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Prepared for:
Terminal 117
Port of Seattle

April 14, 2008; Revised May 12, 2008 and October 1, 2008

Organic and Inorganic Data Validation Report

Port of Seattle - Terminal 117 Groundwater and Water QC Samples Analytical Resources, Inc. data March – April 2008

Prepared By Sue Milcan
Environmental Scientist/Quality Assurance Manager

ENSR Corporation
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Overview

The samples analyzed for the Port of Seattle - Terminal 117 groundwater event from March 2008 are listed in the Table of Samples Analyzed (page 3). Data validation was performed on a total of twelve distinct groundwater samples and two trip blank water QC samples. This report was revised on May 12, 2008 to include review of sample MW-7-041808 submitted under laboratory report MS90. This report was revised on October 1, 2008 to include revisions agreed to during a September 9, 2008 meeting between USEPA Region 10 and ENSR.

Samples were analyzed by Analytical Resources, Inc. (ARI) of Tukwila, Washington.

The validated analyses were Volatile Organic Compounds (VOCs) by SW-846 method 8260B; Semivolatile Organic Compounds (SVOCs) by SW-846 method 8270D; Polynuclear Aromatic Hydrocarbons (PAHs) including 1-Methylnaphthalene, 2-Methylnaphthalene, and Dibenzofuran by SW-846 method 8270D SIM (Select Ion Monitoring); Polychlorinated Biphenyls (PCBs) by SW-846 method 8082; Benzene, Toluene, Ethylbenzene, m,p-Xylene, and o-Xylene (BTEX) by SW-846 method 8021B modified; Gasoline Range Hydrocarbons (GRH) by WDOE method NWTPH-Gx; Diesel Range Hydrocarbons (DRH) and Motor Oil Range Hydrocarbons (MORH) by WDOE method NWTPH-Dx; Total and Dissolved Metals by SW-846 methods 6010B/7470A; and Total Suspended Solids (TSS) by EPA method 160.2).

The ENSR Analytical Data Validation Checklist is presented as pages 4-13. Data were evaluated based on project criteria outlined in the *Quality Assurance Project Plan (*QAPP*), Terminal 117, Seattle, Washington, RETEC, September 11, 2006,* and based on validation criteria set forth in the *USEPA Contract Laboratory Program (CLP) National Functional Guidelines for Organic/Inorganic Data Review*, document numbers EPA540/R-99/008 and EPA540/R-04/004 of October 1999 (Organic) and October 2004 (Inorganic), and the *USEPA CLP National Functional Guidelines for Superfund Organic Methods Data Review*, document number USEPA-540-R-07-003, July 2007, as they applied to the reported methodology. Washington State Department of Ecology (WDOE) methods were also reviewed as per *WDOE Analytical Methods for Petroleum Hydrocarbons*, ECY 97-602 of June 1997. Field duplicate RPD control limits were taken from the USEPA Region I Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses, December 1996.

The following data components were reviewed during the data validation procedure:

Deliverable Requirement	Method	Form*	Method	Form*	
Case Narrative	Organics		Metals/GenChem		✓
Chain-of-Custody form	Organics		Metals/GenChem		✓
Sample results	Organics	I	Metals/GenChem	IA-IN	✓
Surrogate recoveries	Organics	II			✓
LCS, LCSD (blank spike) recoveries	Organics	III	Metals/GenChem	VII-IN	✓
CRQL standard check for ICP			Metals	IIB-IN	✓
Method and/or calibration blank summaries/results	Organics	IV	Metals/GenChem	III-IN	✓
Duplicate/Spike duplicate RPDs	Organics	III	Metals/GenChem	VI-IN	✓
Instrument performance check (tuning)	Organics	V	Metals	XIV-IN	✓
Initial and continuing calibration data/summaries	Organics	VI, VII	Metals/GenChem	IIA-IN	✓
Internal standards areas and/or retention times	Organics	VIII	Metals	XV-IN	✓
Method detection limits and/or Reporting limits	Organics	I	Metals/GenChem	IX-IN	✓
Preparation log	Organics		Metals/GenChem	XII-IN	✓
Analysis run log	Organics		Metals/GenChem	XIII-IN	✓
Reconstructed ion chromatograms (samples/standards)	Organics				✓
Raw Data (Quantitation lists, Instrument printouts)	Organics		Metals		✓
Electronic data deliverables (EDDs)	Organics		Metals/GenChem		✓

* equivalent USEPA CLP summary form; as applicable to the organic methods

Data Validation Qualifiers Assigned During this Review

UJ undetected, reporting limit is estimated

Assigned qualifiers are detailed in the ENSR Analytical Data Validation Checklist and are summarized in the Table of Qualified Analytical Results (pages 14-15).

Other Qualifiers Assigned During this Review

A reported result is likely a combination of both Aroclor 1254 and Aroclor 1260 although accurate identification of Aroclor 1254 can not be achieved (ENSR qualifier).

DNR Do not report, used to identify duplicate results from dilutions or reanalysis that are not reportable because an alternate, acceptable result for that sample and analyte is available (ENSR qualifier).

Overall Data Assessment

Precision, accuracy, method compliance, and completeness of the data set have been determined to be acceptable, based on the data submitted. Data qualified with DNR qualifiers are the result of duplicate analyses and should not be used. These data are designated as not reportable in the project database. The remaining data are suitable for their intended use with the qualifications and clarifications noted.

Table of Samples Analyzed
Port of Seattle - Terminal 117
Groundwater and Water QC Samples
Analytical Resources, Inc. (ARI) Laboratory Reports MN00, MN52, and MS90
March – April 2008

Matrix	Sample ID		Sample Date and Time		Lab SDG	Lab Sample ID
Groundwater	DUP-1-0308	MW-9-0308 Dup	3/12/2008	13:20	MN00	MN00A, MN00L
Groundwater	MW-10-0308		3/11/2008	11:45	MN00	MN00B, MN00M
Groundwater	MW-4R-0308		3/11/2008	14:15	MN00	MN00C, MN00N
Groundwater	MW-2-0308		3/11/2008	16:30	MN00	MN00D, MN00O
Groundwater	MW-9-0308		3/12/2008	13:20	MN00	MN00E, MN00P
Groundwater	MW-7-0308		3/12/2008	14:45	MN00	MN00F, MN00Q
Groundwater	MW-3-0308		3/11/2008	14:10	MN00	MN00G, MN00R
Groundwater	MW-5-0308		3/11/2008	not listed	MN00	MN00H, MN00S
Groundwater	MW-8-0308		3/12/2008	16:45	MN00	MN00I, MN00T
Groundwater	MW-1-0308		3/11/2008	not listed	MN00	MN00J, MN00U
Water QC	Trip Blank-031308		3/13/2008	-	MN00	MN00K
Groundwater	MW-6-0308		3/13/2008	14:30	MN52	MN52A, MN52C
Water QC	Trip Blank-031408		3/14/2008	-	MN52	MN52B
Groundwater	MW-7-041808		4/18/2008	10:46	MS90	MS90A

ENSR ANALYTICAL DATA VALIDATION CHECKLIST

Project Name: Port of Seattle (PSR) – Terminal 117	Laboratory: Analytical Resources, Inc. (ARI) of Tukwila, WA.
Project Reference: Terminal 117 – 1Q2008	Sample Matrix: Groundwater and Soil samples
ENSR Project: 05482-023-210	Sample Start Date: 03/11/2008
Validated By/Date Validated: Sue Milcan 04/14/2008 (completed); Revised 05/12/08 to include review of SDG MS90 data; Revised 10/01/08 to include revisions requested by EPA Region 10	Sample End Date: 04/18/2008

Samples Analyzed: see Table of Samples Analyzed, Port of Seattle - Terminal 117, Groundwater and Water QC Samples, March - April 2008 (page 3).

Parameters Validated -

Volatile Organic Compounds (VOCs) by SW-846 method 8260B;

Semivolatile Organic Compounds (SVOCs) by SW-846 method 8270D;

Polynuclear Aromatic Hydrocarbons (PAHs) including 1-Methylnaphthalene, 2-Methylnaphthalene, and Dibenzofuran by SW-846 method 8270D SIM (Select Ion Monitoring);

Polychlorinated Biphenyls (PCBs) by SW-846 method 8082;

Benzene, Toluene, Ethylbenzene, m,p-Xylene, and o-Xylene (BTEX) by SW-846 method 8021B modified;

Gasoline Range Hydrocarbons (GRH) by WDOE method NWTPH-Gx;

Diesel Range Hydrocarbons (DRH) and Motor Oil Range Hydrocarbons (MORH) by WDOE method NWTPH-Dx;

Total and Dissolved Metals by SW-846 methods 6010B/7470A; and

Total Suspended Solids (TSS) by EPA method 160.2.

Not all samples were analyzed for every parameter. Refer to Chain of Custody records for the exact analyses requested.

Laboratory Project IDs (SDGs): MN00, MN52, and MS90

PRECISION, ACCURACY, METHOD COMPLIANCE, AND COMPLETENESS ASSESSMENT

Precision:	**X**	Acceptable		Unacceptable	SM	Initials

Comments: Precision is the measure of variability of individual sample measurements. Field precision was determined by comparison of field duplicate sample results. Laboratory precision was determined by examination of laboratory duplicate results. Evaluation of field and laboratory duplicates for precision was done using the Relative Percent Difference (RPD) or Percent Difference (%D). The RPD is defined as the difference between two duplicate samples divided by the mean and expressed as a percent. The %D for serial dilutions during metals analysis indicates how close a diluted value corresponds with the original result. All RPD and %D precision measurements were compared to EPA published QC limits. No data require qualification based on these measurements, and overall field and laboratory precision is acceptable. Precision measurements are reviewed in items 17 and 21.

Accuracy:	**X**	Acceptable		Unacceptable	SM	Initials

Comments: Field accuracy, a measure of the sampling bias, was determined by reviewing trip blank results for evidence of sample contamination stemming from bottles and/or sample transport. Laboratory accuracy, a measure of the system bias, was measured by evaluating laboratory control sample, laboratory control sample duplicate (LCS, LCSD), ICP Interference Check Sample (ICS), detection limit (CRI), and organic system monitoring compound (surrogate) percent recoveries (%Rs). LCS, LCSD, and CRI %Rs demonstrated the overall performance of the analysis and ability to achieve quantitation at reported detection limits.

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ENSR ANALYTICAL DATA VALIDATION CHECKLIST

ICS %Rs provided information on sample matrix interferences. System monitoring compound or surrogate recoveries measured system performance and efficiency during organic analysis. All accuracy measurements were compared to EPA published QC limits and/or laboratory control-charted QC limits. No data require qualification based on these measurements, and overall field and laboratory accuracy is acceptable. Accuracy measurements are reviewed in items 12, 14, 15, 16, 19, and 20.

Method Compliance:	X	Acceptable		Unacceptable	SM	Initials

Comments: For this data set, method compliance was determined by evaluating sample integrity, holding time, reporting limits, laboratory blanks, system performance checks, instrument calibrations, and organic sample chromatograms against method specified requirements. Some data were identified as not reportable due to concentrations reported above the instrument calibration range (see item 6), or holding time exceedence (see item 8). For these data, alternate, acceptable results were also reported. Although some data require qualification based on instrument calibration outliers (see item 13), or likely co-elution of target analytes (see item 22), overall method compliance is acceptable since a majority of the data are unqualified and no data are rejected based on these measurements. Method compliance measurements are reviewed in items 4, 6, 8, 11, 13, 18, 19, 20, and 22.

Completeness:	X	Acceptable		Unacceptable	SM	Initials

Comments: Completeness is the overall ratio of the number of samples planned versus the number of samples with valid analyses. Completeness goals were set at 95-100%. Determination of completeness during this data validation procedure included a review of chain of custody records, laboratory analytical methods and detection limits, laboratory case narratives, and project requirements. Completeness also included 100% review of the laboratory sample data results and QC summary reports, with reference to supplied chromatograms and raw data. Electronic data deliverables (EDDs) were QA'd 100% for positive target analytes and method reporting limits. EDD corrections/additions were made by the data validator during this review procedure as outlined in item 23.

Alternate, reportable results were available for all data points designated as not-reportable based on multiple dilutions/analyses, therefore, data set completeness was not affected. All of the reportable data so determined were useable, some with qualification. Since no data were missing or rejected, completeness of the data set is calculated to be 100% and is acceptable.

VALIDATION CRITERIA CHECK

Data validation qualifiers assigned during this review:

UJ undetected, reporting limit is estimated

Other qualifiers used in this review for non-reportable data:

A reported result is likely a combination of Aroclor 1254/1260; accurate identification of Aroclor 1254 can not be achieved

DNR do not report; an alternate, acceptable result is available

The following comments identifying sample results requiring qualification are in bold type. The other comments are of interest, but qualification of the sample results is not necessary.

Refer to the table of Qualified Analytical Results for a listing of the samples, analytes, and concentrations qualified (pages 14-15).

1. Did the laboratory identify any non-conformances related to the analytical results?	X	Yes		No	SM	Initials

Explanation by laboratory: Instrument calibration, surrogate, and holding time outliers as well as required re-extraction and limited sample volume were noted in the laboratory case narratives or on the COCs received. Any assigned laboratory flags were reviewed and evaluated during the data validation procedure.

Data qualification, if any, related to laboratory case narrative comments and assigned laboratory flags are discussed in the following sections.

ENSR ANALYTICAL DATA VALIDATION CHECKLIST

2. Were sample Chain-of-Custody forms complete?		Yes	**X**	No	SM	Initials
Comments: The COC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, and laboratory dates and times of sample receipt, except as noted. SDG MN00- Sample DUP-1-0308 was not listed on the COC record. The sample was correctly logged in and scheduled for all analyses by laboratory personnel. No action is required other than to document this observation.						
3. Were all the analyses requested for the samples on the COCs completed by the laboratory?	**X**	Yes		No	SM	Initials
Comments: All requested analyses as documented on the original COCs, or as added by laboratory personnel (see item 2), were completed by the laboratory.						
4. Were samples received in good condition and at the appropriate temperature?	**X**	Yes		No	SM	Initials
Comments: The samples were received intact, on ice, and in good condition with cooler temperatures of 1.2°C to 6.8°C as noted on the supplied Cooler Receipt Forms received with each SDG. Samples received at less than 2°C were determined to be in acceptable condition since sample containers were intact and samples themselves were not frozen. Samples received at greater than 6°C were determined to be in acceptable condition since no other preservation issues were noted and temperatures were well below 24°C (room temperature). Note that COC notes document limited sample volume received for samples MW-10-0308, MW-3-0308, and MW-5-0308. Sufficient sample volume was received to complete all requested analyses for these samples and data set completeness was not compromised. No action is required other than to note these observations.						
5. Were the requested analytical methods in compliance with WP/QAPP, permit, or COC?	**X**	Yes		No	SM	Initials
Comments: Reported methods met those requested on the COCs and/or the methods reported are in compliance with those methods listed in Tables 2-1 and 2-2 (Sample Handling and Preservation Requirements for Soil and Water) found in the *Quality Assurance Project Plan (*QAPP*), Terminal 117, Seattle, Washington, RETEC, September 11, 2006.*						
6. Were detection limits in accordance with WP/QAPP, permit, or method?	**X**	Yes		No	SM	Initials
Comments: The practical quantitation limits/reporting limits (PQLs/RLs) are achievable by the quoted methods and meet the limit requirements listed in QAPP Tables 2-3 and 2-4 (Method Reporting Limits in Water) prior to any dilution/volume adjustments. Some samples required dilution due to high target analyte concentration. Reporting limits for these samples were adjusted appropriately to reflect the dilution factors. Note that there were no trace concentrations (concentrations > method detection limit but < reporting limit) reported for target analytes in any analytical methods. <u>Method 8082 –</u> SDG MNOO - The laboratory appropriately reanalyzed at dilution initial sample results (Aroclor 1260) that exceeded instrument calibration range in sample MW-3-0308. The sample concentrations that exceeded instrument calibration range were designated as not reportable (DNR qualifier) in the project EDD file since alternative, more accurate results were provided for the analyte. SDG MS90 - The reporting limits for analytes aroclor 1221 and aroclor 1232 in sample MW-7-041808 were raised without dilution due to evidence of interference. <u>All Methods –</u> Note that MDLs are provided in the EDD files for all methods except 160.2. The MDLs are not referenced in the hardcopy laboratory reports. In all cases, the MDLs are correctly listed in the EDDs as a lesser value than the corresponding practical quantitation limit or reporting limit (PQL/RL).						

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7. Do the laboratory reports include only those constituents requested to be reported for a specific analytical method?	**X**	Yes		No	SM	Initials
Comments: Only analytes applicable to the requested methods were reported. The data validator was not given specific target analyte lists for this project.						
8. Were sample holding times met?	**X**	Yes		No	SM	Initials
Comments: Extraction and/or analytical holding times were met for all samples and analyses, with the following notation. The method required holding time periods for water/water QC samples were as follows: 7 days from sample collection to analysis for method 160.2; 7 days from sample collection to extraction, and 40 days from extraction to analysis for methods 8270D, 8270D SIM, and 8082; 14 days from sample collection to analysis for methods 8260B, 8021B modified, and NWTPH-Gx; 14 days from sample collection to extraction, and 40 days from extraction to analysis for method NWTPH-Dx; 28 days from sample collection to analysis for method 7470A; and 6 months from sample collection to analysis for method 6010B. <u>Method 8270D SIM -</u> Sample DUP-1-0308 was reextracted 6 days after the 7 day holding time period from sample collection to extraction had expired due to a lower surrogate %R in the initial in-hold analysis. The reextraction was not required since the surrogate %R was > 10% (see rule outlined in item 14). Since the initial in-hold analysis was considered to be compliant, the out of hold data was identified as not reportable (DNR qualifiers) in the EDD file. (Note that the extraction date for the reextraction data was corrected to 03/24/2008 in the EDD file by the data validator – see item 23).						
9. Were correct concentration units reported?	**X**	Yes		No	SM	Initials
Comments: Correct concentration units were reported. All inorganic data and all organic method NWTPH-G and NWTPH-Dx data were reported as mg/L (ppm). All other organic method data were reported as µg/L (ppb). No action is required other than to alert the data user to these varying units of measure.						
10. Were the reporting requirements for flagged data met?	**X**	Yes		No	SM	Initials
Comments: Laboratory flags were reviewed and considered during the data validation procedure. Data validation qualifiers override assigned laboratory flags.						
11. Were laboratory blank samples free of target analyte contamination?	**X**	Yes		No	SM	Initials
Comments: Laboratory blank samples (including method, preparation, and calibration blanks) were free of target analyte contamination.						
12. Were trip blank, field blank, and/or equipment rinse blank samples free of target analyte contamination?	**X**	Yes		No	SM	Initials
Comments: The trip blank samples submitted for methods 8260B, 8021B modified, and NWTPH-G analyses were free of target analyte contamination. Field blank and equipment rinse blank samples were not applicable to the sampling procedures followed and/or were not submitted for analysis.						

ENSR ANALYTICAL DATA VALIDATION CHECKLIST

13. Were instrument calibrations within method control limits?		Yes	**X**	No	SM	Initials

Comments: Initial and continuing calibrations were within data validation criteria for all target analytes. The frequency of both initial and continuing calibration verification checks (ICVs, CCVs) was sufficient for all methods.

Method 8260B –

Organic method 8260B QC limits were set at 0-15%RSD for ICV or linearity >0.995; 0-20%D for CCV. All System Performance Check Compound (SPCC) RF > 0.10 or 0.30. Any noncompliant relative response factors (RRFs), percent relative standard deviations (%RSDs), or percent differences (%Ds) that were associated with non-target analytes or non-project samples were reviewed but did not initiate data qualification since the outliers did not apply to target analytes in project samples. Additionally, high bias indicators associated with undetected project sample results were reviewed but did not initiate qualification, as per data validation guidance, since the indicated bias did not affect reported project sample results.

The following method 8260B calibration outliers initiated data qualification:

Instrument NT7: The %Ds for 1,1,1-trichloroethane (22.8%), carbon tetrachloride (37.4%), 1,2-dichloroethane (34.2 %), trans-1,3-dichloropropene (29.9%), trichlorofluoromethane (28.8%) exceeded the ≤ 20%D QC limit in the CCV of 03/14/2008 at 11:11. These analytes were undetected in associated project samples and require UJ qualifiers to indicate estimated reporting limits due to compromised system sensitivity.

Instrument NT5: The %D for chloroethane (40.9%) exceeded the ≤ 20%D QC limit in the CCV of 03/18/2008 at 09:44. This analyte was undetected in associated project samples and requires UJ qualifiers to indicate estimated reporting limits due to compromised system sensitivity.

Note that these qualifications are assigned per national guidance of volatile and semivolatile organics and not necessarily on SW-846 requirements.

Methods 8270D/8270D SIM –

Organic methods 8270D and 8270D SIM QC limits were set at 0-20%RSD for ICV or linearity >0.995; 0-20%D for CCV. All System Performance Check Compound (SPCC) RFs met SW-846 method 8270D Table 4 requirements. Any noncompliant relative response factors (RRFs), percent relative standard deviations (%RSDs), or percent differences (%Ds) that were associated with non-target analytes or non-project samples were reviewed but did not initiate data qualification since the outliers did not apply to target analytes in project samples. Additionally, high bias indicators associated with undetected project sample results were reviewed but did not initiate qualification, as per data validation guidance, since the indicated bias did not affect reported project sample results.

There were no method 8270D SIM calibration results that initiated data qualification of project samples. The following method 8270D calibration outliers initiated data qualification:

Instrument NT4: The %D for 2,4-dinitrophenol (30.3%) exceeded the ≤ 20%D QC limit in the CCV of 03/20/2008 at 11:25. This analyte was undetected in associated project samples and requires UJ qualifiers to indicate estimated reporting limits due to compromised system sensitivity.

Note that these qualifications are assigned per national guidance of volatile and semivolatile organics and not necessarily on SW-846 requirements.

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ENSR ANALYTICAL DATA VALIDATION CHECKLIST

Method 8082 –

Organic method 8082 QC limits were set at 0-20%RSD for ICV and 0-25%D for CCV, or averaged %Ds were ≤15%. (Averaged percent deviations are allowed per method 8000B, Section 7 of *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Final Update III.)* Any noncompliant relative response factors (RRFs), percent relative standard deviations (%RSDs), or percent differences (%Ds) that were associated with non-target analytes or non-project samples were reviewed but did not initiate data qualification since the outliers did not apply to target analytes in project samples. Additionally, any high bias indicators associated with undetected project sample results were reviewed but did not initiate qualification, as per data validation guidance, since the indicated bias did not affect reported project sample results.

There were no method 8082 calibration results that initiated data qualification of project samples.

Method 8021B -

Organic methods 8021B modified QC limits were set at 0-20%RSD for ICV and 0-15%D for CCV, or averaged %Ds were ≤15%. (Averaged percent deviations are allowed per method 8000B, Section 7 of *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Final Update III.)* Any noncompliant relative response factors (RRFs), percent relative standard deviations (%RSDs), or percent differences (%Ds) that were associated with non-target analytes or non-project samples were reviewed but did not initiate data qualification since the outliers did not apply to target analytes in project samples. Additionally, any high bias indicators associated with undetected project sample results were reviewed but did not initiate qualification, as per data validation guidance, since the indicated bias did not affect reported project sample results.

There were no method 8021B calibration results that initiated data qualification of project samples.

Methods NWTPH-Gx and NWTPH-Dx -

Method NWTPH-Gx and NWTPH-Dx ICVs reported %RSDs within the 0-20% QC limits (±15% for secondary source calibration). NWTPH-Gx and NWTPH-Dx CCVs were within averaged percent deviations of ≤ 15% (<20% acceptable for GRH). Averaged percent deviations are allowed per method 8000B, Section 7 of *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Final Update III.* Any noncompliant relative response factors (RRFs), percent relative standard deviations (%RSDs), or percent differences (%Ds) that were associated with non-target analytes or non-project samples were reviewed but did not initiate data qualification since the outliers did not apply to target analytes in project samples. Additionally, any high bias indicators associated with undetected project sample results were reviewed but did not initiate qualification, as per data validation guidance, since the indicated bias did not affect reported project sample results. Note that only fuel standards from the appropriate WDOE method and carbon range were considered.

There were no method NWTPH-Gx or NWTPH-Dx calibration results that initiated data qualification of project samples.

Methods 6010B and 7470A -

Inorganic method 6010B ICV and CCV %R limits were set at 90-110%; 7470A ICV and CCV %R limits were set at 80-120%. Any noncompliant percent recoveries that were associated with non-target analytes or non-project samples were reviewed but did not initiate data qualification of project samples since the outliers did not apply to target analytes in project samples.

There were no method 6010B or 7470A calibration results that initiated data qualification of project samples

Refer to the table of Qualified Analytical Results for a listing of the samples, analytes, and concentrations qualified (pages 14-15).

ENSR ANALYTICAL DATA VALIDATION CHECKLIST

14. Were surrogate recoveries within control limits?	**X**	Yes		No	SM	Initials

Comments:

Method 8260B –

Surrogate %Rs were within data validation or laboratory control-charted QC limits for all samples and associated QC samples.

Methods 8270D/8270D SIM –

Surrogate %Rs were within data validation or laboratory control-charted QC limits for all samples and associated QC samples, or met the following requirement. Methods 8270D/8270D SIM allow for one surrogate per fraction (acid or base/neutral) to be outside QC limits as long as the recovery is greater than or equal to 10%. Sample analyses meeting this requirement did not require qualification.

Method 8082 –

Surrogate %Rs were within data validation or laboratory control-charted QC limits for all samples and associated QC samples.

Method 8021B –

Surrogate %Rs were within data validation or laboratory control-charted QC limits for all samples and associated QC samples.

Methods NWTPH-Gx and NWTPH-Dx –

Surrogate %Rs were within data validation or laboratory control-charted QC limits for all samples and associated QC samples.

15. Were laboratory control sample recoveries within control limits?	**X**	Yes		No	SM	Initials

Comments:

Method 8260B –

Reported LCS, LCSD recoveries were within data validation QC limits (70-130%) for all target analytes, or were within laboratory control-charted QC limits for organic target analytes as allowed for SW-846 organic methods, or met the following requirements. If an out of control LCS or LCSD was associated with a same-batch compliant LCS or LCSD, and the noncompliant %R was greater than 30%, then data qualification was not required since a consistent system bias was not demonstrated. High spike recoveries associated with undetected project sample results did not initiate data qualification since the indicated high system bias was not realized.

Methods 8270D/8270D SIM –

Reported LCS, LCSD recoveries were within data validation QC limits (70-130%) for all target analytes, or were within laboratory control-charted QC limits for organic target analytes as allowed for SW-846 organic methods, or met the following requirements. If an out of control LCS or LCSD was associated with a same-batch compliant LCS or LCSD, and the noncompliant %R was greater than 30%, then data qualification was not required since a consistent system bias was not demonstrated. High spike recoveries associated with undetected project sample results did not initiate data qualification since the indicated high system bias was not realized.

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ENSR ANALYTICAL DATA VALIDATION CHECKLIST

Method 8082 –

Reported LCS, LCSD recoveries were within data validation QC limits (70-130%) for all target analytes, or were within laboratory control-charted QC limits for organic target analytes as allowed for SW-846 organic methods, or met the following requirements. If an out of control LCS or LCSD was associated with a same-batch compliant LCS or LCSD, and the noncompliant %R was greater than 30%, then data qualification was not required since a consistent system bias was not demonstrated. High spike recoveries associated with undetected project sample results did not initiate data qualification since the indicated high system bias was not realized.

Method 8021B –

Reported LCS, LCSD recoveries were within data validation QC limits (70-130%) for all target analytes, or were within laboratory control-charted QC limits for organic target analytes as allowed for SW-846 organic methods, or met the following requirements. If an out of control LCS or LCSD was associated with a same-batch compliant LCS or LCSD, and the noncompliant %R was greater than 30%, then data qualification was not required since a consistent system bias was not demonstrated. High spike recoveries associated with undetected project sample results did not initiate data qualification since the indicated high system bias was not realized.

Methods NWTPH-Gx and NWTPH-Dx –

Reported LCS, LCSD recoveries were within data validation QC limits (70-130%) for all target analytes, or were within laboratory control-charted QC limits for organic target analytes as allowed for SW-846 organic methods, or met the following requirements. If an out of control LCS or LCSD was associated with a same-batch compliant LCS or LCSD, and the noncompliant %R was greater than 30%, then data qualification was not required since a consistent system bias was not demonstrated. High spike recoveries associated with undetected project sample results did not initiate data qualification since the indicated high system bias was not realized.

Methods 6010B and 7470A -

Reported LCS, LCSD recoveries were within data validation QC limits 80-120% for all target analytes, or met the following requirement. High spike recoveries associated with undetected project sample results did not initiate data qualification since the indicated high system bias was not realized.

Method 160.2 –

Reported LCS recoveries were within data validation QC limits 50-150%.

16. Were matrix spike recoveries within control limits?		Yes		No	SM	Initials
Comments: Not applicable – there were no MS, MSD samples analyzed/reported with this data set. Refer to the LCS/LCSD and laboratory duplicate summaries (see items 15 ad 17) for evaluation of analytical accuracy and precision.						
17. Were duplicate RPDs and/or serial dilution %Ds within control limits?	**X**	Yes		No	SM	Initials
Comments: Laboratory RPDs for target analytes in LCS/LCSD and project-specific laboratory duplicates were within data validation and/or laboratory control-charted QC limits, were not applicable due to undetected results in both samples, or sample results were within ± the detection limit (RL). High RPDs associated with undetected project sample results did not initiate data qualification since the precision of the reporting limit is not in question. Serial dilutions were not applicable for this data set due to lower sample concentrations reported.						
18. Were organic system performance criteria met?	**X**	Yes		No	SM	Initials
Comments: GC/MS method 8260B BFB and 8270D/SIM DFTPP tunes were within ion abundance and 12-hour clock method criteria for all analytical sequences. Method 8270D and 8270D SIM DDT degradation was <20%. Acceptable performance for organic GC methods were demonstrated by compliant correlation coefficients, instrument calibrations, and retention times as appropriate to the method.						

ENSR ANALYTICAL DATA VALIDATION CHECKLIST

19. Were internal standards within method criteria for GC/MS and/or ICP-MS sample analyses?	**X**	Yes		No	SM	Initials

Comments: Internal standard area counts and retention times were within data validation QC criteria for all GC/MS method 8260B, 8270D, 8270D SIM, and 8082 project sample results, or else high internal standard areas in method 8082 (SDG MS90) were associated with undetected project sample results and did not initiate data qualification.

20. Were inorganic system performance criteria met?	**X**	Yes		No	SM	Initials

Comments: ICP interference check standards (ICS) and CRDL standard (CRI) frequency and percent recoveries were within data validation QC limits (80-120% for ICS; 70-130% for CRI) for all target analytes, or else undetected project sample results were associated with high bias indicators and did not require qualification.

21. Were blind field duplicates collected? If so, discuss the precision (RPD) of the results.	**X**	Yes		No	SM	Initials

Duplicate Sample No.	DUP-1-0308		Primary Sample No.	MW-9-0308

Comments: Field duplicate RPDs were within data validation QC limits of 0-30% for water matrices, or RPDs were not applicable due to results that were $\pm$ the detection limit or were undetected in both samples. Field duplicate and native sample concentrations that were both undetected are not reflected in the table below since RPDs are not applicable. (Only reportable results were considered when calculating field duplicate RPDs).

The following RPDs were calculated:

Method	Units	Analyte	MW-9-0308	DUP-1-0308	RPD	Qualifiers
SW6010B	mg/L	Copper	0.003	0.003	0	
SW6010B	mg/L	Copper, dissolved	0.003	< 0.002	+/- RL	
SW8260B	µg/L	Tetrachloroethene	1.0	0.9	10.5	
SW8270D	µg/L	bis(2-Ethylhexyl)phthalate	< 1.0	1.1	+/- RL	

22. Were qualitative criteria for organic target analyte identification met?		Yes	**X**	No	SM	Initials

Comments: Organic method quantitation reports and chromatograms were reviewed by trained laboratory personnel in accordance with the laboratory's internal QA/QC program. No identification/quantitation flags were assigned, and no anomalies were identified during the data validation process, except as noted.

Method 8082 –

In several instances, accurate identification of aroclor 1254 was not achieved and was not reported by the laboratory as an identified detected target analyte per SW846 method requirements. However, the sample chromatograms show possible influence of aroclor 1254 on the reported aroclor 1260 results. For this reason, the reported aroclor 1260 results in samples MW-7-0308, MW-3-0308, MW-5-0308, and MW-6-0308 require an ENSR-defined A qualifier to indicate that the reported concentration is likely a mixture of aroclor 1254 and aroclor 1260, even though accurate identification of aroclor 1254 can not be achieved.

Continued on next page

ENSR ANALYTICAL DATA VALIDATION CHECKLIST

Method NWTPH-Dx –

The laboratory noted that the diesel results reported for samples MW-2-0308 and MW-3-08 and the motor oil result reported for sample MW-3-0308 were affected by unidentifiable organics and/or hydrocarbons within the specified carbon ranges. Although the hardcopy laboratory report lists the target analytes as "diesel" and "motor oil" in the report pages, the submitted EDD query correctly lists the analyte names as "Diesel Range Hydrocarbons" and "Motor Oil Range Hydrocarbons" to correctly encompass not only diesel and motor oil, but other co-eluting/interfering compounds found within the target ranges of C_{12}-C_{24} and C_{24}-C_{38} respectively. No action is required for the NWTPH-Dx data other than to note these observations since the database contains the correct target analyte determinations.

23. Were 100% of the EDD concentrations and reporting limits compared to the hardcopy data reports?	**X**	Yes		No	SM	Initials

Comments: 100% EDD QA/QC of positive concentrations and RLs was done as part of this data validation procedure. The EDD entries were resolved with the hardcopy data results and corrected as necessary for significant figures. According to validation protocol, the hardcopy data report was accepted as the correct reference.

The matrix code was corrected to WQ (water QC) from WG (groundwater) for the trip blank samples to more accurately reflect the nature and matrix of the QC samples. The sample_dates were corrected to 03/12/2008 for sample DUP-1-0308 to match COC records. The sample_date for the trip blank samples were corrected to reflect the dates of transport.

The extraction date for the reextraction of sample DUP-1-0308 (method 8270D SIM) was corrected to 03/24/2008 from 03/18/2008 in the prep_date field.

Duplicate results within a method (8082, 8270D SIM) were evaluated as documented within this checklist (see items 6 and 8). Duplicate results determined to be less reliable were maintained in the project database but were designated with DNR qualifiers (Do Not Report) and identified as not-reportable since alternate, acceptable results were provided.

The ENSR project manager in Seattle, WA was informed of all EDD corrections made to the file via this checklist. The updated EDD files for SDGs MN00 and MN52, with corrections and data validation qualifiers added, was sent to the ENSR project manager in Seattle, WA on 04/14/2008. The updated EDD file for SDG MS90 was sent to the ENSR project manager in Seattle, WA on 05/12/2008.

An updated EDD excerpt was sent to the ENSR project manager in Seattle, WA on 10/01/2008 to include identification of possible Aroclor 1254/1260 mixtures.

24. General Comments: Data were evaluated based on project criteria outlined in the *Quality Assurance Project Plan (*QAPP*), Terminal 117, Seattle, Washington, RETEC, September 11, 2006,* and based on validation criteria set forth in the *USEPA Contract Laboratory Program (CLP) National Functional Guidelines for Organic/Inorganic Data Review*, document numbers EPA540/R-99/008 and EPA540/R-04/004 of October 1999 (Organic) and October 2004 (Inorganic), and the *USEPA CLP National Functional Guidelines for Superfund Organic Methods Data Review*, document number USEPA-540-R-07-003, July 2007, as they applied to the reported methodology. Washington State Department of Ecology (WDOE) methods were also reviewed as per *WDOE Analytical Methods for Petroleum Hydrocarbons*, ECY 97-602 of June 1997. Field duplicate RPD control limits were taken from the USEPA Region I Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses, December 1996.

Refer to the table of Qualified Analytical Results for a listing of the samples, analytes, and concentrations qualified (pages 14-15).

Table of Qualified Analytical Results
Port of Seattle - Terminal 117
Groundwater and Water QC Samples
Analytical Resources, Inc. (ARI) Laboratory Reports MN00, MN52, and MS90
March – April 2008

Sample ID	Lab Sample ID	Method	Sequence	Analyte		Concentration		Qualifier	Reason Code
Reportable, qualified Groundwater data:									
DUP-1-0308	MN00A	SW8260B	Initial	1,1,1-Trichloroethane	<	0.2	µg/L	UJ	CCV
DUP-1-0308	MN00A	SW8260B	Initial	1,2-Dichloroethane	<	0.2	µg/L	UJ	CCV
DUP-1-0308	MN00A	SW8260B	Initial	Carbon Tetrachloride	<	0.2	µg/L	UJ	CCV
DUP-1-0308	MN00A	SW8260B	Initial	trans-1,3-Dichloropropene	<	0.2	µg/L	UJ	CCV
DUP-1-0308	MN00A	SW8260B	Initial	Trichlorofluoromethane	<	0.2	µg/L	UJ	CCV
DUP-1-0308	MN00A	SW8270D	Initial	2,4-Dinitrophenol	<	10	µg/L	UJ	CCV
MW-10-0308	MN00B	SW8260B	Initial	1,1,1-Trichloroethane	<	0.2	µg/L	UJ	CCV
MW-10-0308	MN00B	SW8260B	Initial	1,2-Dichloroethane	<	0.2	µg/L	UJ	CCV
MW-10-0308	MN00B	SW8260B	Initial	Carbon Tetrachloride	<	0.2	µg/L	UJ	CCV
MW-10-0308	MN00B	SW8260B	Initial	trans-1,3-Dichloropropene	<	0.2	µg/L	UJ	CCV
MW-10-0308	MN00B	SW8260B	Initial	Trichlorofluoromethane	<	0.2	µg/L	UJ	CCV
MW-10-0308	MN00B	SW8270D	Initial	2,4-Dinitrophenol	<	10	µg/L	UJ	CCV
MW-4R-0308	MN00C	SW8260B	Initial	1,1,1-Trichloroethane	<	0.2	µg/L	UJ	CCV
MW-4R-0308	MN00C	SW8260B	Initial	1,2-Dichloroethane	<	0.2	µg/L	UJ	CCV
MW-4R-0308	MN00C	SW8260B	Initial	Carbon Tetrachloride	<	0.2	µg/L	UJ	CCV
MW-4R-0308	MN00C	SW8260B	Initial	trans-1,3-Dichloropropene	<	0.2	µg/L	UJ	CCV
MW-4R-0308	MN00C	SW8260B	Initial	Trichlorofluoromethane	<	0.2	µg/L	UJ	CCV
MW-4R-0308	MN00C	SW8270D	Initial	2,4-Dinitrophenol	<	10	µg/L	UJ	CCV
MW-2-0308	MN00D	SW8260B	Initial	1,1,1-Trichloroethane	<	0.2	µg/L	UJ	CCV
MW-2-0308	MN00D	SW8260B	Initial	1,2-Dichloroethane	<	0.2	µg/L	UJ	CCV
MW-2-0308	MN00D	SW8260B	Initial	Carbon Tetrachloride	<	0.2	µg/L	UJ	CCV
MW-2-0308	MN00D	SW8260B	Initial	trans-1,3-Dichloropropene	<	0.2	µg/L	UJ	CCV
MW-2-0308	MN00D	SW8260B	Initial	Trichlorofluoromethane	<	0.2	µg/L	UJ	CCV
MW-2-0308	MN00D	SW8270D	Initial	2,4-Dinitrophenol	<	10	µg/L	UJ	CCV
MW-9-0308	MN00E	SW8260B	Initial	1,1,1-Trichloroethane	<	0.2	µg/L	UJ	CCV
MW-9-0308	MN00E	SW8260B	Initial	1,2-Dichloroethane	<	0.2	µg/L	UJ	CCV
MW-9-0308	MN00E	SW8260B	Initial	Carbon Tetrachloride	<	0.2	µg/L	UJ	CCV
MW-9-0308	MN00E	SW8260B	Initial	trans-1,3-Dichloropropene	<	0.2	µg/L	UJ	CCV
MW-9-0308	MN00E	SW8260B	Initial	Trichlorofluoromethane	<	0.2	µg/L	UJ	CCV
MW-9-0308	MN00E	SW8270D	Initial	2,4-Dinitrophenol	<	10	µg/L	UJ	CCV
MW-7-0308	MN00F	SW8260B	Initial	1,1,1-Trichloroethane	<	0.2	µg/L	UJ	CCV
MW-7-0308	MN00F	SW8260B	Initial	1,2-Dichloroethane	<	0.2	µg/L	UJ	CCV
MW-7-0308	MN00F	SW8260B	Initial	Carbon Tetrachloride	<	0.2	µg/L	UJ	CCV
MW-7-0308	MN00F	SW8260B	Initial	trans-1,3-Dichloropropene	<	0.2	µg/L	UJ	CCV
MW-7-0308	MN00F	SW8260B	Initial	Trichlorofluoromethane	<	0.2	µg/L	UJ	CCV
MW-7-0308	MN00F	SW8270D	Initial	2,4-Dinitrophenol	<	10	µg/L	UJ	CCV
MW-7-0308	MN00F	SW8082	Initial	Aroclor 1260		0.036	µg/L	A	Aro1254/1260 mix
MW-3-0308	MN00G	SW8260B	Initial	1,1,1-Trichloroethane	<	0.2	µg/L	UJ	CCV
MW-3-0308	MN00G	SW8260B	Initial	1,2-Dichloroethane	<	0.2	µg/L	UJ	CCV
MW-3-0308	MN00G	SW8260B	Initial	Carbon Tetrachloride	<	0.2	µg/L	UJ	CCV
MW-3-0308	MN00G	SW8260B	Initial	trans-1,3-Dichloropropene	<	0.2	µg/L	UJ	CCV

Continued on next page

Table of Qualified Analytical Results
Port of Seattle - Terminal 117
Groundwater and Water QC Samples
Analytical Resources, Inc. (ARI) Laboratory Reports MN00, MN52, and MS90
March – April 2008

Sample ID	Lab Sample ID	Method	Sequence	Analyte		Concentration		Qualifier	Reason Code
MW-3-0308	MN00G	SW8260B	Initial	Trichlorofluoromethane	<	0.2	µg/L	UJ	CCV
MW-3-0308	MN00G	SW8270D	Initial	2,4-Dinitrophenol	<	10	µg/L	UJ	CCV
MW-3-0308	MN00G	SW8082	Reanal 1:10	Aroclor 1260		2.0	µg/L	A	Aro1254/1260 mix
MW-5-0308	MN00H	SW8260B	Initial	1,1,1-Trichloroethane	<	0.2	µg/L	UJ	CCV
MW-5-0308	MN00H	SW8260B	Initial	1,2-Dichloroethane	<	0.2	µg/L	UJ	CCV
MW-5-0308	MN00H	SW8260B	Initial	Carbon Tetrachloride	<	0.2	µg/L	UJ	CCV
MW-5-0308	MN00H	SW8260B	Initial	trans-1,3-Dichloropropene	<	0.2	µg/L	UJ	CCV
MW-5-0308	MN00H	SW8260B	Initial	Trichlorofluoromethane	<	0.2	µg/L	UJ	CCV
MW-5-0308	MN00H	SW8270D	Initial	2,4-Dinitrophenol	<	10	µg/L	UJ	CCV
MW-5-0308	MN00H	SW8082	Initial	Aroclor 1260		0.057	µg/L	A	Aro1254/1260 mix
MW-8-0308	MN00I	SW8260B	Initial	1,1,1-Trichloroethane	<	0.2	µg/L	UJ	CCV
MW-8-0308	MN00I	SW8260B	Initial	1,2-Dichloroethane	<	0.2	µg/L	UJ	CCV
MW-8-0308	MN00I	SW8260B	Initial	Carbon Tetrachloride	<	0.2	µg/L	UJ	CCV
MW-8-0308	MN00I	SW8260B	Initial	trans-1,3-Dichloropropene	<	0.2	µg/L	UJ	CCV
MW-8-0308	MN00I	SW8260B	Initial	Trichlorofluoromethane	<	0.2	µg/L	UJ	CCV
MW-8-0308	MN00I	SW8270D	Initial	2,4-Dinitrophenol	<	10	µg/L	UJ	CCV
MW-1-0308	MN00J	SW8260B	Initial	1,1,1-Trichloroethane	<	0.2	µg/L	UJ	CCV
MW-1-0308	MN00J	SW8260B	Initial	1,2-Dichloroethane	<	0.2	µg/L	UJ	CCV
MW-1-0308	MN00J	SW8260B	Initial	Carbon Tetrachloride	<	0.2	µg/L	UJ	CCV
MW-1-0308	MN00J	SW8260B	Initial	trans-1,3-Dichloropropene	<	0.2	µg/L	UJ	CCV
MW-1-0308	MN00J	SW8260B	Initial	Trichlorofluoromethane	<	0.2	µg/L	UJ	CCV
MW-1-0308	MN00J	SW8270D	Initial	2,4-Dinitrophenol	<	10	µg/L	UJ	CCV
MW-6-0308	MN52A	SW8260B	Initial	Chloroethane	<	0.2	µg/L	UJ	CCV
MW-6-0308	MN52A	SW8270D	Initial	2,4-Dinitrophenol	<	10	µg/L	UJ	CCV
MW-6-0308	MN52A	SW8082	Initial	Aroclor 1260		0.082	µg/L	A	Aro1254/1260 mix
Reportable, qualified Water QC data:									
Trip Blank-031308	MN00K	SW8260B	Initial	1,1,1-Trichloroethane	<	0.2	µg/L	UJ	CCV
Trip Blank-031308	MN00K	SW8260B	Initial	1,2-Dichloroethane	<	0.2	µg/L	UJ	CCV
Trip Blank-031308	MN00K	SW8260B	Initial	Carbon Tetrachloride	<	0.2	µg/L	UJ	CCV
Trip Blank-031308	MN00K	SW8260B	Initial	trans-1,3-Dichloropropene	<	0.2	µg/L	UJ	CCV
Trip Blank-031308	MN00K	SW8260B	Initial	Trichlorofluoromethane	<	0.2	µg/L	UJ	CCV
Trip Blank-031408	MN52B	SW8260B	Initial	Chloroethane	<	0.2	µg/L	UJ	CCV
Non-reportable (DNR) Groundwater data:									
DUP-1-0308	MN00A	SW8270D SIM	Reextract	All Analytes			DNR	HT, use Initial	
MW-3-0308	MN00G	SW8082	Initial 1:1	Aroclor 1260	2.4	µg/L	DNR	ECR, use Reanalysis 1:10	
MW-3-0308	MN00G	SW8082	Reanal 1:10	All Analytes except Aroclor 1260			DNR	use Initial 1:1	

Reason Codes:

A – reported result is likely combination of Aroclor 1254 and Aroclor 1260 although accurate identification of Aroclor 1254 can not be achieved

CCV – continuing calibration outlier, demonstrated analytical system bias (conservative qualification)

ECR – target analyte concentration exceeded instrument calibration range, dilution required

HT - method required holding time was exceeded (extraction)