Lower Duwamish Waterway Group

*Port of Seattle / City of Seattle / King County / The Boeing Company*

# TECHNICAL MEMORANDUM:
# SUMMARY OF CHEMISTRY DATASETS TO BE USED IN THE PHASE 2 RI/FS – ADDENDUM 1

# FINAL

**For submittal to**

**The US Environmental Protection Agency**
**Region 10**
Seattle, WA

**The Washington State Department of Ecology**
**Northwest Regional Office**
Bellevue, WA

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## Acronyms

| | |
|---|---|
| **ARI** | Analytical Resources, Inc. |
| **CAS** | Columbia Analytical Services, Inc. |
| **CSO** | combined sewer overflow |
| **DQO** | data quality objective |
| **Ecology** | Washington State Department of Ecology |
| **EPA** | US Environmental Protection Agency |
| **FS** | feasibility study |
| **ICP-MS** | inductively coupled plasma-mass spectrometry |
| **KC WQA** | King County (1999a) Water Quality Assessment |
| **LDW** | Lower Duwamish Waterway |
| **LDWG** | Lower Duwamish Waterway Group |
| **MS/MSD** | matrix spike/matrix spike duplicate |
| **NOAA** | National Oceanic and Atmospheric Administration |
| **PAH** | polycyclic aromatic hydrocarbon |
| **PCB** | polychlorinated biphenyl |
| **PSDDA** | Puget Sound Dredged Disposal Authority |
| **PSEP** | Puget Sound Estuary Program |
| **QA/QC** | quality assurance/quality control |
| **QA1** | summary data validation (EPA 1999, 2002) |
| **QA2** | full data validation (EPA 1999, 2002) |
| **QAPP** | Quality Assurance Project Plan |
| **RCRA** | Resource Conservation and Recovery Act |
| **RFI** | RCRA Facility Investigation |
| **RI** | Remedial Investigation |
| **RM** | river mile |
| **RPD** | relative percent difference |
| **RSD** | relative standard deviation |
| **SPMD** | semipermeable membrane device |
| **SRM** | standard reference material |
| **SVOC** | semivolatile organic compound |
| **TBT** | tributyltin |
| **TOC** | total organic carbon |
| **TPH** | total petroleum hydrocarbons |
| **USACE** | US Army Corps of Engineers |
| **VOC** | volatile organic compound |
| **Windward** | Windward Environmental LLC |

# 1.0 Introduction

The Lower Duwamish Waterway Group (LDWG) is conducting a Remedial Investigation/Feasibility Study (RI/FS) of the Lower Duwamish Waterway (LDW). As part of the RI/FS, historical chemistry data have been compiled. The Phase 1 RI report, which was completed by Windward Environmental LLC (Windward) in 2003 (Windward 2003), was based on existing sediment and tissue chemistry data that were considered acceptable for use in Phase 1 (Windward 2001a, b). The Phase 1 database was finalized, as agreed to by the US Environmental Protection Agency (EPA) and the Washington Department of Ecology (Ecology), in December 2001, so chemistry data collected or made available to Windward after that time were not incorporated into the Phase 1 RI.

Phase 2 of the RI and the FS will consider the following additional data:

- Data collected by other parties prior to the end of 2001, but not discovered during Phase 1 data compilation
- Data collected by other parties after the end of 2001
- Data collected by LDWG members for purposes other than the RI/FS, including Early Action Area investigations
- Data collected specifically for the Phase 2 RI, as described in the Phase 2 RI work plan (Windward 2004b)

These data will be combined with the data used in Phase 1 to characterize the nature and extent of contamination in the LDW, and to assess the risks to humans, fish, wildlife, and benthic invertebrates. A technical memorandum documenting the data quality of sediment and tissue chemistry datasets used in Phase 1 and data collected after 2001 was prepared after additional chemistry data, as described above, were compiled (Windward 2005b). This addendum describes the data quality of additional datasets identified since the original technical memorandum was prepared. Data collected specifically for the Phase 2 RI are not included in this addendum because separate data reports that document data quality have been prepared or will be prepared in the upcoming months.

The data quality objectives (DQOs) described in the original technical memorandum (Windward 2005b) were also used to review the additional datasets summarized in this addendum. Section 2 of this addendum presents a summary of the data quality reviews recently conducted by Windward. Appendix A presents a summary of all datasets reviewed to date, including those previously summarized in Windward (2005b). Appendix B summarizes the data qualifier changes that were made based on Windward's data quality reviews that are summarized in this addendum.

# 2.0 Summary of Data Quality Review

## 2.1 DATASET SUMMARY

Table 2-1 lists the LDW chemistry datasets not previously summarized in Windward (2005b) that are now being considered for use in the Phase 2 RI.

### Table 2-1. Chemistry datasets reviewed by Windward for this addendum

| SAMPLING EVENT | EVENT CODE | YEAR | CHEMICALS | NUMBER OF SAMPLES BY MEDIUM | REFERENCE |
|---|---|---|---|---|---|
| Boyer Towing dock replacement | BoyerTowing | 2004 | metals, SVOCs, PCB Aroclors, conventionals | 4 surface and 4 subsurface sediment | WR Consulting (2004) |
| PSDDA characterization at the Lehigh Northwest Duwamish Waterway Facility | LehighNW | 2004 | metals, SVOCs, PCB Aroclors, organochlorine pesticides, conventionals | 3 subsurface sediment | MCS (2004b) |
| King County combined sewer overflow water quality assessment for the Duwamish River and Elliott Bay [a] | KC WQA | 1996-1997 | metals, SVOCs, conventionals; PCB congeners and Aroclors; organochlorine pesticides | 1,249 surface water and 4 semi-permeable membrane devices[b] | King County (1999a) |
| RCRA Facility Investigation Duwamish Waterway sediment investigation, Plant 2 – Phase 1 | Plant 2 RFI-1 | 1995 | metals, PCB Aroclors, TPH, SVOCs, VOCs | 22 seep water | Weston (1998) |
| Rhône-Poulenc RCRA Facility Investigation for the Marginal Way facility – Round 3 | Rhône-Poulenc RFI-3 | 1995 | VOCs | 7 seep water | Rhône-Poulenc (1996) |
| Supplemental remedial investigation and feasibility study. Great Western International | GreatWestern Apr-94 | 1994 | VOCs | 6 seep water | Hart Crowser (1994a) |
| | GreatWestern Jul-94 | 1994 | VOCs | 9 seep water | Hart Crowser (1994b) |
| | GreatWestern Nov-94 | 1994 | VOCs | 7 seep water | Hart Crowser (1996) |
| | GreatWestern May-95 | 1995 | VOCs | 7 seep water | Hart Crowser (1996) |
| | GreatWestern-1995Annual | 1995 | VOCs | 7 seep water | Hart Crowser (1996) |
| | GreatWestern-1996Annual | 1996 | VOCs | 5 seep water | Hart Crowser (1997) |
| | GreatWestern-1997Annual | 1997 | VOCs | 4 seep water | Terra Vac, Floyd & Snider (2000) |
| | GreatWestern-1998Annual | 1998 | VOCs | 9 seep water | Terra Vac, Floyd & Snider (2000) |
| | GreatWestern-Embayment Study | 1998 | VOCs | 10 seep water | Terra Vac, Floyd & Snider (2000) |
| | GreatWestern-1999Annual | 1999 | VOCs, SVOCs | 5 seep water | Terra Vac, Floyd & Snider (2000) |

[a] Water chemistry data only. Sediment and tissue chemistry data from this sampling event were previously reviewed in Windward (2005b).

[b] Data collected using semi-permeable membrane devices, including PCB congeners, PAHs, and organochlorine pesticides, are not discussed in this memorandum. The applicability of these data for this project will be discussed in a separate memorandum.

PCB – polychlorinated biphenyl
SVOC – semivolatile organic compound
TPH – total petroleum hydrocarbons
VOC – volatile organic compound

## 2.2 DATA QUALITY REVIEW SUMMARY

This section summarizes the data quality reviews conducted by Windward on the datasets summarized in Table 2-1. A summary of the data quality reviews is presented in Table 2-2. Specific data quality issues researched by Windward for particular datasets are described in greater detail later in this section, as referenced in the "Summary" column of Table 2-2. Data not reviewed (i.e., seep water) are not discussed other than the summary in Table 2-2. The data quality review conclusions are also summarized in Appendix A.

**Table 2-2. Summary of data quality reviews conducted by Windward for datasets not previously reviewed in Windward (2005b)**

| EVENT CODE | YEAR | SUMMARY | ACCEPTABLE FOR ALL PHASE 2 USES? |
|---|---|---|---|
| **Sediment data** | | | |
| BoyerTowing | 2004 | data validation consistent with EPA guidelines; laboratory Form 1s present in data report; validation qualifiers added to database (see Section 2.2.1) | yes |
| LehighNW | 2004 | data validation consistent with EPA guidelines; laboratory Form 1s present in data report; validation qualifiers added to database (see Section 2.2.2) | yes |
| **Surface water data** | | | |
| KC WQA | 1996-1997 | QC consistent with previous King County events approved for all uses by EPA; validation qualifiers added to database (see Section 2.2.3) | yes |
| **Seep water data** | | | |
| Plant 2 RFI-1 | 1995 | Comprehensive data quality review not warranted because EPA has previously approved these data for all uses in the RCRA program. Data validation consistent with EPA guidelines has been conducted, as verified by Windward. | yes |
| Rhône-Poulenc RFI-3 | 1995 | Comprehensive data quality review not warranted because EPA has previously approved these data for all uses in the RCRA program. Data validation consistent with EPA guidelines has been conducted, as verified by Windward. | yes |
| GreatWestern Apr-94 | 1994 | Comprehensive data quality review not warranted because the data from this site will not be used to make risk estimates in Phase 2. Data will be collected at this site under the Phase 2 porewater sampling program. These data represent a more relevant exposure scenario for aquatic organisms and will be validated according to EPA guidelines. | no |
| GreatWestern Jul-94 | 1994 | | no |
| GreatWestern Nov-94 | 1994 | | no |
| GreatWestern May-95 | 1995 | | no |
| GreatWestern-1995Annual | 1995 | | no |
| GreatWestern-1996Annual | 1996 | | no |
| GreatWestern-1997Annual | 1997 | | no |
| GreatWestern-1998Annual | 1998 | | no |
| GreatWestern-Embayment Study | 1998 | | no |
| GreatWestern-1999Annual | 1999 | | no |

Each of the datasets listed in Table 2-2 have been validated at some level. Summaries of data validations for datasets not previously reviewed in Windward (2005b), but now considered acceptable for use in Phase 2 based on the reviews summarized in this memorandum, are included in Sections 2.2.1 through 2.2.3.

### 2.2.1 Boyer Towing

On May 8, 2004, three closely-spaced pairs of manual push-core sediment samples (plus a field duplicate pair) were collected under the Boyer Towing dock, located on the west side of the LDW at approximately river mile (RM) 2.4. Those core samples were split into surface and subsurface fractions (0-10 cm and 1-2 ft depth below mudline) and composited to form 8 samples (WR Consulting 2004). Those composite samples were analyzed by Analytical Resources, Inc. (ARI) for metals (EPA 6010B, EPA 7471A), polycyclic aromatic hydrocarbons (PAHs) and phthalate esters (EPA 8270C), polychlorinated biphenyl (PCB) Aroclors (EPA 8082), tributyltin (TBT) (Krone), grain size (modified PSEP), and conventional analyses (total solids by ILM 03.0 and total organic carbon [TOC] by SM 5310B). All analytical data and laboratory quality control (QC) procedures were evaluated and reviewed by WR Consulting following QA1 guidelines (PTI 1989).

Copper was found in the method blank, but sample concentrations were at least 30 times the blank concentration, so no qualification was necessary. The relative percent differences (RPD) between the matrix spike (MS) and matrix spike duplicate (MSD), and between two laboratory duplicate samples exceeded quality control (QC) criteria (Sample ID B1AB 0-10). Because the percent recovery for the laboratory control sample (LCS) was acceptable, the original data validator concluded that the QC deviation was likely attributable to matrix effects and did not qualify the copper result for this sample. As part of Windward's review, however, the copper result was qualified as an estimate (JK, indicating unknown bias) because the matrix effect is relevant to the sample concentration. The RPDs for chromium (MS/MSD) and lead (laboratory duplicates) in the same sample also exceeded QC criteria. The original data validator did not qualify these results, but as part of Windward's review, JK qualifiers (estimated concentration, unknown bias) were assigned to chromium and lead in Sample B1AB 0-10.

Several results for PAHs were J-qualified by the laboratory, indicating that the detected concentration was less than the sample-specific reporting limit. Windward mapped this laboratory qualifier to a JK qualifier (estimated concentration, unknown bias).

One Aroclor 1248 result was qualified Y by the laboratory, indicating an elevated reporting limit. Windward mapped this laboratory qualifier to a U validation qualifier (undetected) because Aroclors 1254 and 1260 were also detected in this sample at concentrations higher than the reporting limit.

These validation qualifiers were incorporated into the LDW project database. The sample-specific qualifier changes identified during Windward's review are shown in Appendix B. Form 1s were reviewed and found to be acceptable. The data from this event should be usable for all purposes in Phase 2.

### 2.2.2 Lehigh Northwest

On August 29, 2003, four sediment cores were collected by MCS Environmental along the west end of the Lehigh Northwest pier, located on the east side of the LDW at approximately RM 1.1, and composited into one subsurface and two surface samples. These samples were analyzed by ARI for conventional parameters (ammonia by EPA 350.1M, total solids by EPA 160.3 and 160.4, sulfides by EPA 376.2, TOC by Plumb 1981), metals (EPA 6010B, mercury by EPA 7471A, selenium by EPA 7740), SVOCs (EPA 8270), volatile organic compounds (VOCs) (EPA 8260), organochlorine pesticides and PCBs (EPA 8081A, EPA 8082), and grain size (PSEP). All sediment analytical data and laboratory QC procedures were evaluated and reviewed by Sayler Data Solutions following QA1 guidelines (PTI 1989).

All antimony results were rejected by the original data validator because of very low MS recovery. Lead from sample C1 was J-qualified by the validator because of an RPD for a matrix duplicate pair above QC criteria. Windward mapped this to a JL qualifier (estimated concentration, low bias).

In sample C2, RPDs for fluoranthene and phenanthrene laboratory duplicates were outside QC criteria. The results were J-qualified by the original data validator; Windward mapped these qualifiers to a JK qualifier (estimated concentration, unknown bias).

Several pesticide and PCB results were qualified Y by the laboratory because of elevated RLs. Windward mapped this laboratory qualifier to a U validation qualifier (undetected).

All ammonia results were J-qualified by the original data validator because the percent recovery for the standard reference material was above QC criteria. Windward mapped these qualifiers to a JH qualifier (estimated concentration, high bias).

These validation qualifiers were incorporated into the LDW project database. The sample-specific qualifier changes identified during Windward's review are shown in Appendix B. Form 1s were reviewed and found to be acceptable. The data from this event should be usable for all purposes in Phase 2.

### 2.2.3 KC WQA (water chemistry)

Over 1,200 surface water samples were collected by King County as part of the Water Quality Assessment project from October 1996 to June 1997. The samples were analyzed for conventional parameters (EPA 120.1, EPA 130.1, EPA 360.2, SM 2540-D, SM 2540-E, SM 4500-NH3-H, SM 4500-NO3-F, SM 5220-D), metals (EPA 200.8, EPA 245.2), and SVOCs (EPA 625). The King County Environmental Laboratory conducted all analyses of the surface water samples. All analytical data and laboratory QC procedures were evaluated and reviewed by King County following QA1 guidelines (PTI 1989).

Holding times for 38 surface water samples analyzed for ammonia nitrogen and nitrate + nitrite in a single batch were exceeded by one day. This exceedance was considered minor and no validation qualifiers were added to these results as part of Windward's review.

Phthalates were detected in several blank samples, which affected 151 surface water results for bis(2-ethylhexyl)phthalate, 1 result for butyl benzyl phthalate, and 9 results for di-n-butyl phthalate. In all cases, detected concentrations of these phthalates were less than 10 times the concentrations in the associated blank samples. As part of the original data validation, these results were qualified as U (undetected).

As part of the sampling and analysis program for metals, field, filter, and method blanks were analyzed. Lead and zinc were consistently detected in field blanks that were collected after the first 8 weeks of sampling had been completed (no field blanks were collected during the first 8 weeks). Consequently, detected concentrations for both dissolved and total lead and zinc for all samples, including samples from the first 8 weeks, were qualified E (estimated) by the laboratory. This qualifier was added to 2,062 records, as shown in Appendix B. This laboratory qualifier was mapped to a JH validation qualifier (estimated concentration, high bias).

To meet the project requirements for high sensitivity for metals analyses, a reductive co-precipitation procedure was developed for the receiving water samples. Because of the high sensitivity of the procedure, metals were routinely detected in the method blanks. Following efforts to minimize and control contamination, King County decided that blank subtraction could be used to minimize the effects of contamination on the sample results. Evaluation of the method blanks from multiple batches of analyses indicated that certain metals could be accurately characterized by the method blank and therefore the blank responses could be subtracted from sample results. Cadmium, chromium, cobalt, copper, and nickel met the criteria for method blank subtraction. Three method blanks per batch were analyzed for these 5 metals. The average concentration determined from the three method blanks was then subtracted from all sample and QC results. The use of method blank subtraction showed a clear improvement in the observed accuracy of the results for the certified reference materials. Blank subtraction was not performed for any other metals, even those such as lead and zinc, which were routinely detected in the method blanks. The method blank results for these two metals were deemed too variable for blank subtraction. All detected results for copper, chromium, and nickel (total and dissolved) were qualified E (estimated) to indicate that blank correction had occurred. This laboratory qualifier was mapped to a JL validation qualifier (estimated concentration, low bias) for these 3,959 results. Blank correction was also applied to detected cadmium and cobalt results (total and dissolved), but no E laboratory qualifier was assigned by the laboratory. A validation qualifier of JL was also applied to these 2,874 results, as shown in Appendix B.

Metals surface water data were flagged with a B qualifier (blank contamination) by the laboratory if detectable sample results were less than 10 times the highest method blank or filter blank response. If detectable samples were less than 5 times the highest method blank or filter blank response, the result was qualified U (undetected) as part of Windward's data quality review. Results for total nickel (18 samples), dissolved nickel (20 samples), dissolved copper (3 samples), and total copper (1 sample) were qualified in this manner. These 42 results were also qualified E by the laboratory and JH as part of Windward's review because of detected field blank results, resulting in a hybrid data validation qualifier of UJH.

B-qualified surface water results between 5 and 10 times the highest method blank or filter blank response were qualified JH (estimated concentration, high bias) as part of Windward's review. Results for dissolved antimony (28 samples), dissolved chromium (284 results), total chromium (7 results), dissolved thallium (10 results), total thallium (30 results), dissolved nickel (8 results), and total nickel (7 results) were qualified in this manner.

Many other metals results received both B and E qualifiers by the laboratory, which were mapped to JH validation qualifiers as part of this review, except for the 42 results described above which were mapped to UJH because the sample concentrations did not exceed 5 times the highest method blank or filter blank response. Results qualified in this manner include chromium (284 dissolved results, 7 total results), copper (15 dissolved results, 6 total results), lead (370 dissolved results, 136 total results), nickel (9 dissolved results, 6 total results), and zinc (233 dissolved results, 240 total results).

These validation qualifiers were incorporated into the LDW project database. The sample-specific qualifier changes identified during Windward's review are shown in Appendix B. The electronic data transferred to the LDW project database came directly from King County's Laboratory Information Management System. Consequently, no comparison to hard copy results (e.g., Form 1s) was necessary because the data did not travel through any intermediary source before being incorporated to the LDW project database. The data from this event should be usable for all purposes in Phase 2.

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# Appendix A. Dataset Summaries

This appendix summarizes chemistry datasets to be used in the Phase 2 RI (Table A-1) and that will not be used in the Phase 2 RI (Table A-2). The tables are divided into subsections for sediment chemistry, tissue chemistry, and other chemistry (i.e., surface and seep water). These tables will be amended, as necessary, when additional datasets are identified and reviewed.

## Table A-1. Chemistry datasets acceptable for all uses in the Phase 2 RI/FS

| Sampling Event | Event Code | Year | Location | Chemicals | Sample Summary | Data Quality Review Actions/Conclusions [a] | Reference |
|---|---|---|---|---|---|---|---|
| **Sediment chemistry** | | | | | | | |
| *Boyer Towing dock replacement* | *Boyer Towing* | *2004* | *RM 2.4 west* | *metals, SVOCs, PCB Aroclor s, conventionals* | *4 surface (0-10 cm) and 4 subsurface (30-60 cm) sediment samples collected with push core* | *data validation consistent with EPA guidelines; laboratory Form 1s present in data report; validation qualifiers added to database* | *WR Consulting (2004)* |
| *PSDDA characterization at the Lehigh Northwest Duwamish Waterway Facility* | *LehighNW* | *2004* | *RM 1.1 east* | *metals, SVOCs, PCB Aroclor s, organochlorine pesticides, conventionals* | *3 sediment core samples (2 from 0-120 cm, 1 from 120-150 cm) collected with impact corer* | *data validation consistent with EPA guidelines; laboratory Form 1s present in data report; validation qualifiers added to database* | *MCS (2004b)* |
| Slip 4 early action area site characterization | Slip4-EarlyAction | 2004 | Slip 4 (RM 2.8-2.9 east) | PCB Aroclors, mercury | 29 grab samples (van Veen) from 0-10 cm; 58 core samples (vibracorer) taken from 11 locations; 4-6 samples taken at each location to a depth of 360 cm | data validation and data quality review consistent with EPA guidelines; data collected under existing LDW RI AOC, so no data quality review is needed in this memorandum | Integral (2004) |
| Additional vertical characterization, Duwamish Sediment Other Area | DSOAvert char2 | 2004 | RM 2.8-3.7 east | PCB Aroclors | 28 core samples (vibracorer) taken from 15 locations; 1-3 samples from each location from 60-144 cm | data validation consistent with EPA guidelines; laboratory Form 1s present in data report; validation qualifiers added to database | MCS Environmental (2004a) |
| Norfolk CSO sediment remediation project five-year monitoring program: Annual monitoring report - year 5, April 2004. | Norfolk-monit7 | 2004 | RM 4.9-5.0 east | metals, PCB Aroclors, SVOCs | Composites of 3 grab samples (van Veen) at each of 4 locations; 4 samples from 0-2 cm; 4 samples from 0-10 cm | QC consistent with previous King County events approved for all uses by EPA; validation qualifiers added to database | unpublished data from King County |

| Sampling Event | Event Code | Year | Location | Chemicals | Sample Summary | Data Quality Review Actions/Conclusions [a] | Reference |
|---|---|---|---|---|---|---|---|
| Duwamish/Diagonal pre- and post-cleanup monitoring data | DuwDiag-Dredge Monitoring | 2003-2004 | RM 0.4-0.6 east | metals, PCB Aroclors, organochlorine pesticides, SVOCs | 24 composite samples from 10 grab samples (van Veen) from 0-10 cm at 12 locations, sampled both before dredging and after dredging | QC consistent with previous King County events approved for all uses by EPA; validation qualifiers added to database | unpublished data from King County |
| Terminal 117 early action area site characterization | T117 Boundary Definition | 2003-2004 | RM 3.6-3.7 west | PCB Aroclors; metals, SVOCs on selected samples | 46 grab samples (power grab or by hand from intertidal) from 0-10 cm; 101 core samples (vibracorer) from 18 locations, 3-6 samples collected at each core location to a depth of 300 cm [c] | data validation and data quality review consistent with EPA guidelines; data collected under existing LDW RI AOC, so no data quality review is needed in this memorandum | Windward (2004a; 2004b) |
| Norfolk CSO sediment remediation project five-year monitoring program: Annual monitoring report - year 4, April 2003. | Norfolk-monit6 | 2003 | RM 4.9-5.0 east | metals, PCB Aroclors, SVOCs | Composites of 3 grab samples (van Veen) at each of 4 locations; 4 samples from 0-2 cm; 4 samples from 0-10 cm | QC consistent with previous King County events approved for all uses by EPA; validation qualifiers added to database | King County (2003) |
| Sediment characterization results for the Duwamish River navigational channel turning basin | Turning-basin | 2003 | RM 4.2-4.7 | metals, PCB Aroclors, organochlorine pesticides, SVOCs | 5 core samples (vibracorer) taken down to depths of 144 to 390 cm | data validation consistent with EPA guidelines; laboratory Form 1s present in data report; validation qualifiers added to database | Anchor (2003) |
| Boeing Plant 2 transformer investigation – Phase 1 | Plant 2-Trans-former Phase1 | 2003 | RM 3.6 east | PCB Aroclors | 5 surface grab samples (by hand) taken from 0-5 cm; 46 core samples (vibracorer) taken from 13 locations; 3-5 samples at each location from 0-240 cm [b] | data validation consistent with EPA guidelines; laboratory Form 1s present in data report; validation qualifiers added to database | Floyd Snider McCarthy (2004) |
| Norfolk combined sewer overflow (Duwamish River) sediment cap recontamination. Phase I investigation. | Ecology-Norfolk | 2002 | RM 4.9-5.0 east | PCB Aroclors | 20 grab samples (van Veen) from 0-10 cm | data validation consistent with EPA guidelines; laboratory Form 1s present in data report; validation qualifiers added to database | Ecology (2003) |
| Norfolk CSO sediment remediation project five-year monitoring program: Annual monitoring report - year 3, April 2002. | Norfolk-monit5 | 2002 | RM 4.9-5.0 east | metals, PCB Aroclors, SVOCs | Composites of 3 grab samples (van Veen) at each of 4 locations; 4 samples from 0-2 cm; 4 samples from 0-10 cm | QC consistent with previous King County events approved for all uses by EPA; validation qualifiers added to database | King County (2002) |
| Data report, DSOA vertical characterization and outfall 12 data collection. Duwamish sediment other area, Boeing Plant 2 | DSOAvert char | 2001 | RM 2.8-3.7 east | PCB Aroclors | 125 core samples (vibracorer) from 37 locations; 2-6 samples at each location, most locations starting at 60 cm down to depths of 150-280 cm | data validation consistent with EPA guidelines; laboratory Form 1s present in data report; validation qualifiers added to database | Pentec (2001) |

| Sampling Event | Event Code | Year | Location | Chemicals | Sample Summary | Data Quality Review Actions/Conclusions [a] | Reference |
|---|---|---|---|---|---|---|---|
| Norfolk CSO five-year monitoring program, Year Two, April 2001 | Norfolk-monit4 | 2001 | RM 4.9-5.0 east | metals, PCB Aroclors, SVOCs | Composites of 3 grab samples (van Veen) at each of 4 locations; 4 samples from 0-2 cm; 4 samples from 0-10 cm | validation qualifiers added to database | King County (2001b) |
| Norfolk CSO five-year monitoring program – Twelve-month post construction | Norfolk-monit3 | 2000 | RM 4.9-5.0 east | metals, PCB Aroclors, SVOCs | Composites of 3 grab samples (van Veen) at each of 4 locations; 4 samples from 0-2 cm; 4 samples from 0-10 cm | validation qualifiers added to database | King County (2000c) |
| Norfolk CSO five-year monitoring program – Supplemental nearshore sampling | Norfolk-monit2b | 2000 | RM 4.9-5.0 east | PCB Aroclors | Composites of 3 grab samples (van Veen) at each of 3 locations; 3 samples from 0-2 cm; 3 samples from 0-10 cm | validation qualifiers added to database | King County (2000b) |
| Outfall and nearshore sediment sampling report, Duwamish Facility | James Hardie Outfall | 2000 | RM 1.5 east | metals, PCB Aroclors, SVOCs | 9 grab samples (van Veen or by hand in intertidal) from 0-10 cm | data validation consistent with EPA guidelines; laboratory Form 1s present in data report; validation qualifiers added to database | Weston (2000) |
| PSDDA sediment characterization of Duwamish River navigation channel: FY2000 operations and maintenance dredging data report | PSDDA99 | 1999 | RM 1.9-3.4 | metals, PCB Aroclors, organochlorine pesticides, SVOCs | 20 composite core samples (vibracorer) taken from 18 locations; three borings made at each location; 18 samples from 0 to 120 cm; 2 samples from 120 to 240 cm | data validation consistent with EPA guidelines; laboratory Form 1s present in data report; validation qualifiers added to database | Striplin (SEA 2000a, b) |
| Norfolk CSO five-year monitoring program – Six-month post construction | Norfolk-monit2a | 1999 | RM 4.9-5.0 east | metals, PCB Aroclors, SVOCs | Composites of 3 grab samples (van Veen) at each of 4 locations; 4 samples from 0-2 cm; 4 samples from 0-10 cm | validation qualifiers added to database | King County (2000d) |
| Norfolk CSO five-year monitoring program – Post backfill | Norfolk-monit1 | 1999 | RM 4.9-5.0 east | metals, PCB Aroclors, SVOCs | Composites of 3 grab samples (van Veen) at each of 4 locations; 4 samples from 0-10 cm | validation qualifiers added to database | King County (1999b) |
| PSDDA sediment characterization of Duwamish River navigation channel: FY99 operations and maintenance dredging data report. | PSDDA98 | 1998 | RM 3.5-4.6 | metals, PCB Aroclors, organochlorine pesticides, SVOCs | 10 core samples (vibracorer) taken from 12 locations; 7 samples taken from 0 to 60-90 cm, each from single location; 3 samples taken from 2 or 3 locations (0-60 cm, 0-120 cm, and 120-360 cm) | data validation consistent with EPA guidelines; laboratory Form 1s present in data report; validation qualifiers added to database | Striplin (1998) |

| Sampling Event | Event Code | Year | Location | Chemicals | Sample Summary | Data Quality Review Actions/Conclusions [a] | Reference |
|---|---|---|---|---|---|---|---|
| EPA Site Inspection: Lower Duwamish River | EPA SI | 1998 | entire LDW study area | metals, organochlorine pesticides, PCB Aroclors & selected congeners, dioxins & furans, TBT, SVOCs, VOCs | 300 grab samples from 0-10 cm (van Veen); 33 core samples (vibracorer) from 0-60 and 60-120 cm from 17 locations | data collected by EPA for Superfund program; acceptable for all uses | Weston (1999) |
| King County combined sewer overflow water quality assessment for the Duwamish River and Elliott Bay | KC WQA | 1997 | Duwamish/Diagonal (RM 0.5-0.6 east); Kellogg Island (RM 0.7 west); Brandon CSO (RM 1.1 east); 8th Ave CSO (RM 2.8 west); South Park (RM 3.3 east); Hamm Creek (RM 4.4 west) | metals, PCB Aroclors, SVOCs, TBT | 0-10 cm grab samples (van Veen) from 14 locations; single samples from 5 Duwamish/Diagonal locations and 4 Kellogg Island locations; weekly samples from Kellogg Island (9 samples), Brandon (13 samples), 8th Ave (9 samples), South Park (4 samples), Hamm Creek (4 samples) | validation qualifiers added to database | King County (1999a) |
| Duwamish Waterway Phase 1 site characterization | Boeing SiteChar | 1997 | RM 1.8-2.0 west; Slip 4 (RM 2.8-2.9 east); RM 3.6-4.0; RM 4.2-5.0 east | metals, PCB Aroclors, SVOCs | 88[b] grab samples (van Veen) from 0-10 cm | accepted by EPA for all uses | Exponent (1998) |
| Duwamish Waterway sediment characterization study | NOAA SiteChar | 1997 | entire LDW study area | total PCBs, selected PCB congeners, total PCTs | 328 grab samples (van Veen) from 0-10 cm | validation qualifiers added to database; congener data not appropriate for use in Phase 2 risk assessments | NOAA (1997; 1998) |
| Seaboard Lumber site, Phase 2 site investigation | Seaboard-Ph2 | 1996 | RM 0.4-0.7 west | metals, PCB Aroclors, SVOCs | 20 grab samples (van Veen) from 0-10 cm | accepted by EPA for all uses | Herrera (1997) |
| RCRA Facility Investigation Duwamish Waterway sediment investigation, Plant 2 – Phase 2b | Plant 2 RFI-2b | 1996 | RM 2.8-3.7 east | metals, PCB Aroclors, SVOCs | 39 grab samples (van Veen) from 0-10 cm; 44 core samples (vibracorer) from 15 locations – 2 to 4 samples per core, up to 480 cm below mudline | validation qualifiers J+/J- changed to JH/JL; accepted by EPA for all uses | Weston (1998) |
| Duwamish/Diagonal cleanup Study – Phase 2 | Duw/Diag-2 | 1996 | RM 0.4-0.6 east | metals, PCB Aroclors, SVOCs, TPH | 36 grab samples (van Veen) from 0-10 cm; 53 core samples (vibracorer) from 15 locations – 1 to 6 samples per core, up to 270 cm below mudline | validation qualifiers added to database | King County (2000a) |
| Duwamish/Diagonal cleanup Study – Phase 1.5 | Duw/ Diag-1.5 | 1995 | RM 0.4-0.6 east | metals, PCB Aroclors, SVOCs, TBT | 12 grab samples (van Veen) from 0-10 cm | validation qualifiers added to database | King County (2000a) |

| Sampling Event | Event Code | Year | Location | Chemicals | Sample Summary | Data Quality Review Actions/Conclusions [a] | Reference |
|---|---|---|---|---|---|---|---|
| Norfolk CSO sediment cleanup study – Phase 3 | Norfolk-cleanup3 | 1995 | RM 4.9-5.0 east | PCB Aroclors | 16 grab samples (van Veen) from 0-10 cm | validation qualifiers added to database | King County (1996) |
| Norfolk CSO sediment cleanup study – Phase 2 | Norfolk-cleanup2 | 1995 | RM 4.9-5.0 east | metals, organochlorine pesticides, PCB Aroclors and selected congeners, SVOCs, VOCs, TPH | 12 grab samples (van Veen) from 0-10 cm; 27 core samples (vibracorer) from 3 locations at 30 or 60 cm intervals up to 180 cm below mudline | validation qualifiers added to database | King County (1996) |
| RCRA Facility Investigation Duwamish Waterway sediment investigation, Plant 2 – Phase 2a | Plant 2 RFI-2a | 1995 | RM 2.8-3.7 east | metals, PCB Aroclors SVOCs | 54 grab samples (van Veen) from 0-10 cm | validation qualifiers J+/J- changed to JH/JL; accepted by EPA for all uses | Weston (1998) |
| RCRA Facility Investigation Duwamish Waterway sediment investigation, Plant 2 – Phase 1 | Plant 2 RFI-1 | 1995 | RM 2.8-3.7 east | metals, PCB Aroclors, TPH, SVOCs, VOCs | 65 grab samples (van Veen) from 0-10 cm; 22 core samples (vibracorer) from 12 locations at 15-45 cm intervals down to 135 cm below mudline | validation qualifiers J+/J- changed to JH/JL; accepted by EPA for all uses | Weston (1998) |
| Duwamish/Diagonal cleanup Study – Phase 1 | Duw/Diag-1 | 1994 | RM 0.4-0.6 east | metals, organochlorine pesticides, PCB Aroclors, SVOCs, TBT | 38 grab samples (van Veen) from 0-10 cm; 2 grab samples (van Veen) from 0-15 cm; 12 core samples (vibracorer) from 2 locations at 15-30 cm intervals down to 150 cm below mudline | validation qualifiers added to database | King County (2001a) |
| Norfolk CSO sediment cleanup study – Phase 1 | Norfolk-cleanup1 | 1994 | RM 2.8-3.7 east | metals, organochlorine pesticides, SVOCs, PCB Aroclors, VOCs | 21 grab samples (van Veen) from 0-10 cm; 3 core samples from 1 location – 15-30, 30-45, and 45-60 cm | validation qualifiers added to database | King County (1996) |
| Rhône-Poulenc RCRA Facility Investigation for the Marginal Way facility – Round 2 | Rhône-Poulenc RFI-2 | 1994 | Slip 6 (RM 4.2 east) | metals, SVOCs, PCB Aroclors 1254 and 1260, organochlorine pesticides | 7 grab samples (van Veen) from 0-2 cm | accepted by EPA for all uses | Rhône-Poulenc (1995) |
| Results of sampling and analysis, sediment monitoring plan, Duwamish Shipyard, Inc. | Duwamish Shipyard | 1993 | RM 1.4-1.5 west | metals, SVOCs, TBT | 5 grab samples (van Veen) from 0-10 cm | data validation consistent with EPA guidelines; laboratory Form 1s present in data report; validation qualifiers added to database | Hart Crowser (1993) |

| Sampling Event | Event Code | Year | Location | Chemicals | Sample Summary | Data Quality Review Actions/Conclusions [a] | Reference |
|---|---|---|---|---|---|---|---|
| Harbor Island Remedial Investigation | Harbor Island RI | 1991 | RM 0.0-0.4 | metals, organochlorine pesticides, PCB Aroclors, SVOCs, VOCs, TPH, TBT | 34 grab samples (van Veen) from 0-10 cm | data collected by EPA for Superfund program; acceptable for all uses | Weston (1993) |
| **Tissue chemistry** | | | | | | | |
| East Waterway, Harbor Island Superfund site: Technical memorandum: Tissue chemistry results for juvenile chinook salmon collected from Kellogg Island and East Waterway. | EW-Salmon | 2002 | Kellogg Island (RM 0.8-0.9 west) | PCB Aroclors, mercury | 12 composite samples of whole-body juvenile chinook salmon (6 from LDW, 6 from East Waterway) collected by beach seine; each sample consisted of 6-7 fish | data validation consistent with EPA guidelines; laboratory Form 1s present in data report; validation qualifiers added to database | Windward (2002) |
| NMFS Duwamish injury assessment project | NOAA-salmon2 | 2000 | Kellogg Island (RM 0.8-0.9 west), Slip 4 (RM 2.8 east) | PCB congeners, organochlorine pesticides (salmon); PCB Aroclors (shiner perch) | 29 samples of whole-body juvenile chinook salmon collected by beach seine (9 were composites of 3-10 fish, 20 were individual fish); 6 composite samples of chinook salmon stomach contents; 2 composite samples of whole-body shiner perch | neither EPA nor LDWG plan to conduct a review of the salmon portion of this dataset because LDWG's 2003 juvenile chinook salmon sampling results make the effort required for such a review unwarranted, as documented by Windward (2005a); therefore, these data will not be used in Phase 2; the shiner perch portion of the dataset has been previously approved for all uses by EPA (2003) | NMFS (2002) |
| Preliminary exposure assessment of dioxin-like chlorobiphenyls in great blue herons of the lower Duwamish River | Heron USFWS | 1998 | heron colony west of RM 0.5 west | PCB congeners | 6 samples taken from 5 great blue heron eggs collected by hand from nest (5 egg samples, 1 egg yolk sample) | no formal data validation conducted, laboratory Form 1s not present in data report; EPA plans to conduct additional QA review of this dataset; determination of whether these data will be used in Phase 2 is therefore pending | Krausmann (2002) |

| Sampling Event | Event Code | Year | Location | Chemicals | Sample Summary | Data Quality Review Actions/Conclusions [a] | Reference |
|---|---|---|---|---|---|---|---|
| Waterway Sediment Operable Unit Harbor Island Superfund Site | WSOU | 1998 | RM 0.4-0.9 (crab), RM 2.0-4.4 (English sole), RM 0.0-0.2 (striped perch) | Hg, TBT, PCB Aroclors | 3 English sole skinless fillet composite samples (5 fish/composite caught by trawl); 3 red rock crab edible meat composite samples (5 crab/composite caught by crab trap); 1 Dungeness crab edible meat sample (1 individual caught by crab trap); 3 striped perch skinless fillet samples (5 fish/composite for 2 samples, 1 individual fish for 1 sample; caught by diver) | collected under EPA oversight for a previously conducted Superfund risk assessment; previously approved for all uses by EPA (2003) | ESG (1999) |
| King County Combined Sewer Overflow Water Quality Assessment for the Duwamish River and Elliott Bay | KC WQA | 1996-1997 | RM 0.5-0.9 | metals, TBT, SVOCs, PCB Aroclors | 3 English sole skinless fillet composite samples (20 fish/composite caught by trawl); 3 English sole whole-body composite samples[d] (20 fish/composite caught by trawl); 2 Dungeness crab edible meat composite samples (3 crabs/sample caught by crab trap); 1 Dungeness crab hepatopancreas composite sample (3 crabs caught by crab trap); 4 amphipod composite samples (caught by benthic sledge); 3 shiner surfperch whole-body composite samples (10 fish/sample caught by trawl); 22 mussels edible meat composite samples (20 mussels/sample collected by hand) [e] | add validation qualifiers (Section 3.2.1); English sole whole-body composite samples not acceptable for all uses because they don't truly represent whole bodies | King County (1999a) |
| Puget Sound Ambient Monitoring Program – annual sampling | PSAMP-fish | 1992 | RM 0.4-1.3 | SVOCs, organochlorine pesticides, PCB Aroclors, As, Cu, Pb, Hg | 3 English sole skinless fillet (10-20 fish/sample collected by trawl) | acceptable for all uses | West et al. (2001) |
| | | 1995 | RM 0.4-1.3 | organochlorine pesticides, PCB Aroclors, As, Cu, Pb, Hg | 3 English sole skinless fillet composite samples (10-20 fish/sample collected by trawl) | acceptable for all uses | |
| | | 1997 | RM 0.4-1.3 | Hg, organochlorine pesticides | 3 English sole skinless fillet composite samples (10-20 fish/sample collected by trawl) | acceptable for all uses | |

| Sampling Event | Event Code | Year | Location | Chemicals | Sample Summary | Data Quality Review Actions/Conclusions [a] | Reference |
|---|---|---|---|---|---|---|---|
| Elliott Bay/Duwamish River Fish Tissue Investigation | EVS 95 | 1995 | RM 1.1-1.4 | PCB Aroclors, Hg, MeHg, TBT | 3 English sole skinless fillet composite samples (6 fish/sample collected by trawl) | collected under EPA oversight for a previously conducted Superfund risk assessment; previously approved for all uses by EPA (2003) | Battelle (1996); EVS (unpublished); Frontier Geosciences (1996) |
| Contaminant exposure and associated biochemical effects in outmigrant juvenile chinook salmon from urban and non-urban estuaries of Puget Sound | NOAA-salmon | 1989-1990 | RM 0.7 | organochlorine pesticides, PCB Aroclors, PAHs | 14 composite samples of whole-body juvenile chinook salmon collected by beach seine (2-10 fish/sample); 6 composite samples of stomach contents (10 fish/sample) [f] | neither EPA nor LDWG plan to conduct a review of this dataset because LDWG's 2003 juvenile chinook salmon sampling results make the effort required for such a review unwarranted; therefore, these data will not be used in Phase 2 | Varanasi et al. (1993) |
| **Other chemistry** | | | | | | | |
| *RCRA Facility Investigation Duwamish Waterway sediment investigation, Plant 2 – Phase 1* | *Plant 2 RFI-1* | *1995* | *RM 2.8 – 3.7 east* | *metals, PCB Aroclors, TPH, SVOCs, VOCs* | *22 seep water* | *comprehensive data quality review not warranted because EPA has previously approved these data for all uses in the RCRA program* | *Weston (1998)* |
| *Rhône-Poulenc RCRA Facility Investigation for the Marginal Way facility – Round 3* | *Rhône-Poulenc RFI-3* | *1995* | *Slip 6 (RM 4.2 east)* | *VOCs* | *7 seep water* | *comprehensive data quality review not warranted because EPA has previously approved these data for all uses in the RCRA program* | *Rhône-Poulenc (1996)* |
| *Supplemental remedial investigation and feasibility study. Great Western International* | *Great Western Apr-94* | *1994* | *RM 2.2 east* | *VOCs* | *6 seep water* | *comprehensive data quality review not warranted because Ecology has previously approved these data for all uses in the MTCA program* | *Hart Crowser (1994a)* |
| | *Great Western Jul-94* | *1994* | | *VOCs* | *9 seep water* | *comprehensive data quality review not warranted because Ecology has previously approved these data for all uses in the MTCA program* | *Hart Crowser (1994b)* |
| | *Great Western Nov-94* | *1994* | | *VOCs* | *7 seep water* | *comprehensive data quality review not warranted because Ecology has previously approved these data for all uses in the MTCA program* | *Hart Crowser (1996)* |

| Sampling Event | Event Code | Year | Location | Chemicals | Sample Summary | Data Quality Review Actions/Conclusions [a] | Reference |
|---|---|---|---|---|---|---|---|
| | *Great Western May-95* | *1995* | | *VOCs* | *7 seep water* | *comprehensive data quality review not warranted because Ecology has previously approved these data for all uses in the MTCA program* | *Hart Crowser (1996)* |
| | *Great Western-1995 Annual* | *1995* | | *VOCs* | *7 seep water* | *comprehensive data quality review not warranted because Ecology has previously approved these data for all uses in the MTCA program* | *Hart Crowser (1996)* |
| | *Great Western-1996 Annual* | *1996* | | *VOCs* | *5 seep water* | *comprehensive data quality review not warranted because Ecology has previously approved these data for all uses in the MTCA program* | *Hart Crowser (1997)* |
| | *Great Western-1997 Annual* | *1997* | | *VOCs* | *4 seep water* | *comprehensive data quality review not warranted because Ecology has previously approved these data for all uses in the MTCA program* | *Terra Vac, Floyd & Snider (2000)* |
| | *Great Western-1998 Annual* | *1998* | | *VOCs* | *9 seep water* | *comprehensive data quality review not warranted because Ecology has previously approved these data for all uses in the MTCA program* | *Terra Vac, Floyd & Snider (2000)* |
| | *Great Western-Embay-ment Study* | *1998* | | *VOCs* | *10 seep water* | *comprehensive data quality review not warranted because Ecology has previously approved these data for all uses in the MTCA program* | *Terra Vac, Floyd & Snider (2000)* |
| | *Great Western-1999 Annual* | *1999* | | *VOCs, SVOCs* | *5 seep water* | *comprehensive data quality review not warranted because Ecology has previously approved these data for all uses in the MTCA program* | *Terra Vac, Floyd & Snider (2000)* |

| Sampling Event | Event Code | Year | Location | Chemicals | Sample Summary | Data Quality Review Actions/Conclusions [a] | Reference |
|---|---|---|---|---|---|---|---|
| *King County combined sewer overflow water quality assessment for the Duwamish River and Elliott Bay* [g] | *KC WQA* | *1996-1997* | *Duwamish/Diagonal CSO (RM 0.5 east), Brandon CSO (RM 1.1 east), SW Michigan CSO (RM 2.0 east), Norfolk CSO (RM 4.9 east)* [h] | *metals, SVOCs, conventionals, PCB Aroclors* | *1,249 surface water samples collected using Niskin and van Dorn samplers. Samples were collected from multiple depths (near-surface and near-bottom) and up to 3 locations horizontally across the waterway. Samples were collected weekly and also during storm events.* [h] | *QC consistent with previous King County events approved for all uses by EPA; validation qualifiers added to database* | *King County (1999a)* |

Note: *New datasets discussed in this memorandum are shown in italics*

[a] All events listed on this table are: 1) considered acceptable for all uses in Phase 2, even if not specifically mentioned, 2) acceptable for some uses, but not others, as noted, or 3) undergoing additional review by EPA; acceptability determination is still pending

[b] Sample total does not include three reference samples that were collected upstream of the study area

[c] Does not include soil, groundwater, and seep data collected concurrently during this investigation

[d] Samples are of remnant tissues following the subsampling of fillet tissue. In addition, livers were removed from some fish in the composite samples.

[e] Sample counts do not include data from cooked crab and English sole samples or data from caged mussel deployments. These data will not be used in the Phase 2 RI

[f] Six composite samples of juvenile chinook salmon livers were also analyzed, but these data were not used in the Phase 1 RI.

[g] Water chemistry data only. Sediment and tissue chemistry data from this sampling event were previously reviewed in Windward (2005b).

[h] Samples collected outside the LDW study area are also included in this sampling event

NOAA – National Oceanic and Atmospheric Administration

PAH – polycyclic aromatic hydrocarbon

PCB – polychlorinated biphenyl

PCT – polychlorinated terphenyl

RCRA – Resource Conservation and Recovery Act

SVOC – semivolatile organic compound

TBT – tributyltin

TPH – total petroleum hydrocarbons

VOC – volatile organic compound

MeHg – methylmercury

## Table A-2. Chemistry datasets not acceptable for all uses in the Phase 2 RI/FS

| Sampling Event | Event Code | Year | Location | Chemicals | Sample Summary | Data Quality Review Action/ Conclusions | Reference |
|---|---|---|---|---|---|---|---|
| **Sediment chemistry** | | | | | | | |
| Dredge material characterization Duwamish Yacht Club | Duwam Yacht Club | 1999 | RM 4.1 west | metals, organochlorine pesticides, PCB Aroclors, SVOCs, VOCs, TBT | 6 core samples (vibracorer), each made from 2 separate cores collected to 50-65 cm | not reviewed by Windward; sediment characterized has been dredged | Hart Crowser (1999) |
| Sediment sampling and analysis James Hardie Gypsum Inc. – Round 1 | Hardie Gypsum-1 | 1999 | RM 1.6-1.7 east | metals, organochlorine pesticides, PCB Aroclors, SVOCs, VOCs | 5 core samples (vibracorer) made from single cores down to 120 cm | not reviewed by Windward; sediment characterized has been dredged | Spearman (1999) |
| Sediment sampling and analysis James Hardie Gypsum Inc. – Round 2 | Hardie Gypsum-2 | 1999 | RM 1.6-1.7 east | metals, organochlorine pesticides, PCB Aroclors, SVOCs, VOCs | 9 core samples (vibracorer) made from single cores down to 90 cm | not reviewed by Windward; sediment characterized has been dredged | Spearman (1999) |
| Dredge material characterization Hurlen Construction Company & Boyer Alaska Barge Lines berthing areas | Hurlen-Boyer | 1998 | RM 2.4-2.7 west | metals, organochlorine pesticides, PCB Aroclors, SVOCs, TBT, TPH | 6 core samples (vibracorer), 2 from Boyer, 4 from Hurlen, each made from 2 separate cores collected to 60-120 cm | not reviewed by Windward; sediment characterized has been dredged | Hart Crowser (1998) |
| Sediment quality in Puget Sound. Year 2 – Central Puget Sound | PSAMP/ NOAA98 | 1998 | RM 0.5, 0.6, 1.8 | metals, PCB Aroclors, organochlorine pesticides, SVOCs, TBT | 3 grab samples (van Veen) collected from 0-2 cm | LDWG did not conduct a review of this dataset because the QA/QC information was not readily available. The effort that would have been required to obtain this QA/QC information was not justified for the purposes of the Phase 2 RI and risk assessments. | Ecology (2000) |
| RCRA facility investigation (RFI) report for the Marginal Way facility. Round 3 data and sewer sediment technical memorandum. | Rhône Poulenc RFI3 | 1996 | RM 4.2 east | metals, phenols (4 samples) | 16 grab samples collected by hand from 0-10 cm | data validation consistent with EPA guidelines, but laboratory Form 1s not present in data report; Phase 2 RI DQOs not met, so not acceptable for all uses | Rhône-Poulenc (1996) |
| Proposed dredging of Slip No. 4, Duwamish River, Seattle, WA | Slip4-Crowley | 1996 | RM 2.8 east | metals, organochlorine pesticides, PCB Aroclors, SVOCs, VOCs, TBT | 4 core samples (vibracorer) composited from sediment at 9 locations collected to a depth of 70-130 cm | not reviewed by Windward; sediment characterized has been dredged | PTI (1996) |

| Sampling Event | Event Code | Year | Location | Chemicals | Sample Summary | Data Quality Review Action/ Conclusions | Reference |
|---|---|---|---|---|---|---|---|
| 1996 USACE Duwamish O&M | PSDDA96 | 1996 | RM 4.2-4.6 | metals, organochlorine pesticides, PCB Aroclors, SVOCs, VOCs, | 4 core samples (vibracorer) collected to a depth of 120 cm | not reviewed by Windward; sediment characterized has been dredged | Striplin (1996) |
| Lone Star Northwest and James Hardie Gypsum – Kaiser dock upgrade | Lone Star-Hardie Gypsum | 1995 | RM 1.6 east | metals, organochlorine pesticides, PCB Aroclors, SVOCs, VOCs | 5 core samples (vibracorer); 4 collected to a depth of 120-150 cm, 1 at 120-360 cm | not reviewed by Windward; sediment characterized has been dredged | Hartman (1995) |
| Rhône-Poulenc RCRA Facility Investigation for the Marginal Way facility – Round 1 | Rhône-Poulenc RFI-1 | 1994 | RM 4.2 east | metals, SVOCs, PCB Aroclors, organochlorine pesticides | 7 grab samples (van Veen) collected from 0-15 cm | data validation consistent with EPA guidelines, but laboratory Form 1s not present in data report; Phase 2 RI DQOs not met, so not acceptable for all uses | Rhône-Poulenc (1995) |
| Lone Star Northwest – West Terminal US ACOE – Seattle | Lone Star 92 | 1992 | RM 1.5 east | metals, organochlorine pesticides, PCB Aroclors, SVOCs, VOCs | 1 core sample (vibracorer), made from 2 separate cores collected to 120 cm | not reviewed by Windward; sediment characterized has been dredged | Hartman (1992) |
| Sediment sampling and analysis, South Park Marina, Duwamish Waterway, Seattle, Washington. | South Park Marina | 1991 | RM 3.5 west | metals, SVOCs, PCB Aroclors, organochlorine pesticides | 2 core samples (vibracorer), each made from 2 separate cores collected to 120 cm | data not reviewed because of age of data; sediment characterized has been dredged | Spearman (1991) |

| Sampling Event | Event Code | Year | Location | Chemicals | Sample Summary | Data Quality Review Action/ Conclusions | Reference |
|---|---|---|---|---|---|---|---|
| **Tissue chemistry** | | | | | | | |
| Puget Sound Ambient Monitoring Program – annual sampling | PSAMP-fish | 1992 | RM 0.7 | SVOCs, organochlorine pesticides, PCB Aroclors, As, Cu, Pb, Hg | 6 coho salmon and 6 chinook salmon composite fillet samples (5 fish/composite caught by gill net) | Adult salmon; data were summarized in the Phase 1 RI, but were not used in the risk assessments because almost all the chemicals in these fish are associated with exposure outside the LDW | West et al. (2001) |
| | | 1993 – 1996 | RM 0.7 | organochlorine pesticides, PCB Aroclors, As, Cu, Pb, Hg | 1993: 5 coho salmon and 6 chinook salmon composite fillet samples (5 fish/composite caught by gill net); 1994: 5 coho salmon composite fillet samples and 6 chinook salmon filet samples (5 composite, 1 individual) (5 fish/composite caught by gill net); 1995: 7 coho salmon (6 composite, 1 individual) and 15 chinook salmon filet samples (13 composite, 2 individual) (5 fish/composite caught by gill net); 1996: 19 coho salmon (5 composite, 14 individual) and 49 chinook salmon fillet samples (all individual) (5 fish/composite caught by gill net) | | |
| | | 1998 | RM 0.7 | Hg, organochlorine pesticides | 13 coho salmon composite fillet samples (5 fish/composite caught by gill net) | | |

PCB – polychlorinated biphenyl SVOC – semivolatile organic compound

TBT – tributyltin TPH – total petroleum hydrocarbons VOC – volatile organic compound

## Appendix B. Sample-specific Data Qualifier Changes

This appendix lists the sample-specific data qualifier changes resulting from the data quality reviews conducted by Windward and summarized in this memorandum.

## Table B-1. Sample-specific data qualifier changes

| Sampling Event | Location | Sample ID | Analyte | Laboratory Qualifier | Validation Qualifier-original | Validation Qualifier-revised | Interpreted Qualifier |
|---|---|---|---|---|---|---|---|
| KC WQA | DHD | L10039-7 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L10937-7 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L10871-7 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L10846-7 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L10736-7 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L10643-7 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L10646-7 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L10591-7 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L10478-7 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L11046-10 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L10285-7 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L11093-7 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L9929-7 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L9928-7 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L9927-7 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L9841-37 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L9806-37 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L11240-10 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L11238-10 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L11164-10 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L11164-14 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L10346-7 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L10039-8 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L10941-8 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L10937-8 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L10871-8 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L10846-8 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L10736-8 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L10643-8 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L10646-8 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L10591-8 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L10478-8 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L10941-7 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L10285-8 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L11046-7 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L9929-8 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L9928-8 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L9927-8 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L9841-38 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L9806-38 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L11240-7 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L11238-7 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L11164-7 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L10991-10 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L10346-8 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L10346-9 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L10991-9 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L10941-9 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L10937-9 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L10871-9 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L10846-9 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L10736-9 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L10643-9 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L10646-9 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L11093-10 | Cobalt (total) | | | JL | J |

## Table B-1. Sample-specific data qualifier changes

| Sampling Event | Location | Sample ID | Analyte | Laboratory Qualifier | Validation Qualifier-original | Validation Qualifier-revised | Interpreted Qualifier |
|---|---|---|---|---|---|---|---|
| KC WQA | CON/W | L10478-9 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L11164-9 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L10285-9 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L10039-9 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L10037-9 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L9929-9 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L9928-9 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L9927-9 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L9806-32 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L11240-14 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L11236-21 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L10591-9 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L10039-10 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L10941-10 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L10937-10 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L10871-10 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L10846-10 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L10736-10 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L10643-10 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L10646-10 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L10591-10 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L10478-10 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L11046-9 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L10285-10 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L11093-9 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L10037-10 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L9929-10 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L9928-10 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L9927-10 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L9841-33 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L9806-33 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L11240-9 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L11238-9 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L11164-8 | Cobalt (total) | | | JL | J |
| KC WQA | CON/W | L10346-10 | Cobalt (total) | | | JL | J |
| KC WQA | DWO | L10591-4 | Cobalt (total) | | | JL | J |
| KC WQA | DWO | L11164-4 | Cobalt (total) | | | JL | J |
| KC WQA | DWO | L11093-4 | Cobalt (total) | | | JL | J |
| KC WQA | DWO | L11046-4 | Cobalt (total) | | | JL | J |
| KC WQA | DWO | L10941-4 | Cobalt (total) | | | JL | J |
| KC WQA | DWO | L10937-4 | Cobalt (total) | | | JL | J |
| KC WQA | DWO | L10871-4 | Cobalt (total) | | | JL | J |
| KC WQA | DWO | L10846-4 | Cobalt (total) | | | JL | J |
| KC WQA | DWO | L10736-4 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L11046-8 | Cobalt (total) | | | JL | J |
| KC WQA | DWO | L10646-4 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L9806-18 | Cobalt (total) | | | JL | J |
| KC WQA | DWO | L10478-4 | Cobalt (total) | | | JL | J |
| KC WQA | DWO | L10346-4 | Cobalt (total) | | | JL | J |
| KC WQA | DWO | L10285-4 | Cobalt (total) | | | JL | J |
| KC WQA | DWO | L10039-4 | Cobalt (total) | | | JL | J |
| KC WQA | DWO | L9928-4 | Cobalt (total) | | | JL | J |
| KC WQA | DWO | L9927-4 | Cobalt (total) | | | JL | J |
| KC WQA | DWO | L9841-36 | Cobalt (total) | | | JL | J |
| KC WQA | DWO | L9806-36 | Cobalt (total) | | | JL | J |

## Table B-1. Sample-specific data qualifier changes

| Sampling Event | Location | Sample ID | Analyte | Laboratory Qualifier | Validation Qualifier-original | Validation Qualifier-revised | Interpreted Qualifier |
|---|---|---|---|---|---|---|---|
| KC WQA | DWC | L11240-6 | Cobalt (total) | | | JL | J |
| KC WQA | DWO | L10643-4 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10346-17 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10991-17 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10941-17 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10937-17 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10871-17 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10846-17 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10736-17 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10643-17 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10646-17 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10591-17 | Cobalt (total) | | | JL | J |
| KC WQA | DWO | L11238-4 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10478-17 | Cobalt (total) | | | JL | J |
| KC WQA | DWO | L11240-4 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10285-17 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10039-17 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10037-17 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L9929-17 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L9928-17 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L9927-17 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L9885-17 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L9841-18 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L11093-6 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10519-17 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L10285-5 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L11238-6 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L10941-5 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L10937-5 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L10871-5 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L10846-5 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L10736-5 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L10643-5 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L10646-5 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L10591-5 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L11093-5 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L10346-5 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L11164-5 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L10039-5 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L9929-5 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L9928-5 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L9927-5 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L9841-34 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L9806-34 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L11240-8 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L11238-8 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L11093-14 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L10478-5 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L10346-6 | Cobalt (total) | | | JL | J |
| KC WQA | DHD | L11093-8 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L11046-6 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L10941-6 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L10937-6 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L10871-6 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L10846-6 | Cobalt (total) | | | JL | J |

## Table B-1. Sample-specific data qualifier changes

| Sampling Event | Location | Sample ID | Analyte | Laboratory Qualifier | Validation Qualifier-original | Validation Qualifier-revised | Interpreted Qualifier |
|---|---|---|---|---|---|---|---|
| KC WQA | DWC | L10736-6 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L10643-6 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L10646-6 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L11046-5 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L10478-6 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L11164-6 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L10285-6 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L10039-6 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L9929-6 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L9928-6 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L9927-6 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L9841-35 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L9806-35 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L11240-5 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L11238-5 | Cobalt (total) | | | JL | J |
| KC WQA | DWC | L10591-6 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L9841-27 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L10519-26 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L10478-26 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L10346-26 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L10285-26 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L10039-26 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L10037-26 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L9929-26 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L9928-26 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L10871-25 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L9885-26 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L10643-26 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L9806-27 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L11240-25 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L11238-25 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L11236-25 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L11164-25 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L11046-25 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L10991-25 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L10941-25 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L11238-14 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L9927-26 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L11236-26 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L10285-11 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L10039-11 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L10037-11 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L9929-11 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L9928-11 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L9927-11 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L9885-11 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L9841-30 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L9806-30 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L10591-26 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L11238-26 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L10646-26 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L11164-26 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L11046-26 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L10991-26 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L10941-26 | Cobalt (total) | | | JL | J |

## Table B-1. Sample-specific data qualifier changes

| Sampling Event | Location | Sample ID | Analyte | Laboratory Qualifier | Validation Qualifier-original | Validation Qualifier-revised | Interpreted Qualifier |
|---|---|---|---|---|---|---|---|
| KC WQA | CHE/W | L10937-26 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L10871-26 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L10846-26 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L10736-26 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L10846-25 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L11240-26 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L10039-22 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L10871-22 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L10846-22 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L10736-22 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L10643-22 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L10646-22 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L10591-22 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L10519-22 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L10478-22 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L10937-25 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L10285-22 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L11046-22 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L10037-22 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L9929-22 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L9928-22 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L9927-22 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L9885-22 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L9841-23 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L9806-23 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L11240-21 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L10346-22 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L9928-25 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L10736-25 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L10643-25 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L10646-25 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L10591-25 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L10519-25 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L10478-25 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L10346-25 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L10285-25 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L10039-25 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L10941-22 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L9929-25 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L10991-22 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L9927-25 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L9885-25 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L9841-26 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L9806-26 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L11240-22 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L11238-22 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L11236-22 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L11164-22 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L10519-11 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/W | L10037-25 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L10643-13 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L11238-13 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L11164-13 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L11093-13 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L11046-13 | Cobalt (total) | | | JL | J |

## Table B-1. Sample-specific data qualifier changes

| Sampling Event | Location | Sample ID | Analyte | Laboratory Qualifier | Validation Qualifier-original | Validation Qualifier-revised | Interpreted Qualifier |
|---|---|---|---|---|---|---|---|
| KC WQA | CON/E | L10991-13 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L10941-13 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L10937-13 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L10871-13 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L10346-11 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L10736-13 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L9841-29 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L10646-13 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L10591-13 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L10519-13 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L10478-13 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L10346-13 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L10285-13 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L10039-13 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L10037-13 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L9929-13 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L10846-13 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L10478-14 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L11046-14 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L10991-14 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L10941-14 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L10937-14 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L10871-14 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L10846-14 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L10736-14 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L10643-14 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L10646-14 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L11240-13 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L10519-14 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L9806-29 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L10346-14 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L10285-14 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L10039-14 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L10037-14 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L9929-14 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L9928-14 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L9927-14 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L9885-14 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L9885-13 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L10591-14 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L10991-11 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L9928-13 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L9928-12 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L9927-12 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L9885-12 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L9841-31 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L9806-31 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L11240-11 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L11238-11 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L11164-11 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L10037-12 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L11046-11 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L10039-12 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L10941-11 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L10937-11 | Cobalt (total) | | | JL | J |

## Table B-1. Sample-specific data qualifier changes

| Sampling Event | Location | Sample ID | Analyte | Laboratory Qualifier | Validation Qualifier-original | Validation Qualifier-revised | Interpreted Qualifier |
|---|---|---|---|---|---|---|---|
| KC WQA | CON/C | L10871-11 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L10846-11 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L10736-11 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L10643-11 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L10646-11 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L10591-11 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L11164-17 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L11093-11 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L10871-12 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L10478-11 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L9841-28 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L9806-28 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L11240-12 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L11238-12 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L11164-12 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L11093-12 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L11046-12 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L10991-12 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L9929-12 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L10937-12 | Cobalt (total) | | | JL | J |
| KC WQA | CON/E | L9927-13 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L10846-12 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L10736-12 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L10643-12 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L10646-12 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L10591-12 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L10519-12 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L10478-12 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L10346-12 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L10285-12 | Cobalt (total) | | | JL | J |
| KC WQA | CON/C | L10941-12 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L9885-33 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L10591-33 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L10519-33 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L10478-33 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L10346-33 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L10285-33 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L10039-33 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L10037-33 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L9929-33 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10937-36 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L9927-33 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L10736-33 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L9841-4 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L9806-4 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L11240-36 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L11238-36 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L11236-36 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L11164-36 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L11046-36 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10991-36 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L11046-17 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L9928-33 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L11238-33 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L10346-34 | Cobalt (total) | | | JL | J |

## Table B-1. Sample-specific data qualifier changes

| Sampling Event | Location | Sample ID | Analyte | Laboratory Qualifier | Validation Qualifier-original | Validation Qualifier-revised | Interpreted Qualifier |
|---|---|---|---|---|---|---|---|
| KC WQA | SWM/E | L10285-34 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L10039-34 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L10037-34 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L9929-34 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L9928-34 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L9927-34 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L9885-34 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L9841-5 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L10646-33 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L11240-33 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L10643-33 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L11236-33 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L11164-33 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L11046-33 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L10991-33 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L10941-33 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L10937-33 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L10871-33 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L10846-33 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10871-36 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L9806-5 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10346-35 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10941-35 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10937-35 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10871-35 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10846-35 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10736-35 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10643-35 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10646-35 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10591-35 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10941-36 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10478-35 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L11164-35 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10285-35 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10039-35 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10037-35 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L9929-35 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L9928-35 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L9927-35 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L9885-35 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L9841-6 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L9806-6 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10519-35 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L9929-36 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10846-36 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10736-36 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10643-36 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10646-36 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10591-36 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10519-36 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10478-36 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10346-36 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10285-36 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10991-35 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10037-36 | Cobalt (total) | | | JL | J |

## Table B-1. Sample-specific data qualifier changes

| Sampling Event | Location | Sample ID | Analyte | Laboratory Qualifier | Validation Qualifier-original | Validation Qualifier-revised | Interpreted Qualifier |
|---|---|---|---|---|---|---|---|
| KC WQA | SWM/C | L11046-35 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L9928-36 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L9927-36 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L9885-36 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L9841-7 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L9806-7 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L11240-35 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L11238-35 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L11236-35 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L10591-34 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/C | L10039-36 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L10736-38 | Cobalt (total) | | | JL | J |
| KC WQA | TGS | L9806-1 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L11240-38 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L11238-38 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L11236-38 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L11164-38 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L11046-38 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L10941-38 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L10937-38 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L10478-34 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L10846-38 | Cobalt (total) | | | JL | J |
| KC WQA | TGS | L9928-1 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L10643-38 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L10646-38 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L10591-38 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L10519-38 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L10478-38 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L10346-38 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L10285-38 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L10039-38 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L10037-38 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L10871-38 | Cobalt (total) | | | JL | J |
| KC WQA | TGS | L10646-1 | Cobalt (total) | | | JL | J |
| KC WQA | TGS | L11238-1 | Cobalt (total) | | | JL | J |
| KC WQA | TGS | L11164-1 | Cobalt (total) | | | JL | J |
| KC WQA | TGS | L11093-1 | Cobalt (total) | | | JL | J |
| KC WQA | TGS | L11046-1 | Cobalt (total) | | | JL | J |
| KC WQA | TGS | L10991-1 | Cobalt (total) | | | JL | J |
| KC WQA | TGS | L10937-1 | Cobalt (total) | | | JL | J |
| KC WQA | TGS | L10871-1 | Cobalt (total) | | | JL | J |
| KC WQA | TGS | L10846-1 | Cobalt (total) | | | JL | J |
| KC WQA | TGS | L10736-1 | Cobalt (total) | | | JL | J |
| KC WQA | TGS | L9841-1 | Cobalt (total) | | | JL | J |
| KC WQA | TGS | L10643-1 | Cobalt (total) | | | JL | J |
| KC WQA | TGS | L9927-1 | Cobalt (total) | | | JL | J |
| KC WQA | TGS | L10591-1 | Cobalt (total) | | | JL | J |
| KC WQA | TGS | L10519-1 | Cobalt (total) | | | JL | J |
| KC WQA | TGS | L10478-1 | Cobalt (total) | | | JL | J |
| KC WQA | TGS | L10346-1 | Cobalt (total) | | | JL | J |
| KC WQA | TGS | L10285-1 | Cobalt (total) | | | JL | J |
| KC WQA | TGS | L10039-1 | Cobalt (total) | | | JL | J |
| KC WQA | TGS | L10037-1 | Cobalt (total) | | | JL | J |
| KC WQA | TGS | L9929-1 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L9927-38 | Cobalt (total) | | | JL | J |

## Table B-1. Sample-specific data qualifier changes

| Sampling Event | Location | Sample ID | Analyte | Laboratory Qualifier | Validation Qualifier-original | Validation Qualifier-revised | Interpreted Qualifier |
|---|---|---|---|---|---|---|---|
| KC WQA | TGS | L10651-1 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L11046-34 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L9929-38 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L9929-37 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L9928-37 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L9927-37 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L9885-37 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L9841-8 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L9806-8 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L11240-34 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L11238-34 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L10039-37 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L11164-34 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L10285-37 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L10991-34 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L10941-34 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L10937-34 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L10871-34 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L10846-34 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L10736-34 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L10643-34 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L10646-34 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/W | L11164-3 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L11236-34 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L10937-37 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/E | L10519-34 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L9885-38 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L9841-9 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L9806-9 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L11240-37 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L11238-37 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L11236-37 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L11164-37 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L11046-37 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L10037-37 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L10941-37 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L9928-38 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L10871-37 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L10846-37 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L10736-37 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L10643-37 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L10646-37 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L10591-37 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L10519-37 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L10478-37 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L10346-37 | Cobalt (total) | | | JL | J |
| KC WQA | SWM/W | L10991-37 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L9806-17 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10478-16 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10346-16 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10285-16 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10039-16 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10037-16 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L9929-16 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L9928-16 | Cobalt (total) | | | JL | J |

## Table B-1. Sample-specific data qualifier changes

| Sampling Event | Location | Sample ID | Analyte | Laboratory Qualifier | Validation Qualifier-original | Validation Qualifier-revised | Interpreted Qualifier |
|---|---|---|---|---|---|---|---|
| KC WQA | HNF/E | L9927-16 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L10285-19 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L9841-17 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10646-16 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L11240-15 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L11238-15 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L11164-15 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L11093-15 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L11046-15 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10991-15 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10941-15 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10937-15 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10871-15 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L9885-16 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L11093-16 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/W | L11240-3 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L10037-19 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L9929-19 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L9928-19 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L9927-19 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L9885-19 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L9841-20 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L9806-20 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L11240-16 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10519-16 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L11164-16 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10591-16 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L11046-16 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10991-16 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10941-16 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10937-16 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10871-16 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10846-16 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10736-16 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10643-16 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10643-15 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L11238-16 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10037-18 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10846-15 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10846-18 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10736-18 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10643-18 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10646-18 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10591-18 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10519-18 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10478-18 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10346-18 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10937-18 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10039-18 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10941-18 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L9929-18 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L9928-18 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L9927-18 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L9885-18 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L9841-19 | Cobalt (total) | | | JL | J |

## Table B-1. Sample-specific data qualifier changes

| Sampling Event | Location | Sample ID | Analyte | Laboratory Qualifier | Validation Qualifier-original | Validation Qualifier-revised | Interpreted Qualifier |
|---|---|---|---|---|---|---|---|
| KC WQA | HNF/C | L9806-19 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L11240-17 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L11238-17 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L11164-21 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10285-18 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L9927-15 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L10346-19 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10646-15 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10591-15 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10519-15 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10478-15 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10346-15 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10285-15 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10039-15 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10037-15 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10871-18 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L9928-15 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L10736-15 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L9885-15 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L9841-16 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L9806-16 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L11240-18 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L11238-18 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L11164-18 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L11093-18 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L11046-18 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L10991-18 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/E | L9929-15 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/E | L10643-2 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/E | L11238-2 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/E | L11164-2 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/E | L11093-2 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/E | L11046-2 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/E | L10991-2 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/E | L10937-2 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/E | L10871-2 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/E | L10846-2 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L10039-19 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/E | L10651-2 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/W | L9841-3 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/E | L10646-2 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/E | L10591-2 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/E | L10519-2 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/E | L10478-2 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/E | L10346-2 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/E | L10285-2 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/E | L10039-2 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/E | L10037-2 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/E | L9929-2 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/E | L10736-2 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/W | L10591-3 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/C | L11093-17 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/W | L11093-3 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/W | L11046-3 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/W | L10991-3 | Cobalt (total) | | | JL | J |

## Table B-1. Sample-specific data qualifier changes

| Sampling Event | Location | Sample ID | Analyte | Laboratory Qualifier | Validation Qualifier-original | Validation Qualifier-revised | Interpreted Qualifier |
|---|---|---|---|---|---|---|---|
| KC WQA | NFK/W | L10937-3 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/W | L10871-3 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/W | L10846-3 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/W | L10736-3 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/W | L10651-3 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/E | L11240-2 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/W | L10646-3 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/W | L9806-3 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/W | L10478-3 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/W | L10346-3 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/W | L10285-3 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/W | L10039-3 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/W | L10037-3 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/W | L9929-3 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/W | L9928-3 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/W | L9927-3 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/E | L9841-2 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/W | L10643-3 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L10941-19 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/E | L9928-2 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L9927-20 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L9885-20 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L9841-21 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L9806-21 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L11240-19 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L11238-19 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L11164-19 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L11093-19 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L9929-20 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L10991-19 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L10037-20 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L10937-19 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L10871-19 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L10846-19 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L10736-19 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L10643-19 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L10646-19 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L10591-19 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L10519-19 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L10478-19 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L11046-19 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L10846-20 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/W | L11238-3 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/E | L9806-2 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L11240-20 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L11238-20 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L11164-20 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L11093-20 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L11046-20 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L10991-20 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L10941-20 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L9928-20 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L10871-20 | Cobalt (total) | | | JL | J |
| KC WQA | NFK/E | L9927-2 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L10736-20 | Cobalt (total) | | | JL | J |

## Table B-1. Sample-specific data qualifier changes

| Sampling Event | Location | Sample ID | Analyte | Laboratory Qualifier | Validation Qualifier-original | Validation Qualifier-revised | Interpreted Qualifier |
|---|---|---|---|---|---|---|---|
| KC WQA | HNF/W | L10643-20 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L10646-20 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L10591-20 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L10519-20 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L10478-20 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L10346-20 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L10285-20 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L10039-20 | Cobalt (total) | | | JL | J |
| KC WQA | HNF/W | L10937-20 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L11238-21 | Cobalt (total) | | | JL | J |
| KC WQA | TGS | L11240-1 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L11238-28 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L10285-31 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L10039-31 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L10037-31 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L9929-31 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L9928-31 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L9927-31 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L9885-31 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L9841-14 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10643-28 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L11240-28 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L10519-31 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L11236-28 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L11164-28 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L11046-28 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10991-28 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10941-28 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10937-28 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10871-28 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10846-28 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L9806-14 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L11046-31 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L10037-32 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L9929-32 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L9928-32 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L9927-32 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L9885-32 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L9841-15 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L9806-15 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L11240-31 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L11238-31 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L10346-31 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L11164-31 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L10478-31 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L10941-31 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L10937-31 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L10871-31 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L10846-31 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L10736-31 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L10643-31 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L10646-31 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L10591-31 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10646-28 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L11236-31 | Cobalt (total) | | | JL | J |

## Table B-1. Sample-specific data qualifier changes

| Sampling Event | Location | Sample ID | Analyte | Laboratory Qualifier | Validation Qualifier-original | Validation Qualifier-revised | Interpreted Qualifier |
|---|---|---|---|---|---|---|---|
| KC WQA | BRN/E | L9929-27 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10736-27 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10643-27 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10646-27 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10591-27 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10519-27 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10478-27 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10346-27 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10285-27 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10736-28 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10037-27 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10937-27 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L9928-27 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L9927-27 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L9885-27 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L9841-10 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L9806-10 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L11240-30 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L11238-30 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L11236-30 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L11164-30 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10039-27 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L9841-11 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10591-28 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10519-28 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10478-28 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10346-28 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10285-28 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10039-28 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10037-28 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L9929-28 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L9928-28 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10846-27 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L9885-28 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10871-27 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L9806-11 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L11240-27 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L11238-27 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L11236-27 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L11164-27 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L11046-27 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10991-27 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L10941-27 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L10346-32 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/E | L9927-28 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L10646-24 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L11236-24 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L11164-24 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L11046-24 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L10991-24 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L10941-24 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L10937-24 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L10871-24 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L10846-24 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L10039-32 | Cobalt (total) | | | JL | J |

## Table B-1. Sample-specific data qualifier changes

| Sampling Event | Location | Sample ID | Analyte | Laboratory Qualifier | Validation Qualifier-original | Validation Qualifier-revised | Interpreted Qualifier |
|---|---|---|---|---|---|---|---|
| KC WQA | CHE/C | L10643-24 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L9806-22 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L10591-24 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L10519-24 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L10478-24 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L10346-24 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L10285-24 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L10039-24 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L10037-24 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L9929-24 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L9928-24 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L10736-24 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L10346-21 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L11046-21 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L10991-21 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L10941-21 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L10871-21 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L10846-21 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L10736-21 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L10643-21 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L10646-21 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L10591-21 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L11238-24 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L10478-21 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L11240-24 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L10285-21 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L10039-21 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L10037-21 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L9929-21 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L9928-21 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L9927-21 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L9885-21 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L9841-22 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L9841-25 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/E | L10519-21 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L10937-32 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L9927-24 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L9885-23 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L9841-24 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L9806-24 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L11240-32 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L11238-32 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L11236-32 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L11164-32 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L11046-32 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L9928-23 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L10941-32 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L9929-23 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L10871-32 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L10846-32 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L10736-32 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L10643-32 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L10646-32 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L10591-32 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L10519-32 | Cobalt (total) | | | JL | J |

## Table B-1. Sample-specific data qualifier changes

| Sampling Event | Location | Sample ID | Analyte | Laboratory Qualifier | Validation Qualifier-original | Validation Qualifier-revised | Interpreted Qualifier |
|---|---|---|---|---|---|---|---|
| KC WQA | BRN/W | L10478-32 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L10941-30 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L10991-32 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L10736-23 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/W | L10285-32 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L9806-25 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L11240-23 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L11238-23 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L11164-23 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L11046-23 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L10991-23 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L10941-23 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L10937-23 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L9927-23 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L10846-23 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L9885-24 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L10643-23 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L10646-23 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L10591-23 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L10519-23 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L10478-23 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L10346-23 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L10285-23 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L10039-23 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L10037-23 | Cobalt (total) | | | JL | J |
| KC WQA | CHE/C | L10871-23 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L11046-30 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L10591-29 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L11164-29 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L11046-29 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L10991-29 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L10941-29 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L10937-29 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L10871-29 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L10846-29 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L10736-29 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L10646-29 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L11240-29 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L10519-29 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L10478-29 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L10346-29 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L10285-29 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L10039-29 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L10037-29 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L9929-29 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L9928-29 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L9927-29 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L10643-29 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L10285-30 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L10937-30 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L10871-30 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L10846-30 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L10736-30 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L10643-30 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L10646-30 | Cobalt (total) | | | JL | J |

## Table B-1. Sample-specific data qualifier changes

| Sampling Event | Location | Sample ID | Analyte | Laboratory Qualifier | Validation Qualifier-original | Validation Qualifier-revised | Interpreted Qualifier |
|---|---|---|---|---|---|---|---|
| KC WQA | BRN/C | L10591-30 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L10519-30 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L11236-29 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L10346-30 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L11238-29 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L10039-30 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L10037-30 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L9929-30 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L9928-30 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L9927-30 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L9885-30 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L9841-13 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L9806-13 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L9806-12 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L10478-30 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L9885-29 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L10991-30 | Cobalt (total) | | | JL | J |
| KC WQA | BRN/C | L9841-12 | Cobalt (total) | | | JL | J |