potential low bias.

Calculation Verification

SDG 580-906-1: Calculation verifications were performed on this SDG. No calculation errors were found.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the surrogate, laboratory control sample/laboratory control sample duplicate (LCS/LCSD), and MS/MSD %R values, with the exceptions mentioned above. Precision was acceptable as demonstrated by the RPD values for the LCS/LCSD and MS/MSD analyses, with the exceptions as noted.

Data were estimated based on holding time violations and internal standard area outliers.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Benthic Sediments, Fall 2005
Organotins by Krone Method
Columbia Analytical Services - Kelso

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

SDG	No. Samples	Validation Level
K0506421	2 Sediment	Full
K0506520	5 Sediment	Summary
K0506554	3 Sediment	Summary
K0506644	6 Sediment & 1 Field Blank	Summary
K0506744	6 Sediment	Summary
K0506813	12 Sediment	Summary
K0506873	3 Sediment & 1 Field Blank	Full

I. DATA PACKAGE COMPLETENESS

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

II. EDD TO HARDCOPY VERIFICATION

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

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

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

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

Holding Times and Sample Receipt

The validation guidance documents state that the cooler temperatures should be within an advisory temperature range of 2° to 6°C.

The laboratory received the majority of the sample coolers with temperatures below the advisory control limits, with a low of -0.3ºC. Since the sediment samples were immediately preserved by freezing, at or below -20 ºC, it was determined that these outliers did not impact data quality and no action was taken.

The QAPP-required holding time criterion for frozen sediment samples is 1 year and water samples is 7 days from date of sampling to date of extraction. The QAPP-required holding time criterion for extracts is 40 days from extraction to analysis. All samples were prepared and analyzed within the holding time criteria.

Laboratory Blanks

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times the concentration detected in the blank. If a contaminant is detected in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U-7). If the result is also less than the reporting limit, then the result is elevated to the reporting limit. No action is taken if the sample result is greater than the action level, or for non-detected results.

Method blanks were analyzed at the appropriate frequency. A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets. Various target analytes were detected in the method blanks. However, only the following analytes were qualified as not detected in one or more samples in the associated laboratory data sets:

SDG K0506554: Tri-n-butyl tin (one result)

SDG K0506644: Di-n-butyl tin & tri-n-butyl tin (one result each in Rinsate Blank 1)

SDG K0506744: Tri-n-butyl tin & di-n-butyl tin (one result each)

SDG K0506813: Tri-n-butyl tin (two results)

SDG K0506873: Tri-n-butyl tin (one result in Rinsate Blank 2)

Field Blanks

After method blanks are used to evaluate all associated samples, including field blanks, any remaining positive results in the field blanks are used to evaluate all associated samples. Any results designated as not detected because of field blank contamination were qualified (U-6). A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets. Various target analytes were detected in the field blanks. However, only the following analytes were qualified as not detected in one or more samples in the associated laboratory data sets:

SDG K0506644: A positive result for butyltin was reported in Rinsate Blank 1. No qualifiers were applied; all results were greater than the action level.

SDG K0506873: Positive results for di-n-butyltin & n-butyltin were reported in Rinsate Blank 2. Results for both analytes were below the action levels in two associated sediment samples and were qualified as not detected (U-6).

Matrix Spike/Matrix Spike Duplicates

SDGs K0506813 and K0506873: Matrix spike/matrix spike duplicate (MS/MSD) analysis was performed on Sample LW2-GBT023. The percent recovery (%R) values for n-butyltin were less than the control limit. The result for n-butyltin was qualified as estimated (J-8) in the parent sample. Also, the MSD %R values for tri-n-butyltin and di-n-butyltin were greater than the upper control limits. No action was taken based on acceptable recoveries in the MS and laboratory control sample (LCS) analyses.

Field Replicates

Replicate sample pairs were listed below. The following acceptance criteria were applied: the relative percent difference (RPD) control limit is 50% for results greater than five times (5x) the reporting limit (RL). For results less than 5x the RL, the absolute difference between the sample and replicate must be less than 2x the RL. No data were qualified based on field replicate precision outliers. Users of the data should consider the impact of field precision outliers on the reported results.

SDGs K0506421 & K0506520: One pair of samples, LW2-BT027-1 & LW2-BT027-2, was submitted as field replicates. Results for di-n-butyltin and tri-n-butyltin exceeded the acceptance criteria.

SDG K0506813: One pair of samples, LW2-GBT006-1 & LW2-GBT006-2, was submitted as field replicates. The field precision met the above criteria for all target analytes.

Reporting Limits

The specified method reporting limits (MRL) were met for all analytes, except when dilutions were required to bring results within the calibration range.

Compound Identification

The laboratory applies a “P” qualifier to values when the RPD value between the two analytical columns is greater than 40%. When the RPD value was greater than 40% the reported value was qualified as estimated (J-3) for poor column confirmation agreement.

SDG K0506421: In Sample LWG2-BT027-1 tetra-n-butyl tin was estimated.

SDG K0506520: In Sample LWG2-BT027-3 tetra-n-butyl tin was estimated.

SDG K0506644: Two results for tetra-n-butyl tin were estimated.

SDG K0506744: In Sample LW2-GBT009 tetra-n-butyl tin was estimated.

SDG K0506813: In Sample LW2-GBT006 tetra-n-butyl tin was estimated.

SDG K0506873: In Sample LW2-GBT015 tetra-n-butyl tin was estimated.

Calculation Verification (Full validation only)

SDG K0506421 & K0506873: Calculation verifications were performed on these SDGs. No anomalies were found.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the surrogate, MS/MSD, and LCS/LCSD %R values, with the exceptions noted above. Precision was also acceptable as demonstrated by the field duplicate, MS/MSD, and LCS/LCSD RPD values, with the exceptions as noted.

Data were estimated based on column confirmation outliers and a MS/MSD recovery outlier. Data were qualified as not detected based on contamination in the associated laboratory and field blanks. Field replicate outliers were noted, although no qualifiers were applied.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Benthic Sediments, Fall 2005
Gasoline Range Organics by Method NWTPH-Gx
Columbia Analytical Services - Kelso

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

SDG	No. Samples	Validation Level
K0506421	2 Sediment	Full
K0506520	5 Sediment	Summary
K0506554	3 Sediment	Summary
K0506644	6 Sediment, 1 Trip Blank & 1 Field Blank	Summary
K0506744	6 Sediment & 2 Trip Blanks	Summary
K0506813	12 Sediment & 2 Trip Blanks	Summary
K0506873	3 Sediment, 1 Trip Blank & 1 Field Blank	Full

I. DATA PACKAGE COMPLETENESS

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

II. EDD TO HARDCOPY VERIFICATION

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

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

1 Holding Times and Sample Receipt
Initial Calibration (ICAL)
Continuing Calibration (CCAL)
2 Laboratory Blanks
Field Blanks
Surrogate Compounds
2 Laboratory Duplicates
Laboratory Control Samples
Field Duplicates
Reporting Limits (MDL and MRL)
2 Compound Identification
1 Calculation Verification (full validation only)

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

Holding Times and Sample Receipt

The validation guidance documents state that the cooler temperatures should be within an advisory temperature range of 2° to 6°C.

The laboratory received the majority of the sample coolers with temperatures below the advisory control limits, with a low of -0.3ºC. Since the sediment samples were immediately preserved by freezing, at or below -20 ºC, it was determined that these outliers did not impact data quality and no action was taken.

The QAPP-required holding time criterion for frozen sediment samples is 1 year and water samples is 7 days from date of sampling to date of extraction. The QAPP-required holding time criterion for extracts is 40 days from extraction to analysis. All samples were prepared and analyzed within the holding time criteria.

Laboratory Blanks

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times (5x) the concentration detected in the blank. If a contaminant is detected in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U-7). If the result is also less than the reporting limit, then the result is elevated to the reporting limit. No action is taken if the sample result is greater than the action level, or for non-detected results.

Method blanks were analyzed at the appropriate frequency. A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets. Various target analytes were detected in the method blanks. However, only the following analytes were qualified as not detected in one or more samples in the associated laboratory data sets:

SDG K0506421: GRO (1 result)

SDG K0506520: GRO (5 results)

SDG K0506644: GRO (4 results)

Field Blanks

After method blanks are used to evaluate all associated samples, any remaining positive gasoline results in the trip blanks are used to evaluate all associated samples. Any results designated as not detected because of trip blank contamination were qualified (U-18). Next, any remaining positive gasoline results in the rinsate blanks are used to evaluate all associated samples. Any results designated as not detected because of rinsate blank contamination were qualified (U-6).

A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets. However, there were no qualifiers associated with any of these field blanks because the associated sample results were either not detected or greater than the action levels.

Laboratory Duplicates

To evaluate analytical precision, laboratory duplicate analyses were performed with each data set. A list of all duplicate samples analyzed is in the data validation worksheets.

Precision is assessed using the relative percent difference (RPD) values if both sample results are greater than five times the reporting limit for an analyte, otherwise the absolute difference between the two results is used to evaluate precision. All RPD values were less than the 40% control limit, or all absolute difference values were less than twice the reporting limit of the compound, with the exceptions noted below. For precision outliers, positive results for the affected compounds were estimated (J-9) in the parent sample.

SDG K0506421: A laboratory duplicate analysis was performed on Sample LW2-GBT-027-1. The RPD value was outside control limits; the results were estimated (J/UJ-9) in both samples for gasoline range organics (GRO).

Field Replicates

Replicate sample pairs are listed below. The following acceptance criteria were applied: the RPD control limit is 50% for results greater than five times (5x) the reporting limit (RL). For results less than 5x the RL, the absolute difference between the sample and replicate must be less than 2x the RL. No data were qualified based on field replicate precision outliers. Users of the data should consider the impact of field precision outliers on the reported results.

SDG K0506520: Field replicate sample LWG2-BT027-2 was submitted with this SDG. The parent sample, LWG2-BT027-1, was reported in SDG K0506421 (as LW2-GBT-027-1). The precision acceptance criteria were not met for GRO in these samples.

SDG K0506813: One pair of samples, LW2-GBT006-1 & LW2-GBT006-2, was submitted as field replicates. There were no positive results. Field precision was judged acceptable.

Calculation Verification

SDG K0506421 and K0506873: Calculation verifications were performed on these SDGs. No calculation errors were found.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the surrogate, matrix spike/matrix spike duplicate (MS/MSD), and laboratory control sample/laboratory control sample duplicate (LCS/LCSD) percent recovery values, with the exceptions noted above. Precision was also acceptable as demonstrated by the field duplicate, MS/MSD, and LCS/LCSD RPD values, with the exceptions as noted.

Data were qualified as estimated based on laboratory duplicate precision and chromatographic pattern mismatches. Data were also qualified as not detected based on contamination in the associated laboratory blanks.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Benthic Sediments, Fall 2005
Diesel and Residual Range Hydrocarbons by Method NWTPH-Dx
Columbia Analytical Services - Kelso

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

SDG	No. Samples	Validation Level
K0506421	2 Sediment	Full
K0506520	5 Sediment	Summary
K0506554	3 Sediment	Summary
K0506644	6 Sediment & 1 Field Blank	Summary
K0506744	6 Sediment & 2 Trip Blanks	Summary
K0506813	12 Sediment	Summary
K0506873	3 Sediment & 1 Field Blank	Full

I. DATA PACKAGE COMPLETENESS

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

II. EDD TO HARDCOPY VERIFICATION

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

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

1	Holding Times & Sample Receipt
	GC/MS Instrument Performance Check
	Initial Calibration (ICAL)
	Continuing Calibration (CCAL)
2	Laboratory Blanks
	Field Blanks
	Surrogate Compounds
	Laboratory Control Samples (LCS/LCSD)
1	Laboratory Duplicates
	Field Replicates
	Target Analyte List
	Reporting Limits (MDL and MRL)
2	Compound Identification
1	Calculation Verification (Full validation only)

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

Holding Times and Sample Receipt

The validation guidance documents state that the cooler temperatures should be within an advisory temperature range of 2° to 6°C.

The laboratory received the majority of the sample coolers with temperatures below the advisory control limits, with a low of -0.3ºC. Since the sediment samples were immediately preserved by freezing, at or below -20 ºC, it was determined that these outliers did not impact data quality and no action was taken.

The QAPP-required holding time criterion for frozen sediment samples is 1 year and water samples is 7 days from date of sampling to date of extraction. The QAPP-required holding time criterion for extracts is 40 days from extraction to analysis. All samples were prepared and analyzed within the holding time criteria.

Laboratory Blanks

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times (5x) the concentration detected in the blank. If a contaminant is detected in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U-7). If the result is also less than the reporting limit, then the result is elevated to the reporting limit. No action is taken if the sample result is greater than the action level, or for non-detected results.

Method blanks were analyzed at the appropriate frequency. A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets. Various target analytes were detected in the method blanks. However, only the following analytes were qualified as not detected in one or more samples in the associated laboratory data sets:

SDG K0506644: RRO (1 result)

SDG K0506744: RRO (1 result)

Field Blanks

After method blanks are used to evaluate all associated samples, any remaining positive results in the field blanks are used to evaluate all associated samples. Any results designated as not detected because of field blank contamination were qualified (U-6).

A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets. However, there were **no** qualifiers associated with any of these field blanks because the associated sample results were either not detected or greater than the action levels.

Laboratory Duplicates

To evaluate analytical precision, laboratory duplicate analyses were performed with each data set. A list of all duplicate samples analyzed is in the data validation worksheets.

Precision is assessed using the relative percent difference (RPD) values if both sample results are greater than five times the reporting limit for an analyte, otherwise the absolute difference between the two results is used to evaluate precision. All RPD values were less than the 40% control limit, or all absolute difference values were less than twice the reporting limit of the compound, with the exceptions noted below. For precision outliers, positive results for the affected compounds were estimated (J-9) in the parent sample.

SDG K0506644: Laboratory duplicate analyses were performed on a four batch QC samples. The RPD values for residual range organics (RRO) in both sediment duplicate analyses were outside control limits. No action was taken as the parent samples were from a different SDG.

SDG K0506744: Laboratory duplicate analyses were performed on Sample LW2-GBT004. The RPD values for diesel range organics (DRO) and RRO in sediment duplicate analyses were outside control limits. No action was taken as the difference between sample and duplicate was less than twice the reporting limit.

Field Replicates

Replicate sample pairs were listed below. The following acceptance criteria were applied: the RPD control limit is 50% for results greater than five times (5x) the reporting limit (RL). For results less than 5x the RL, the absolute difference between the sample and replicate must be less than 2x the RL. No data were qualified based on field replicate precision outliers. Users of the data should consider the impact of field precision outliers on the reported results.

SDGs K0506421 & K0506554: One pair of samples, LW2-BT027-1 & LW2-BT027-2, was submitted as field replicates. Results for DRO and RRO met the acceptance criteria.

SDG K0506520: Field replicate sample LWG2-BT027-2 was submitted with this SDG. The parent sample, LWG2-BT027-1, was reported in SDG K0506421 (as LW2-GBT-027-1). Field precision was acceptable.

SDG K0506813: One pair of samples, LW2-GBT006-1 & LW2-GBT006-2, was submitted as field replicates. Results for DRO and RRO met the acceptance criteria.

Compound Identification

When the chromatographic pattern in the sample does not match that of the DRO or RRO standard used for calibration the laboratory flags the result. These flagged results are then qualified as estimated (J-2).

SDG K0506421: Two results for each DRO and RRO were estimated (J-2).

SDG K0506520: Five results for each DRO and RRO were estimated (J-2).

SDG K0506554: Three results for each DRO and RRO were estimated (J-2).

SDG K0506644: Six results for each DRO and RRO were estimated (J-2).

SDG K0506744: Four results for each DRO and RRO were estimated (J-2).

SDG K0506813: All results for DRO and RRO were estimated (J-2).

SDG K0506873: Two results for DRO and three results for RRO were estimated (J-2).

Calculation Verification

SDG K0506421 and K0506873: Calculation verifications were performed on these SDGs. No calculation errors were found.

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the surrogate, matrix spike/matrix spike duplicate (MS/MSD), and laboratory control sample/laboratory control sample duplicate (LCS/LCSD) percent recovery values, with the exceptions noted above. Precision was also acceptable as demonstrated by the field duplicate, MS/MSD, and LCS/LCSD RPD values, with the exceptions as noted.

Data were estimated because of chromatographic pattern mismatches. Data were also qualified as not detected based on contamination in the associated laboratory blanks.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Benthic Sediments, Fall 2005
Dioxin/Furan Compounds by EPA 1613B
Columbia Analytical Services - Houston

This report documents the review of analytical data from the analyses of sediment samples and the associated laboratory and field quality control (QC) samples. Columbia Analytical Services of Houston, Texas analyzed the samples.

SDG	No. Samples	Validation Level
K0506421	2 Sediments	Full
K0506520	5 Sediments	Summary
K0506554	3 Sediments	Summary
K0506644	6 Sediments, 1 Field Blank	Summary
K0506744	6 Sediments	Summary
K0506813	12 Sediments	Summary
K0506873	3 Sediments, 1 Field Blank	Full

I. DATA PACKAGE COMPLETENESS

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

The closing calibration standards from the DB-5 column were not included in the data packages. A closing calibration is not required by EPA Method 1613 version B. As nearly all of the submitted calibration standards were acceptable no action was taken.

II. EDD TO HARDCOPY VERIFICATION

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

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

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

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

Holding Times and Sample Receipt

The validation guidance documents state that the cooler temperatures should be within an advisory temperature range of 2° to 6°C.

The laboratory received the majority of the sample coolers with temperatures below the advisory control limits, with a low of 1ºC. Since the sediment samples were immediately preserved by freezing, at or below -20 ºC, it was determined that these outliers did not impact data quality and no action was taken.

The QAPP-required holding time criterion for frozen sediment samples is 1 year and water samples is 7 days from date of sampling to date of extraction. The QAPP-required holding time criterion for extracts is 40 days from extraction to analysis. All samples were prepared and analyzed within the holding time criteria.

Laboratory Blanks

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times (5x) the concentration detected in the blank. If a contaminant is detected in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U-7). If the result is also less than the reporting limit, then the result is elevated to the reporting limit. No action is taken if the sample result is greater than the action level, or for non-detected results.

Method blanks were analyzed at the appropriate frequency. A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets. Various target analytes were detected in the method blanks. However, only the following analytes were qualified as not detected in one or more samples in the associated laboratory data sets:

SDG K0506644: OCDD (3 results) and 1,2,3,4,6,7,8-HpCDF (2 results)

SDG K0506744: 1,2,3,4,7,8-HxCDF (6 results), 1,2,3,4,6,7,8-HpCDF (2 results)

SDG K0506873: OCDD (1 result) and 1,2,3,4,7,8-HxCDF (1 result)

Field Blanks

After method blanks are used to evaluate all associated samples, including field blanks, any remaining positive results in the field blanks are used to evaluate all associated samples. Any results designated as not detected because of field blank contamination were qualified (U-6). A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets.

SDG K0506644: One field blank, Sample Rinsate Blank 1, was submitted. No positive results were reported in this blank.

SDG K0506873: One field blank, Sample Rinsate Blank 2, was submitted. After qualifiers based on laboratory blank contamination were assigned, positive results for 1,2,3,4,6,7,8-HpCDD and 1,2,3,4,7,8-HxCDF remained in this blank. All sample concentrations exceeded the action levels and no qualifiers were required.

Labeled Compounds

The percent recovery (%R) values for the labeled compounds were within the specified control limits of with the exceptions noted below. If the outliers indicated a potential high bias, only the associated positive results were estimated (J-13). If the outliers indicated a potential low bias, positive results and reporting limits were estimated (J/UJ-13).

SDG K0506520:

- **Sample LWG2-BT027-3:** $^{13}C_{12}$-1,2,3,4,7,8-HxCDD; $^{13}C_{12}$-1,2,3,6,7,8-HxCDD; $^{13}C_{12}$-1,2,3,7,8,9-HxCDF; $^{13}C_{12}$-2,3,4,6,7,8-HxCDF, and $^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF (all high bias).
- **Sample LWG2-BT032:** $^{13}C_{12}$-1,2,3,4,7,8-HxCDD; $^{13}C_{12}$-1,2,3,6,7,8-HxCDD; $^{13}C_{12}$-1,2,3,4,6,7,8-HpCDD; $^{13}C_{12}$-1,2,3,4,7,8,-HxCDF; $^{13}C_{12}$-1,2,3,6,7,8-HxCDF; $^{13}C_{12}$-1,2,3,7,8,9-HxCDF; $^{13}C_{12}$-2,3,4,6,7,8-HxCDF, and $^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF (all high bias).

SDG K0506813:

- **Sample LW2-GBT010:** $^{13}C_{12}$-1,2,3,4,7,8-HxCDD and $^{13}C_{12}$-1,2,3,4,7,8-HxCDF (high bias).
- **Sample LW2-GBT014:** $^{13}C_{12}$-1,2,3,4,7,8-HxCDD, $^{13}C_{12}$-1,2,3,6,7,8-HxCDF, $^{13}C_{12}$-1,2,3,7,8,9-HxCDF, and $^{13}C_{12}$-2,3,4,6,7,8-HxCDF (all high bias)

Matrix Spikes/Matrix Spike Duplicates

No matrix spike/matrix spike duplicate (MS/MSD) sets were performed. Accuracy and precision were assessed using labeled compound recoveries, ongoing precision and recovery samples, and laboratory duplicate samples.

Field Replicates

Replicate sample pairs were listed below. The following acceptance criteria were applied: the relative percent difference (RPD) control limit is 50% for results greater than five times (5x) the reporting limit (RL). For results less than 5x the RL, the absolute difference between the sample and replicate must be less than 2x the RL. No data were qualified based on field replicate precision outliers. Users of the data should consider the impact of field precision outliers on the reported results.

SDGs K0506421 & K0506520: One pair of samples, LW2-BT027-1 & LW2-BT027-2, was submitted as field replicates. The results reported for 1,2,3,4,6,7,8-HpCDD, OCDD, OCDF, and all homologues did not meet the acceptance criteria.

SDG K0506813: Samples LW2-GBT006-1 and LW2-GBT006-2 were submitted as field replicates. The results reported for 1,2,3,4,6,7,8-HpCDD, OCDD, heptachlorodibenzo-p-dioxin homologues, and heptachlorodibenzofuran homologues did not meet the acceptance criteria.

Laboratory Duplicates

No laboratory duplicates were performed. Laboratory precision was assessed using duplicate ongoing precision and recovery samples.

Compound Identification

The laboratory assigned K-flags to values when a peak was detected but did not meet quantitation criteria, therefore the reported results cannot be considered as positive identification for these analytes. These results were considered potential false positives or "estimated maximum possible concentrations" and were qualified as not detected (U-21) at the reported values. Laboratory blank values with K flags were considered not detected.

All results for 2,3,7,8-TCDF were confirmed on a DB-225 column as required by the method. Although the 2,3,7,8-TCDF results from both columns were reported in the raw data, only the results from the DB-225 column were reported in the EDD. No action was necessary.

SDG K0506520: The reported results for OCDD in Samples LWG2-BT028 and LWG2-BT032 exceeded the initial calibration linear range. These results were “E” flagged by the laboratory. No re-analyses at dilution were performed. The OCDD results in these samples were qualified as estimated (J-20).

SDG K0506744: The results for OCDD in Samples LW2-GBT007 and LW2-GBT009 were greater than the linear range of the calibration. These results were “E” flagged by the laboratory. No dilution analysis was performed. The results for OCDD in these samples were estimated (J-20).

Calculation Verification

SDGs K0506421 & K0506873: A full validation, including calculation verifications, was performed on these SDG only. No anomalies were identified.

IV. OVERALL ASSESSMENT

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

Data were qualified as estimated due to labeled compound outliers and results greater than the linear range of the calibration. Data were qualified as not detected due to ion ratio criteria outliers and contamination in the associated blanks. Field replicate outliers were noted, although no qualifiers were applied.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Benthic Sediments, Fall 2005
Hexavalent Chromium Analyses by EPA Method 7196A
Columbia Analytical Services - Kelso

This report documents the review of analytical data from the analyses of surface water samples and the associated laboratory and field quality control (QC) samples. Columbia Analytical Services, Inc., Kelso, WA, analyzed the samples.

SDG	No. Samples	Validation Level
K0506421	2 Sediment	Full
K0506520	5 Sediment	Summary
K0506554	3 Sediment	Summary
K0506644	6 Sediment, 1 field blank	Summary
K0506744	6 Sediment	Summary
K0506813	12 Sediment	Summary
K0506873	3 Sediment, 1 Field blank	Full

I. DATA PACKAGE COMPLETENESS

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

II. EDD TO HARDCOPY VERIFICATION

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

III. TECHNICAL DATA VALIDATION

The quality control (QC) requirements for review are listed below.

1 Technical Holding Times and Sample Preservation
Initial Calibration
Calibration Verification
1 Laboratory Blanks
Field Blanks
Laboratory Control Samples
2 Matrix Spike/Matrix Spike Duplicates (MS/MSD)
Laboratory Duplicates & Triplicates
1 Field Duplicates
Reporting Limits (MDL and MRL)
1 Calculation Verification (Full validation only)

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

Technical Holding Times and Sample Receipt

The validation guidance documents state that the cooler temperatures should be within an advisory temperature range of 2° to 6°C.

The laboratory received the majority of the sample coolers with temperatures below the advisory control limits. Since the sediment samples were immediately preserved by freezing, at or below -20 ºC, it was determined that these outliers did not impact data quality and no action was taken.

The QAPP-required holding time criterion for sediment samples is 1 month from date of sampling to date of extraction and 7 days from extraction to analysis. The samples were prepped and analyzed within the holding time criteria.

Laboratory Blanks

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times (5x) the concentration detected in the blank. If a contaminant is detected in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U-7). If the result is also less than the reporting limit, then the result is elevated to the reporting limit. No action is taken if the sample result is greater than the action level, or for non-detected results.

Method blanks were analyzed at the appropriate frequency. A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets. Hexavalent chromium was either not detected in the associated samples or was at concentrations greater than the action level of five times the blank concentrations; no action was taken.

Matrix Spikes

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed at an acceptable frequency. All percent recovery (%R) values were within the 85% to 115% control limits, with the exceptions noted below. If the outliers indicated a potential high bias, only the associated positive results were estimated (J-8). If the outliers indicated a potential low bias, positive results and reporting limits were estimated (J/UJ-8).

For the cases where the spike recoveries were less than 1%, the laboratory performed follow up tests such as oxidation-reduction to potential to show that the sample matrix was highly reducing and would therefore be incapable of supporting chromium in the hexavalent oxidation state. Because the low recoveries were due to matrix effects and not the extraction procedure, associated results were estimated (J/UJ-8) instead of being rejected.

All MS/MSD relative percent difference (RPD) values were within the specified control limits, with the exceptions noted below. For RPD outliers, positive results for the affected compounds were estimated (J-9).

RPD and %R value outliers (with bias, when appropriate) are listed below. Data were qualified as discussed above.

SDG K0506421: LW2-GBT-027-1 - hexavalent chromium (low bias)

SDG K0506520: LWG2-BT027 - hexavalent chromium (low bias)

SDG K0506554: LWG2-BT030 - hexavalent chromium (low bias)

SDG K0506644: LW2-GBT024- hexavalent chromium (low bias)

SDG K0506744: LW2-GBT007- hexavalent chromium (low bias)

SDG K0506813: LW2-GBT006-1- hexavalent chromium (low bias)

SDG K0506873: LW2-GBT015- hexavalent chromium (low bias)

Field Replicates

Replicate sample pairs were listed below. The following acceptance criteria were applied: the RPD control limit is 50% for results greater than five times (5x) the reporting limit (RL). For results less than 5x the RL, the absolute difference between the sample and replicate must be less than 2x the RL. No data were qualified based on field replicate precision outliers. Users of the data should consider the impact of field precision outliers on the reported results.

SDG K0506520: Field replicate sample LWG2-BT027-2 was submitted with this SDG. The parent sample, LWG2-BT027-1, was reported in SDG K0506421 (as LW2-GBT-027-1). Field precision was acceptable.

SDG K0506813: One set of field replicates, LW2-GBT006-1 & LW2-GBT006-2, was submitted with this SDG. The field precision met the acceptance criteria.

Calculation Verification

SDGs K0506421 and K0506873: Several results were verified by recalculation. No calculation or transcription errors were noted

IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the MS/MSD, and laboratory control sample/laboratory control sample duplicate (LCS/LCSD) %R values, with the exceptions noted above. Precision was also acceptable as demonstrated by field and laboratory duplicate, MS/MSD, and LCS/LCSD RPD values, with the exceptions as noted.

Data were qualified based on MS/MSD %R outliers.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Benthic Sediments, Fall 2005
Metals by EPA Methods 6010/6020, 7470A/7471A, & 7742
Columbia Analytical Services - Kelso

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

SDG	No. Samples	Validation Level
K0506421	2 Sediment	Full
K0506520	5 Sediments	Summary
K0506554	3 Sediments	Summary
K0506644	6 Sediment, 1 Rinse blank	Summary
K0506744	6 Sediments	Summary
K0506813	12 Sediments	Summary
K0506873	3 Sediment, 1 Rinse blank	Full

I. DATA PACKAGE COMPLETENESS

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

II. EDD TO HARDCOPY VERIFICATION

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

III. TECHNICAL DATA VALIDATION

The QC requirements for review are listed below.

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

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

Technical Holding Times and Sample Preservation

The validation guidance documents state that the cooler temperatures should be within an advisory temperature range of 2° to 6°C.

For metals analyses the QAPP-required holding time criterion for sediment samples is 6 months from date of sampling to date of extraction. For mercury analyses the QAPP-required holding time criterion for sediment samples is 28 days from date of sampling to date of extraction. All samples were prepared and analyzed within the holding time criteria.

The laboratory received the majority of the sample coolers with temperatures below the advisory control limits, with a low of -1.1ºC. Since the sediment samples were immediately preserved by freezing, at or below -20 ºC, it was determined that these outliers did not impact data quality and no action was taken.

CRDL Standard

Contract required detection limit (CRDL) standards were analyzed at the beginning of each analytical sequence. For recoveries greater than upper control limit of 130%, positive results less than two times the CRDL were estimated (J-14) to indicate a potential high bias. For recoveries less than the lower control limit of 70%, positive results less than twice the CRDL and non-detects were estimated (J/UJ-14) to indicate a potential low bias. The following outliers were noted:

SDGs K0506520 and K0506554: barium (54%) – no qualifiers assigned

SDGs K0506644, K0506744, and K0506873: cadmium (42%), lead (137%), silver (137%) – no qualifiers assigned

SDG K0506813: aluminum (149%), chromium (176%), copper (143%), lead (159%) – no qualifiers assigned

Laboratory Blanks

Various analytes were detected in the method and instrument blanks at levels greater than the method detection limits (MDL). To evaluate the effect on the sample data, action levels of five times (5x) the blank concentrations were established. Positive results less than the action levels in the associated samples were qualified as not detected (U-7) at the reported concentration. No action was taken for non-detects.

In addition, some analytes were found at levels less than the negative MDL in some instrument blanks. For negative blanks, action levels of 5x the absolute value of the blank concentrations were established. Results less than the action levels in the associated samples were qualified as estimated (J/UJ-7), indicating a potential low bias.

SDG K0506421: Cadmium, manganese, selenium, and silver were detected in the method and/or instrument blanks. Results for selenium were qualified as not detected (U-7).

SDG K0506520: Cadmium, manganese, selenium, and silver were detected in the method and/or instrument blanks. Several results for selenium were qualified as not detected (U-7).

One manganese instrument blank result was less than the negative MDL. Associated results were positive and greater than the action level, so no qualifiers were applied.

SDG K0506520: Cadmium, manganese, selenium, and silver were detected in the method and/or instrument blanks. Some results for selenium were qualified as not detected (U-7).

Some manganese instrument blanks results were less than the negative MDL. Associated results were positive and greater than the action level, so no qualifiers were applied.

SDG K0506554: Cadmium, manganese, selenium, and silver were detected in the method and/or instrument blanks. All results for selenium were qualified as not detected (U-7).

One manganese instrument blank result was less than the negative MDL. Associated results were positive and greater than the action level, so no qualifiers were applied.

SDG K0506644: Aluminum, cadmium, chromium, copper, selenium, silver, and zinc were detected in the method and/or instrument blanks. Some results for cadmium and selenium were qualified as not detected (U-7).

Some silver instrument blanks results were less than the negative MDL. Associated results were positive and greater than the action level, so no qualifiers were applied.

SDG K0506744: Aluminum, cadmium, selenium, and silver were detected in the method and/or instrument blanks. All positive results for selenium were qualified as not detected (U-7).

Some silver instrument blanks results were less than the negative MDL. Associated results were positive and greater than the action level, so no qualifiers were applied.

SDG K0506813: Aluminum, cadmium, lead, selenium, and silver were detected in the method and/or instrument blanks. Some results for silver and selenium were qualified as not detected (U-7).

Some nickel and selenium instrument blanks results were less than the negative MDL. Associated results were positive and greater than the action level, so no qualifiers were applied.

SDG K0506873: Aluminum, cadmium, chromium, copper, mercury, selenium, silver, and zinc were detected in the method and/or instrument blanks. Some results for cadmium and selenium were qualified as not detected (U-7).

Some silver instrument blanks results were less than the negative MDL. Associated results were positive and greater than the action level, so no qualifiers were applied.

Field Blanks

After method blanks are used to evaluate all associated samples, including field blanks, any remaining positive results in the field blanks are used to evaluate all associated samples. Any results designated as not detected because of field blank contamination were qualified (U-6). A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets. Various target analytes were detected in the field blanks. These analytes were either not detected in the associated samples or were at concentrations greater than the action level of five times the blank concentrations; no action was taken.

SDG K0506644: One field blank, Rinsate Blank 1, was submitted with this SDG.

SDG K0506873: One field blank, Rinsate Blank 2, was submitted with this SDG.

Matrix Spike/Matrix Spike Duplicates

Matrix spike/matrix spike duplicate (MS/MSD) analyses were performed at an acceptable frequency. All percent recovery (%R) values were within the 70% to 130% control limits, with the exceptions noted below. If the outliers indicated a potential high bias, only the associated positive results were estimated (J-8). If the outliers indicated a potential low bias, positive results and reporting limits were estimated (J/UJ-8).

All MS/MSD relative percent difference (RPD) values were within the specified control limits, with the exceptions noted below. For RPD outliers, positive results for the affected compounds were estimated (J-9).

RPD and %R value outliers (with bias, when appropriate) are listed below. Data were qualified as discussed above.

SDGs K0506421, K0506554, and K0506520: antimony (low bias)

SDG K0506644 and K0506873 - sediment: antimony (low bias); chromium (high bias)

SDG K0506744: antimony (low bias); chromium (high bias)

SDG K0506813: antimony (low bias)

Laboratory Duplicates

Laboratory duplicates were analyzed at the proper frequency. The following acceptance criteria were applied: the RPD control limit is 30% for results greater than five times the reporting limit (RL). For results less than five times the RL, the absolute difference between the sample and duplicate must be less than two times the RL. For RPD values exceeding the control limits, associated positive results and non-detects were qualified as estimated (J/UJ-9). Laboratory precision outliers were as follows:

SDGs K0506644 and K0506873 - sediments: silver exceeded the acceptance criteria.

SDG K0506744: The result for silver exceeded the acceptance criteria.

SDG K0506813: The result for silver exceeded the acceptance criteria.

Field Replicates

Replicate sample pairs were listed below. The following acceptance criteria were applied: the RPD control limit is 50% for results greater than 5x the reporting limit (RL). For results less than 5x the RL, the absolute difference between the sample and replicate must be less than 2x the RL. No data were qualified based on field replicate precision outliers. Users of the data should consider the impact of field precision outliers on the reported results.

SDG K0506520: Field replicate sample LWG2-BT027-2 was submitted with this SDG. The parent sample, LWG2-BT027-1, was reported in SDG K0506421 (as LW2-GBT-027-1). Field precision was acceptable.

SDG K0506813: One pair of samples, LW2-GBT006-1 & LW2-GBT006-2, was submitted as field replicates. The results for silver exceeded the acceptance criteria.

ICP Interference Check Samples

The concentration of the interfering element iron was greater than the level in the interference check samples (ICSA/ICSAB) in several samples. The ICSA results were carefully evaluated to determine if there was a potential high or low bias caused by iron interference. The ICSA values for chromium, copper, nickel, and zinc were greater than ± MDL. An action level of 2x the absolute value of the ICSA result was established. All sample results for these analytes were greater than the action level; therefore no data were qualified.

ICP Serial Dilution

Serial dilutions were analyzed at the proper frequency of one per 20 samples or one per batch; whichever was more frequent. The percent difference (%D) values were less than the control limit of 10% for results greater than 50x the MDL, with the following exceptions. For %D outliers, all associated results were estimated (J/UJ-16). The sample used for the serial dilution analysis and the outliers were as follows:

SDGs K0506421, K0506520, & K0506554: Batch QC - beryllium (22%), nickel (27%), and silver (21%)

SDGs K0506644, K0506744, & K0506873 - sediments: Batch QC - lead (14%) and silver (37%)

SDG K0506813: Batch QC - nickel (27%)

IV. OVERALL ASSESSMENT

As determined by this evaluation, the laboratory followed the specified analytical methods. The laboratory duplicate RPD values indicated acceptable precision, except as noted above. Accuracy was also acceptable, as demonstrated by the MS and laboratory control sample %R values, except as previously noted.

Data were qualified as estimated and/or not detected based on laboratory blank contamination. Data were also estimated based on MS %R, laboratory duplicate RPD, and serial dilution %D outliers. Field replicate outliers were noted, although no qualifiers were applied.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Benthic Sediments, Fall 2005
Conventional Parameter Analyses
Columbia Analytical Services – Kelso

This report documents the review of analytical data from the analyses of sediment samples and the associated laboratory and field quality control (QC) samples. Columbia Analytical Services, Inc, Kelso, Washington.

SDG	No. Samples	Validation Level
K0506421	2 Sediments	Full
K0506520	5 Sediments	Summary
K0506554	3 Sediments	Summary
K0506644	6 Sediments, 1 field blank	Summary
K0506744	6 Sediments	Summary
K0506813	12 Sediments	Summary
K0506873	3 Sediment Samples, 1 Rinse blank	Full

The analytical tests that were performed are summarized below:

Parameter	Method
Total Solids	160.3
Grain Size	PSEP 1986
Total Organic Carbon (TOC)	PSEP 1986
Specific Gravity	ASTM D-854
Total Sulfide	9030M
Ammonia as Nitrogen	350.1/PLUMB

I. DATA PACKAGE COMPLETENESS

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

II. EDD TO HARDCOPY VERIFICATION

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

III. TECHNICAL DATA VALIDATION

The QC requirements for review are listed below.

2 Technical Holding Times and Sample Receipt
Initial Calibration

1 Matrix Spike/Matrix Spike Duplicates (MS/MSD)
2 Laboratory Duplicates and Triplicates

	Calibration Verification	1	Field Duplicates
1	Laboratory Blanks	1	Reporting Limits (MDL and MRL)
1	Field Blanks	1	Calculation Verification (Full validation only)
	Laboratory Control Samples		

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

Technical Holding Times and Sample Receipt

The validation guidance documents state that the cooler temperatures should be within an advisory temperature range of 2° to 6°C.

The laboratory received the majority of the sample coolers with temperatures below the advisory control limits, with a low of 0.1°C. It was determined that these outliers did not impact data quality and no action was taken.

SDGs K0506421 & K0506554: All samples were analyzed for ammonia and sulfide past the 7 day holding time. Results for these analytes were estimated (J-1).

SDGs K0506520, K0506644, K0506744, & K0506813: All samples were analyzed for ammonia past the 7 day holding time. Results for these analytes were estimated (J-1).

SDG K0506873: All sediment samples were analyzed for ammonia and sulfide past the 7 day holding time. Results for these analytes were estimated (J-1).

The rinsate blank was also analyzed for ammonia after the 7 day holding time had expired. The result was estimated (UJ-1).

Laboratory Blanks

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times (5x) the concentration detected in the blank. If a contaminant is detected in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U-7). If the result is also less than the reporting limit, then the result is elevated to the reporting limit. No action is taken if the sample result is greater than the action level, or for non-detected results.

Method blanks were analyzed at the appropriate frequency. A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets. Various target analytes were detected in the method blanks. These analytes were either not detected in the associated samples or were at concentrations greater than the action level of five times the blank concentrations; no action was taken.

Field Blanks

SDG K0506644: One field blank, Rinsate Blank 1, was submitted with this SDG. There were no positive results reported.

SDG K0506873: One field blank, Rinsate Blank 2, was submitted with this SDG. There were no positive results reported.

Matrix Spike Samples

A matrix spike sample (MS) was analyzed at the proper frequency of one per 20 samples or one per batch; whichever was more frequent. All percent recovery (%R) values were within the control limits.

Laboratory Duplicates

Laboratory duplicate samples were performed at the frequency of one per batch. The relative percent difference (RPD) values were within the control limit of 20%, with the following exceptions. (Note: for grain size, the laboratory performed triplicate analysis. A relative standard deviation [RSD] limit of 20% was used for all fractions with sieve size results of at least 5%). For RPD outliers, all associated samples are qualified (J/UJ-9). If the RSD value for a grain size fraction was greater than the control limit only the result for the parent sample was qualified (J-9).

SDG K0506644: Sample LW2-GBT025 was used for the grain size replicate analyses. The RSD value for the 8-9 Phi Clay fraction (34%) and the >9 Phi Clay fraction (25%) were greater than the control limit.

Field Replicates

Replicate sample pairs were listed below. The following acceptance criteria were applied: the RPD control limit is 50% for results greater than 5x the reporting limit (RL). For results less than 5x the RL, the absolute difference between the sample and replicate must be less than 2x the RL. No data were qualified based on field replicate precision outliers. Users of the data should consider the impact of field precision outliers on the reported results.

SDG K0506520: Field replicate sample LWG2-BT027-2 was submitted with this SDG. The parent sample, LWG2-BT027-1, was reported in SDG K0506421 (as LW2-GBT-027-1). Field precision was acceptable.

SDG K0506813: One set of field replicates, LW2-GBT006-1 & LW2-GBT006-2, was submitted with this SDG. The RPD value for total organic carbon was greater than 50%.

Reporting Limits (Method Detection Limit and Method Reporting Limit)

The QAPP calls for the grain size analysis to report clay sizes 8-9 Phi, 9-10 Phi, and >10 Phi. The laboratory only reported >9 Phi and 8-9 Phi.

Calculation Verification

SDG K0506873, K0506421, & K0506554: Several results were verified by recalculation. No calculation or transcription errors were noted

IV. OVERALL ASSESSMENT

As determined by this evaluation, the laboratory followed the specified analytical methods. The laboratory duplicate RPD and laboratory triplicate RSD values indicated acceptable precision, with the exceptions noted above. Accuracy was also acceptable, as demonstrated by the MS and laboratory control sample %R values.

Data were qualified based on exceeded holding times and laboratory triplicate RSD outliers. Field replicate outliers were noted, although no qualifiers were applied.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Portland Harbor RI/FS
Benthic Sediments, Fall 2005
Pesticide Analysis - Method: MLA013
Axys Analytical Services – Sidney, BC

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

SDG	No. Samples	Validation Level
WG18872	12 Sediment	Summary
WG18873	13 Sediment	Summary
WG18874	12 Sediment	Summary
WG19127	3 Sediment (Re-Analysis)	Summary

I. DATA PACKAGE COMPLETENESS

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

SDG WG19127: This SDG contains reanalysis data for three samples from SDG WG18873. The reanalysis was used for DDT, DDE, and DDD results only. All other results from this SDG were qualified as do-not-report (DNR). See the laboratory duplicate section (below) for more details.

II. EDD TO HARDCOPY VERIFICATION

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

III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

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

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

Holding Times and Sample Receipt

The validation guidance documents state that the cooler temperatures should be within an advisory temperature range of 2° to 6°C. All sample coolers were received within the control limits of $4^{o}C \pm 2^{o}$, with the exceptions noted below. These temperature outliers did not impact data quality and no action was taken.

The laboratory received the majority of the sample coolers with temperatures outside the advisory control limits of 2° to 6°C, at 0.0ºC. Samples were stored under archive conditions (-20ºC) and were still frozen upon arrival at Axys. Seventeen of 37 sample jars arrived broken. The laboratory was able to salvage the samples. No action was necessary.

Initial Calibration (ICAL)

The analyte hexachlorobutadiene was not included in the standards used for the initial calibration. Positive values and reporting limits were for hexachlorobutadiene were estimated (J/UJ-5A).

Continuing Calibration (CCAL)

The analyte hexachlorobutadiene was not included in the continuing calibration verification standards. Positive values and reporting limits were for hexachlorobutadiene were estimated (J/UJ-5B).

Laboratory Blanks

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times the concentration detected in the blank. If a contaminant is detected in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U-7). If the result is also less than the reporting limit, then the result is elevated to the reporting limit. No action is taken if the sample result is greater than the action level, or for non-detected results.

Method blanks were analyzed at the appropriate frequency. A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets. Various target analytes were detected in the method blanks. However, only the following analytes were qualified as not detected in one or more samples in the associated laboratory data sets:

SDG WG18872: Hexachlorobutadiene (5 results)

SDG WG18873: Hexachlorobutadiene (5 results)

SDG WG18874: Hexachlorobutadiene (3 results)

Labeled Compounds

When the %R value was less than the lower control limit but greater than 10%, positive values and reporting limits were estimated (J/UJ-13) for associated compounds. The quantitation of hexachlorobutadiene is associated with this labeled compound. When the %R value was below 10% reporting limits (for hexachlorobutadiene) were rejected (R-10).

SDG WG18872: $^{13}C_{12}$-1,2,3-trichlorobenzene (low bias in nine samples and less than 10% in three samples).

SDG WG18873: $^{13}C_{12}$-1,2,3-trichlorobenzene (low bias in seven samples and less than 10% in two samples).

SDG WG18874: $^{13}C_{12}$-1,2,3-trichlorobenzene (low bias in eight samples and less than 10% in five samples). $^{13}C_{12}$-alpha endosulfan and $^{13}C_{12}$-methoxychlor (low bias in Sample LW2-BTLW033).

Matrix Spikes/Matrix Spike Duplicates

No matrix spike/matrix spike duplicate (MS/MSD) sets were performed with these SDGs. Accuracy and precision were assessed using labeled compound recoveries, ongoing precision and recovery/ongoing precision and recovery duplicate samples, and laboratory duplicate samples.

Ongoing Precision & Recovery

Hexachlorobutadiene was not included in the ongoing precision and recovery (OPR) samples. Positive values and/or reporting limits for this analyte were estimated (J/UJ-10) in all samples.

SDG WG18873: The %R values for endrin aldehyde and endrin ketone exceeded the upper control limit. These analytes were not detected in any sample, no qualifiers were assigned.

SDG WG18874: The %R value for endrin aldehyde exceeded the upper control limit. Endrin aldehyde was not detected in any sample, no qualifiers were assigned.

Laboratory Duplicates

SDG WG18872: One pair of samples, LW2-GBT025 & LW2-GBT025-Duplicate, were analyzed as laboratory duplicates. Precision results were within control limits for all positive results.

SDG WG18873: One pair of samples, LW2-GBT003 & LW2-GBT003-Duplicate, were analyzed as laboratory duplicates. The following analytes did not meet the acceptance criteria: alpha-HCH, gamma-HCH, cis-chlordane, trans-chlordane, endrin, and heptachlor epoxide. Positive results and reporting limits for these analytes were estimated (J/UJ-9) in the parent and the duplicate samples.

The laboratory duplicate precision values for all DDT compounds exceeded the control limit in Sample LW2-GBT003. The sample was re-extracted in duplicate, along with Samples LW2-GBT-006-1 and LW2-GBT-015. Both sets of results were submitted. The results and reporting limits for all DDT compounds were qualified do-not-report (DNR) in the original analysis. All DDT compounds from the re-analyses were reported for all three samples. The results and reporting limits for all other compounds were qualified as DNR in the reanalysis. The original results were reported.

SDG WG18874: One pair of samples, LW2-GBT019 & LW2-GBT019-Duplicate, were analyzed as laboratory duplicates. The following analytes did not met the acceptance criteria: 2,4′-DDT, 4,4′-DDT, beta-HCH, delta-HCH, gamma-HCH, and heptachlor. Positive results and reporting limits for these analytes were estimated (J-9) in the parent and the duplicate samples.

Field Replicates

Replicate sample pairs were listed below. The following acceptance criteria were applied: the relative percent difference (RPD) control limit is 50% for results greater than five times the reporting limit (RL). For results less than five times the RL, the absolute difference between the sample and replicate must be less than two times the RL. No data were qualified based on field replicate precision outliers. Users of the data should consider the impact of field precision outliers on the reported results.

SDGs WG18872 & WG18874: Samples LW2-BTLC027-1 and LW2-BTLC027-2 were submitted as field replicates. The following analytes did not met the acceptance criteria: 2,4'-DDE, 2,4'-DDT, beta endosulfan, endosulfan sulfate, delta-HCH, gamma-HCH, heptachlor epoxide, oxychlordane, and hexachlorobutadiene.

SDG WG18873: Samples LW2-BTLC006-1 and LW2-BTLC006-2 were submitted as field replicates. The following analytes did not met the acceptance criteria: 2,4'-DDD, 2,4'-DDT, 4,4'-DDT, aldrin, alpha endosulfan, beta endosulfan, and gamma-HCH.

Compound Identification & Quantitation

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

Reporting Limits (MDL and MRL)

Toxaphene is listed as a target analyte in the QAPP but was not reported by the laboratory.

IV. OVERALL ASSESSMENT

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

Data were estimated due to a target analyte not being included in the calibration standards and OPR analyses, due to labeled compound %R outliers, and for a laboratory duplicate precision outlier. Data were qualified as not detected based on contamination in the associated blanks and potential false positive results. Field replicate outliers were noted, although no qualifiers were applied.

Data were rejected due to very low (less than 10%) labeled compound recoveries. Data that have been rejected should not be used for any purpose.

Data were labeled as do-not report to indicate which data should be used when multiple sets of data were reported.

All other data, as qualified, are acceptable for use.

EcoChem, INC.
Environmental Data Quality

APPENDIX A

DATA QUALIFIER DEFINITIONS, REASON CODES, AND CRITERIA TABLES

DATA VALIDATION QUALIFIER CODES
National Functional Guidelines

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

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

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

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

DATA QUALIFIER REASON CODES

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

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

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Cooler Temperature	4°C ±2°	J(+)/UJ(-) if greater than 6 deg. C (EcoChem PJ)	1
Holding Time	Water: 7 days from collection Soil: 14 days from collection Analysis: 40 days from extraction	Water: J(+)/UJ(-) if ext. > 7 and < 21 days J(+)/R(-) if ext > 21 days (EcoChem PJ) Solids/Wastes: J(+)/UJ(-) if ext > 14 and < 42 days J(+)/R(-) if ext. > 42 days (EcoChem PJ) J(+)/UJ(-) if analysis >40 days	1
Tuning	DFTPP Beginning of each 12 hour period Method acceptance criteria	R(+/-) all analytes in all samples associated with the tune	5A
Initial Calibration (Minimum 5 stds.)	RRF > 0.05	(EcoChem PJ, see TM-06) If MDL= reporting limit: J(+)/R(-) if RRF < 0.05 If reporting limit > MDL: note in worksheet if RRF <0.05	5A
	%RSD < 30%	(EcoChem PJ, see TM-06) J(+) if %RSD > 30%	5A
Continuing Calibration (Prior to each 12 hr. shift)	RRF > 0.05	(EcoChem PJ, see TM-06) If MDL= reporting limit: J(+)/R(-) if RRF < 0.05 If reporting limit > MDL: note in worksheet if RRF <0.05	5B
	%D <25%	(EcoChem PJ, see TM-06) If > +/-90%: J+/R- If -90% to -26%: J- (high bias) If 26% to 90%: J+/UJ- (low bias)	5B
Method Blank	One per matrix per batch No results > QL	U(+) if sample (+) result is less than QL and less than appropriate 5X or 10X rule (raise sample value to QL)	7
		U(+) if sample (+) result is greater than or equal to QL and less than appropriate 5X and 10X rule (at reported sample value)	7
	No TICs present	R(+) TICs using 10X rule	7
Field Blanks	No results > QL	Apply 5X/10X rule; U(+) < action level	6

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

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
MS/MSD (recovery)	One per matrix per batch Use method acceptance criteria	Qualify parent only unless other QC indicates systematic problems: J(+) if both %R > UCL J(+)/UJ(-) if both %R < LCL J(+)/R(-) if both %R < 10% **PJ if only one %R outlier**	8
MS/MSD (RPD)	One per matrix per batch Use method acceptance criteria	J(+) if RPD > CL	9
LCS **low conc. H2O SVOA**	One per lab batch Within method control limits	J(+) assoc. cmpd if > UCL J(+)/R(-) assoc. cmpd if < LCL J(+)/R(-) all cmpds if half are < LCL	10
LCS **regular SVOA (H2O & solid)**	One per lab batch Lab or method control limits	J(+) if %R > UCL J(+)/UJ(-) if %R <LCL J(+)/R(-) if %R < 10% **(EcoChem PJ)**	10
LCS/LCSD *(if required)*	One set per matrix and batch of 20 samples RPD < 35%	J(+) assoc. cmpd. in all samples	9
Surrogates	Minimum of 3 acid and 3 base/neutral compounds Use method acceptance criteria	Do not qualify if only 1 acid and/or 1 B/N surrogate is out unless <10% J(+) if %R > UCL J(+)/UJ(-) if %R < LCL J(+)/R(-) if %R < 10%	13
Internal Standards	Added to all samples Acceptable Range: IS area 50% to 200% of CCAL area RT within 30 seconds of CC RT	J(+) if > 200% J(+)/UJ(-) if < 50% J(+)/R(-) if < 25% R T>30 seconds, **narrate and Notify PM**	19
Field Duplicates	QAPP specified RPD < 50% (sediment & water)	Narrate; do not qualify	na
TICs	Major ions (>10%) in reference must be present in sample; intensities agree within 20%; check identification	R(+) common laboratory contaminants R(+) target compouds from other fractions **See Technical Director for ID issues**	4
Quantitation/ Identification	RRT within 0.06 of standard RRT Ion relative intensity within 20% of standard All ions in std. at > 10% intensity must be present in sample	**See Technical Director if outliers**	14 21 (false +)

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

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

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

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Continuing Calibration	Analyzed at the start and end of each 12 hour shift. %D+/-20% for native compounds %D +/-30% for labeled compounds (Must meet limits in Table 6 for 1613B) (If %Ds in the closing CCAL are w/in 25%/35% the avg RF from the 2 CCAL may be used to calculate samples per Section 8.3.2.4 of 8290)	Do not qualify labeled compounds. Narrate in report for labeled compound %D outliers. For native compound %D outliers: 8290: J(+)/UJ(-) if %D = 20% - 75% J(+)/R(-) if %D > 75% 1613: J(+)/UJ(-) if %D is outside Table 6 limits J(+)/R(-) if %D is +/- 75% of Table 6 limit	5B
	Abs. RT of $^{13}C_{12}$-1234-TCDD and ^{13}C12-123789-HxCDD +/- 15 sec of ICAL.	**EcoChem PJ, see ICAL section of TM-05**	
	RRT of all other compounds must meet table 2 of 1613B.	**EcoChem PJ, see TM-05**	
	Ion Abundance ratios within QC limits (Table 8 of method 8290) (Table 9 of method 1613B)	**EcoChem PJ, see TM-05**	
	S/N ratio > 10	If <10, elevate Det. Limit or R(-)	
Method Blank	One per matrix per batch No positive results	If sample result <5X action level, qualify U at reported value. (<10X for phthalates)	7
Field Blanks	No results > QL	Apply 5X rule; U(+) < action level	6
LCS / OPR	Concentrations must meet limits in Table 6 of method 1613B or lab limits.	J(+) if %R > UCL J(+)/UJ(-) if %R < LCL J(+)/R(-) using PJ if %R <<LCL (< 10%)	10
MS/MSD (recovery)	May not analyze MS/MSD %R should meet lab limits.	Qualify parent only unless other QC indicates systematic problems: J(+) if both %R > UCL J(+)/UJ(-) if both %R < LCL J(+)/R(-) if both %R < 10% **PJ if only one %R outlier**	8

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

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

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Butyltins by GC/FPD

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Cooler Temperature	4°C ±2°	J(+)/UJ(-) if greater than 6 deg. C (EcoChem PJ)	1
Holding Time	Water: 7 days from collection Soil: 14 days from collection Analysis: 40 days from extraction	J(+)/UJ(-) if ext/analyzed > HT J(+)/R(-) if ext/analyzed > 3X HT (EcoChem PJ)	1
Initial Calibration	%RSD<30% or correlation co-efficient >0.99	J(high bias), J/UJ(low bias)	5A
Continuing Calibration	%D < 25%	J(high bias), J/UJ(low bias)	5B
Method Blank	One per matrix per batch	U(+) if sample result is < CRQL and < 5X rule (raise sample value to CRQL)	7
		U(+) if sample result is > or equal to CRQL and < 5X rule (at reported sample value)	7
Instrument Blanks	Analyzed at the beginning of every 12 hour sequence No analyte > MRL	Same as Method Blank	7
Field Blanks	No results > QL	Apply 5X rule; U(+) < action level	6
MS/MSD (recovery)	One set per matrix per batch Method Acceptance Criteria	Qualify parent only unless other QC indicates systematic problems; J(+) if both %R > UCL J(+)/UJ(-) if both %R < LCL J(+)/R(-) if both %R < 10% PJ if only one %R outlier	8
MS/MSD (RPD)	One set per matrix per batch Method Acceptance Criteria	J(+) if RPD > CL	9
LCS	One per SDG Method Acceptance Criteria	J(+) if %R > UCL J(+)/UJ(-) if %R < LCL J(+)/R(-) using PJ if %R <<LCL (< 10%)	10
LCS/LCSD *(if required)*	One set per matrix and batch of 20 samples RPD < 35%	J(+) assoc. cmpd. in all samples	9
Surrogates	tri-n-propyltin added to every sample %R = Laboratory control limits	J(+)/UJ(-) if both %R = 10 - 60% J(+) if both >150% J(+)/R(-) if any %R <10%	13
Quantitation/ Identification	Analyte within RTW on both columns Quantitated using ICAL CF Higher value from either column reported %D between columns (40%)	J(+) if RPD = 40 - 60% NJ(+) if RPD >60% **EcoChem PJ - See TM-08**	3

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Butyltins by GC/FPD

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Two analyses for one sample	Report only one result per analyte	"DNR" results that should not be used to avoid reporting two results for one sample	11
Field Duplicates	QAPP specified RPD < 50% (sediment & water)	Narrate; do not qualify.	na

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

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

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

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

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Metals by ICP (Based on Inorganic NFG 1994 & 2002)

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

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

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

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

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Metals by ICP (Based on Inorganic NFG 1994 & 2002)

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

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Metals by ICP-MS (Based on Inorganic NFG 1994 & 2002)

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

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

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

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

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Metals by ICP-MS (Based on Inorganic NFG 1994 & 2002)

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

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Mercury by CVAA (Based on Inorganic NFG 1994 & 2002)

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

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

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

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

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Mercury by CVAA (Based on Inorganic NFG 1994 & 2002)

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

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EcoChem Validation Guidelines (Based on Methods)
Conventionals Analyses

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Cooler Temperature and Preservation	4°C ±2° Water: NaOH to pH > 12 (for CN)	J(+)/UJ(-) if preservation requirements not met EcoChem PJ	1
Holding Time	Method Specific	Professional Judgment J(+)/UJ(-) if holding time exceeded J(+)/R(-) if HT exceeded by > 3X	1
Initial Calibration	Method specific once every 24 hours One at CRDL r>0.995	Professional judgment J(+)/UJ(-) for r < 0.995	5A
Initial Calibration Verification (ICV)	Independent source analyzed immediately after cal. %R method specific	R(+/-) if %R sig < LCL J(+)/UJ(-) if %R < LCL J(+) if %R > UCL R(+) if %R sig > UCL	5A
Continuing Cal Verification (CCV)	Every ten samples, immed. following ICV/ICB and end of run %R method specific	R(+/-) if %R sig < LCL J(+)/UJ(-) if %R < LCL J(+) if %R > UCL R(+) if %R sig > UCL	5B
Initial and Continuing Cal Blanks (ICB/CCB)	After each ICV and CCV every ten samples and end of run blank < +/- IDL	For positive blk results: UJ(+) < 5X blk contamination For negative blk results: J(+)/UJ(-) < abs. value of 5X blk contamination	7
Prep Blank	One per matrix per batch (not to exceed 20 samples)	For positive blk results: UJ(+) < 5X blk contamination For negative blk results: J(+)/UJ(-) < abs. value of 5X blk contamination	7
Matrix Spike	One per matrix per batch; 5% frequency 75-125% for samples less than 4 x spike level	J(+) if %R > 125% or < 75% UJ(-) if %R = 30-74% R(+/-) results < IDL if %R < 30%	8
Laboratory Duplicate	One per matrix per batch RPD <20% for samples > 5x CRDL Diff < CRDL for samples >CRDL and <5 x CRDL (may use RPD < 35%, Diff < 2X CRDL for solids)	J(+)/UJ(-) in assoc samples if RPD > 20% or diff > CRDL	9
Laboratory Control Sample	Waters: One per matrix per batch %R (80-120%)	R(+/-) if MS/MSD & LCS %R outside limits J(+)/UJ(-) if %R = 50-79% J(+) if %R > 120% R(+/-) if %R < 50%	10
	Soils: One per matrix per batch Result within manufacturer's certified acceptance range	J(+)/UJ(-) if < LCL, J(+) if > UCL	10

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EcoChem Validation Guidelines (Based on Methods)
Conventionals Analyses

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Field Blanks	taken on same day as samples	Action level is 5x blk conc. U(+) sample values < AL	6
Field Duplicates	Waters RPD < 35% Soils RPD < 50% for values > 5 x CRDL Diff < CRDL for samples >CRDL and <5 x CRDL (may use Diff < 2X CRDL for solids)	J(+)/UJ(-) in parent samples only	9

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