



DATA VALIDATION REPORT
Portland Harbor
Swan Island Lagoon Phases 1b & 2
ARI PCB Results

Prepared for:

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EcoChem Project: C27701-3

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Approved for Release:

A handwritten signature in black ink that reads "Christina Mott Frans". The signature is written in a cursive style.

Christina Mott Frans
Project Manager
EcoChem, Inc.

PROJECT NARRATIVE

Basis for the Data Validation

This report presents the results of Summary and Full Validation (EPA Stage 2A and EPA Stage 4) performed on sediment and field and laboratory quality control sample data for samples collected at the Head of Swan Island Lagoon at Portland Harbor. A complete list of samples is provided in the **Sample Index**.

Samples were analyzed by Analytical Resources, Inc., Tukwila, Washington. The analytical methods and EcoChem project chemists are listed below.

ANALYSIS	METHOD	PRIMARY REVIEW	SECONDARY REVIEW
PCB Aroclors	SW8082A	E. Clayton	C. Frans
Total Organic Carbon	SW9060A		
Total Solids	SM 2540 G-97		

The data were reviewed using guidance and quality control criteria documented in the analytical methods; *Head of Swan Island Lagoon Sediment Field Sampling Plan Portland Harbor Superfund Site* (Pacific Groundwater Group, October 22, 2018); *National Functional Guidelines for Organic Data Review* (USEPA 2008 & 2014); and *National Functional Guidelines for Inorganic Data Review* (USEPA 2010).

EcoChem's goal in assigning data assessment qualifiers is to assist in proper data interpretation. If values are estimated (J or UJ), data may be used for site evaluation and risk assessment purposes but reasons for data qualification should be taken into consideration when interpreting sample concentrations. If values are assigned an R, the data are to be rejected and should not be used for any site evaluation purposes. If values have no data qualifier assigned, then the data meet the data quality objectives as stated in the documents and methods referenced previously.

Data qualifier definitions, reason codes, and validation criteria are included as **Appendix A**. A Qualified Data Summary Table is included in **Appendix B**. Data Validation Worksheets will be kept on file at EcoChem, Inc. A qualified laboratory electronic data deliverable (EDD) is also submitted with this report.

Sample Index

Pacific Groundwater Group - Portland Harbor Head of Swan Island Phases 1b and 2

SDG	Sample ID	Laboratory ID	PCBs	TOC	Total Solids
1910008	L3-SC1b-20to30-82619	1910008-01	✓	✓	✓
	L3-SC1b-30to40-82619	1910008-02	✓	✓	✓
	D6-SC1b-20to30-82619	1910008-05	✓	✓	✓
	D6-SC1b-30to40-82619	1910008-06	✓	✓	✓
	D6-SC1b-40to50-82619	1910008-07	✓	✓	✓
	D6-SC1b-50to60-82619	1910008-08	✓	✓	✓
	D6-SC1b-60to70-82619	1910008-09	✓	✓	✓
	D6-SC1b-70to80-82619	1910008-10	✓	✓	✓
	D6-SC1b-80to90-82619	1910008-11	✓	✓	✓
	D6-SC1b-90to100-82619	1910008-12	✓	✓	✓
	D6-SC1b-100to110-82619	1910008-13	✓	✓	✓
	D6-SC1b-110to120-82619	1910008-14	✓	✓	✓
	411-SC1b-50to60-82619	1910008-16	✓		✓
	J3-SC1b-20to30-82719	1910008-17	✓	✓	✓
	J3-SC1b-30to40-82719	1910008-18	✓	✓	✓
	J3-SC1b-40to50-82719	1910008-19	✓	✓	✓
	J3-SC1b-50to60-82719	1910008-20	✓	✓	✓
	J3-SC1b-60to70-82719	1910008-21	✓	✓	✓
	J3-SC1b-70to80-82719	1910008-22	✓	✓	✓
	J3-SC1b-80to90-82719	1910008-23	✓	✓	✓
	J3-SC1b-90to100-82719	1910008-24	✓	✓	✓
	J3-SC1b-10to20-82719	1910008-25	✓	✓	✓
	412-SC1b-80to90-82719	1910008-26	✓	✓	✓
	J6-SC1b-20to30-82819	1910008-27	✓	✓	✓
	J6-SC1b-30to40-82819	1910008-28	✓	✓	✓
	J6-SC1b-40to50-82819	1910008-29	✓	✓	✓
	J6-SC1b-50to60-82819	1910008-30	✓	✓	✓
	J6-SC1b-60to70-82819	1910008-31	✓	✓	✓
	J6-SC1b-70to80-82819	1910008-32	✓	✓	✓
	J6-SC1b-80to90-82819	1910008-33	✓	✓	✓
	J6-SC1b-90to100-82819	1910008-34	✓	✓	✓
	J6-SC1b-100to110-82819	1910008-35	✓	✓	✓
	J6-SC1b-110to120-82819	1910008-36	✓	✓	✓
	R4-SC1b-20to30-82819	1910008-40	✓	✓	✓
	R4-SC1b-30to40-82819	1910008-41	✓	✓	✓
	R4-SC1b-40to50-82819	1910008-42	✓	✓	✓
	R4-SC1b-50to60-82819	1910008-43	✓	✓	✓
	R4-SC1b-60to70-82819	1910008-44	✓	✓	✓
	R4-SC1b-70to80-82819	1910008-45	✓	✓	✓

Sample Index

Pacific Groundwater Group - Portland Harbor Head of Swan Island Phases 1b and 2

SDG	Sample ID	Laboratory ID	PCBs	TOC	Total Solids
19I0008	R4-SC1b-80to90-82819	19I0008-46	✓	✓	✓
	R4-SC1b-90to100-82819	19I0008-48	✓	✓	✓
	R4-SC1b-100to110-82819	19I0008-50	✓	✓	✓
	R4-SC1b-110to120-82819	19I0008-51	✓	✓	✓
	R4-SC1b-120to130-82819	19I0008-52	✓	✓	✓
	413-SC1b-40to50-82819	19I0008-53	✓	✓	✓
	R4-SC1b-130to140-82819	19I0008-54	✓	✓	✓
	R4-SC1b-140to150-82819	19I0008-55	✓	✓	✓
	H3-SC1b-20to30-82819	19I0008-56	✓	✓	✓
	H3-SC1b-30to40-82919	19I0008-57	✓	✓	✓
	H3-SC1b-40to50-82919	19I0008-58	✓	✓	✓
	H3-SC1b-50to60-82919	19I0008-59	✓	✓	✓
	H3-SC1b-60to70-82919	19I0008-60	✓	✓	✓
	H3-SC1b-70to80-82919	19I0008-61	✓	✓	✓
	H3-SC1b-80to90-82919	19I0008-62	✓	✓	✓
	H3-SC1b-90to100-82919	19I0008-63	✓	✓	✓
	H3-SC1b-100to110-82919	19I0008-64	✓	✓	✓
	711-82719	19I0008-67	✓	✓	
	712-82819	19I0008-68	✓	✓	
	H3-SC1b-110to114-82919	19I0008-69	✓	✓	✓
	J5-SC1b-20to30-82719	19I0008-70	✓		
	J5-SC1b-30to40-82719	19I0008-71	✓		
	J5-SC1b-40to50-82719	19I0008-72	✓		
	J5-SC1b-50to60-82719	19I0008-73	✓		
	J5-SC1b-60to70-82719	19I0008-74	✓		
	J5-SC1b-70to80-82719	19I0008-75	✓		
	J5-SC1b-80to90-82719	19I0008-76	✓		
	J5-SC1b-90to100-82719	19I0008-77	✓		
J5-SC1b-100to110-82719	19I0008-78	✓			
19J0249	J3-SC-00to10-102218	19J0249-01	✓		
	D6-SC-0to1-102118	19J0249-02	✓		
	R4-SC-0to1-102118	19J0249-03	✓		

DATA VALIDATION REPORT
Pacific Groundwater Group: PH Head of Swan Island Sediments
PCB Aroclors by EPA 8082A

This report documents the review of analytical data from the analysis of sediment samples and the associated laboratory quality control (QC) samples. Samples were analyzed by Analytical Resources, Inc., Tukwila, Washington. Refer to the **Sample Index** for a complete list of samples.

SDG	NUMBER OF SAMPLES	VALIDATION LEVEL
19I0008	66 Sediment, 2 Water & 2 Field Blank	EPA Stage 2A EPA Stage 4 (batch BHI0176)
19J0249	3 Sediment	EPA Stage 2A

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.

EDD TO HARDCOPY VERIFICATION

All sample IDs and results reported in the electronic data deliverable (EDD) were verified (100% verification) by comparing the EDD to the hardcopy laboratory data package. Ten percent (10%) of the laboratory QC results were also verified.

TECHNICAL DATA VALIDATION

This report documents the review of analytical QC requirements as listed in the following table.

1	Sample Receipt, Preservation, and Holding Times	✓	Laboratory Control Samples (LCS)
✓	Initial Calibration (ICAL)	1	Certified Reference Material
✓	Continuing Calibration (CCAL)	1	Field Duplicates
✓	Laboratory Blanks	✓	Target Analyte List
1	Field Blanks	1	Reporting Limits
2	Surrogate Compounds	2	Compound Identification
2	Internal Standards	2	Reported Results
2	Matrix Spikes/Matrix Spike Duplicates (MS/MSD)	1	Calculation Verification (Full validation only)
2	Laboratory Duplicates		

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.

Sample Receipt, Preservation, and Holding Times

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 sample coolers within the advisory temperature range.

SDG 19I0008: Sample 712-82819 has a collection date of 8/27/19 on the chain-of-custody (COC), however, the identification (ID) segment indicates 8/28/19. This field blank sample was associated with samples collected on 8/28/19.

Field Blanks

SDG 19I0008: Samples 711-82719 and 712-82819 were identified as field blanks. Target analytes were not detected in these blank samples, no qualification was required.

Surrogate Compounds

The surrogate compounds tetrachloro-m-xylene (TCMX) and decachlorobiphenyl (DCBP) were added to all samples. With the following exceptions, all surrogate recovery values were within the laboratory control limits.

SDG 19I0008: The surrogate recoveries were greater than the laboratory control limit for decachlorobiphenyl in Samples J5-SC1b-40to50-82719 and H3-SC1b-50to60-82719, and the matrix spike samples for H3-SC1b-20to30-82819 and H3-SC1b-20to30-82819. No results were qualified for these outliers because QC samples are not qualified, and the field samples were analyzed at a 10X dilution factor and were diluted beyond a level of accurate quantitation.

Matrix Spikes/Matrix Spike Duplicates

Matrix spike/matrix spike duplicate samples (MS/MSD) were analyzed at the appropriate frequency. No action is taken unless both the MS and MSD %R values are outside the control limits for MS/MSD %R outliers. When the MS/MSD %R values indicate a potential low bias, associated results are estimated (J/UJ-8). Only the associated positive results are estimated (J-8) if the %R values indicate a potential high bias. Precision is indicated by the relative percent difference (RPD) between the MS and MSD values. Associated positive results are estimated (J-9) if the RPD values indicate uncertainty. Qualifiers were only issued to the parent sample.

SDG 19I0008: Samples J3-SC1b-30to40-82719, H3-SC1b-20to30-82819, and J5-SC1b-20to30-82719 were analyzed as the MS/MSD samples. The %R values for Aroclor 1260 were less than the lower control limit or not recovered; the associated results in the parent samples were estimated (J-8L).

Sample R4-SC1b-20to30-82819 was analyzed as the MS/MSD sample. The MS %R value for Aroclor 1260 was less than the lower control limit but was in control in the associated MSD sample; no data were qualified for this single outlier.

SDG 19J0129: Sample J3-SC-00to10-102218 was analyzed as the MS/MSD sample. The MSD %R values for Aroclor 1016 and 1260 were less than the lower control limits but were in control in the associated MS sample; no data were qualified for these single outliers.

Laboratory Duplicates

One sample from each laboratory batch was extracted and analyzed in duplicate. Relative percent difference (RPD) values were calculated for detected analytes where results are greater than five

times the reporting limit (RL). With the exception noted below, all RPD values were less than the 20% control limit.

SDG 19I0008: Sample J5-SC1b-30to40-82719 was analyzed as a laboratory duplicate sample. The RPD value for Aroclor 1254 was greater than the control limit 32%; the associated result in the parent sample was estimated (J-9).

Certified Reference Material

The laboratory extracted and analyzed Sigma-Aldrich reference material for Aroclor-1254 (PCB1254-Loam). The criteria for CRM recovery are that the reported results are within $\pm 20\%$ of the 95% confidence interval of the true value for analytes with reference concentrations greater than five times the detection limit.

All CRM results were within the control limits.

Field Duplicates

For sediment samples, 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 duplicate precision outliers. Users of the data should consider the impact of field precision outliers on the reported results.

SDG 19I0008: Samples J3-SC1b-80to90-82719 & 412-80to90-82719, R4-SC1b-40to50-82819 & 413-SC1b-40to50-82819, and 411-SC1b-50to60-82619 & D6-SC1b-50to60-82619 were submitted as field duplicates. Field precision was acceptable.

Reporting Limits

Reporting limits were elevated due to required dilutions and/or percent moisture adjustment and were greater than the work plan specified limits.

Compound Identification

As required by the method, the laboratory analyzed any samples with positive detections on a confirmatory column. The results from the two analytical columns were compared for agreement. An elevated RPD value may indicate the presence of an interference resulting in a high bias. When the RPD value was greater than or equal to 40% but less than 60% the reported value was estimated (J-3). If the RPD value was greater than 60%, the result was qualified as a tentative identification (NJ-3). Confirmation outliers resulting in data qualification are discussed below.

For the following samples, the second column confirmation RPD values were greater than 40% and were estimated (J/NJ-3):

SDG	Sample ID	Compound	RPD	Qualifier
19I0008	J3-SC1b-40to50-82719	Aroclor 1254	49.0	J-3

SDG	Sample ID	Compound	RPD	Qualifier
19I0008	J6-SC1b-20to30-82819	Aroclor 1254	43.2	J-3
	R4-SC1b-20to30-82819	Aroclor 1260	73.8	NJ-3
	R4-SC1b-70to80-82819	Aroclor 1248	44.4	J-3
	R4-SC1b-80to90-82819	Aroclor 1254	42.5	J-3
		Aroclor 1248	68.0	NJ-3
	R4-SC1b-100to110-82819	Aroclor 1248	70.4	NJ-3
	R4-SC1b-110to120-82819	Aroclor 1248	46.3	J-3
	R4-SC1b-120to130-82819	Aroclor 1254	40.3	J-3
		Aroclor 1248	64.1	NJ-3
	R4-SC1b-130to140-82819	Aroclor 1254	44.3	J-3
	J5-SC1b-90to100-82719	Aroclor 1260	48.0	J-3
J5-SC1b-80to90-82719	Aroclor 1254	200	NJ-3	
19J0129	D6-SC-0to1-102118	Aroclor 1248	48.4	J-3

Reported Results

SDG 19I0008: Sample J6-SC1b-40to50-82819 was reanalyzed at a 5x dilution due to an instrument response for Aroclor 1260 that exceeded the calibration range. Both sets of results were reported. The over range result was flagged as do-not report (DNR-20) and all other results in the diluted sample were flagged as do-not-report (DNR-11).

Calculation Verification

SDG 19I0008: Several results in batch 288730 of this SDG were verified by recalculation from the raw data. No calculation or transcription errors were found.

OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. With the exceptions noted above, accuracy was acceptable as demonstrated by the surrogate, LCS/LCSD, and MS/MSD recoveries. With the exceptions noted above, precision was also acceptable as demonstrated by the LCS/LCSD, MS/MSD, and field and laboratory duplicate RPD values.

Data were estimated due to MS/MSD accuracy outliers and a laboratory duplicate precision outlier. Results were also estimated and tentatively identified based on dual column confirmation RPD outliers.

Results were qualified as do-not-report to indicate which result not to use from multiple reported results. Data flagged as do-not-report should not be used for any reason.

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

DATA VALIDATION REPORT

Pacific Groundwater Group: PH Head of Swan Island Sediments Conventional Tests

This report documents the review of analytical data from the analysis of sediment samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Analytical Resources, Inc, Tukwila, Washington. Refer to the **Sample Index** for a complete list of samples.

SDG	NUMBER OF SAMPLES AND MATRIX	VALIDATION LEVEL
19I0008	48 Sediment & 2 Field Blank	EPA Stage 3 (batch BHI0179) & EPA Stage 2A

The analytical tests that were performed are summarized below:

PARAMETER	METHOD
Total Solids	SM2540G
Total Organic Carbon (TOC)	EPA 9060

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.

EDD TO HARDCOPY VERIFICATION

All sample IDs and results reported in the electronic data deliverable (EDD) were verified (100% verification) by comparing the EDD to the hardcopy laboratory data package. Ten percent (10%) of the laboratory QC results were also verified.

TECHNICAL DATA VALIDATION

This report documents the review of analytical QC requirements as listed in the following table.

✓	Sample Receipt, Preservation, and Holding Times	2	Matrix Spikes (MS) and Matrix Spike Duplicates (MSD)
✓	Initial Calibration	✓	Laboratory Duplicates
✓	Calibration Verification	1	Field Duplicates
✓	Laboratory Blanks	✓	Reporting Limits
1	Field Blanks	✓	Reported Results
1	Reference Materials	1	Calculation Verification (Full validation only)
✓	Laboratory Control Samples (LCS)		

✓ Method quality objectives (MQO) and QC criteria have been met. No outliers are noted or discussed.

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.

Field Blanks

Samples 711-82719 and 712-82819 were identified as field blanks. No target analytes were detected.

Reference Materials

No certified reference materials were submitted.

Matrix Spikes/Matrix Spike Duplicate

Matrix spike/matrix spike duplicate samples (MS/MSD) were analyzed at the proper frequency of one per 20 samples or one per batch for soil samples. Where analyte concentrations were less than 4x the spike amount, the percent recovery (%R) and relative percent difference (RPD) values were evaluated. The recovery control limits are 80%-120%. If the percent recovery values indicate a potential low bias, associated results are estimated (J/UJ-8). If the %R values indicate a potential high bias, only the associated positive results are estimated (J-8). Precision is indicated by the relative percent difference (RPD) between the MS and MSD values. RPD values outside the control limits indicate uncertainty in the measured results for the sample and positive results are estimated (J-9). Qualifiers were issued to all samples associated with a QC batch. With the following exceptions %R and RPD values were within the laboratory control limits.

For batch BH10374, Sample J3-SC1b-30to40-82719 was used for the TOC matrix spikes, the MS/MSD %R values for total organic carbon (TOC) were less than the lower control limit; all associated TOC results in the batch were estimated (J-8L) to indicate a potential low bias.

Field Duplicate

For sediment samples, 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 duplicate precision outliers. Users of the data should consider the impact of field precision outliers on the reported results.

Samples J3-SC1b-80to90-82719 & 412-80to90-82719 and R4-SC1b-40to50-82819 & 413-SC1b-40to50-82819 were submitted as field duplicates. Field precision was acceptable.

Calculation Verification

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

OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical methods. With the exceptions noted previously, accuracy was acceptable, as demonstrated by the laboratory control sample and matrix spike recoveries. Precision was also acceptable as demonstrated by the laboratory and field duplicate RPD values.

Data were qualified for matrix spike recovery outliers.

All data, as qualified, are acceptable for use.



APPENDIX A

DATA QUALIFIER DEFINITIONS REASON CODES AND CRITERIA TABLES

DATA VALIDATION QUALIFIER CODES **Based on 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.
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.
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DATA QUALIFIER REASON CODES

Group	Code	Reason for Qualification
Sample Handling	1	Improper Sample Handling or Sample Preservation (i.e., headspace, cooler temperature, pH, summa canister pressure); Exceeded Holding Times
Instrument Performance	24	Instrument Performance (i.e., tune, resolution, retention time window, endrin breakdown, lock-mass)
	5A	Initial Calibration (RF, %RSD, r^2)
	5B	Calibration Verification (CCV, CCAL; RF, %D, %R) Use bias flags (H,L) ¹ where appropriate
	5C	Initial Calibration Verification (ICV %D, %R) Use bias flags (H,L) ¹ where appropriate
Blank Contamination	6	Field Blank Contamination (Equipment Rinsate, Trip Blank, etc.)
	7	Lab Blank Contamination (i.e., method blank, instrument blank, etc.) Use low bias flag (L) ¹ for negative instrument blanks
Precision and Accuracy	8	Matrix Spike (MS and/or MSD) Recoveries Use bias flags (H,L) ¹ where appropriate
	9	Precision (all replicates: LCS/LCSD, MS/MSD, Lab Replicate, Field Replicate)
	10	Laboratory Control Sample Recoveries (a.k.a. Blank Spikes) Use bias flags (H,L) ¹ where appropriate
	12	Reference Material Use bias flags (H,L) ¹ where appropriate
	13	Surrogate Spike Recoveries (a.k.a. labeled compounds, recovery standards) Use bias flags (H,L) ¹ where appropriate
Interferences	16	ICP/ICP-MS Serial Dilution Percent Difference
	17	ICP/ICP-MS Interference Check Standard Recovery Use bias flags (H,L) ¹ where appropriate
	19	Internal Standard Performance (i.e., area, retention time, recovery)
	22	Elevated Detection Limit due to Interference (i.e., chemical and/or matrix)
	23	Bias from Matrix Interference (i.e. diphenyl ether, PCB/pesticides)
Identification and Quantitation	2	Chromatographic pattern in sample does not match pattern of calibration standard
	3	2 nd column confirmation (RPD or %D)
	4	Tentatively Identified Compound (TIC) (associated with NJ only)
	20	Calibration Range or Linear Range Exceeded
	25	Compound Identification (i.e., ion ratio, retention time, relative abundance, etc.)
Miscellaneous	11	A more appropriate result is reported (multiple reported analyses i.e., dilutions, re-extractions, etc. Associated with "R" and "DNR" only)
	14	Other (See DV report for details)
	26	Method QC information not provided

¹H = high bias indicated

L = low bias indicated

PCB Aroclors by GC
(Based on Organic NFG 2008 and SW-846 Method 8082A)

QC Element	Acceptance Criteria (NFG)	Source of Criteria	Action for Non-Conformance	Reason Code	Discussion and Comments
Sample					
Cooler/Storage Temperature Preservation	4°C ± 2°C Tissue/sediments (may be frozen -20°C)	NFG ⁽¹⁾ Method ⁽²⁾	If required by project: J (pos)/UJ (ND) if greater than 6° C	1	Use Professional Judgment (PJ) to qualify for temperature outlier. Current SW846 criterion is ≤ 6° C ⁽³⁾
Holding Time	Extraction Aqueous: 7 days from collection Extraction Solid: 14 days from collection Extraction Tissue/Sediment (frozen): 1 year Analysis (all matrices): 40 days from extraction	NFG ⁽¹⁾ Method ⁽²⁾	If required by project: J (pos)/UJ (ND) if ext/analyzed > HT J (pos)/R (ND) if gross exceedance (> 2x HT)	1	Use PJ to qualify for holding time outlier. Current SW846 does not have an extraction holding time limit. ⁽³⁾ Gross exceedance > 2x HT, as per NFG 1999
Instrument Performance					
Retention Times	Surrogates: TCMX (± 0.05); DCB (± 0.10) Aroclors (± 0.07)	NFG ⁽¹⁾	NJ (pos)/R (ND) results for analytes with RT shifts	24	
Initial Calibration	Minimum 5 point with RSD ≤ 20% OR correlation coefficient (r-value) ≥ 0.995 OR Minimum 6-point with co-efficient of determination (r ² -value) ≥ 0.99	NFG ⁽¹⁾ Method ⁽⁴⁾	J (pos) if %RSD greater than 20% OR r-value < 0.995 OR r ² -value < 0.99	5A	Refer to TM-01 for additional information. Use bias flags (H,L) ⁽⁵⁾ where appropriate
Initial Calibration Verification (ICV)	No NFG criteria. Project specific.	Project	J (pos) if > UCL J (pos)/UJ (ND) if < LCL	5B	Use bias flags (H,L) where appropriate
Continuing Calibration (Prior to each 12 hr. shift)	%D ± 20%	Method ⁽²⁾	If > 20% (high bias): J (pos) If < 20% (low bias): J (pos)/UJ (ND)	5B	Refer to TM-01 for additional information. Use bias flags (H,L) where appropriate
Blank Contamination					
Method Blank (MB)	MB: One per matrix per batch of (of ≤ 20 samples) No detected compounds > RL	NFG ⁽¹⁾ Method ⁽²⁾	U (pos) if result is less than appropriate 5X action level.	7	Hierarchy of blank review: #1 - Review MB and IB, qualify as needed #2 - Review FB , qualify as needed Note: Actions as per NFG 1999 Note: IB not required by method
Field Blank (FB)	FB: frequency as per QAPP No detected compounds > RL	NFG ⁽¹⁾ Method ⁽²⁾	U (pos) if result is less than appropriate 5X action level.	6	
Instrument Blanks (IB)	Analyzed at the beginning and end of every 12 hour sequence No analyte > CRQL	NFG ⁽¹⁾	U (pos) if result is less than appropriate 5X action level.	7	

PCB Aroclors by GC
(Based on Organic NFG 2008 and SW-846 Method 8082A)

QC Element	Acceptance Criteria (NFG)	Source of Criteria	Action for Non-Conformance	Reason Code	Discussion and Comments
Precision and Accuracy					
MS/MSD (recovery)	One set per matrix per batch (of ≤ 20 samples) AR1016 and AR1260: %R = 29% - 135%, or project limits	NFG ⁽¹⁾ Method ⁽²⁾	Qualify parent only unless other QC indicates systematic problems. J (pos) if both %R > upper control limit (UCL) J (pos)/UJ (ND) if both %R < lower control limit (LCL) J (pos)/R (ND) if both %R < 10%	8	No action if only one spike %R is outside criteria. No action if native analyte conc. > 5x the amount spiked. Use bias flags (H,L) where appropriate. Actions apply to all Aroclors in parent sample.
MS/MSD (RPD)	One set per matrix per batch (of ≤ 20 samples) AR1016: RPD < 15%, AR1260: RPD < 20% or project limits	NFG ⁽¹⁾ Method ⁽²⁾	Qualify parent only unless other QC indicates systematic problems. J (pos) if RPD > control limit	9	No action if parent is ND.
LCS	One per lab batch (of ≤ 20 samples) AR1016 and AR1260: %R = 50% - 150%, or project limits	NFG ⁽¹⁾	J (pos) if %R > UCL J (pos)/UJ (ND) if %R < LCL J (pos)/R (ND) if %R < 10%	10	Use bias flags (H,L) where appropriate. Actions apply to all Aroclors in associated samples.
LCS/LCSD (RPD)	if analyzed use MS/MSD RPD criteria	NFG ⁽¹⁾	J (pos) assoc. compound in all samples	9	LCSD not required by method or NFG
Precision and Accuracy					
Surrogates	TCMX and DCBP added to every sample %R = 30% - 150% or project limits	NFG ⁽¹⁾ Method ⁽²⁾	J (pos) if either %R > UCL J (pos)/UJ (ND) if either %R < LCL J (pos)/R (ND) if either %R < 10%	13	If %R < 10% (sample dilution is a factor), use PJ Use bias flags (H,L) where appropriate
Internal Standards (if used)	Acceptable Range: IS area = 50% to 200% of CCAL area RT within 30 seconds of CC RT	Method ⁽²⁾	J (pos) if area > 200% J (pos)/UJ (ND) if area < 50% J (pos)/R (ND) if area < 25% RT > 30 seconds, narrate	19	
Field Duplicates	Solids: RPD < 50% OR difference < 2X RL (for results < 5X RL) Aqueous: RPD < 35% OR difference < 1X RL (for results < 5X RL)	EcoChem	J (pos)/UJ (ND) Qualify only parent and field duplicate samples	9	use project limits if specified

PCB Aroclors by GC
(Based on Organic NFG 2008 and SW-846 Method 8082A)

QC Element	Acceptance Criteria (NFG)	Source of Criteria	Action for Non-Conformance	Reason Code	Discussion and Comments
Compound Identification/Quantification					
Quantitation/ Identification	Between two columns: RPD < 40% or %D < 25% Within Retention Time Windows on both columns.	NFG ⁽¹⁾ Method ⁽²⁾	J (pos) if RPD = 40% - 60% (25% - 60% for %D) NJ (pos) if > 60% R (pos) if RTW criterion not met	3	See TM-08 for additional info.
Calibration Range	on column concentration < high calibration standard	NFG ⁽¹⁾ Method ⁽²⁾	J (pos) if conc > high standard and sample was not diluted	20	
Dilutions, Re-extractions and/or Reanalyses	Report only one result per analyte	Standard reporting policy	Use "DNR" to flag results that will not be reported.	11	TM-04 Rev. 1 for additional info.
Sample Clean-up					
GPC/Sulfur/ Florisil/Acid	No criteria - cleanups are optional	NFG ⁽¹⁾ Method ⁽²⁾	Use Professional Judgment	14	special cleanups may be required for project cleanup standards may be associated with GPC/florisil cleanups

¹ National Functional Guidelines for Organic Data Review, June, 2008

² Polychlorinated Biphenyls (PCBs) by Gas Chromatography USEPA Method SW846 8082A, Feb 2007, Rev. 1

³ SW846, Chapter 4, Organic Analytes

⁴ Determinative Chromatographic Separations, Method 8000C, March 2003, Rev.3

⁵ "H" = high bias indicated; "L" = low bias indicated

DATA VALIDATION CRITERIA

Table: CONV-Calibrated
 Revision No.: 0
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Conventional Methods with Instrument Calibrations (i.e., Ion Chromatography, Total Organic Carbon) (Based on Inorganic NFG 2010 and EPA methods)

QC Element	Acceptance Criteria	Source of Criteria	Action for Non-Conformance	Reason Code	Discussion and Comments
Sample Handling					
Cooler/Storage Temperature Preservation	Cooler temperature: 4°C±2°C Preservation: Analyte/Method Specific	NFG ⁽¹⁾ Method ⁽²⁾	J (pos)/UJ (ND) if preservation requirements not met	1	Use PJ to qualify for cooler temp outliers.
Holding Time	Analyte/Method Specific	NFG ⁽¹⁾ Method ⁽²⁾	J (pos)/UJ (ND) if holding time exceeded	1	
Instrument Performance					
Initial Calibration (ICAL)	blank + multiple standards as per method requirements r ≥ 0.995	NFG ⁽¹⁾ Method ⁽²⁾	J (pos)/UJ (ND) for r < 0.995	5A	
Initial Calibration Verification (ICV)	Independent source analyzed immediately after calibration %R method specific	NFG ⁽¹⁾ Method ⁽²⁾	J (pos)/UJ (ND) if %R < lower control limit (LCL) J (pos) if %R > upper control limit (UCL)	5A (H,L) ³	Qualify all samples in run
Continuing Calibration Verification (CCV)	Immediately following ICV, every 10 samples, and end of run %R method specific	NFG ⁽¹⁾ Method ⁽²⁾	J(pos)/UJ(ND) if %R < LCL J(pos) if %R > UCL	5B (H,L) ³	Qualify samples bracketed by CCV outliers
Blank Contamination					
Method Blank (MB)	One per matrix per batch of (of ≤ 20 samples) Blank conc < MDL	NFG ⁽¹⁾ Method ⁽²⁾	U (pos) if result is < 5X method blank concentration	7	Refer to TM-02 for additional information. Blank Evaluation based on NFG 1994

DATA VALIDATION CRITERIA

Table: CONV-Calibrated
 Revision No.: 0
 Last Rev. Date: 01/14/2015
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Conventional Methods with Instrument Calibrations (i.e., Ion Chromatography, Total Organic Carbon) (Based on Inorganic NFG 2010 and EPA methods)

QC Element	Acceptance Criteria	Source of Criteria	Action for Non-Conformance	Reason Code	Discussion and Comments
Instrument Blanks (ICB/CCB)	After each ICV & CCV blank concentration < MDL	NFG ⁽¹⁾ Method ⁽²⁾	Action level is 5x absolute value of blank conc. For positive blanks: U (pos) results < action level For negative blanks: J (pos)/UJ (ND) results < action level	Pos Blanks: 7 Neg Blanks: 7L ³	Use blanks bracketing samples for Qualification Refer to TM-02 for additional information. Hierarchy of blank review: #1 - Review MB, qualify as needed #2 - Review IB, qualify as needed #3 - Review FB, qualify as needed
Field Blank (FB)	Blank conc < MDL	EcoChem standard policy	U (pos) if result is < 5x action level, as per analyte.	6	Qualify in associated field samples only. Refer to TM-02 for additional information.
Precision and Accuracy					
Laboratory Control Sample (LCS)	One per matrix per batch (of ≤ 20 samples) %R within Method control limits (or Laboratory control limits if none specified in method)	NFG ⁽¹⁾ Method ⁽²⁾	J (pos)/UJ (ND) if %R < LCL J (pos) if %R > UCL	10 (H,L) ³	Qualify all samples in batch QAPP may have overriding accuracy limits.
Reference Materials (RM, CRM, SRM)	Result ±20% of the 95% confidence interval of the true value for analytes	EcoChem standard policy	J (pos)/UJ (ND) if < LCL J (pos) if > UCL	12 (H,L) ³	QAPP may have overriding accuracy limits. Some manufacturers may have different RM control limits

DATA VALIDATION CRITERIA

Table: CONV-Calibrated
 Revision No.: 0
 Last Rev. Date: 01/14/2015
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Conventional Methods with Instrument Calibrations (i.e., Ion Chromatography, Total Organic Carbon) (Based on Inorganic NFG 2010 and EPA methods)

QC Element	Acceptance Criteria	Source of Criteria	Action for Non-Conformance	Reason Code	Discussion and Comments
Matrix Spike/ Matrix Spike Duplicate (MS/MSD)	Where applicable to method; MSD may not be required One per matrix per batch (of ≤ 20 samples) For samples <4x spike level, %R within method control limits (or Laboratory control limits if none specified in method)	NFG ⁽¹⁾ Method ⁽²⁾	J (pos)/UJ (ND) if %R < LCL J (pos) if %R > UCL	8 (H,L)3	Qualify all samples in batch No action if native analyte concentration ≥ 4x spike added. Qualify all samples in batch. QAPP may have overriding accuracy limits.
Laboratory Duplicate (or MS/MSD)	One per matrix per batch (of ≤ 20 samples) RPD ≤ 20% for results ≥ 5x RL Solids: difference < 2X RL for results < 5X RL Aqueous: difference < 1X RL for results < 5X RL	NFG ⁽¹⁾ Method ⁽²⁾	J (pos)/UJ (ND) if RPD > 20% or if difference > control limit	9	Qualify all samples in batch. QAPP may have overriding precision limits.
Field Duplicate	Solids: RPD <50% (for results ≥ 5x RL) OR difference < 2X RL (for results < 5X RL) Aqueous: RPD <35% (for results ≥ 5x RL) OR difference < 1X RL (for results < 5X RL)	EcoChem standard policy	Qualify only parent and field duplicate samples J (pos)/UJ (ND)	9	QAPP may have overriding precision limits. Client/QAPP may not require qualification based on field precision.
Compound Quantitation					
Linear Range	Sample concentrations less than highest calibration standard	NFG ⁽¹⁾ Method ⁽²⁾	If result exceeds linear range & sample was not diluted J (pos)	20	
Dilutions, Re-extractions and/or Reanalyses	Report only one result per analyte	EcoChem standard policy	Use "DNR" to flag results that will not be reported.	11	TM-04 EcoChem Policy for Rejection/Selection Process for Multiple Results

¹ National Functional Guidelines for Inorganic Superfund Data Review, January 2010.

² SW846 or EPA Standard Methods

³ "H" = high bias indicated; "L" = low bias indicated

(pos): Positive Result

(ND): Not Detected

**Conventional Methods by Gravimetric Analysis
 (i.e., Total Solids, Total Dissolved Solids, Total Suspended Solids, Grain Size)
 (Based on Inorganic NFG 2010 and EPA methods)**

QC Element	EcoChem Acceptance Criteria	Source of Criteria	EcoChem Action for Non-Conformance	Reason Code	Discussion and Comments
Sample Handling					
Cooler/Storage Temperature Preservation	Cooler temperature: 4°C±2°C Preservation: Analyte/Method Specific	Method ⁽¹⁾ NFG ⁽²⁾	J (pos)/UJ (ND) if preservation requirements not met	1	Use PJ to qualify for cooler temp outliers.
Holding Time	Analyte/Method Specific	Method NFG ⁽²⁾	J (pos)/UJ (ND) if holding time exceeded	1	
Blank Contamination					
Method Blank (MB)	If required by method,one per matrix per batch of (of ≤ 20 samples) Blank conc < MDL	NFG ⁽¹⁾ Method ⁽²⁾	U (pos) if result is < 5X method blank concentration	7	Refer to TM-02 for additional information. Blank Evaluation based on NFG 1994
Precision and Accuracy					
LCS (If appropriate to method)	One per matrix per batch (of ≤ 20 samples) %R between 80-120%	Method ⁽²⁾	J (pos)/R (ND) if %R <50% J (pos)/UJ (ND) if %R 50% - 79% J (pos) if %R > 120%	10 (H,L) ³	Qualify all samples in batch QAPP may have overriding accuracy limits.
Reference Material (RM, SRM, or CRM)	Result ±20% of the 95% confidence interval of the true value for analytes	EcoChem standard policy	J (pos)/UJ (ND) if < LCL J (pos) if > UCL	12 (H,L) ³	QAPP may have overriding accuracy limits. Some manufacturers may have different RM control limits

**Conventional Methods by Gravimetric Analysis
 (i.e., Total Solids, Total Dissolved Solids, Total Suspended Solids, Grain Size)
 (Based on Inorganic NFG 2010 and EPA methods)**

QC Element	EcoChem Acceptance Criteria	Source of Criteria	EcoChem Action for Non-Conformance	Reason Code	Discussion and Comments
Laboratory Duplicate	One per matrix per batch (of ≤ 20 samples) RPD ≤ 20% for results ≥ 5x RL Solids: difference < 2X RL for results < 5X RL Aqueous: difference < 1X RL for results < 5X RL	NFG ⁽¹⁾ Method ⁽²⁾	J (pos)/UJ (ND) if RPD > 20% For Grain Size, no action if results for fraction are less than 5%	9	Qualify all samples in batch, except Grain Size - qualify parent only. QAPP may have overriding precision limits.
Field Duplicate	Solids: RPD < 50% (for results ≥ 5x RL) OR difference < 2X RL (for results < 5X RL) Aqueous: RPD < 35% (for results ≥ 5x RL) OR difference < 1X RL (for results < 5X RL)	EcoChem standard policy	Qualify only parent and field duplicate samples J (pos)/UJ (ND)	9	QAPP may have overriding precision limits. Client/QAPP may not require qualification based on field precision.
Compound Quantitation					
Dilutions, Re-extractions and/or Reanalyses	Report only one result per analyte per sample	EcoChem standard policy	Use "DNR" to flag results that will not be reported.	11	

¹ National Functional Guidelines for Inorganic Superfund Data Review, January 2010.

² SW846 or EPA Standard Methods

³ "H" = high bias indicated; "L" = low bias indicated

(pos): Positive Result
 (ND): Not Detected



ECO-CHEM
Data Quality

APPENDIX B

QUALIFIED DATA SUMMARY TABLE

Qualified Data Summary Table
Pacific Groundwater Group - Portland Harbor Head of Swan Island Phases 1b and 2

SDG	Sample ID	Laboratory ID	Method	Analyte	Result	Units	Laboratory Qualifier	Validation Qualifier	Validation Reason Code
19I0008	J3-SC1b-30to40-82719	19I0008-18	SW8082A	Aroclor 1260	153	ug/kg	D	J	8L
	J3-SC1b-30to40-82719	19I0008-18	SW9060A	Total Organic Carbon	2.99	%	H	J	8L
	J3-SC1b-40to50-82719	19I0008-19	SW8082A	Aroclor 1254	68.3	ug/kg	P1	J	3
	J3-SC1b-40to50-82719	19I0008-19	SW9060A	Total Organic Carbon	1.06	%	H	J	8L
	J6-SC1b-20to30-82819	19I0008-27	SW8082A	Aroclor 1254	76.9	ug/kg	P1	J	3
	J6-SC1b-40to50-82819	19I0008-29	SW8082A	Aroclor 1260	242	ug/kg	E	DNR	20
	J6-SC1b-40to50-82819	19I0008-29RE1	SW8082A	Aroclor 1262		ug/kg	D U	DNR	11
	J6-SC1b-40to50-82819	19I0008-29RE1	SW8082A	Aroclor 1254	231	ug/kg	D	DNR	11
	J6-SC1b-40to50-82819	19I0008-29RE1	SW8082A	Aroclor 1268		ug/kg	D U	DNR	11
	J6-SC1b-40to50-82819	19I0008-29RE1	SW8082A	Aroclor 1221		ug/kg	D U	DNR	11
	J6-SC1b-40to50-82819	19I0008-29RE1	SW8082A	Aroclor 1016		ug/kg	D U	DNR	11
	J6-SC1b-40to50-82819	19I0008-29RE1	SW8082A	Aroclor 1242		ug/kg	D U	DNR	11
	J6-SC1b-40to50-82819	19I0008-29RE1	SW8082A	Aroclor 1248	97.3	ug/kg	D	DNR	11
	J6-SC1b-40to50-82819	19I0008-29RE1	SW8082A	Aroclor 1232		ug/kg	D U	DNR	11
	R4-SC1b-20to30-82819	19I0008-40	SW8082A	Aroclor 1260	83.3	ug/kg	P1	NJ	3
	R4-SC1b-70to80-82819	19I0008-45	SW8082A	Aroclor 1248	36.9	ug/kg	P1	J	3
	R4-SC1b-80to90-82819	19I0008-46	SW8082A	Aroclor 1254	91	ug/kg	P1	J	3
	R4-SC1b-80to90-82819	19I0008-46	SW8082A	Aroclor 1248	27.8	ug/kg	P1	NJ	3
	R4-SC1b-100to110-82819	19I0008-50	SW8082A	Aroclor 1248	16.9	ug/kg	P1	NJ	3
	R4-SC1b-110to120-82819	19I0008-51	SW8082A	Aroclor 1248	17.3	ug/kg	P1	J	3
	R4-SC1b-120to130-82819	19I0008-52	SW8082A	Aroclor 1248	20.6	ug/kg	P1	NJ	3
	R4-SC1b-120to130-82819	19I0008-52	SW8082A	Aroclor 1254	79	ug/kg	P1	J	3
	R4-SC1b-130to140-82819	19I0008-54	SW8082A	Aroclor 1254	10.2	ug/kg	P1	J	3
	H3-SC1b-20to30-82819	19I0008-56	SW8082A	Aroclor 1260	374	ug/kg	D	J	8L
	J5-SC1b-20to30-82719	19I0008-70	SW8082A	Aroclor 1260	413	ug/kg	D	J	8L
	J5-SC1b-30to40-82719	19I0008-71	SW8082A	Aroclor 1254	72.1	ug/kg		J	9
	J5-SC1b-90to100-82719	19I0008-77	SW8082A	Aroclor 1260	3.1	ug/kg	J	J	3
19J0249	D6-SC-0to1-102118	19J0249-02	SW8082A	Aroclor 1248	190	ug/kg	P1 D	J	3