EcoChem, Inc.

Environmental Data Quality

# DATA QUALITY EVALUATION

## PORTLAND HARBOR

### Surface Water – High Flow Sampling – 2006

**Semivolatile Organic Compounds (SVOC) - Method SW8270C**
**Polycyclic Aromatic Hydrocarbons (PAH) - Method SW8270-SIM**
**Chlorinated Herbicides - Method 8151A**
**Butyltins - Krone Method**
**Metals - Methods SW6020 & SW7470A**
**Conventionals - Methods 160.1, 160.2, 415.1 & 6010B**

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# DATA QUALITY EVALUATION

## BASIS OF DATA EVALUATION

The data were validated using guidance and quality control (QC) criteria documented in the analytical methods; *Guidance on Environmental Data Verification and Validation* (EPA 2002c); *Portland Harbor RI/FS, Round 2, Quality Assurance Project Plan* (QAPP) *Addendum 1: Surface Water*; and *National Functional Guidelines for Organic and/or Inorganic Data Review* (USEPA 1994, 1999 & 2002).

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

## PROCESS FOR DATA VALIDATION

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

The surface water data received a Level III validation, which included evaluation of (as appropriate for each method):

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

Ten percent (10%) of all surface water data packages received full (Level IV) data validation, which includes evaluation of compound identification and quantitation (transcription and calculation checks).

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

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

## SUMMARY OF DATA VALIDATION: SEMIVOLATILE ORGANIC COMPOUNDS

A total of four surface water samples were analyzed for semi-volatile organic compounds (SVOC) for the Portland Harbor Surface Water High Flow sampling event. The samples included one field duplicate. One rinsate blank was collected to monitor the field collection process and two system blanks (Lab Blank and Decon Blank) were also analyzed. Columbia Analytical Services, Kelso, Washington completed the PAH analyses.

The SVOC data for the High Flow samples were acceptable. No data points were rejected. Seven data points (1.9% of all High Flow SVOC results) were qualified as estimated because control limits were exceeded in one or more laboratory QC samples or procedures. Qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose.

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

### Completeness of Data Set

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

### Holding Times and Sample Preservation

The holding time requirements were met for all SVOC surface water samples and associated field QC samples.

The sample preservation requirements (cooler temperature of 4°C ±2°) were not met for most samples. The majority of the coolers were received at the laboratory at temperatures below the control limits. It was determined that these temperature outliers did not impact data quality and no qualifiers were required.

### Instrument Performance

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

### Method Blank Analyses

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

Various target analytes were detected in the method blanks. A total of 13 results (3.6% of all High Flow SVOC results) were qualified as not detected (U) based on method blank contamination. The qualifiers were issued to dibutyl phthalate (seven results), and diethyl phthalate (six results).

## Accuracy

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

### *Surrogate Compound Recoveries*

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

### *Matrix Spike Recoveries*

Matrix spike analyses were not performed with any data set. Laboratory control sample/laboratory control sample duplicate (LCS/LCSD) analyses were used to assess accuracy and precision.

### *Laboratory Control Sample Recoveries*

LCS/LCSD analyses met the criteria for frequency of analysis. The recovery of 2,3,4,6-tetrachlorophenol from the LCS/LCSD analyses could not be verified since this compound was not included in the spike mixture. Reporting limits for this compound in the associated samples were qualified as estimated (UJ) due to the absence of recovery data. A total of seven results (1.9%) were qualified for accuracy.

## Precision

LCS/LCSD analyses were evaluated for laboratory precision. Relative percent difference (RPD) values for 2,4-dinitrophenol in LCS/LCSD sets were greater than the control limit. As the affected compound was not detected in associated samples, no qualifiers were required.

## Method Detection Limits and Method Reporting Limits

The laboratory reported non-detects at the method detection limits (MDLs), adjusted for sample size and any dilution factor. These method reporting limits (MRLs) ranged from 0.0074 to 1.9 µg/L for the non-detected results. These met the MRL values from the Surface Water QAPP.

## Field Quality Control Samples

Field QC samples collected for the SVOC analysis included field blank, system blank and field duplicate samples. The results for the field QC samples are discussed in the following sections.

### *Field Blanks*

One field blank (LW2-W1901) was associated with the samples. Benzoic acid, diethyl phthalate, and butyl benzyl phthalate were present in this field blank. The benzoic acid and butyl benzyl phthalate results in one sample were less than the action levels, and were qualified as not detected (U). The other analyte was not detected in the associated field samples. A total of two results (0.5%) were qualified for field blank contamination.

### *System Blanks*

Two system blanks (Decon Blank and Lab Blank) were generated and analyzed with the surface water samples. No target analytes were reported in these blanks. No data were qualified based on system blank contamination.

### *Field Duplicate Samples*

All RPD values for field duplicate analyses of Samples LW3-W1023-1 & LW3-W1023-2 met the criteria for acceptable precision. The field duplicates are discussed in more detail in the data validation reports.

## SUMMARY OF DATA VALIDATION: POLYCYCLIC AROMATIC HYDROCARBONS

A total of four surface water samples were analyzed for polycyclic aromatic hydrocarbon (PAH) for the Portland Harbor Surface Water High Flow sampling event. The samples included one field duplicate. One rinsate blank was collected to monitor the field collection process and two system blanks (Lab Blank and Decon Blank) were also analyzed. Columbia Analytical Services, Kelso, Washington completed the PAH analyses.

The PAH data for the High Flow samples were acceptable. No data points were rejected or estimated.

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

### Completeness of Data Set

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

### Holding Times and Sample Preservation

The extraction and analytical holding time requirements were met for all samples and associated field QC samples.

The sample preservation requirements (cooler temperature of 4°C ±2°) were not met for most samples. The majority of the coolers were received at the laboratory at temperatures below the control limits. It was determined that these temperature outliers did not impact data quality and no qualifiers were required.

### Instrument Performance

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

### Method Blank Analyses

Method blanks are used to evaluate all associated samples, including field blanks. Any remaining positive results in the field blanks are used to evaluate all associated samples. No target analytes were detected in the method blanks.

### Accuracy

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

### *Surrogate Compound Recoveries*

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

### *Matrix Spike Recoveries*

Matrix spike analyses were not performed with any data set. LCS/LCSD analyses were used to assess accuracy and precision.

### *Laboratory Control Sample Recoveries*

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

## Precision

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

## Method Detection Limits and Method Reporting Limits

The laboratory reported non-detects at the method detection limits (MDLs), adjusted for sample size and any dilution factor. These method reporting limits (MRLs) ranged from 0.0011 to 0.0071 µg/L for the non-detected results. These met the target MRL values from the Surface Water QAPP.

## Field Quality Control Samples

Field QC samples collected for the PAH analysis included field blank, system blank, and field duplicate samples. The results for the field QC samples are discussed in the following sections.

### *Field Blanks*

One field blank (LW3-W1901) was associated with the samples. Several target analytes were present in these field blanks. Twelve positive results (three for 2-methylnaphthalene, four each for naphthalene and phenanthrene and one for indeno(1,2,3-cd)pyrene were qualified as not detected (U) based on field blank contamination (9.5% of all PAH results).

### *System Blanks*

Two system blanks (Decon Blank and Lab Blank) were generated and analyzed with the surface water samples. Two target compounds (naphthalene and phenanthrene) were detected in each blank. No qualifiers were applied, since these blanks were not directly associated with specific samples.

### *Field Duplicate Samples*

All RPD values for field duplicate analyses of Samples LW3-W1023-1 & LW3-W1023-2 met the criteria for acceptable precision. The field duplicates are discussed in more detail in the data validation reports.

## SUMMARY OF DATA VALIDATION: CHLORINATED HERBICIDES

A total of four surface water samples were analyzed for chlorinated herbicide compounds for the Portland Harbor Surface Water High Flow sampling event. The samples included one field duplicate. One rinsate blank was collected to monitor the field collection process and two system blanks (Lab Blank and Decon Blank) were also analyzed. Columbia Analytical Services, Kelso, Washington completed the herbicide analyses.

The herbicide data for the High Flow samples were acceptable. No data points were rejected or estimated.

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

### Completeness of Data Set

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

### Holding Times and Sample Preservation

The extraction and analytical holding time requirements were met for all samples and associated field QC samples.

The sample preservation requirements (cooler temperature of 4°C ±2°) were not met for most samples. The majority of the coolers were received at the laboratory at temperatures below the control limits. It was determined that these temperature outliers did not impact data quality and no qualifiers were required.

### Instrument Performance

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

### Method Blank Analyses

Method blanks are used to evaluate all associated samples, including field blanks. Any remaining positive results in the field blanks are used to evaluate all associated samples. No target analytes were detected in any method blank.

### Accuracy

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

### *Surrogate Compound Recoveries*

A surrogate compound was added to all field and QC samples. The recoveries reported by the laboratory met the criteria for acceptable performance.

### *Matrix Spike Recoveries*

Matrix spike analyses were not performed with any data set. LCS/LCSD analyses were used to assess accuracy and precision.

### *Laboratory Control Sample Recoveries*

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

## Precision

LCS/LCSD analyses were evaluated for laboratory precision. All relative percent difference (RPD) values in LCS/LCSD sets were within the control limit.

## Method Detection Limits and Method Reporting Limits

The laboratory reported non-detects at the method detection limits (MDL), adjusted for sample size and any dilution factor. These method reporting limits (MRLs) ranged from 0.043 to 0.062 µg/L for the non-detected results. These met the target MRL values from the Surface Water QAPP.

## Field Quality Control Samples

Field QC samples collected for the herbicide analysis included field blank, system blank, and field duplicate samples. The results for the field QC samples are discussed in the following sections.

### *Field Blanks*

One field blank (LW3-W1901) was associated with the samples. No target analytes were detected in any field blank.

### *System Blanks*

Two system blanks (Decon Blank and Lab Blank) were generated and analyzed with the surface water samples. No target analytes were detected in any system blank.

### *Field Duplicate Samples*

All RPD values for field duplicate analyses of Samples LW3-W1023-1 & LW3-W1023-2 met the criteria for acceptable precision. The field duplicates are discussed in more detail in the data validation reports.

## SUMMARY OF DATA VALIDATION: BUTYLTINS

A total of four surface water samples were analyzed for butyltin compounds for the Portland Harbor Surface Water High Flow sampling event. The samples included one field duplicate. One rinsate blank was collected to monitor the field collection process and two system blanks (Lab Blank and Decon Blank) were also analyzed. Columbia Analytical Services, Kelso, Washington completed the butyltin analyses.

The butyltin data for the surface water samples were generally acceptable. No data points were rejected. Two data points (7.1% of all High Flow butyltin results) were qualified as estimated because control limits were exceeded in one or more laboratory QC samples or procedures. Qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose.

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

### Completeness of Data Set

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

### Holding Times and Sample Preservation

The extraction and analytical holding time requirements were met for all samples and associated field QC samples.

The sample preservation requirements (cooler temperature of 4°C ±2°) were not met for most samples. The majority of the coolers were received at the laboratory at temperatures below the control limits. It was determined that these temperature outliers did not impact data quality and no qualifiers were required.

### Instrument Performance

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

### Method Blank Analyses

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

Tributyltin was detected in the method blank. A total of seven tributyltin results (25% of all High Flow SVOC results) were qualified as not detected (U) based on method blank contamination.

## Accuracy

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

### *Surrogate Compound Recoveries*

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

### *Matrix Spike Recoveries*

Matrix spike/matrix spike duplicate (MS/MSD) analyses met the criteria for frequency of analysis. All recoveries met the criteria for acceptable performance.

### *Laboratory Control Sample Recoveries*

Laboratory control sample/laboratory control sample duplicate (LCS/LCSD) analyses met the criteria for frequency of analysis. The recovery of n-butyltin from an LCS analysis was below the control limit. Reporting limits for this compound in the associated samples (system blanks) were qualified as estimated (UJ) with potential low bias. A total of two results (7.1%) were qualified for accuracy.

## Precision

LCS/LCSD and MS/MSD analyses were evaluated for laboratory precision. The relative percent difference (RPD) value for n-butyltin exceeded the control limit from an LCS/LCSD set. No positive results were detected, so no precision qualifiers were required.

## Method Detection Limits and Method Reporting Limits

The laboratory reported non-detects at the method detection limits (MDL), adjusted for sample size and any dilution factor. These method reporting limits (MRL) ranged from 0.0006 to 0.011 µg/L for the non-detected results. These met the MRL values from the Surface Water QAPP.

## Field Quality Control Samples

Field QC samples collected for the butyltin analysis included field blank, system blank, and field duplicate samples. The results for the field QC samples are discussed in the following sections.

### *Field Blanks*

One field blank (LW3-W1901) was associated with the High Flow samples. No positive results were detected, so no qualifiers were required.

### *System Blanks*

Two system blanks (Decon Blank and Lab Blank) were generated and analyzed with the surface water samples. No target analytes were detected in these blanks.

### *Field Duplicate Samples*

All RPD values for field duplicate analyses of Samples LW3-W1023-1 & LW3-W1023-2 met the criteria for acceptable precision. The field duplicates are discussed in more detail in the data validation reports.

## SUMMARY OF DATA VALIDATION: METALS

A total of four surface water samples were analyzed for total and dissolved metals for the Portland Harbor Surface Water High Flow sampling event. The samples included one field duplicate. One rinsate blank was collected to monitor the field collection process and two system blanks (Lab Blank and Decon Blank) were also analyzed. Columbia Analytical Services, Kelso, Washington, completed all analyses. The following analytical methods were used:

| Parameter | Method |
|---|---|
| ICP-MS Metals | SW6020 |
| Mercury | SW7470A |

The metals data for the surface water samples were generally acceptable. No data were rejected for any reason. Ten data points (6.9% of all High Flow metals results) were estimated because control limits were exceeded in one or more laboratory quality control (QC) samples or procedures. These qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose.

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

### Completeness of Data Set

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

### Holding Times and Sample Preservation

The sample preservation requirements (cooler temperature of 4°C ±2°) were not met for most samples. The majority of the coolers were received at the laboratory at temperatures below the control limits. It was determined that these temperature outliers did not impact data quality and no qualifiers were required.

### Instrument Performance

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

### Method Blank Analyses

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

Method and instrument blanks were analyzed at the appropriate frequency. Various target analytes were detected in the method and/or instrument blanks. A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets. A total of 45 metals results

(31% of all metals results) were qualified as not detected (U) based on method blank contamination. The qualifiers were applied to antimony (11 results), cadmium (seven results), chromium (eight results), lead (seven results), silver (11 results) and zinc (one result).

## Accuracy

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

### *Matrix Spike Recoveries*

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

### *Laboratory Control Sample Recoveries*

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

### *Contract Required Detection Limit Standard Analyses*

CRDL standards were analyzed at the beginning of each analytical sequence. For recoveries greater than the 130% upper control limit, the associated positive results less than two times the CRDL are estimated (J) to indicate a potential high bias. For recoveries less than the 70% lower control limit, positive results less than twice the CRDL and non-detects are estimated (J/UJ) to indicate a potential low bias. One CRDL standard outlier, with high bias for antimony, was reported. No positive results were reported so no qualifiers were applied.

### *Interference Check Samples*

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

### *Serial Dilution Analyses*

Serial dilution analyses were performed at the proper frequency. Serial dilution %D values greater exceeding 10% may indicate the presence of matrix interference, resulting in potential bias. A serial dilution result for copper exceeded the criterion for acceptable performance. Ten results for copper (6.9% of all metals results) were qualified as estimated.

## Precision

LCS/LCSD and MS/MSD analyses were evaluated for laboratory precision. For mercury analyses, laboratory duplicate analyses were evaluated instead of MS/MSD analyses. All relative percent difference (RPD) values were acceptable.

## Method Detection Limits and Method Reporting Limits

The laboratory reported non-detects at the MDLs, adjusted for sample size and any dilution factor. These method reporting limits (MRL) ranged from 0.002 µg/L to 0.5 µg/L for the non-detected results. These met the MRL values from the Surface Water QAPP.

## Field Quality Control Samples

Field QC samples collected for the metals analysis included field blank, system blank, and field duplicate samples. The results for the field QC samples are discussed in the following sections.

### *Field Blanks*

One field blank (LW3-W1901) was associated with the High Flow samples. After qualifiers based on method blank contamination were issued, action levels were established for the remaining positive results. Four (4) positive results – one for aluminum and three for zinc - were qualified as not detected (U) based on field blank contamination (2.7% of all metals results).

### *System Blanks*

Two system blanks (Decon Blank and Lab Blank) were generated and analyzed with the surface water samples. Positive results for copper and zinc were detected in these blanks. There was no direct association between these blanks and other field samples. No data were qualified based on system blank contamination.

### *Field Duplicate Samples*

The RPD value for dissolved aluminum from the field duplicate analysis of Samples LW3-W1023-1 & LW3-W1023-2 did not meet the criteria for acceptable precision. The field duplicates are discussed in more detail in the data validation reports. No data were qualified based on field precision.

## SUMMARY OF DATA VALIDATION: CONVENTIONALS

A total of four surface water samples were analyzed for some or all of the following parameters for the Portland Harbor Surface Water High Flow sampling event. The samples included one field duplicate. One rinsate blank was collected to monitor the field collection process and two system blanks (Lab Blank and Decon Water [Blank]) were also analyzed. Note that system blank samples were not analyzed for TDS, DOC or hardness. Columbia Analytical Services, Kelso, Washington, completed all analyses. The following analytical methods were used:

| Parameter | Method |
|---|---|
| Total Dissolved Solids (TDS) | EPA 160.1 |
| Total Suspended Solids (TSS) | EPA 160.2 |
| Total Organic Carbon (TOC) | EPA 415.1 |
| Dissolved Organic Carbon (DOC) | EPA 415.1 |
| Hardness as $CaCO_3$ | SW6010B / SM2340B |

Data for the conventional parameters analysis for the surface water samples were acceptable. No data were rejected. Six data points (17% of all High Flow conventionals results) were estimated because control limits were exceeded in one or more laboratory quality control (QC) samples or procedures. Qualified data points may have a larger associated bias or may be less precise than unqualified data, but are usable for the intended purpose.

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

### Completeness of Data Set

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

### Holding Times and Sample Preservation

Several samples were analyzed for TDS and/or TSS 1 or 2 days after the 7 day holding time. A total of two TDS results and four TSS results (17% of all High Flow conventionals results) were qualified as estimated (J/UJ) for holding time outliers.

The sample preservation requirements (cooler temperature of 4°C ±2°) were not met for most samples. The majority of the coolers were received at the laboratory at temperatures below the control limits. It was determined that these temperature outliers did not impact data quality and no qualifiers were required.

### Instrument Performance

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

## Method Blank Analyses

Method blanks are used to evaluate all associated samples, including field blanks. Any remaining positive results in the field blanks are used to evaluate all associated samples. No target analytes were detected in any method blank.

## Accuracy

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

### *Matrix Spike Recoveries*

MS/MSD analyses were evaluated for accuracy of the TOC and DOC analyses. All MS/MSD recovery values were acceptable.

### *Laboratory Control Sample Recoveries*

LCS analyses met the frequency criteria for all analyses. All of the LCS recoveries were acceptable.

## Precision

MS/MSD analyses were evaluated for laboratory precision for the TOC and DOC analyses. Laboratory replicate analyses were performed for the total dissolved and suspended solids analyses. All precision measurements were acceptable.

## Method Detection Limits and Method Reporting Limits

The project analytical concentration goal (ACG) goals were met for all conventional parameters, with the following exception. The ACG for total suspended solids (1 mg/L) was not met. The laboratory reporting limit for several samples was 3 or 4 mg/L.

## Field Quality Control Samples

Field QC samples collected for the conventionals analyses included field blank, system blank, and field duplicate samples. The results for the field QC samples are discussed in the following sections.

### *Field Blanks*

One field blank (LW3-W1901) was associated with the High Flow samples. After qualifiers based on method blank contamination were issued, action levels were established for positive TDS and TOC results. Three results for TOC were qualified as not detected (U) based on field blank contamination (8.6% of all conventionals results).

### *System Blanks*

Two system blanks (Decon Water [Blank] and Lab Blank) were generated and analyzed with the surface water samples. A positive result for TOC was detected in Decon Water [Blank]. There was no direct association between these blanks and other field samples. No data were qualified based on system blank contamination.

### *Field Duplicate Samples*

All RPD values for field duplicate analyses of Samples LW3-W1023-1 & LW3-W1023-2 met the criteria for acceptable precision. The field duplicates are discussed in more detail in the data validation reports.

# DATA VALIDATION REPORT
# Portland Harbor RI/FS
# High Flow Surface Water Sampling - 2006
# Semivolatile Organic Compounds
# Columbia Analytical Services - Kelso

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

| SDG | No. Samples | Validation Level |
|---|---|---|
| K0600500 | 2 System Blanks | Compliance Screening |
| K0600601 | 4 Waters & 1 Field Blank | Full |

## I. DATA PACKAGE COMPLETENESS

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

## II. EDD TO HARDCOPY VERIFICATION

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

## III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

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

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

### Holding Times and Sample Receipt

The laboratory received one of the sample coolers with temperatures below the advisory control limits of 2° to 6°C, with a low of 1.2ºC. It was determined that these temperature outliers did not impact data quality and no qualifiers were required.

## Laboratory Blanks

To assess the impact of each blank contaminant on the reported sample results, an action level is established at five times (5x) the concentration reported in the blank (10x for common laboratory contaminants). If a contaminant is reported in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U-7). If the result is also less than the reporting limit, then the result is elevated to the reporting limit. No action is taken if the sample result is greater than the action level, or for non-detected results.

Method blanks were analyzed at the appropriate frequency. For the analytical batches noted below, one or more target analytes were reported in the method blank. A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets.

Positive results for 4-chloro-3-methylphenol, 4-chlorophenyl phenyl ether, diethyl phthalate, and di-n-butyl phthalate were reported in the method blank extracted on 1/24/06. The di-n-butyl phthalate results and diethyl phthalate results in some or all samples were less than the action levels and were qualified as not detected (U-7).

## Field Blanks

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

***SDG K0600500:*** One decontamination blank (Decon Blank) and one laboratory blank (Lab Blank) were reported with this SDG. After qualifiers based on method blank contamination, no target analytes remained in either of these blanks.

***SDG K0600601:*** One field blank (LW2-W1901) was reported with this SDG. Positive results for benzoic acid, diethyl phthalate, and butyl benzyl phthalate were reported. The benzoic acid result in Sample LW3-W1023-1 and the butyl benzyl phthalate result in Sample LW3-W1005 were less than the action levels and were qualified as not detected (U-6).

## Matrix Spike/Matrix Spike Duplicates

Matrix spike/matrix spike duplicate (MS/MSD) analyses were not performed with this data set. Laboratory control sample/laboratory control sample duplicate (LCS/LCSD) analyses were used to assess accuracy and precision for these SDGs.

## Laboratory Control Sample/Laboratory Control Sample Duplicate

The relative percent difference (RPD) value for 2,4-dinitrophenol was greater than the control limit of 30%. No qualifiers were required, since this analyte was not detected in any associated samples.

The percent recovery (%R) values for 2,3,4,6-tetrachlorophenol could not be verified because this compound was not spiked into the LCS/LCSD samples. For this reason, reporting limits for this compound were qualified as estimated (UJ-10) in the associated samples.

### Field Duplicates

No qualifiers were applied based on field duplicate precision outliers. However, any outliers were noted below. Data users should take field precision into account when interpreting sample data. The RPD value is used to assess precision if both sample results are greater than five times the reporting limit for a given analyte. Otherwise, the absolute difference between the two results is used.

***SDG K0600601:*** One set of field duplicates, LW3-W1023-1 & LW3-W1023-2, was submitted with this SDG. There were no positive results greater than the reporting limits. Field precision was judged to be acceptable.

### Target Analyte List

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

### Reporting Limits (Method Detection Limit and Method Reporting Limit)

The Quality Assurance Project Plan (QAPP) calls for a method reporting limit (MRL) of 0.002 µg/L for n-nitrosodimethylamine. The laboratory MRL was 2.0 µg/L for this analyte in the water samples. No action was taken, other than to note the discrepancy.

### Compound Identification

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

### Calculation Verification

***SDG K0600601:*** Calculation verifications were performed on this SDG. No calculation errors were found.

## IV. OVERALL ASSESSMENT

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

Data were estimated because of LCS/LCSD %R outliers. Data were also qualified as not detected based on contamination in the associated method and field blanks.

All data, as qualified, are acceptable for use.

# DATA VALIDATION REPORT
# Portland Harbor RI/FS
# High Flow Surface Water Sampling - 2006
# Polyaromatic Hydrocarbons (PAHs)
# Columbia Analytical Services - Kelso

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

| SDG | No. Samples | Validation Level |
|---|---|---|
| K0600500 | 2 System Blanks | Compliance Screening |
| K0600601 | 4 Waters & 1 Field Blank | Full |

## I. DATA PACKAGE COMPLETENESS

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

## II. EDD TO HARDCOPY VERIFICATION

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

## III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

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

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

### Holding Times and Sample Receipt

The laboratory received one of the sample coolers with temperatures below the advisory control limits of 2° to 6°C, with a low of 1.2ºC. It was determined that these temperature outliers did not impact data quality and no qualifiers were required.

## Laboratory Blanks

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

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

## Field Blanks

Method blanks are used to evaluate all associated samples, including field blanks. Any remaining positive results in the field blanks are used to evaluate all associated samples. If a contaminant is reported in an associated field sample and the concentration is less than the action level, the result is qualified as not detected (U-6).

***SDG K0600500:*** Two (2) system blanks (Decontamination Blank and Laboratory Blank) were submitted with this SDG. Naphthalene and phenanthrene were detected in both system blanks. These blanks were not directly associated with other samples, so no qualifiers were applied.

***SDG K0600601:*** One field blank (LW3-W1901) was reported with this SDG. Indeno(1,2,3-c,d)pyrene, 2-methylnaphthalene, naphthalene, and phenanthrene were qualified as not detected (U-6).

## Matrix Spike/Matrix Spike Duplicates

***SDGs K0600500, K0600601:*** No matrix spike/matrix spike duplicate (MS/MSD) analyses were performed. A laboratory control sample/laboratory control sample duplicate (LCS/LCSD) were used to assess accuracy and precision for these SDGs. The LCS/LCSD accuracy and precision measurements were within criteria control limits.

## Field Duplicates

Note that the relative percent difference (RPD) value is used to assess precision only if both sample results are greater than 5x the reporting limit for a given analyte; otherwise the absolute difference between the two results is used to evaluate precision. The RPD control limit for sediment samples is 35%. The absolute difference control limit is twice the reporting limit of the compound.

No qualifiers were applied based on field duplicate precision outliers. However, any outliers were noted below. Data users should take field precision into account when interpreting sample data.

***SDG K0600601:*** One set of field duplicates, LW3-W1023-1 & LW3-W1023-2, was submitted with this SDG. All positive results were less than reporting limits. Precision was judged as acceptable.

### Target Analyte List

Dibenzofuran, listed in the QAPP as a semi-volatile compound, was instead reported with the PAH target analyte list.

### Calculation Verification

***SDG K0600601:*** Calculation verifications were performed on this SDG. No calculation errors were found.

## IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the surrogate, LCS/LCSD percent recovery values. Precision was also acceptable as demonstrated by the field duplicate and LCS/LCSD RPD values.

Data were qualified as not detected based on contamination in associated field blanks.

All data, as qualified, are acceptable for use.

# DATA VALIDATION REPORT
# Portland Harbor RI/FS
# High Flow Surface Water Sampling - 2006
# Herbicides
# Columbia Analytical Services—Kelso

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

| SDG | No. Samples | Validation Level |
|---|---|---|
| K0600500 | 2 System Blanks | Compliance Screening |
| K0600601 | 4 Surface Waters & 1 Field Blank | Full |

## I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables with the following exceptions:

Summary forms for retention times were not submitted. Retention time data were verified using the raw data.

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

## II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory QC results were also verified (10%).

## III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

1 Holding Times and Sample Receipt
Instrument Performance Check
Initial Calibration (ICAL)
Continuing Calibration (CCAL)
Laboratory Blanks
1 Field Blanks
Surrogate Compounds
1 Matrix Spikes/Matrix Spike Duplicates
Laboratory Control Samples
1 Field Duplicates
Reporting Limits (MDL and MRL)
Compound Identification (full validation only)
1 Calculation Verification (full validation only)

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

## Holding Times and Sample Receipt

The laboratory received one of the sample coolers with temperatures below the advisory control limits of 2° to 6°C, with a low of 1.2ºC. It was determined that these temperature outliers did not impact data quality and no qualifiers were required.

## Field Blanks

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

***SDG K0600500:*** One decontamination blank (Decon Water) and one laboratory blank (Lab Blank) were reported with this SDG. No positive results for herbicides were reported in these blanks.

***SDG K0600601:*** One field blank (LW2-W1901) was reported with this SDG. No positive results for herbicides were reported in this blank.

## Matrix Spike/Matrix Spike Duplicates

A laboratory control sample and duplicate (LCS/LCSD) were used to assess accuracy and precision for this SDG. The LCS/LCSD accuracy and precision measurements were within control limits.

## Field Duplicates

No qualifiers were applied based on field duplicate precision outliers. However, any outliers were noted below. Data users should take field precision into account when interpreting sample data.

***SDG K0600601:*** One set of field duplicates were submitted with this SDG. For Samples LW3-W1023-1 & LW3-W1023-2, no herbicides were detected in either sample. Field precision was judged to be acceptable.

## Calculation Verification

***SDG K060601:*** Calculation verifications were performed on this SDG. No calculation errors were found.

# IV. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory performed an appropriate analytical method. Accuracy was acceptable, as demonstrated by the surrogate and LCS/LCSD percent recovery values. Precision was acceptable as demonstrated by the relative percent difference values for the LCS/LCSD and field duplicate analyses.

No data were qualified for any reason.

All data, as reported, are acceptable for use.

# DATA VALIDATION REPORT
# Portland Harbor RI/FS
# High Flow Surface Water Sampling - 2006
# Butyltins
# Columbia Analytical Services - Kelso

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

| SDG | No. Samples | Validation Level |
|---|---|---|
| K0600500 | 2 System Blanks | Compliance Screening |
| K0600601 | 4 Waters & 1 Field Blank | Full |

## I. DATA PACKAGE COMPLETENESS

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

## II. EDD TO HARDCOPY VERIFICATION

A complete (100%) verification of the electronic data deliverable (EDD) results was performed by comparison to the hardcopy laboratory data package. Laboratory QC results were also verified (10%). The following errors were found:

## III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

1 Holding Times and Sample Receipt
Initial Calibration (ICAL)
Continuing Calibration (CCAL)
2 Blanks (Laboratory and Field)
Surrogate Compounds
1 Matrix Spike/Matrix Spike Duplicates
2 Laboratory Control Samples
1 Field Duplicates
Reporting Limits (MDL and MRL)
Compound Identification
Calculation Verification (full validation only)

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

### Holding Times and Sample Receipt

The laboratory received one of the sample coolers with temperatures below the advisory control limits of 2° to 6°C, with a low of 1.2ºC. It was determined that these temperature outliers did not impact data quality and no qualifiers were required.

## Blanks (Laboratory and Field)

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

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

Method blanks were analyzed at the appropriate frequency. A summary of contaminant levels, associated samples, and action levels is provided in the data validation worksheets.

***SDGs K0600500, K0600601:*** Tri-n-butyl tin was detected in the laboratory method blank. Results below the action level were qualified as not detected.

## Field Blanks

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

***SDG K0600500:*** Two (2) system blanks (Decon Blank and Lab Blank) were submitted with this SDG. No target analytes were detected in these system blanks.

***SDG K0600601:*** One field blank (LW3-W1901) was reported with this SDG. No target analytes were detected.

## Matrix Spike/Matrix Spike Duplicates

***SDG K0600500:*** Matrix spike (MS) analysis was reported using a batch QC sample. The percent recovery (%R) value for n-butyltin was 10%. No qualifiers were applied to batch QC samples.

***SDG K0600601:*** MS analysis was reported using Sample LW3-W1901. The %R value for tetra-n-butyltin exceeded the upper control limit. No positive results were reported for tetra-n-butyltin, so no qualifiers were applied.

## Laboratory Control Sample

***SDG K0600500:*** The laboratory control sample (LCS) %R value for n-butyltin was less than lower control limits and the relative percent difference (RPD) exceeded the control limit. Reporting limits were estimated (UJ-10) for potential low bias in associated samples.

***SDG K0600601:*** The RPD value for di-n-butyltin was outside control limits. Results for di-n-butyltin were not reported for these analyses; no qualifiers were applied.

## Field Duplicates

Note that the RPD value is used to assess precision only if both sample results are greater than five times (5x) the reporting limit for a given analyte; otherwise the absolute difference between the two results is used to evaluate precision. The RPD control limit for sediment samples is 35%. The absolute difference control limit is twice the reporting limit of the compound.

No qualifiers were applied based on field duplicate precision outliers. However, any outliers were noted below. Data users should take field precision into account when interpreting sample data.

***SDG K0600601:*** One set of field duplicates, LW3-W1023-1 & LW3-W1023-2, was submitted with this SDG. All positive results were less than reporting limits. Precision was acceptable.

## Calculation Verification

***SDG K0600601:*** Calculation verifications were performed on this SDG. No calculation errors were found.

# IV. OVERALL ASSESSMENT

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

Data were qualified as not detected based on contamination in the associated laboratory blanks. Data were also qualified as estimated because of LCS/LCSD recovery outliers.

All data, as qualified, are acceptable for use.

# DATA VALIDATION REPORT
# Portland Harbor RI/FS
# High Flow Surface Water Sampling - 2006
# Metals
# Columbia Analytical Services - Kelso

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

| SDG | No. Samples | Validation Level |
|---|---|---|
| K0600500 | 2 System Blanks | Compliance Screening |
| K0600601 | 4 Surface Waters, 1 Field Blank | Full |

## I. DATA PACKAGE COMPLETENESS

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

## II. EDD TO HARDCOPY VERIFICATION

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

## III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

| | |
|---|---|
| 1 | Holding Times and Sample Preservation |
| | Initial Calibration |
| | Continuing Calibration Verification |
| 1 | CRDL Standards |
| 2 | Laboratory Blanks |
| 2 | Field Blanks |
| | Laboratory Control Samples |
| 1 | Matrix Spikes & Matrix Spike Duplicates |
| | Laboratory Duplicates |
| | ICP Interference Check Samples |
| 2 | ICP Serial Dilution |
| | ICP-MS Internal Standards |
| 1 | Field Duplicates |
| | Reporting Limits (MDL and MRL) |
| | Calculation Verification (Full validation only) |

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

### Holding Times and Sample Receipt

The laboratory received many of the sample coolers with temperatures outside the advisory control limits of 2° to 6°C. The temperature outliers ranged from 1.2º to 6.1°C, with only one cooler at a

temperature greater than 6°C. It was determined that these temperature outliers did not impact data quality and no qualifiers were required.

## CRDL Standard

Contract required detection limit (CRDL) standards were analyzed at the beginning of each analytical sequence. Recoveries were within the control limits of 70%-130%, with the following exception:.

***SDG K0600601:*** The percent recovery (%R) value for antimony (134%) exceeded the upper control limit. After qualification for laboratory blank contamination, there were no positive results. No action was necessary based on the potential high bias.

## Laboratory Blanks

Various analytes were detected in the method and instrument blanks at levels greater than the method detection limits (MDL). To evaluate the effect on the sample data, action levels of five times (5x) the blank concentrations were established. Positive results less than the action levels in the associated samples were qualified as not detected (U) at the reported concentration. No action was taken for non-detects.

In addition, some analytes were found at levels less than the negative MDL in some instrument blanks. For negative blanks, action levels of 5x the absolute value of the blank concentrations were established. Results less than the action levels in the associated samples were qualified as estimated (J/UJ) to indicate a potential low bias.

***SDG K0600500:*** Antimony, cadmium, chromium, lead and silver were detected in some instrument blanks at levels greater than the MDL. Associated results which were less than the action levels were qualified as not detected (U-7).

***SDG K0600601:*** Antimony, cadmium, chromium, lead, silver and zinc were detected in some instrument blanks at levels greater than the MDL. Associated results which were less than the action levels were qualified as not detected (U-7).

## Field Blanks

***SDG K0600500:*** Two system blanks, Lab Blank and Decon Water, were submitted with this SDG. After qualification for laboratory blank contamination, the following positive results remained: Lab Blank – copper, Decon Blank – copper and zinc

***SDG K0600601:*** One field blank, LW3-W1901, was submitted with this SDG. After qualification for laboratory blank contamination, positive results remained for total aluminum and copper and dissolved aluminum, copper, and zinc. Associated results which were less than the action levels were qualified as not detected (U-6).

### Matrix Spike/Matrix Spike Duplicates

Matrix spike/matrix spike duplicate samples (MS/MSD) were analyzed at the proper frequency of one per 20 samples or one per batch, with the exception noted below. The %R values were within the control limits of 75%-125%.

***SDG K0600601:*** There was insufficient volume provided to analyze MS for the samples in this SDG. Accuracy was demonstrated by laboratory control sample/laboratory control sample duplicate (LCS/LCSD) and post-digest spike recoveries. Precision was evaluated using the LCS/LCSD relative percent difference (RPD) values (and a laboratory duplicate analysis for mercury).

### Serial Dilution

***SDG K0600601:*** The percent difference (%D) value for copper (14%) was greater than the control limit of 10%; all results were qualified as estimated (J-16).

### Field Duplicates

Duplicate sample pairs are listed below. The following acceptance criteria were applied: the RPD control limit is 50% for results greater than five times the reporting limit. For results less than 5x the reporting limit, the absolute difference between the sample and duplicate must be less than the reporting limit. No data were qualified based on field duplicate outliers; however, data users should take field precision into account when interpreting sample data.

***SDG K0600601:*** One set of field duplicate samples, LW3-W1023-1 and LW3-W1023-2, was submitted with this SDG. The RPD value for dissolved aluminum (69.3%) exceeded the control limit.

## IV. OVERALL ASSESSMENT

As determined by this evaluation, the laboratory followed the specified analytical methods. The LCS/LCSD, laboratory duplicate, and field duplicate RPD values indicated acceptable precision, except as noted above. Accuracy was also acceptable, as demonstrated by the post spike and LCS/LCSD %R values.

Data were qualified as estimated and/or not detected based on laboratory and field blank contamination. Data were also estimated based on serial dilution %D outliers

All data, as qualified, are acceptable for use.

# DATA VALIDATION REPORT
# Portland Harbor RI/FS
# High Flow Surface Water Sampling - 2006
# Conventional Parameter Analyses
# Columbia Analytical Services - Kelso

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

| SDG | No. Samples | Validation Level |
|---|---|---|
| K0600500 | 2 System Blanks | Compliance Screening |
| K0600601 | 4 Surface Waters, 1 Field Blank | Full |

The analytical tests that were performed are summarized below:

| Parameter | Method |
|---|---|
| Hardness as $CaCO_3$ | 6010B/SM 2340B |
| Total Dissolved Solids (TDS) | 160.1 |
| Total Suspended Solids (TSS) | 160.2 |
| Total Organic Carbon (TOC) | 415.1 |
| Dissolved Organic Carbon (DOC) | 415.1 |

## I. DATA PACKAGE COMPLETENESS

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

## II. EDD TO HARDCOPY VERIFICATION

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

## III. TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

2 Holding Times and Sample Preservation
Initial Calibration
Calibration Verification
Laboratory Blanks
2 Field Blanks
Laboratory Control Samples
Matrix Spike/Matrix Spike Duplicates (MS/MSD)
Laboratory Duplicates & Triplicates
Field Duplicates
1 Reporting Limits (MDL and MRL)
Calculation Verification (Full validation only)

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

## Holding Times and Sample Receipt

The laboratory received many of the sample coolers with temperatures outside the advisory control limits of 2° to 6°C. The temperature outliers ranged from 1.2º to 6.1°C, with only one cooler at a temperature greater than 6°C. The cooler temperature outliers were judged to have no impact on the reported results. No action was taken.

***SDG K0600500:*** The samples were analyzed for total suspended solids (TSS) 1 or 2 days past the 7 day holding time. There were no positive results for TSS in the samples; reporting limits were estimated (UJ-1).

***SDG K0600601:*** Samples LW3-W1901 and LW3-W1024 were analyzed for TSS past the 7 day holding time. Samples LW3-W1901 and LW3-W1901Dup were analyzed for total dissolved solids (TDS) one day past the 7 day holding time. These results were estimated (J-1).

## Field Blanks

***SDG K0600500:*** Two system blanks, Decon Water and Lab Blank, were submitted with this SDG. Total organic carbon (TOC) was detected in Sample Decon Water at a level greater than the method detection limit.

***SDG K0600601:*** One field blank, LW3-W1901, was submitted with this SDG. TOC and TDS were detected at levels greater than the method detection limits (MDL). All TOC results were greater than the action level of five times (5x) the blank concentration. The TDS results less than the action level were qualified as not detected (U-6).

## Reporting Limits (Method Detection Limit and Method Reporting Limit)

***SDGs K0600500 & K0600601:*** Due to insufficient sample volume, the laboratory was unable to meet the QAPP specified method reporting limit (MRL) of 1 mg/L for TSS analysis of several samples (Decon Water [Blank], Lab Blank, LW3-W1024, LW3-W1023-1 and LW3-W1023-2). The TSS MRL values for these samples were raised to 3 or 4mg/L.

## Field Duplicates

Duplicate sample pairs are listed below. The following acceptance criteria were applied: the relative percent difference (RPD) control limit is 50% for results greater than 5x the reporting limit. For results less than 5x the reporting limit, the absolute difference between the sample and duplicate must be less than the reporting limit. No data were qualified based on field duplicate outliers; however, data users should take field precision into account when interpreting sample data.

***SDG K0600601:*** One set of field duplicate samples, LW3-W1023-1 and LW3-W1023-2, was submitted with this SDG. All RPD values were less than the 50% control limit. Field precision was acceptable.

## IV. OVERALL ASSESSMENT

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

Data were qualified as not detected field blank contamination. Data were estimated based on exceeded holding times.

All data, as qualified, are acceptable for use.