Port of Seattle
Lora Lake Apartments Site

Remedial Investigation/ Feasibility Study

Volume II

Appendix H
1982 Dredged Material Containment Area Data Report

Attachment H.3
EcoChem, Inc. Data Validation Reports

FINAL

EcoChem, INC.
Environmental Data Quality

DATA VALIDATION REPORT

Port of Seattle
Lora Lake Parcel RI/FS
DMA Soils

Prepared for:

Floyd|Snider
601 Union Street, Suite 600
Seattle, WA 98101

Prepared by:

EcoChem, Inc.
710 Second Avenue, Suite 660
Seattle, Washington 98104

EcoChem Project: C15212-3

July 5, 2011

Approved for Release:

Christine Ransom
Project Manager
EcoChem, Inc.

PROJECT NARRATIVE

Basis for the Data Validation

This report summarizes the results of data validation performed on soil and quality control (QC) sample data for the Remedial Investigation/Feasibility Study at Lora Lake Parcel, Burien, WA. The dioxin data received full validation (EPA Stage 4); all other parameters received summary validation (EPA Stage 2B). A complete list of samples is provided in the **Sample Index**.

Frontier Analytical Laboratory (El Dorado Hills, California) performed the dioxin/furan analyses. Analytical Resources, Inc. (Tukwila, Washington) performed all other analyses. The analytical methods and EcoChem project chemists are listed in the table below.

Analysis	Method	Primary Review	Secondary Review
Dioxin Furan Compounds	EPA 1613	M. Swanson	C. Ransom
Volatile Organic Compounds	SW8060C	M. Brindle	
BTEX	SW8021-Mod		
Polycyclic Aromatic Hydrocarbons	SW8270D-SIM		
Pentachlorophenol	SW8041		
Total Petroleum Hydrocarbons – Diesel Range Organics	NWTPH-Dx		
Total Petroleum Hydrocarbons – Gasoline Range Organics	NWTPH-Gx		
Metals	SW6010B	J. Maute	
Total Organic Carbon	Plumb, 1981		
Total Solids	EPA 160.3		

The data were reviewed using guidance and quality control criteria documented in the analytical methods; *Port of Seattle Lora Lake Parcel, Remedial Investigation/Feasibility Study Work Plan* (February 11, 2011); *National Functional Guidelines for Inorganic Data Review* (USEPA 1994 & 2004); *National Functional Guidelines for Organic Data Review* (USEPA 1999 & 2008); and *USEPA National Functional Guidelines for Chlorinated Dioxin/Furan Data Review* (USEPA, September 2005).

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 above.

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
Lora Lake Parcel - DMA Soils
Analytical Resources Inc.

SDG	Sample ID	Laboratory ID	Matrix	VOC	PAH	PCP	BTEX	TPH-Gx	TPH-Dx	Metals	TOC/TS
SS83	DMA-TP1-0-3-041911	11-8711-SS83A	Soil	✓	✓	✓	✓	✓	✓	✓	✓
SS83	DMA-TP1-3-4.5-041911	11-8712-SS83B	Soil	✓	✓	✓	✓	✓	✓	✓	✓
SS83	DMA-TP1-4.5-5.5-041911	11-8713-SS83C	Soil	✓	✓	✓	✓	✓	✓	✓	✓
SS83	DMA-TP2-1.5-3-041911	11-8714-SS83D	Soil	✓	✓	✓	✓	✓	✓	✓	✓
SS83	DMA-TP2-3-4-041911	11-8715-SS83E	Soil	✓	✓	✓	✓	✓	✓	✓	✓
SS83	DMA-TP6-0-2.5-041911	11-8716-SS83F	Soil	✓	✓	✓	✓	✓	✓	✓	✓
SS83	DMA-TP6-2.5-5-041911	11-8717-SS83G	Soil	✓	✓	✓	✓	✓	✓	✓	✓
SS83	DMA-TP4-0-1.5-042011	11-8718-SS83H	Soil	✓	✓	✓	✓	✓	✓	✓	✓
SS83	DMA-TP4-1.5-2-042011	11-8719-SS83I	Soil	✓	✓	✓	✓	✓	✓	✓	✓
SS83	DMA-TP5-1.5-2-042011	11-8720-SS83J	Soil	✓	✓	✓	✓	✓	✓	✓	✓
SS83	DMA-TP5-1.5-2-042011-D	11-8721-SS83K	Soil	✓	✓	✓	✓	✓	✓	✓	✓
SS83	DMA-TP5-2-3-042011	11-8722-SS83L	Soil	✓	✓	✓	✓	✓	✓	✓	✓
SS83	DMA-TP3-2-3-042011	11-8723-SS83M	Soil	✓	✓	✓	✓	✓	✓	✓	✓
SS83	DMA-TP3-3-4-042011	11-8724-SS83N	Soil	✓	✓	✓	✓	✓	✓	✓	✓
SS83	DMA-TP3-5-6-042011	11-8725-SS83O	Soil	✓	✓	✓	✓	✓	✓	✓	✓
SS83	DMA-RB-042011	11-8726-SS83P	Rinsate	✓	✓	✓	✓	✓	✓	✓	
SS83	TP-TB-042011	11-8727-SS83Q	Trip Blank	✓			✓	✓			

Sample Index
Lora Lake Parcel - DMA Soils
Frontier Analytical Laboratory

SDG	Sample ID	Laboratory ID	Matrix	Dioxins
6735	DMA-TP1-0-3-041911	6735-001-SA	Soil	✓
6735	DMA-TP1-3-4.5-041911	6735-002-SA	Soil	✓
6735	DMA-TP1-4.5-5.5-041911	6735-003-SA	Soil	✓
6735	DMA-TP2-1.5-3-041911	6735-004-SA	Soil	✓
6735	DMA-TP2-3-4-041911	6735-005-SA	Soil	✓
6735	DMA-TP6-0-2.5-041911	6735-006-SA	Soil	✓
6735	DMA-TP6-2.5-5-041911	6735-007-SA	Soil	✓
6735	DMA-TP4-0-1.5-042011	6735-008-SA	Soil	✓
6735	DMA-TP4-1.5-2-042011	6735-009-SA	Soil	✓
6735	DMA-TP5-1.5-2-042011	6735-010-SA	Soil	✓
6735	DMA-TP5-1.5-2-042011-D	6735-011-SA	Soil	✓
6735	DMA-TP5-2-3-042011	6735-012-SA	Soil	✓
6735	DMA-TP3-2-3-042011	6735-013-SA	Soil	✓
6735	DMA-TP3-3-4-042011	6735-014-SA	Soil	✓
6735	DMA-TP3-5-6-042011	6735-015-SA	Soil	✓

DATA VALIDATION REPORT
Lora Lake Parcel – DMA Soils
Volatile Organic Compounds by SW846 Method 8260C

This report documents the review of analytical data from the analysis of soil samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Analytical Resources, Inc., Tukwila, Washington. Summary validation (EPA Stage 2B) was performed on all soil data. Compliance screening (EPA Stage 2A) was performed on all field blank data. Refer to the **Sample Index** for a complete list of samples.

SDG	Number of Samples
SS83	15 Soil, 1 Trip Blank, 1 Equipment Rinsate

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. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

1	Sample Receipt, Preservation, and Holding Times		Matrix Spike/Matrix Spike Duplicates (MS/MSD)
	GC/MS Instrument Performance Check	1	Field Duplicates
	Initial Calibration (ICAL)	1	Internal Standards
	Continuing Calibration (CCAL)		Target Analyte List
	Laboratory Blanks		Reporting Limits
1	Field Blanks		Compound Identification
	Surrogate Compounds		Reported Results
	Laboratory Control Samples (LCS/LCSD)		

[1] ***Quality control results are discussed below, but no data were qualified.***

Sample Receipt, Preservation, Holding Times

As stated in validation guidance documents, sample coolers should arrive at the laboratory within the advisory temperature range of 2°C to 6°C. One of the sample coolers was received with a temperature less than the lower limit, at 1.3°C. The temperature outliers did not impact data quality and no action was taken.

Field Blanks

One equipment rinse blank, DMA-RB-042011, and one trip blank, TP-TB-042011, were submitted. No target analytes were detected in these blanks.

Field Duplicates

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 difference between the sample and duplicate must be less than 2x the RL.

The data for one set of field duplicates, DMA-TP5-1.5-2-042011 & DMA-TP5-1.5-2-042011-D, were submitted. All field precision criteria were met.

Internal Standards

The recoveries for 1,4-dichlorobenzene-d4 were less than the lower control limit in Samples DMA-TP1-3-4.5-041911, DMA-TP2-1.5-3-041911, and DMA-TP4-0-1.5-042011. This internal standard was not used to quantitate any of the target analytes. No qualification of data was necessary.

IV. OVERALL ASSESSMENT

As 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 (LCS/LCSD), and matrix spike/matrix spike duplicate (MS/MSD) recovery values. Precision was also acceptable as demonstrated by the LCS/LCSD, MS/MSD, and field duplicate RPD values.

No data were qualified for any reason.

All data, as reported, are acceptable for use.

DATA VALIDATION REPORT
Lora Lake Parcel – DMA Soils
Polycyclic Aromatic Hydrocarbons by SW846 Method 8270D- SIM

This report documents the review of analytical data from the analysis of soil samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Analytical Resources, Inc., Tukwila, Washington. Summary validation (EPA Stage 2B) was performed on all soil data. Compliance screening (EPA Stage 2A) was performed on all field blank data. Refer to the **Sample Index** for a complete list of samples.

SDG	Number of Samples
SS83	15 Soil, 1 Equipment Rinsate

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. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

1	Sample Receipt, Preservation, and Holding Times		Matrix Spikes/Matrix Spike Duplicates (MS/MSD)
	GC/MS Instrument Performance	1	Field Duplicates
	Initial Calibration (ICAL)		Internal Standards
	Continuing Calibration (CCAL)		Target Analyte List
	Laboratory Blanks		Reporting Limits
1	Field Blanks		Compound Identification
2	Surrogate Compounds		Reported Results
	Laboratory Control Samples (LCS/LCSD)		

[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, Holding Times

As stated in validation guidance documents, sample coolers should arrive at the laboratory within the advisory temperature range of 2°C to 6°C. One of the sample coolers was received with a temperature less than the lower limit, at 1.3°C. The temperature outliers did not impact data quality and no action was taken.

Field Blanks

One equipment rinsate blank, DMA-RB-042011, was submitted. No target analytes were detected in this blank.

Surrogate Compounds

The percent recovery (%R) values for dibenzo(a,h)anthracene-d14 were less than the lower control limit of 40% in Samples DMA-TP5-1.5-2-042011 and DMA-TP5-1.5-2-042011-D. All results for these samples were estimated (J/UJ-13) to indicate a potential low bias.

Field Duplicates

The field duplicate relative percent difference (RPD) control limit is 50% for concentrations greater than 5x the reporting limit (RL). For concentrations less than 5x the RL, the difference between the sample result and the duplicate result must be less than 2x the RL.

The data for one set of field duplicates, DMA-TP5-1.5-2-042011 & DMA-TP5-1.5-2-042011-D, were submitted. All field precision criteria were met.

III. OVERALL ASSESSMENT

As determined by this evaluation, the laboratory followed the specified analytical method. With the exceptions noted above, accuracy was acceptable, as demonstrated by the surrogate, laboratory control sample/laboratory control sample duplicate (LCS/LCSD), and matrix spike/matrix spike duplicate (MS/MSD) %R values. Precision was also acceptable, as demonstrated by the MS/MSD, LCS/LCSD, and field duplicate RPD values.

Data were estimated due to surrogate recovery outliers.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Lora Lake Parcel – DMA Soils
Pentachlorophenol by EPA Method 8041A

This report documents the review of analytical data from the analysis of soil samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Analytical Resources, Inc., Tukwila, Washington. Summary validation (EPA Stage 2B) was performed on all soil data and compliance screening (EPA Stage 2A) was performed on all field blank data. Refer to the **Sample Index** for a complete list of samples.

SDG	Number of Samples
SS83	15 Soil, 1 Equipment Rinsate

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. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

1	Sample Receipt, Preservation, and Holding Times	1	Field Duplicates
	Initial Calibration (ICAL)		Retention Time Window
	Continuing Calibration (CCAL)		Target Analyte List
	Laboratory Blanks		Compound Identification
1	Field Blanks	2	Compound Quantitation
	Surrogate Compounds		Reporting Limits
	Laboratory Control Samples (LCS)		Reported Results
	Matrix Spikes/Matrix Spike Duplicates (MS/MSD)		

[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, Holding Times

As stated in validation guidance documents, sample coolers should arrive at the laboratory within the advisory temperature range of 2°C to 6°C. One of the sample coolers was received with a temperature less than the lower limit, at 1.3°C. The temperature outliers did not impact data quality and no action was taken.

Field Blanks

One equipment rinsate, DMA-RB-042011, was submitted. No target analytes were detected in this blank.

Field Duplicates

The field duplicate relative percent difference (RPD) control limit is 50% for concentrations greater than 5x the reporting limit (RL). For concentrations less than 5x the RL, the difference between the sample result and the duplicate result must be less than 2x the RL.

The data for one set of field duplicates, DMA-TP5-1.5-2-042011 & DMA-TP5-1.5-2-042011-D, were submitted.

Pentachlorophenol was detected in the parent sample, but not the duplicate. The difference between the positive result and the RL was greater than 2x the RL. No data were qualified based on the outlier; however, data users should take field precision into account when interpreting sample data.

Compound Quantitation

The percent difference (%D) between the primary column and confirmation column was greater than the control limit of 40% for Sample DMA-TP5-1.5-2-042011. The %D was also greater than 60%; therefore the pentachlorophenol result for this sample was tentatively identified (NJ-3).

IV. OVERALL ASSESSMENT

As 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 matrix spike/matrix spike duplicate (MS/MSD) recoveries. Precision was also acceptable as demonstrated by the LCS/LCSD, MS/MSD, and field duplicate RPD values, with the exception noted above.

One data point was qualified as tentatively identified based on a second column confirmation outlier.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Lora Lake Parcel – DMA Soils
Diesel Range Organics by NWTPH-Dx

This report documents the review of analytical data from the analysis of soil samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Analytical Resources Incorporated, Tukwila, Washington. Summary validation (EPA Stage 2B) was performed on all soil data and compliance screening (EPA Stage 2A) was performed on all field blank data. Refer to the **Sample Index** for a complete list of samples.

SDG	Number of Samples
SS83	15 Soil, 1 Equipment Rinsate

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. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

1	Sample Receipt, Preservation, and Holding Times		Laboratory Control Samples (LCS/LCSD)
	Initial Calibration (ICAL)		Matrix Spikes/Matrix Spike Duplicates (MS/MSD)
	Continuing Calibration (CCAL)	1	Field Duplicates
	Laboratory Blanks		Reporting Limits
1	Field Blanks		Reported Results
	Surrogate Compounds		

[1] ***Quality control results are discussed below, but no data were qualified.***

Sample Receipt, Preservation, Holding Times

As stated in validation guidance documents, sample coolers should arrive at the laboratory within the advisory temperature range of 2°C to 6°C. One of the sample coolers was received with a temperature less than the lower limit, at 1.3°C. The temperature outliers did not impact data quality and no action was taken.

Field Blanks

One equipment rinsate, DMA-RB-042011, was submitted. No target analytes were detected in this blank.

Field Duplicates

The relative percent difference (RPD) value control limit is 50% for results greater than five times the reporting limit (RL). For results less than five times the RL, the difference between the sample and duplicate must be less than two times the RL.

The data for one set of field duplicates, DMA-TP5-1.5-2-042011 and DMA-TP5-1.5-2-042011-D, were submitted. All field precision criteria were met.

III. OVERALL ASSESSMENT

As 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) recoveries. Precision was also acceptable as demonstrated by the MS/MSD, LCS/LCSD, and field duplicate RPD values.

No data were qualified for any reason.

All data, as reported, are acceptable for use.

DATA VALIDATION REPORT
Lora Lake Parcel – DMA Soils
BTEX by Method SW8021B Mod
Gasoline Range Organics by NWTPH-Gx

This report documents the review of analytical data from the analysis of soil samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Analytical Resources Incorporated, Tukwila, Washington. Summary validation (EPA Stage 2B) was performed on all soil data and compliance screening (EPA Stage 2A) was performed on all field blank data. Refer to the **Sample Index** for a complete list of samples.

SDG	Number of Samples
SS83	15 Soil, 1 Equipment Rinsate, 1 Trip Blank

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. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

1	Sample Receipt, Preservation, and Holding Times		Laboratory Control Samples (LCS)
	Initial Calibration (ICAL)		Matrix Spikes/Matrix Spike Duplicates (MS/MSD)
	Continuing Calibration (CCAL)	1	Field Duplicates
	Blanks		Target Analyte List
1	Field Blanks		Reporting Limits
	Surrogate Compounds		Reported Results

[1] ***Quality control results are discussed below, but no data were qualified.***

Sample Receipt, Preservation, and Holding Times

As stated in validation guidance documents, sample coolers should arrive at the laboratory within the advisory temperature range of 2°C to 6°C. One of the sample coolers was received with a temperature less than the lower limit, at 1.3°C. The temperature outliers did not impact data quality and no action was taken.

Field Blanks

One equipment rinsate, DMA-RB-042011, and one trip blank, TP-TB-042011, were submitted. No target analytes detected were detected in these blanks.

Field Duplicates

The RPD value control limit is 50% for results greater than five times the reporting limit (RL). For results less than five times the RL, the difference between the sample and duplicate must be less than the two times the RL.

The data for one set of field duplicates, DMA-TP5-1.5-2-042011 and DMA-TP5-1.5-2-042011-D, were submitted. All field precision criteria were met.

III. OVERALL ASSESSMENT

As 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) recoveries. Precision was acceptable as demonstrated by the MS/MSD, LCS/LCSD, and field duplicate RPD values.

No data were qualified for any reason.

All data, as reported, are acceptable for use.

DATA VALIDATION REPORT
Lora Lake Parcel – DMA Soils
Dioxin/Furan Compounds by Method 1613

This report documents the review of analytical data from the analysis of soil samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Frontier Analytical Laboratory, El Dorado Hills, California. Full validation (EPA Stage 4) was performed on all sediment data. The **Sample Index** contains a complete list of samples.

SDG	Number of Samples
6735	15 Soil

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. TECHNICAL DATA VALIDATION

The quality control (QC) requirements reviewed are summarized in the following table:

1	Sample Receipt, Preservation, and Holding Times		Matrix Spike/Matrix Spike Duplicates (MS/MSD)
	System Performance and Resolution Checks		Ongoing Precision and Recovery (OPR)
	Initial Calibration (ICAL)	1	Field Duplicates
	Calibration Verification (CVER)		Target Analyte List
	Method Blanks	2	Reported Results
1	Field Blanks		Compound Identification
2	Labeled Compound Recovery	1	Calculation Verification

[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 samples were transferred from Analytical Resources, Inc (ARI) to Frontier Analytical Laboratory. As stated in validation guidance documents, samples should be maintained within the advisory temperature range of 2°C to 6°C. The temperatures recorded by Frontier were as low as 0.0°C, which is less than the lower control limit. The temperature outliers did not impact data quality and no action was taken.

Field Blanks

No equipment rinsate samples were submitted with this data package.

Labeled Compound Recovery

Several labeled compound percent recovery (%R) values were outside of the QAPP specified control limits of 70% - 130%. For recoveries greater than the upper control limit, positive results for the associated compounds were estimated (J-13) to indicate a potential high bias. Outliers in the following samples resulted in qualification of data.

Sample ID	Labeled Compound	Bias
DMA-TP1-3-4.5-041911	13C-1,2,3,4,7,8,9-HpCDF	High
DMA-TP1-4.5-5.5-041911		
DMA-TP2-1.5-3-041911		
DMA-TP4-0-1.5-041911		
DMA-TP5-1.5-2-041911-D		
DMA-TP6-0-2.5-041911		
DMA-TP5-1.5-2-041911	13C-1,2,3,4,6,7,8-HpCDD	High

Field Duplicates

The control limit for relative percent difference (RPD) is 30% for results greater than five times the reporting limit (RL). For results less than five times the RL, the difference between the sample and duplicate must be less than 2x the RL. No data were qualified based on field duplicate precision outliers; however users of the data should consider the impact of field precision on the reported results.

The data for one field duplicate set, DMA-TP5-1.5-2-042011 and DMA-TP5-1.5-2-042011-D, were submitted. All field precision criteria were met.

Reported Results

Several samples were reanalyzed at dilution due to analyte concentrations that exceeded the calibration range of the instrument. In each case, the laboratory reported only the most appropriate positive result for each congener from either the original or diluted analysis.

The laboratory assigned “D and/or M” flags to several of the reported homologue group totals to indicate that a diphenyl ether (D) or some other interference (M) was present, resulting in a high bias in the reported result. All analytes that were “D” and/or “M” flagged were estimated (J-14).

Calculation Verification

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

III. OVERALL ASSESSMENT

As determined by this evaluation, the laboratory followed the specified analytical method. With the above noted exceptions, accuracy was acceptable as demonstrated by the labeled compound, OPR, and matrix spike/matrix spike duplicate (MS/MSD) %R values. Precision was also acceptable as demonstrated by the MS/MSD and field duplicate RPD values.

Data were estimated based on labeled compound recovery outliers and interference from diphenyl ether.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Lora Lake Parcel – DMA Soils
Total Arsenic and Lead by EPA 6010B

This report documents the review of analytical data from the analysis of soil samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Analytical Resources Incorporated, Tukwila, Washington. Summary validation (EPA Stage 2B) was performed on all soil data. Compliance screening (EPA Stage 2A) was performed on all field blank data. The **Sample Index** contains a complete list of samples.

SDG	Number of Samples
SS83	15 Soil, 1 Equipment Rinsate

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. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

1	Sample Receipt, Preservation, and Holding Times		Reference Materials
	Initial Calibration	1	Laboratory Duplicates
	Continuing Calibration Verification		Field Duplicates
	CRDL Standards		Interference Check Samples
	Laboratory Blanks		Target Analyte List
1	Field Blanks		Reporting Limits
	Laboratory Control Samples (LCS)		Reported Results
	Matrix Spikes (MS)		

[1] ***Quality control results are discussed below, but no data were qualified***

Sample Receipt, Preservation, and Holding Times

As stated in validation guidance documents, sample coolers should arrive at the laboratory within the advisory temperature range of 2°C to 6°C. Several coolers were received. One cooler was received with a temperature less than the lower limit, at 1.3°C. The temperature outlier did not impact data quality and no action was taken.

Field Blanks

One equipment rinsate blank, DMA-RB-042011, was submitted. No target analytes were detected in the field blank.

Field Duplicates

The relative percent difference (RPD) control limit is 20% for results greater than five times the reporting limit (RL). For results less than five times the RL, the difference between the sample and duplicate must be less than two times the RL.

The data for one set of field duplicates, DMA-TP5-1.5-2-042011 & DMA-TP5-1.5-2-042011-D, were submitted. All field precision criteria were met.

III. OVERALL ASSESSMENT

As determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the laboratory control sample and matrix spike sample percent recovery values. Precision was also acceptable as demonstrated by the laboratory and field duplicate RPD values.

No data were qualified for any reason.

All data, as reported, are acceptable for use.

DATA VALIDATION REPORT
Lora Lake Parcel – DMA Soils
Total Solids by 160.3M & Total Organic Carbon by Plumb, 1981

This report documents the review of analytical data from the analysis of soil samples and the associated laboratory and field quality control (QC) samples. Samples were analyzed by Analytical Resources Incorporated, Tukwila, Washington. Summary validation (EPA Stage 2B) was performed on all data. The **Sample Index** contains a complete list of samples.

SDG	Number of Samples
SS83	15 Soil

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. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

1	Sample Receipt, Preservation, and Holding Times		Matrix Spikes/Matrix Spike Duplicates (MS/MSD)
	Initial Calibration		Laboratory Replicates
	Calibration Verification	1	Field Duplicates
	Laboratory Blanks		Reporting Limits
	Laboratory Control Samples (LCS)		Reported Results
1	Reference Materials		

[1] ***Quality control results are discussed below, but no data were qualified***

Sample Receipt, Preservation, and Holding Times

As stated in validation guidance documents, sample coolers should arrive at the laboratory within the advisory temperature range of 2°C to 6°C. Several coolers were received. One cooler was received with a temperature less than the lower limit, at 1.3°C. The temperature outlier did not impact data quality and no action was taken.

Reference Materials

The certified reference material NIST 1941B was analyzed with the TOC samples. The reference material recovery was within the certified acceptance ranges.

Field Duplicates

The relative percent difference (RPD) value control limit is 20% for TOC and 25% for total solids. For results less than five times the RL, the difference between the sample and duplicate must be less than two times the RL.

The data for one set of field duplicates, DMA-TP5-1.5-2-042011 & DMA-TP5-1.5-2-042011-D, were submitted. All field precision criteria were met.

III. OVERALL ASSESSMENT

As determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable as demonstrated by the laboratory control sample, matrix spike, and reference material percent recovery values. Precision was acceptable as demonstrated by the laboratory replicate percent relative standard deviation (%RSD) and field duplicate RPD values.

No data were qualified for any reason.

All data, as reported, are acceptable for use.

EcoChem, INC.
Environmental Data Quality

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.

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
22	Elevated Detection Limit Due to Interference (i.e., laboratory, chemical and/or matrix)

EcoChem Validation Guidelines for Volatile Analysis by GC/MS (Based on Organic NFG 1999)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Cooler Temperature	4°C±2°C Water: HCl to pH < 2	J(+)/UJ(-) if greater than 6 deg. C (EcoChem PJ)	1
Hold Time	Waters: 14 days preserved 7 Days: unpreserved (for aromatics) Solids: 14 Days	J(+)/UJ(-) if hold times exceeded If exceeded by > 3X HT: J(+)/R(-) (EcoChem PJ)	1
Tuning	BFB 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 > CRQL	U(+) if sample (+) result is less than CRQL and less than appropriate 5X or 10X rule (raise sample value to CRQL)	7
		U(+) if sample (+) result is greater than or equal to CRQL and less than appropriate 5X and 10X rule (at reported sample value)	7
	No TICs present	R(+) TICs using 10X rule	7
Storage Blank	One per SDG <CRQL	U(+) the specific analyte(s) results in all assoc.samples using the 5x or 10x rule	7
Trip Blank	Frequency as per project QAPP	Same as method blank for positive results remaining in trip blank after method blank qualifiers are assigned	18
Field Blanks (if required in QAPP)	No results > CRQL	Apply 5X/10X rule; U(+) < action level	6

EcoChem Validation Guidelines for Volatile 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(+) in parent sample if RPD > CL	9
LCS *low conc. H2O VOA*	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 VOA (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(+)/UJ(-) assoc. cmpd. in all samples	9
Surrogates	Added to all samples Within method control limits	J(+) if %R >UCL J(+)/UJ(-) if %R <LCL but >10% (see PJ[1]) J(+)/R(-) if <10%	13
Internal Standard (IS)	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% RT>30 seconds, narrate and Notify PM	19
Field Duplicates	Use QAPP limits. If no QAPP: Solids: RPD <50% OR absolute diff. < 2X RL (for results < 5X RL) Aqueous: RPD <35% OR absolute diff. < 1X RL (for results < 5X RL)	Narrate and qualify if required by project (EcoChem PJ)	9
TICs	Major ions (>10%) in reference must be present in sample; intensities agree within 20%; check identification	NJ the TIC unless: R(+) common laboratory contaminants 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 +)

PJ[1] No action if there are 4+ surrogates and only 1 outlier.

EcoChem Validation Guidelines for 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 > CRQL	U(+) if sample (+) result is less than CRQL and less than appropriate 5X or 10X rule (raise sample value to CRQL)	7
		U(+) if sample (+) result is greater than or equal to CRQL and less than appropriate 5X and 10X rule (at reported sample value)	7
	No TICs present	R(+) TICs using 10X rule	7
Field Blanks (Not Required)	No results > CRQL	Apply 5X/10X rule; U(+) < action level	6

EcoChem Validation Guidelines for 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(+) in parent sample 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(+)/UJ(-) 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% RT>30 seconds, narrate and Notify PM	19
Field Duplicates	Use QAPP limits. If no QAPP: Solids: RPD <50% OR absolute diff. < 2X RL (for results < 5X RL) Aqueous: RPD <35% OR absolute diff. < 1X RL (for results < 5X RL)	Narrate and qualify if required by project (EcoChem PJ)	9
TICs	Major ions (>10%) in reference must be present in sample; intensities agree within 20%; check identification	NJ the TIC unless: R(+) common laboratory contaminants 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 +)

EcoChem Validation Guidelines for Pesticides, PCBs, Herbicides, and Phenol by GC/ECD (Based on Organic NFG 1999 & EPA SW-846 Methods 8081/8082/8041/8151)

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) 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	Not addressed by NFG No results > CRQL	Apply 5X rule; U(+) < action level	6

EcoChem Validation Guidelines for Pesticides, PCBs, Herbicides, and Phenol by GC/ECD (Based on Organic NFG 1999 & EPA SW-846 Methods 8081/8082/8041/8151)

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(+) in parent sample 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(+)/UJ(-) 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	Quantitated using ICAL calibration factor (CF) RPD between columns <40%	J(+) if RPD = 40 - 60% NJ(+) if RPD >60% EcoChem PJ - See TM-08	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	Use QAPP limits. If no QAPP: Solids: RPD <50% OR absolute diff. < 2X RL (for results < 5X RL) Aqueous: RPD <35% OR absolute diff. < 1X RL (for results < 5X RL)	Narrate (Qualifiy if required by project QAPP)	9

EcoChem Validation Guidelines for Total Petroleum Hydrocarbons-Diesel & Residual Range

(Based on EPA National Functional Guidelines as applied to criteria in NWTPH-Dx, June 1997, Wa DOE & Oregon DEQ)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Cooler Temperature & Preservation	4°C±2°C Water: HCl to pH < 2	J(+)/UJ(-) if greater than 6 deg. C	1
Holding Time	Ext. Waters: 14 days preserved 7 days unpreserved Ext. Solids: 14 Days Analysis: 40 days from extraction	J(+)/UJ(-) if hold times exceeded J(+)/R(-) if exceeded > 3X (EcoChem PJ)	1
Initial Calibration	5 calibration points (All within 15% of true value) Linear Regression: $R^2 \geq 0.990$ If used, RSD of response factors ≤20%	Narrate if fewer than 5 calibration levels or if %R >15% J(+)/UJ(-) if R^2 <0.990 J(+)/UJ(-) if %RSD > 20%	5A
Mid-range Calibration Check Std.	Analyzed before and after each analysis shift & every 20 samples. Recovery range 85% to 115%	Narrate if frequency not met. J(+)/UJ(-) if %R < 85% J(+) if %R >115%	5B
Method Blank	At least one per batch (≤20 samples) No results >RL	U (at the RL) if sample result is < RL & < 5X blank result.	7
		U (at reported sample value) if sample result is ≥ RL and < 5X blank result	7
Field Blanks (if required by project)	No results > RL	Action is same as method blank for positive results remaining in the field blank after method blank qualifiers are assigned.	6
MS samples (accuracy) (if required by project)	%R within lab control limits	Qualify parent only, unless other QC indicates systematic problems. J(+) if both %R > upper control limit (UCL) J(+)/UJ(-) if both %R < lower control limit (LCL) No action if parent conc. >5X the amount spiked. Use PJ if only one %R outlier	8
Precision: MS/MSD or LCS/LCSD or sample/dup	At least one set per batch (≤10 samples) RPD ≤ lab control limit	J(+) if RPD > lab control limits	9
LCS (not required by method)	%R within lab control limits	J(+)/UJ(-) if %R < LCL J(+) if %R > UCL J(+)/R(-) if any %R <10% (EcoChem PJ)	10

EcoChem Validation Guidelines for Total Petroleum Hydrocarbons-Diesel & Residual Range

(Based on EPA National Functional Guidelines as applied to criteria in NWTPH-Dx, June 1997, Wa DOE & Oregon DEQ)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Surrogates	2-fluorobiphenyl, p-terphenyl, o-terphenyl, and/or pentacosane added to all samples (inc. QC samples). %R = 50-150%	J(+)/UJ(-) if %R < LCL J(+) if %R > UCL J(+)/R(-) if any %R <10% No action if 2 or more surrogates are used, and only one is outside control limits. (EcoChem PJ)	13
Pattern Identification	Compare sample chromatogram to standard chromatogram to ensure range and pattern are reasonable match. Laboratory may flag results which have poor match.	J(+)	2
Field Duplicates	Use project control limits, if stated in QAPP EcoChem default: water: RPD < 35% solids: RPD < 50%	Narrate (Use Professional Judgement to qualify)	9
Two analyses for one sample (dilution)	Report only one result per analyte	"DNR" (or client requested qualifier) all results that should not be reported. (See TM-04)	11

EcoChem Validation Guidelines for Total Petroleum Hydrocarbons-Gasoline Range

(Based on EPA National Functional Guidelines as applied to criteria in NWTPH-Gx, June 1997, Wa DOE & Oregon DEQ)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Cooler Temperature & Preservation	4°C±2°C Water: HCl to pH < 2	J(+)/UJ(-) if greater than 6 deg. C	1
Holding Time	Waters: 14 days preserved 7 days unpreserved Solids: 14 Days	J(+)/UJ(-) if hold times exceeded J(+)/R(-) if exceeded > 3X (EcoChem PJ)	1
Initial Calibration	5 calibration points (All within 15% of true value) Linear Regression: $R^2 \geq 0.990$ If used, RSD of response factors ≤20%	Narrate if fewer than 5 calibration levels or if %R >15% J(+)/UJ(-) if R^2 <0.990 J(+)/UJ(-) if %RSD > 20%	5A
Mid-range Calibration Check Std.	Analyzed before and after each analysis shift & every 20 samples. Recovery range 80% to 120%	Narrate if frequency not met. J(+)/UJ(-) if %R < 80% J(+) if %R >120%	5B
Method Blank	At least one per batch (≤10 samples) No results >RL	U (at the RL) if sample result is < RL & < 5X blank result.	7
		U (at reported sample value) if sample result is ≥ RL and < 5X blank result	7
Trip Blank (if required by project)	No results >RL	Action is same as method blank for positive results remaining in trip blank after method blank qualifiers are assigned.	18
Field Blanks (if required by project)	No results > RL	Action is same as method blank for positive results remaining in field blank after method and trip blank qualifiers are assigned.	6
MS samples (accuracy) (if required by project)	%R within lab control limits	Qualify parent only, unless other QC indicates systematic problems. J(+) if both %R > upper control limit (UCL) J(+)/UJ(-) if both %R < lower control limit (LCL) No action if parent conc. >5X the amount spiked. Use PJ if only one %R outlier	8
Precision: MS/MSD or LCS/LCSD or sample/dup	At least one set per batch (≤10 samples) RPD ≤ lab control limit	J(+) if RPD > lab control limits	9

EcoChem Validation Guidelines for Total Petroleum Hydrocarbons-Gasoline Range

(Based on EPA National Functional Guidelines as applied to criteria in NWTPH-Gx, June 1997, Wa DOE & Oregon DEQ)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
LCS (not required by method)	%R within lab control limits	J(+)/UJ(-) if %R < LCL J(+) if %R > UCL J(+)/R(-) if any %R <10% (EcoChem PJ)	10
Surrogates	Bromofluorobenzene and/or 1,4-difluorobenzene added to all samples (inc. QC samples). %R = 50-150%	J(+)/UJ(-) if %R < LCL J(+) if %R >UCL J(+)/R(-) if any %R <10% No action if 2 or more surrogates are used, and only one is outside control limits. (EcoChem PJ)	13
Pattern Identification	Compare sample chromatogram to standard chromatogram to ensure range and pattern are reasonable match. Laboratory may flag results which have poor match.	J(+)	2
Field Duplicates	Use project control limits, if stated in QAPP EcoChem default: water: RPD < 35% solids: RPD < 50%	Narrate outliers If required by project, qualify with J(+)/UJ(-)	9
Two analyses for one sample (e.g., dilution)	Report only one result per analyte	"DNR" (or client requested qualifier) all results that should not be reported. (See TM-04)	11

EcoChem Validation Guidelines for Dioxin/Furan Analysis by HRMS
(Based on EPA Reg. 10 SOP, Rev. 2, 1996 & EPA SW-846, Methods 1613b and 8290)

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	Extraction - Water: 30 days from collection *Note:* Under CWA, SDWA, and RCRA the HT for H2O is 7 days* Extraction - Soil: 30 days from collection Analysis: 40 days from extraction	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	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(-)	

EcoChem Validation Guidelines for Dioxin/Furan Analysis by HRMS
(Based on EPA Reg. 10 SOP, Rev. 2, 1996 & EPA SW-846, Methods 1613b and 8290)

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, Method 1613B) (If %Ds in the closing CCAL are w/in 25%/35% the avg RF from the two CCAL may be used to calculate samples per Method 8290, Section 8.3.2.4)	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.	7
Field Blanks (Not Required)	No positive results	If sample result <5X action level, qualify U at reported value.	6
LCS / OPR	Concentrations must meet limits in Table 6, 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
MS/MSD (RPD)	May not analyze MS/MSD RPD < 20%	J(+) in parent sample if RPD > CL	9

EcoChem Validation Guidelines for Dioxin/Furan Analysis by HRMS
(Based on EPA Reg. 10 SOP, Rev. 2, 1996 & EPA SW-846, Methods 1613b and 8290)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Lab Duplicate	RPD <25% if present.	J(+)/UJ(-) if outside limts	9
Labeled Compounds / Internal Standards	*Method 8290:* %R = 40% - 135% in all samples *Method 1613B:* %R must meet limits specified in Table 7, Method 1613	J(+)/UJ(-) if %R = 10% to LCL J(+) if %R > UCL J(+)/R(-) if %R < 10%	13
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 idenfication 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	Use QAPP limits. If no QAPP: Solids: RPD <50% OR absolute diff. < 2X RL (for results < 5X RL) Aqueous: RPD <35% OR absolute diff. < 1X RL (for results < 5X RL)	Narrate and qualify if required by project (EcoChem PJ)	9
Two analyses for one sample	Report only one result per analyte	"DNR" results that should not be used	11

EcoChem Validation Guidelines for Metals Analysis by ICP (Based on Inorganic NFG 1994 & 2004)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Cooler Temperature and Preservation	Cooler temperature: 4°C ±2° Waters: Nitric Acid to pH < 2 For Dissolved Metals: 0.45um filter & preserve after filtration Tissues: Frozen	EcoChem Professional Judgment - no qualification based on cooler temperature outliers J(+)/UJ(-) if pH preservation requirements are not met	1
Holding Time	180 days from date sampled Frozen tissues - HT extended to 2 years	J(+)/UJ(-) if holding time exceeded	1
Initial Calibration	Blank + minimum 1 standard If more than 1 standard, r > 0.995	J(+)/UJ(-) if r < 0.995 (multi point cal)	5A
Initial Calibration Verification (ICV)	Independent source analyzed immediately after calibration %R within ±10% of true value	J(+)/UJ(-) if %R 75-89% J(+) if %R = 111-125% R(+) if %R > 125% R(+/-) if %R < 75%	5A
Continuing Calibration Verification (CCV)	Every ten samples, immediately following ICV/ICB and at end of run %R within ±10% of true value	J(+)/UJ(-) if %R = 75-89% J(+) if %R 111-125% R(+) if %R > 125% R(+/-) if %R < 75%	5B

Initial and Continuing Calibration Blank (ICB/CCB)	After each ICV and CCV
	every ten samples and end of run
	| blank | < IDL (MDL)
		Action level is 5x absolute value of blank conc.
		For (+) blanks, U(+) results < action level
		For (-) blanks, J(+)/UJ(-) results < action level
		(Refer to TM-02 for additional information)
			7

Reporting Limit Standard	2x RL analyzed beginning of run Not required for Al, Ba, Ca, Fe, Mg, Na, K %R = 70%-130% (50%-150% Sb, Pb, Tl)	R(-)/J(+) < 2x RL if %R <50% (< 30% Sb, Pb, Tl) J(+) < 2x RL, UJ(-) if %R 50-69% (30-49% Sb, Pb,Tl) J(+) < 2x RL if %R 130-180% (150-200% Sb, Pb, Tl) R(+) < 2x RL if %R > 180% (200% Sb, Pb, Tl)	14
Interference Check Samples (ICSA/ICSAB)	ICSAB %R 80 - 120% for all spiked elements | ICSA | < MDL for all unspiked elements except: K, Na	For samples with Al, Ca, Fe, or Mg > ICS levels R(+/-) if %R < 50% J(+) if %R >120% J(+)/UJ(-) if %R= 50 to 79% Use Professional Judgment for ICSA to determine if bias is present see TM-09 for additional details	17
Method Blank	One per matrix per batch (batch not to exceed 20 samples) blank < MDL	Action level is 5x blank concentration U(+) results < action level	7
Laboratory Control Sample (LCS)	One per matrix per batch		10
	Blank Spike: %R within 80-120%	R(+/-) if %R < 50% J(+)/UJ(-) if %R = 50-79% J(+) if %R >120%	
	CRM: Result within manufacturer's certified acceptance range or project guidelines	J(+)/UJ(-) if < LCL, J(+) if > UCL	

EcoChem Validation Guidelines for Metals Analysis by ICP
(Based on Inorganic NFG 1994 & 2004)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Matrix Spikes	One per matrix per batch 75-125% for samples less than 4x spike level	J(+) if %R > 125% J(+)/UJ(-) if %R < 75% J(+)/R(-) if %R < 30% or J(+)/UJ(-) if Post Spike %R 75-125% Qualify all samples in batch	8
Post-digestion Spike	If Matrix Spike is outside 75-125%, spike at twice the sample conc.	No qualifiers assigned based on this element	
Laboratory Duplicate (or MS/MSD)	One per matrix per batch RPD < 20% for samples > 5x RL Diff < RL for samples >RL and < 5x RL (Diff < 2x RL for solids)	J(+)/UJ(-) if RPD > 20% or diff > RL (2x RL for solids) qualify all samples in batch	9
Serial Dilution	5x dilution one per matrix %D < 10% for original sample conc. > 50x MDL	J(+)/UJ(-) if %D >10% qualify all samples in batch	16
Field Blank	Blank < MDL	Action level is 5x blank conc. U(+) sample values < action level in associated field samples only	6
Field Duplicate	For results > 5x RL: Water: RPD < 35% Solid: RPD < 50% For results < 5 x RL: Water: Diff < RL Solid: Diff < 2x RL	J(+)/UJ(-) in parent samples only	9
Linear Range	Sample concentrations must fall within range	J values over range	20

EcoChem Validation Guidelines for Conventional Chemistry Analysis (Based on EPA Standard Methods)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Cooler Temperature and Preservation	Cooler Temperature 4°C ±2°C Preservation: Method Specific	Use Professional Judgment to qualify based to qualify for coole temp outliers J(+)/UJ(-) if preservation requirements not met	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 r>0.995	Use professional judgment J(+)/UJ(-) for r < 0.995	5A
Initial Calibration Verification (ICV)	Where applicable to method Independent source analyzed immediately after calibration %R method specific, usually 90% - 110%	R(+/-) if %R significantly < LCL J(+)/UJ(-) if %R < LCL J(+) if %R > UCL R(+) if %R significantly > UCL	5A
Continuing Cal Verification (CCV)	Where applicable to method Every ten samples, immed. following ICV/ICB and end of run %R method specific, usually 90% - 110%	R(+/-) if %R significantly < LCL J(+)/UJ(-) if %R < LCL J(+) if %R > UCL R(+) if %R significantly > UCL	5B

Initial and Continuing Cal Blanks (ICB/CCB)	Where applicable to method
	After each ICV and CCV every ten samples and end of run
	| blank| < MDL
		Action level is 5x absolute value of blank conc.
		For (+) blanks, U(+) results < action level
		For (-) blanks, J(+)/UJ(-) results < action level
		refer to TM-02 for additional details
			7

Method Blank	One per matrix per batch
	(not to exceed 20 samples)
	blank < MDL
		Action level is 5x absolute value of blank conc.
		For (+) blk value, U(+) results < action level
		For (-) blk value, J(+)/UJ(-) results < action level
			7

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
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 RL Diff <RL for samples >RL and <5 x RL (may use RPD < 35%, Diff < 2X RL for solids)	J(+)/UJ(-) if RPD > 20% or diff > RL all samples in batch	9

EcoChem Validation Guidelines for Conventional Chemistry Analysis (Based on EPA Standard Methods)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Field Blank	blank < MDL	Action level is 5x blank conc. U(+) sample values < action level in associated field samples only	6
Field Duplicate	For results > 5X RL: Water: RPD < 35% Solid: RPD < 50% For results < 5 x RL: Water: Diff<RL Solid: Diff < 2X RL	J(+)/UJ(-) in parent samples only	9

EcoChem, INC.
Environmental Data Quality

APPENDIX B
QUALIFIED DATA SUMMARY TABLE

Qualified Data Summary Table
Lora Lake Parcel - DMA Soils

SDG	Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qual	DV Qual	DV Reason
SS83	DMA-TP5-1.5-2-042011	11-8720-SS83J	SW8041	Pentachlorophenol	39	ug/kg	P	NJ	3
SS83	DMA-TP5-1.5-2-042011	11-8720-SS83J	SW8270D SIM	Benzo(a)anthracene	14	ug/kg		J	13
SS83	DMA-TP5-1.5-2-042011	11-8720-SS83J	SW8270D SIM	Benzo(a)pyrene	12	ug/kg		J	13
SS83	DMA-TP5-1.5-2-042011	11-8720-SS83J	SW8270D SIM	Chrysene	44	ug/kg		J	13
SS83	DMA-TP5-1.5-2-042011	11-8720-SS83J	SW8270D SIM	Dibenz(a,h)anthracene	4.9	ug/kg	U	UJ	13
SS83	DMA-TP5-1.5-2-042011	11-8720-SS83J	SW8270D SIM	Indeno(1,2,3-cd)pyrene	13	ug/kg		J	13
SS83	DMA-TP5-1.5-2-042011	11-8720-SS83J	SW8270D SIM	Total Benzofluoranthenes	54	ug/kg		J	13
SS83	DMA-TP5-1.5-2-042011-D	11-8721-SS83K	SW8270D SIM	Benzo(a)anthracene	14	ug/kg		J	13
SS83	DMA-TP5-1.5-2-042011-D	11-8721-SS83K	SW8270D SIM	Benzo(a)pyrene	12	ug/kg		J	13
SS83	DMA-TP5-1.5-2-042011-D	11-8721-SS83K	SW8270D SIM	Chrysene	47	ug/kg		J	13
SS83	DMA-TP5-1.5-2-042011-D	11-8721-SS83K	SW8270D SIM	Dibenz(a,h)anthracene	4.8	ug/kg	U	UJ	13
SS83	DMA-TP5-1.5-2-042011-D	11-8721-SS83K	SW8270D SIM	Indeno(1,2,3-cd)pyrene	12	ug/kg		J	13
SS83	DMA-TP5-1.5-2-042011-D	11-8721-SS83K	SW8270D SIM	Total Benzofluoranthenes	57	ug/kg		J	13
6735	DMA-TP1-3-4.5-041911	6735-002-SA	EPA 1613 D/F	1,2,3,4,7,8,9-HpCDF	1.66	pg/g	J	J	13
6735	DMA-TP1-4.5-5.5-041911	6735-003-SA	EPA 1613 D/F	1,2,3,4,7,8,9-HpCDF	1.73	pg/g	J	J	13
6735	DMA-TP2-1.5-3-041911	6735-004-SA	EPA 1613 D/F	1,2,3,4,7,8,9-HpCDF	2.31	pg/g	J	J	13
6735	DMA-TP6-0-2.5-041911	6735-006-SA	EPA 1613 D/F	1,2,3,4,7,8,9-HpCDF	0.309	pg/g	J	J	13
6735	DMA-TP4-0-1.5-042011	6735-008-SA	EPA 1613 D/F	1,2,3,4,7,8,9-HpCDF	23.1	pg/g		J	13
6735	DMA-TP5-1.5-2-042011	6735-010-SA	EPA 1613 D/F	1,2,3,4,6,7,8-HpCDD	1600	pg/g		J	13
6735	DMA-TP5-1.5-2-042011	6735-010-SA	EPA 1613 D/F	Total HxCDF	402	pg/g	D,M	J	14
6735	DMA-TP5-1.5-2-042011	6735-010-SA	EPA 1613 D/F	Total PeCDF	178	pg/g	D,M	J	14
6735	DMA-TP5-1.5-2-042011	6735-010-SA	EPA 1613 D/F	Total TCDF	150	pg/g	D,M	J	14
6735	DMA-TP5-1.5-2-042011-D	6735-011-SA	EPA 1613 D/F	1,2,3,4,7,8,9-HpCDF	25.2	pg/g		J	13
6735	DMA-TP5-1.5-2-042011-D	6735-011-SA	EPA 1613 D/F	Total HxCDF	506	pg/g	D,M	J	14
6735	DMA-TP5-1.5-2-042011-D	6735-011-SA	EPA 1613 D/F	Total PeCDF	222	pg/g	D,M	J	14
6735	DMA-TP5-1.5-2-042011-D	6735-011-SA	EPA 1613 D/F	Total TCDF	180	pg/g	D,M	J	14
6735	DMA-TP3-3-4-042011	6735-014-SA	EPA 1613 D/F	Total HxCDF	289	pg/g	D,M	J	14
6735	DMA-TP3-3-4-042011	6735-014-SA	EPA 1613 D/F	Total PeCDF	118	pg/g	D,M	J	14
6735	DMA-TP3-3-4-042011	6735-014-SA	EPA 1613 D/F	Total TCDF	83.7	pg/g	D,M	J	14

EcoChem, INC.
Environmental Data Quality

DATA VALIDATION REPORT

Port of Seattle
Lora Lake Parcel RI/FS
DMA Groundwater

Prepared for:

Floyd|Snider
601 Union Street, Suite 600
Seattle, WA 98101

Prepared by:

EcoChem, Inc.
710 Second Avenue, Suite 660
Seattle, Washington 98104

EcoChem Project: C15212-3

July 15, 2011

Approved for Release:

Christine Ransom
Project Manager
EcoChem, Inc.

PROJECT NARRATIVE

Basis for the Data Validation

This report summarizes the results of data validation performed on groundwater and quality control (QC) sample data for the Remedial Investigation/Feasibility Study at Lora Lake Parcel, Burien, WA. The dioxin data received full validation (EPA Stage 4); all other parameters received summary validation (EPA Stage 2B). A complete list of samples is provided in the **Sample Index**.

Frontier Analytical Laboratory (El Dorado Hills, California) performed the dioxin/furan analyses. Analytical Resources, Inc. (Tukwila, Washington) performed all other analyses. The analytical methods and EcoChem project chemists are listed in the table below.

Analysis	Method	Primary Review	Secondary Review
Dioxin Furan Compounds	EPA 1613	M. Swanson	C. Mott
Volatile Organic Compounds	SW8060C		C. Ransom
Polycyclic Aromatic Hydrocarbons	SW8270D-SIM		
Pentachlorophenol	SW8041	M. Brindle	
Total Petroleum Hydrocarbons – Diesel Range Organics	NWTPH-Dx		
BTEX	SW8021-Mod		
Total Petroleum Hydrocarbons – Gasoline Range Organics	NWTPH-Gx		
Metals	EPA 200.8	J. Maute	
Total Suspended Solids	EPA 160.2		
pH	EPA 150.1		

The data were reviewed using guidance and quality control criteria documented in the analytical methods; *Port of Seattle Lora Lake Parcel, Remedial Investigation/Feasibility Study Work Plan* (February 11, 2011); *National Functional Guidelines for Inorganic Data Review* (USEPA 1994 & 2004); *National Functional Guidelines for Organic Data Review* (USEPA 1999 & 2008); and *USEPA National Functional Guidelines for Chlorinated Dioxin/Furan Data Review* (USEPA, September 2005).

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 above.

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
Lora Lake Parcel - DMA Groundwater

Sample ID	Lab ID	Dioxins	VOC	PAH	PCP	BTEX	TPH-Gx	TPH-Dx	Metals	Conv
B312-042911	11-9772-SU74A		√	√	√	√	√	√	√	√
B310-042911	11-9773-SU74B		√	√	√	√	√	√	√	√
B311-042911	11-9774-SU74C		√	√	√	√	√	√	√	√
B312-042911	6744-001-SA	√								
B310-042911	6744-002-SA	√								
B311-042911	6744-003-SA	√								

DATA VALIDATION REPORT
Lora Lake Parcel – DMA Groundwater
Volatile Organic Compounds by SW846 Method 8260C-SIM

This report documents the review of analytical data from the analysis of groundwater samples and the associated laboratory quality control (QC) samples. Samples were analyzed by Analytical Resources, Inc., Tukwila, Washington. Summary validation (EPA Stage 2B) was performed on all groundwater data. The **Sample Index** contains a complete list of samples.

SDG	Number of Samples
SU74	3 Groundwater

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. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

1	Sample Receipt, Preservation, and Holding Times		Laboratory Control Samples (LCS/LCSD)
	GC/MS Instrument Performance Check		Matrix Spike/Matrix Spike Duplicate (MS/MSD)
	Initial Calibration (ICAL)	1	Field Duplicates
	Continuing Calibration (CCAL)		Internal Standards
	Laboratory Blanks		Target Analyte List
1	Field Blanks		Reporting Limits
	Surrogate Compounds		

[1] ***Quality control results are discussed below, but no data were qualified.***

Sample Receipt, Preservation, and Holding Times

As stated in validation guidance documents, sample coolers should arrive at the laboratory within the advisory temperature range of 2° to 6°C. Several coolers were received. One cooler was received with a temperature of 0.4°C, which is less than the lower control limit. The temperature outlier did not impact data quality and no action was taken.

Field Blanks

One trip blank, TB-042911 was submitted in SDG SU73, which was included in the Lora Lake Apartments RIFS Groundwater report (7/8/11). No target analytes were detected in this blank.

Field Duplicates

No field duplicates were submitted.

IV. OVERALL ASSESSMENT

As determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the surrogate, laboratory control sample (LCS/LCSD), and matrix spike sample (MS/MSD) recovery values. Precision was also acceptable as demonstrated by the LCS/LCSD and MS/MSD relative percent difference values.

No data were qualified for any reason.

All data, as reported, are acceptable for use.

DATA VALIDATION REPORT
Lora Lake Parcel – DMA Groundwater
Polycyclic Aromatic Hydrocarbons by SW846 Method 8270D-SIM

This report documents the review of analytical data from the analysis of groundwater samples and the associated laboratory quality control (QC) samples. Samples were analyzed by Analytical Resources, Inc., Tukwila, Washington. Summary validation (EPA Stage 2B) was performed on all groundwater data. The **Sample Index** contains a complete list of samples.

SDG	Number of Samples
SU74	3 Groundwater

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. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

1	Sample Receipt, Preservation, and Holding Times	1	Field Duplicates
	Initial Calibration (ICAL)		Retention Time Window
	Continuing Calibration (CCAL)		Target Analyte List
	Laboratory Blanks		Compound Identification
1	Field Blanks		Compound Quantitation
	Surrogate Compounds		Reporting Limits
2	Laboratory Control Samples (LCS/LCSD)		Reported Results
	Matrix Spikes/Matrix Spike Duplicates (MS/MSD)		

[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

As stated in validation guidance documents, sample coolers should arrive at the laboratory within the advisory temperature range of 2° to 6°C. Several coolers were received. One cooler was received with a temperature of 0.4°C, which is less than the lower control limit. The temperature outlier did not impact data quality and no action was taken.

Field Blanks

No field blanks were submitted.

Laboratory Control Samples

The laboratory control sample (LCS) percent recovery (%R) value for benzo(a)pyrene was less than the lower control limit of 40%. All results for benzo(a)pyrene in the associated samples were estimated (J/UJ-10) to indicate a potential low bias.

Field Duplicate

No field duplicates were submitted.

III. OVERALL ASSESSMENT

As determined by this evaluation, the laboratory followed the specified analytical method. With the exception noted above, accuracy was acceptable as demonstrated by the surrogate, laboratory control sample and matrix spike/matrix spike duplicate (MS/MSD) recoveries. Precision was acceptable as demonstrated by the MS/MSD relative percent difference values.

Data were estimated based on an LCS recovery outlier.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Lora Lake Parcel – DMA Groundwater
Pentachlorophenol by EPA Method 8041

This report documents the review of analytical data from the analysis of groundwater samples and the associated laboratory quality control (QC) samples. Samples were analyzed by Analytical Resources, Inc., Tukwila, Washington. Summary validation (Stage 2B) was performed on all data. The **Sample Index** contains a complete list of samples.

SDG	Number of Samples
SU74	3 Groundwater

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. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

1	Sample Receipt, Preservation, and Holding Times	1	Field Duplicates
	Initial Calibration (ICAL)		Second Column Confirmation
	Continuing Calibration (CCAL)		Retention Time Window
	Laboratory Blanks		Target Analyte List
	Surrogate Compounds		Reporting Limits
	Laboratory Control Samples (LCS)		
	Matrix Spikes/Matrix Spike Duplicates (MS/MSD)		

[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

As stated in validation guidance documents, sample coolers should arrive at the laboratory within the advisory temperature range of 2° to 6°C. Several coolers were received. One cooler was received with a temperature of 0.4°C, which is less than the lower control limit. The temperature outlier did not impact data quality and no action was taken.

Field Duplicates

No field duplicates were submitted.

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 matrix spike sample (MS/MSD) recoveries. Precision was also acceptable as demonstrated by the MS/MSD relative percent difference values.

No data were qualified for any reason.

All data, as reported, are acceptable for use.

DATA VALIDATION REPORT
Lora Lake Parcel – DMA Groundwater
BETX by Method SW8021B Mod
Gasoline Range Organics by NWTPH-Gx

This report documents the review of analytical data from the analysis of groundwater samples and the associated laboratory quality control (QC) samples. Samples were analyzed by Analytical Resources Incorporated, Tukwila, Washington. Summary validation (EPA Stage 2B) was performed on all data. The **Sample Index** contains a complete list of samples.

SDG	Number of Samples
SU74	3 Groundwater

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. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

1	Sample Receipt, Preservation, and Holding Times		Laboratory Control Samples (LCS/LCSD)
	Initial Calibration (ICAL)		Matrix Spikes/Matrix Spike Duplicates (MS/MSD)
	Continuing Calibration (CCAL)	1	Field Duplicates
	Laboratory Blanks		Target Analyte List
1	Field Blanks	1	Reporting Limits
	Surrogate Compounds		Reported Results

[1] ***Quality control results are discussed below, but no data were qualified.***

Sample Receipt, Preservation, and Holding Times

As stated in validation guidance documents, sample coolers should arrive at the laboratory within the advisory temperature range of 2°to 6°C. Several coolers were received. One cooler was received with a temperature of 0.4°C, which is less than the lower control limit. The temperature outlier did not impact data quality and no action was taken.

Field Blanks

One trip blank, TB-042911 was submitted with SDG SU73, which was included in the Lora Lake Apartments RIFS Groundwater report (7/8/11). No target analytes were detected in this blank.

Field Duplicates

No field duplicates were submitted.

Reporting Limits

The reporting limit of 1.0 µg/L for all BETX analytes (benzene, toluene, ethylbenzene, xylenes) exceeded the (QAPP) specified reporting limit of 0.25 µg/L.

III. OVERALL ASSESSMENT

As determined by this evaluation, the laboratory followed the specified analytical methods. 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. Precision was acceptable as demonstrated by the MS/MSD and LCS/LCSD relative percent difference values.

No data were qualified for any reason.

All data, as reported, are acceptable for use.

DATA VALIDATION REPORT
Lora Lake Parcel – DMA Groundwater
Motor Oil and Diesel Range Organics by NWTPH-Dx

This report documents the review of analytical data from the analysis of groundwater samples and the associated laboratory quality control (QC) samples. Samples were analyzed by Analytical Resources Incorporated, Tukwila, Washington. Summary validation (Stage 2B) was performed on all data. The **Sample Index** contains a complete list of samples.

SDG	Number of Samples
SU74	3 Groundwater

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. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

1	Sample Receipt, Preservation, and Holding Times		Laboratory Control Samples (LCS/LCSD)
	Initial Calibration (ICAL)		Matrix Spikes/Matrix Spike Duplicates (MS/MSD)
	Continuing Calibration (CCAL)	1	Field Duplicates
	Blanks		Target Analyte List
	Field Blanks		Reporting Limits
	Surrogate Compounds		Reported Results

[1] ***Quality control results are discussed below, but no data were qualified.***

Sample Receipt, Preservation, and Holding Times

As stated in validation guidance documents, sample coolers should arrive at the laboratory within the advisory temperature range of 2° to 6°C. Several coolers were received. One cooler was received with a temperature of 0.4°C, which is less than the lower control limit. The temperature outlier did not impact data quality and no action was taken.

Field Blanks

No field blanks were submitted.

Field Duplicates

No field duplicates were submitted.

III. OVERALL ASSESSMENT

As determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the surrogate, laboratory control sample, and matrix spike sample (MS/MSD) recoveries. Precision was also acceptable as demonstrated by the MS/MSD relative percent difference values.

No data were qualified for any reason.

All data, as reported, are acceptable for use.

DATA VALIDATION REPORT
Lora Lake Parcel – DMA Groundwater
Dioxin/Furan Compounds by Method 1613

This report documents the review of analytical data from the analysis of groundwater samples and the associated laboratory quality control (QC) samples. Samples were analyzed by Frontier Analytical Laboratory, El Dorado Hills, California. Full validation (EPA Stage 4) was performed on all data. The **Sample Index** contains a complete list of samples.

SDG	Number of Samples
6744	3 Groundwater

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. TECHNICAL DATA VALIDATION

The quality control (QC) requirements reviewed are summarized in the following table:

1	Sample Receipt, Preservation, and Holding Times	1	Matrix Spike/Matrix Spike Duplicates (MS/MSD)
	System Performance and Resolution Checks		Ongoing Precision and Recovery (OPR)
	Initial Calibration (ICAL)	1	Field Duplicates
	Calibration Verification (CVER)		Target Analyte List
	Method Blanks		Reported Results
1	Field Blanks		Compound Identification
2	Labeled Compound Recovery	1	Calculation Verification

[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 Preservation

The samples were transferred from Analytical Resources, Inc (ARI) to Frontier Analytical Laboratory. As stated in validation guidance documents, samples should be maintained within the advisory temperature range of 2° to 6°C. The temperatures recorded by Frontier were as low as 0.0°C, which is less than the lower control limit. The temperature outliers did not impact data quality; therefore no action was taken.

Field Blanks

No field blanks were submitted.

Labeled Compound Recovery

The percent recovery (%R) value for the labeled compound 13C-OCDF was less than the QAPP specified lower control limit of 70% in Sample B312-042911. The OCDF result for this sample was estimated (UJ-13) to indicate a potential low bias.

Matrix Spike/Matrix Spike Duplicates

Matrix spike/matrix spike duplicate (MS/MSD) samples were not analyzed. Laboratory accuracy was evaluated from the on-going precision and recovery (OPR) standard recoveries. Precision within the analytical batch could not be assessed.

Field Duplicates

No field duplicates were submitted.

Calculation Verification

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

III. OVERALL ASSESSMENT

As determined by this evaluation, the laboratory followed the specified analytical method. With the above noted exception, accuracy was acceptable as demonstrated by the labeled compound and OPR %R values. Precision for the batch could not be assessed.

One data point was estimated based on a labeled compound recovery outlier.

All data, as qualified, are acceptable for use.

DATA VALIDATION REPORT
Lora Lake Parcel – DMA Groundwater
Dissolved Arsenic and Lead by EPA 200.8

This report documents the review of analytical data from the analysis of groundwater samples and the associated laboratory quality control (QC) samples. Samples were analyzed by Analytical Resources Incorporated, Tukwila, Washington. Summary validation (Stage 2B) was performed on all data. Refer to the **Sample Index** for a complete list of samples.

SDG	Number of Samples
SU74	3 Groundwater

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. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

1	Sample Receipt, Preservation, and Holding Times		Laboratory Duplicates
	Initial Calibration	1	Field Duplicates
	Continuing Calibration Verification		Interference Check Samples
	CRDL Standards		Internal Standards
	Laboratory Blanks		Target Analyte List
	Laboratory Control Samples (LCS)		Reporting Limits
	Matrix Spike (MS)		Reported Results

[1] ***Quality control results are discussed below, but no data were qualified***

Sample Receipt, Preservation, and Holding Times

As stated in validation guidance documents, sample coolers should arrive at the laboratory within the advisory temperature range of 2° to 6°C. Several coolers were received. One cooler was received with a temperature of 0.4°C, which is less than the lower control limit. The temperature outlier did not impact data quality and no action was taken.

Field Duplicates

No field duplicates were submitted.

III. OVERALL ASSESSMENT

As determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the laboratory control sample and matrix spike sample recovery values. Precision was also acceptable as demonstrated by the laboratory duplicate relative percent difference values.

No data were qualified for any reason.

All data, as reported, are acceptable for use.

DATA VALIDATION REPORT
Lora Lake Parcel – DMA Groundwater
pH by EPA 150.1 and Total Suspended Solids by EPA 160.2

This report documents the review of analytical data from the analyses of groundwater samples and the associated laboratory quality control (QC) samples. Samples were analyzed by Analytical Resources Incorporated, Tukwila, Washington. Summary validation (EPA Stage 2B) was performed on all data. Refer to the **Sample Index** for a complete list of samples.

SDG	Number of Samples
SU74	3 Groundwater

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. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

1	Sample Receipt, Preservation, and Holding Times		Laboratory Duplicates
	Laboratory Blanks	1	Field Duplicates
	Laboratory Control Samples (LCS)		Reporting Limits
	Matrix Spikes (MS)		Reported Results

[1] ***Quality control results are discussed below, but no data were qualified***

Sample Receipt, Preservation, and Holding Times

As stated in validation guidance documents, sample coolers should arrive at the laboratory within the advisory temperature range of 2° to 6°C. Several coolers were received. One cooler was received with a temperature of 0.4°C, which is less than the lower control limit. The temperature outlier did not impact data quality and no action was taken.

Field Duplicates

No field duplicates were submitted.

III. OVERALL ASSESSMENT

As determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the laboratory control sample percent recovery values. Precision was acceptable as demonstrated by the laboratory duplicate relative percent difference values.

No data were qualified for any reason.

All data, as reported, are acceptable for use.

EcoChem, INC.
Environmental Data Quality

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.

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
22	Elevated Detection Limit Due to Interference (i.e., laboratory, chemical and/or matrix)

EcoChem Validation Guidelines for Volatile Analysis by GC/MS (Based on Organic NFG 1999)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Cooler Temperature	4°C±2°C Water: HCl to pH < 2	J(+)/UJ(-) if greater than 6 deg. C (EcoChem PJ)	1
Hold Time	Waters: 14 days preserved 7 Days: unpreserved (for aromatics) Solids: 14 Days	J(+)/UJ(-) if hold times exceeded If exceeded by > 3X HT: J(+)/R(-) (EcoChem PJ)	1
Tuning	BFB 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 > CRQL	U(+) if sample (+) result is less than CRQL and less than appropriate 5X or 10X rule (raise sample value to CRQL)	7
		U(+) if sample (+) result is greater than or equal to CRQL and less than appropriate 5X and 10X rule (at reported sample value)	7
	No TICs present	R(+) TICs using 10X rule	7
Storage Blank	One per SDG <CRQL	U(+) the specific analyte(s) results in all assoc.samples using the 5x or 10x rule	7
Trip Blank	Frequency as per project QAPP	Same as method blank for positive results remaining in trip blank after method blank qualifiers are assigned	18
Field Blanks (if required in QAPP)	No results > CRQL	Apply 5X/10X rule; U(+) < action level	6

EcoChem Validation Guidelines for Volatile 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(+) in parent sample if RPD > CL	9
LCS *low conc. H2O VOA*	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 VOA (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(+)/UJ(-) assoc. cmpd. in all samples	9
Surrogates	Added to all samples Within method control limits	J(+) if %R >UCL J(+)/UJ(-) if %R <LCL but >10% (see PJ[1]) J(+)/R(-) if <10%	13
Internal Standard (IS)	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% RT>30 seconds, narrate and Notify PM	19
Field Duplicates	Use QAPP limits. If no QAPP: Solids: RPD <50% OR absolute diff. < 2X RL (for results < 5X RL) Aqueous: RPD <35% OR absolute diff. < 1X RL (for results < 5X RL)	Narrate and qualify if required by project (EcoChem PJ)	9
TICs	Major ions (>10%) in reference must be present in sample; intensities agree within 20%; check identification	NJ the TIC unless: R(+) common laboratory contaminants 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 +)

PJ[1] No action if there are 4+ surrogates and only 1 outlier.

EcoChem Validation Guidelines for 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 > CRQL	U(+) if sample (+) result is less than CRQL and less than appropriate 5X or 10X rule (raise sample value to CRQL)	7
		U(+) if sample (+) result is greater than or equal to CRQL and less than appropriate 5X and 10X rule (at reported sample value)	7
	No TICs present	R(+) TICs using 10X rule	7
Field Blanks (Not Required)	No results > CRQL	Apply 5X/10X rule; U(+) < action level	6

EcoChem Validation Guidelines for 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(+) in parent sample 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(+)/UJ(-) 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% RT>30 seconds, narrate and Notify PM	19
Field Duplicates	Use QAPP limits. If no QAPP: Solids: RPD <50% OR absolute diff. < 2X RL (for results < 5X RL) Aqueous: RPD <35% OR absolute diff. < 1X RL (for results < 5X RL)	Narrate and qualify if required by project (EcoChem PJ)	9
TICs	Major ions (>10%) in reference must be present in sample; intensities agree within 20%; check identification	NJ the TIC unless: R(+) common laboratory contaminants 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 +)

EcoChem Validation Guidelines for Pesticides, PCBs, Herbicides, and Phenol by GC/ECD (Based on Organic NFG 1999 & EPA SW-846 Methods 8081/8082/8041/8151)

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) 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	Not addressed by NFG No results > CRQL	Apply 5X rule; U(+) < action level	6

EcoChem Validation Guidelines for Pesticides, PCBs, Herbicides, and Phenol by GC/ECD (Based on Organic NFG 1999 & EPA SW-846 Methods 8081/8082/8041/8151)

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(+) in parent sample 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(+)/UJ(-) 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	Quantitated using ICAL calibration factor (CF) RPD between columns <40%	J(+) if RPD = 40 - 60% NJ(+) if RPD >60% EcoChem PJ - See TM-08	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	Use QAPP limits. If no QAPP: Solids: RPD <50% OR absolute diff. < 2X RL (for results < 5X RL) Aqueous: RPD <35% OR absolute diff. < 1X RL (for results < 5X RL)	Narrate (Qualifiy if required by project QAPP)	9

EcoChem Validation Guidelines for Total Petroleum Hydrocarbons-Diesel & Residual Range

(Based on EPA National Functional Guidelines as applied to criteria in NWTPH-Dx, June 1997, Wa DOE & Oregon DEQ)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Cooler Temperature & Preservation	4°C±2°C Water: HCl to pH < 2	J(+)/UJ(-) if greater than 6 deg. C	1
Holding Time	Ext. Waters: 14 days preserved 7 days unpreserved Ext. Solids: 14 Days Analysis: 40 days from extraction	J(+)/UJ(-) if hold times exceeded J(+)/R(-) if exceeded > 3X (EcoChem PJ)	1
Initial Calibration	5 calibration points (All within 15% of true value) Linear Regression: $R^2 \geq 0.990$ If used, RSD of response factors ≤20%	Narrate if fewer than 5 calibration levels or if %R >15% J(+)/UJ(-) if R^2 <0.990 J(+)/UJ(-) if %RSD > 20%	5A
Mid-range Calibration Check Std.	Analyzed before and after each analysis shift & every 20 samples. Recovery range 85% to 115%	Narrate if frequency not met. J(+)/UJ(-) if %R < 85% J(+) if %R >115%	5B
Method Blank	At least one per batch (≤20 samples) No results >RL	U (at the RL) if sample result is < RL & < 5X blank result.	7
		U (at reported sample value) if sample result is ≥ RL and < 5X blank result	7
Field Blanks (if required by project)	No results > RL	Action is same as method blank for positive results remaining in the field blank after method blank qualifiers are assigned.	6
MS samples (accuracy) (if required by project)	%R within lab control limits	Qualify parent only, unless other QC indicates systematic problems. J(+) if both %R > upper control limit (UCL) J(+)/UJ(-) if both %R < lower control limit (LCL) No action if parent conc. >5X the amount spiked. Use PJ if only one %R outlier	8
Precision: MS/MSD or LCS/LCSD or sample/dup	At least one set per batch (≤10 samples) RPD ≤ lab control limit	J(+) if RPD > lab control limits	9
LCS (not required by method)	%R within lab control limits	J(+)/UJ(-) if %R < LCL J(+) if %R > UCL J(+)/R(-) if any %R <10% (EcoChem PJ)	10

EcoChem Validation Guidelines for Total Petroleum Hydrocarbons-Diesel & Residual Range

(Based on EPA National Functional Guidelines as applied to criteria in NWTPH-Dx, June 1997, Wa DOE & Oregon DEQ)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Surrogates	2-fluorobiphenyl, p-terphenyl, o-terphenyl, and/or pentacosane added to all samples (inc. QC samples). %R = 50-150%	J(+)/UJ(-) if %R < LCL J(+) if %R > UCL J(+)/R(-) if any %R <10% No action if 2 or more surrogates are used, and only one is outside control limits. (EcoChem PJ)	13
Pattern Identification	Compare sample chromatogram to standard chromatogram to ensure range and pattern are reasonable match. Laboratory may flag results which have poor match.	J(+)	2
Field Duplicates	Use project control limits, if stated in QAPP EcoChem default: water: RPD < 35% solids: RPD < 50%	Narrate (Use Professional Judgement to qualify)	9
Two analyses for one sample (dilution)	Report only one result per analyte	"DNR" (or client requested qualifier) all results that should not be reported. (See TM-04)	11

EcoChem Validation Guidelines for Total Petroleum Hydrocarbons-Gasoline Range

(Based on EPA National Functional Guidelines as applied to criteria in NWTPH-Gx, June 1997, Wa DOE & Oregon DEQ)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Cooler Temperature & Preservation	4°C±2°C Water: HCl to pH < 2	J(+)/UJ(-) if greater than 6 deg. C	1
Holding Time	Waters: 14 days preserved 7 days unpreserved Solids: 14 Days	J(+)/UJ(-) if hold times exceeded J(+)/R(-) if exceeded > 3X (EcoChem PJ)	1
Initial Calibration	5 calibration points (All within 15% of true value) Linear Regression: $R^2 \geq 0.990$ If used, RSD of response factors ≤20%	Narrate if fewer than 5 calibration levels or if %R >15% J(+)/UJ(-) if R^2 <0.990 J(+)/UJ(-) if %RSD > 20%	5A
Mid-range Calibration Check Std.	Analyzed before and after each analysis shift & every 20 samples. Recovery range 80% to 120%	Narrate if frequency not met. J(+)/UJ(-) if %R < 80% J(+) if %R >120%	5B
Method Blank	At least one per batch (≤10 samples) No results >RL	U (at the RL) if sample result is < RL & < 5X blank result.	7
		U (at reported sample value) if sample result is ≥ RL and < 5X blank result	7
Trip Blank (if required by project)	No results >RL	Action is same as method blank for positive results remaining in trip blank after method blank qualifiers are assigned.	18
Field Blanks (if required by project)	No results > RL	Action is same as method blank for positive results remaining in field blank after method and trip blank qualifiers are assigned.	6
MS samples (accuracy) (if required by project)	%R within lab control limits	Qualify parent only, unless other QC indicates systematic problems. J(+) if both %R > upper control limit (UCL) J(+)/UJ(-) if both %R < lower control limit (LCL) No action if parent conc. >5X the amount spiked. Use PJ if only one %R outlier	8
Precision: MS/MSD or LCS/LCSD or sample/dup	At least one set per batch (≤10 samples) RPD ≤ lab control limit	J(+) if RPD > lab control limits	9

EcoChem Validation Guidelines for Total Petroleum Hydrocarbons-Gasoline Range

(Based on EPA National Functional Guidelines as applied to criteria in NWTPH-Gx, June 1997, Wa DOE & Oregon DEQ)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
LCS (not required by method)	%R within lab control limits	J(+)/UJ(-) if %R < LCL J(+) if %R > UCL J(+)/R(-) if any %R <10% (EcoChem PJ)	10
Surrogates	Bromofluorobenzene and/or 1,4-difluorobenzene added to all samples (inc. QC samples). %R = 50-150%	J(+)/UJ(-) if %R < LCL J(+) if %R >UCL J(+)/R(-) if any %R <10% No action if 2 or more surrogates are used, and only one is outside control limits. (EcoChem PJ)	13
Pattern Identification	Compare sample chromatogram to standard chromatogram to ensure range and pattern are reasonable match. Laboratory may flag results which have poor match.	J(+)	2
Field Duplicates	Use project control limits, if stated in QAPP EcoChem default: water: RPD < 35% solids: RPD < 50%	Narrate outliers If required by project, qualify with J(+)/UJ(-)	9
Two analyses for one sample (e.g., dilution)	Report only one result per analyte	"DNR" (or client requested qualifier) all results that should not be reported. (See TM-04)	11

EcoChem Validation Guidelines for Dioxin/Furan Analysis by HRMS
(Based on EPA Reg. 10 SOP, Rev. 2, 1996 & EPA SW-846, Methods 1613b and 8290)

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	Extraction - Water: 30 days from collection *Note:* Under CWA, SDWA, and RCRA the HT for H2O is 7 days* Extraction - Soil: 30 days from collection Analysis: 40 days from extraction	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	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(-)	

EcoChem Validation Guidelines for Dioxin/Furan Analysis by HRMS
(Based on EPA Reg. 10 SOP, Rev. 2, 1996 & EPA SW-846, Methods 1613b and 8290)

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, Method 1613B) (If %Ds in the closing CCAL are w/in 25%/35% the avg RF from the two CCAL may be used to calculate samples per Method 8290, Section 8.3.2.4)	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.	7
Field Blanks (Not Required)	No positive results	If sample result <5X action level, qualify U at reported value.	6
LCS / OPR	Concentrations must meet limits in Table 6, 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
MS/MSD (RPD)	May not analyze MS/MSD RPD < 20%	J(+) in parent sample if RPD > CL	9

EcoChem Validation Guidelines for Dioxin/Furan Analysis by HRMS
(Based on EPA Reg. 10 SOP, Rev. 2, 1996 & EPA SW-846, Methods 1613b and 8290)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Lab Duplicate	RPD <25% if present.	J(+)/UJ(-) if outside limts	9
Labeled Compounds / Internal Standards	*Method 8290:* %R = 40% - 135% in all samples *Method 1613B:* %R must meet limits specified in Table 7, Method 1613	J(+)/UJ(-) if %R = 10% to LCL J(+) if %R > UCL J(+)/R(-) if %R < 10%	13
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 idenfication 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	Use QAPP limits. If no QAPP: Solids: RPD <50% OR absolute diff. < 2X RL (for results < 5X RL) Aqueous: RPD <35% OR absolute diff. < 1X RL (for results < 5X RL)	Narrate and qualify if required by project (EcoChem PJ)	9
Two analyses for one sample	Report only one result per analyte	"DNR" results that should not be used	11

EcoChem Validation Guidelines for Metals Analysis by ICP (Based on Inorganic NFG 1994 & 2004)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Cooler Temperature and Preservation	Cooler temperature: 4°C ±2° Waters: Nitric Acid to pH < 2 For Dissolved Metals: 0.45um filter & preserve after filtration Tissues: Frozen	EcoChem Professional Judgment - no qualification based on cooler temperature outliers J(+)/UJ(-) if pH preservation requirements are not met	1
Holding Time	180 days from date sampled Frozen tissues - HT extended to 2 years	J(+)/UJ(-) if holding time exceeded	1
Initial Calibration	Blank + minimum 1 standard If more than 1 standard, r > 0.995	J(+)/UJ(-) if r < 0.995 (multi point cal)	5A
Initial Calibration Verification (ICV)	Independent source analyzed immediately after calibration %R within ±10% of true value	J(+)/UJ(-) if %R 75-89% J(+) if %R = 111-125% R(+) if %R > 125% R(+/-) if %R < 75%	5A
Continuing Calibration Verification (CCV)	Every ten samples, immediately following ICV/ICB and at end of run %R within ±10% of true value	J(+)/UJ(-) if %R = 75-89% J(+) if %R 111-125% R(+) if %R > 125% R(+/-) if %R < 75%	5B

Initial and Continuing Calibration Blank (ICB/CCB)	After each ICV and CCV
	every ten samples and end of run
	| blank | < IDL (MDL)
		Action level is 5x absolute value of blank conc.
		For (+) blanks, U(+) results < action level
		For (-) blanks, J(+)/UJ(-) results < action level
		(Refer to TM-02 for additional information)
			7

Reporting Limit Standard	2x RL analyzed beginning of run Not required for Al, Ba, Ca, Fe, Mg, Na, K %R = 70%-130% (50%-150% Sb, Pb, Tl)	R(-)/J(+) < 2x RL if %R <50% (< 30% Sb, Pb, Tl) J(+) < 2x RL, UJ(-) if %R 50-69% (30-49% Sb, Pb,Tl) J(+) < 2x RL if %R 130-180% (150-200% Sb, Pb, Tl) R(+) < 2x RL if %R > 180% (200% Sb, Pb, Tl)	14
Interference Check Samples (ICSA/ICSAB)	ICSAB %R 80 - 120% for all spiked elements | ICSA | < MDL for all unspiked elements except: K, Na	For samples with Al, Ca, Fe, or Mg > ICS levels R(+/-) if %R < 50% J(+) if %R >120% J(+)/UJ(-) if %R= 50 to 79% Use Professional Judgment for ICSA to determine if bias is present see TM-09 for additional details	17
Method Blank	One per matrix per batch (batch not to exceed 20 samples) blank < MDL	Action level is 5x blank concentration U(+) results < action level	7
Laboratory Control Sample (LCS)	One per matrix per batch		10
	Blank Spike: %R within 80-120%	R(+/-) if %R < 50% J(+)/UJ(-) if %R = 50-79% J(+) if %R >120%	
	CRM: Result within manufacturer's certified acceptance range or project guidelines	J(+)/UJ(-) if < LCL, J(+) if > UCL	

EcoChem Validation Guidelines for Metals Analysis by ICP
(Based on Inorganic NFG 1994 & 2004)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Matrix Spikes	One per matrix per batch 75-125% for samples less than 4x spike level	J(+) if %R > 125% J(+)/UJ(-) if %R < 75% J(+)/R(-) if %R < 30% or J(+)/UJ(-) if Post Spike %R 75-125% Qualify all samples in batch	8
Post-digestion Spike	If Matrix Spike is outside 75-125%, spike at twice the sample conc.	No qualifiers assigned based on this element	
Laboratory Duplicate (or MS/MSD)	One per matrix per batch RPD < 20% for samples > 5x RL Diff < RL for samples >RL and < 5x RL (Diff < 2x RL for solids)	J(+)/UJ(-) if RPD > 20% or diff > RL (2x RL for solids) qualify all samples in batch	9
Serial Dilution	5x dilution one per matrix %D < 10% for original sample conc. > 50x MDL	J(+)/UJ(-) if %D >10% qualify all samples in batch	16
Field Blank	Blank < MDL	Action level is 5x blank conc. U(+) sample values < action level in associated field samples only	6
Field Duplicate	For results > 5x RL: Water: RPD < 35% Solid: RPD < 50% For results < 5 x RL: Water: Diff < RL Solid: Diff < 2x RL	J(+)/UJ(-) in parent samples only	9
Linear Range	Sample concentrations must fall within range	J values over range	20

EcoChem Validation Guidelines for Conventional Chemistry Analysis (Based on EPA Standard Methods)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Cooler Temperature and Preservation	Cooler Temperature 4°C ±2°C Preservation: Method Specific	Use Professional Judgment to qualify based to qualify for coole temp outliers J(+)/UJ(-) if preservation requirements not met	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 r>0.995	Use professional judgment J(+)/UJ(-) for r < 0.995	5A
Initial Calibration Verification (ICV)	Where applicable to method Independent source analyzed immediately after calibration %R method specific, usually 90% - 110%	R(+/-) if %R significantly < LCL J(+)/UJ(-) if %R < LCL J(+) if %R > UCL R(+) if %R significantly > UCL	5A
Continuing Cal Verification (CCV)	Where applicable to method Every ten samples, immed. following ICV/ICB and end of run %R method specific, usually 90% - 110%	R(+/-) if %R significantly < LCL J(+)/UJ(-) if %R < LCL J(+) if %R > UCL R(+) if %R significantly > UCL	5B

Initial and Continuing Cal Blanks (ICB/CCB)	Where applicable to method
	After each ICV and CCV every ten samples and end of run
	| blank| < MDL
		Action level is 5x absolute value of blank conc.
		For (+) blanks, U(+) results < action level
		For (-) blanks, J(+)/UJ(-) results < action level
		refer to TM-02 for additional details
			7

Method Blank	One per matrix per batch
	(not to exceed 20 samples)
	blank < MDL
		Action level is 5x absolute value of blank conc.
		For (+) blk value, U(+) results < action level
		For (-) blk value, J(+)/UJ(-) results < action level
			7

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
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 RL Diff <RL for samples >RL and <5 x RL (may use RPD < 35%, Diff < 2X RL for solids)	J(+)/UJ(-) if RPD > 20% or diff > RL all samples in batch	9

EcoChem Validation Guidelines for Conventional Chemistry Analysis (Based on EPA Standard Methods)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Field Blank	blank < MDL	Action level is 5x blank conc. U(+) sample values < action level in associated field samples only	6
Field Duplicate	For results > 5X RL: Water: RPD < 35% Solid: RPD < 50% For results < 5 x RL: Water: Diff<RL Solid: Diff < 2X RL	J(+)/UJ(-) in parent samples only	9

EcoChem, INC.
Environmental Data Quality

APPENDIX B
QUALIFIED DATA SUMMARY TABLE

QUALIFIED DATA SUMMARY TABLE
Lora Lake Parcel - DMA Groundwater

Sample ID	Lab ID	Method	Analyte	Result	Units	Lab Qualifier	DV Qualifier	DV Reason Code
B312-042911	11-9772-SU74A	SW8270D SIM	Benzo(a)pyrene	0.01	ug/L	U	UJ	10
B310-042911	11-9773-SU74B	SW8270D SIM	Benzo(a)pyrene	0.01	ug/L	U	UJ	10
B311-042911	11-9774-SU74C	SW8270D SIM	Benzo(a)pyrene	0.01	ug/L	U	UJ	10
B312-042911	6744-001-SA	EPA 1613 D/F	OCDF	4	pg/L	U	UJ	13

Port of Seattle
Lora Lake Apartments Site

Remedial Investigation/ Feasibility Study

Volume II

Appendix H
1982 Dredged Material Containment Area Data Report

Attachment H.4
Groundwater Sample Collection Forms

FINAL

GROUNDWATER SAMPLE COLLECTION FORM

Project Name: Lora Lake Apartments RI
Project Number: POS-LLA

Date of Collection: 4/29/11
Field Personnel: EM TS

Purge Data

Well ID: B310 Secure: ☒ Yes ☐ No Well Condition/Damage Description: good condition

pumping rate = 1/3 L/min

Depth Sounder decontaminated Prior to Placement in Well: ☒ Yes ☐ No One Casing Volume (gal): 1.9 gal

Depth of water (from top of well casing): 8.60' Well Casing Type/Diameter/Screened Interval: 2" PVC; 8-18'

After 5 minutes of purging (from top of casing): 8.73'

Begin purge (time): 1320

End purge (time): 1410

Gallons purged: 2.75 gal

Purge water disposal method: Drum

Volume of Schedule 40 PVC Pipe

Diameter	O.D.	I.D.	Volume (Gal/Linear Ft.)	Weight of Water (Lbs/Lineal Ft.)
1 ¼"	1.660"	1.380"	0.08	0.64
2"	2.375"	2.067"	0.17	1.45
3"	3.500"	3.068"	0.38	3.2
4"	4.500"	4.026"	0.66	5.51
6"	6.625"	6.065"	1.5	12.5

Time	Depth to Water (ft)	Vol. Purged	pH	DO (mg/L)	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	ORP (mV)	Comments
1320	8.60'	0	6.25	2.91	0.201	9.39	11.72	171	
1325	8.73	1.66L	6.29	0.75	0.214	12.4	10.99	158	
1330	8.76	3.33L	6.25	0.54	0.229	5.0	10.98	157	
1335	8.76	5.0L	6.19	0.42	0.241	4.62	10.98	154	
1340	8.76	6.66L	6.23	0.37	0.244	3.81	11.01	146	

Sampling Data

Sample No: B310-042911 Location and Depth: B310, 14'

Date Collected (mo/dy/yr): 4/29/11 Time Collected: 1345 ☐ AM ☒ PM Weather: partly cloudy, dry

Type: ☒ Ground Water ☐ Surface Water Other: Sample: ☐ Filtered ☒ Unfiltered Other:

Sample Collected with: ☐ Bailer ☒ Pump Other: Type: Peristaltic

Sample Decon Procedure: Disposable, Alconox

Sample Description (Color, Turbidity, Odor, Other): clear; no odor

Sample Analyses

Analytes	Containers:	Preservatives	Deviations/Comments:
PB/AS	1 x 500 mL HDPE	HNO_3	
Dioxin	~~1 x 500mL HDPE~~	2 x 1 Liter Amber	
pH	1 x 500mL HDPE		
TSS	1 1-L HDPE		
cPAH/PCP/TPH-DX	5 x 500mL Amber		
VOC/BTEX/TPH-GX	6 VOA 40mL	HCL	

Signature: [signature] Date: 4/29/11

GROUNDWATER SAMPLE COLLECTION FORM

Project Name: Lora Lake Apartments RI
Project Number: POS-LLA

Date of Collection: 4/29/11
Field Personnel: TS EM

Purge Data

Well ID: B311 Secure: ☒ Yes ☐ No Well Condition/Damage Description: good 1/3 L/minute

Depth Sounder decontaminated Prior to Placement in Well: ☒ Yes ☐ No
One Casing Volume (gal): 1.8 g

Depth of water (from top of well casing): 9.30'
Well Casing Type/Diameter/Screened Interval: 2" PVC 8-18'

After 5 minutes of purging (from top of casing): 9.23

Begin purge (time): 1433

End purge (time):

Gallons purged: 2.5 g

Purge water disposal method: drum

Volume of Schedule 40 PVC Pipe				
Diameter	O.D.	I.D.	Volume (Gal/Linear Ft.)	Weight of Water (Lbs/Lineal Ft.)
1 ¼"	1.660"	1.380"	0.08	0.64
2"	2.375"	2.067"	0.17	1.45
3"	3.500"	3.068"	0.38	3.2
4"	4.500"	4.026"	0.66	5.51
6"	6.625"	6.065"	1.5	12.5

Time	Depth to Water (ft)	Vol. Purged	pH	DO (mg/L)	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	ORP (mV)	Comments
1435	9.23	1.1 L 0	6.09	9.23	0.314	2.43	13.83	148	
1440	9.23	2.2 L 3.33	6.16	1.38	0.319	4.71	12.14	147	
1445	9.24	3.3 L 3.32	6.12	0.81	0.320	5.23	11.93	147	
1450	9.26	4.4 L 3.33	6.11	0.66	0.320	0.72	11.88	145	
1455	9.26	5.5 L 3.33	6.08	0.61	0.320	0.03	11.78	145	

Sampling Data

Sample No: B311-042911 Location and Depth: B311, 14'

Date Collected (mo/dy/yr): 4/29/11 Time Collected: 1455 ☐ AM ☒ PM Weather: Sunny, dry

Type: ☒ Ground Water ☐ Surface Water Other: Sample: ☐ Filtered ☒ Unfiltered Other:

Sample Collected with: ☐ Bailer ☒ Pump Other: Type: peristaltic

Sample Decon Procedure: Disposable tubing / Alconox

Sample Description (Color, Turbidity, Odor, Other): clear; no odor

Sample Analyses

Analytes	Containers:	Preservatives	Deviations/Comments:
Dioxins	2 x 1 L Amber		
CP AH/PCP/TPH-D	5 x 500 mL Am.		
pH	1 x 500 mL HDPE		
As/Pb	1 x 500 mL HDPE	HNO_3	
VOA/BTEX/TPH-G	6 x 40 mL VOA	HCl	
TSS	1 x 1 L HDPE		

Signature: [signature] Date: 4/29/11

GROUNDWATER SAMPLE COLLECTION FORM

Project Name: Lora Lake Apartments RI
Project Number: POS-LLA

Date of Collection: 4/29/11
Field Personnel: TS ; EM

Purge Data

Well ID: B312 Secure: ☐ Yes ☒ No Well Condition/Damage Description: J Plug loose, no monument

Pumping rate = 0.25 L/min

Depth Sounder decontaminated Prior to Placement in Well: ☒ Yes ☐ No One Casing Volume (gal): 3.128 gal

Depth of water (from top of well casing): 11.59' Well Casing Type/Diameter/Screened Interval: 2" PVC Screen 18-28'

After 5 minutes of purging (from top of casing): 11.62'

Begin purge (time): 1145

End purge (time): 1215

Gallons purged: 2 gal

Purge water disposal method: Drum

Volume of Schedule 40 PVC Pipe				
Diameter	O.D.	I.D.	Volume (Gal/Linear Ft.)	Weight of Water (Lbs/Lineal Ft.)
1 ¼"	1.660"	1.380"	0.08	0.64
2"	2.375"	2.067"	0.17	1.45
3"	3.500"	3.068"	0.38	3.2
4"	4.500"	4.026"	0.66	5.51
6"	6.625"	6.065"	1.5	12.5

Time	Depth to Water (ft)	Vol. Purged	pH	DO (mg/L)	Conductivity (mS/cm)	Turbidity (NTU)	Temp (°C)	ORP (mV)	Comments
1150	11.62	1.25L	6.13	1.81	0.272	5.40	12.07	116	
1155	11.62	2.50L	6.07	1.51	0.271	1.50	11.95	121	
1200	11.62	3.75 L	6.10	1.45	0.271	1.13	11.92	120	
1205	11.62	5 L	6.05	1.35	0.272	0.41	11.90	124	
1210	11.62	6.25L	6.07	1.27	0.273	-0.67	12.07	122	
1215	11.62	7.5L	6.10	1.34	0.272	2.23	12.06	121	

Sampling Data

Sample No: B312-042911 Location and Depth: B312 23'

Date Collected (mo/dy/yr): 4/29/11 Time Collected: 1230 ☐ AM ☒ PM Weather: partly cloudy, dry

Type: ☒ Ground Water ☐ Surface Water Other: Sample: ☐ Filtered ☒ Unfiltered Other:

Sample Collected with: ☐ Bailer ☒ Pump Other: Type: Peristaltic

Sample Decon Procedure: Disposable tubing, alconox

Sample Description (Color, Turbidity, Odor, Other): Clear, no odor

Sample Analyses

Analytes	Containers:	Preservatives	Deviations/Comments:
Pb ; As	1 x 500ml HDPE	Lab Preserved and filtered - HNO_3	
pH	1 x 500ml HDPE	–	
TSS	1 x 1L HDPE	–	
Dioxins/Furans	2 x 1L Amber	–	
BTEX/TPH-gx/VOC	6 x 40ml VOA	HCL	
cPAH / PCP / TPH-dx	5 x 500ml Amber	–	

Signature: Tucker Stevens Date: 4/29/11