Susitna-Watana Hydroelectric Project

(FERC No. 14241)

Water Quality and Mercury Monitoring Program

Data Validation Technical Memo

Prepared for

Alaska Energy Authority



Prepared by

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ATTACHMENTS

Attachment A: Analytical Results with Hand-entered Data Qualifiers for SDG 1132615

Attachment B: Chain-of-Custody Documentation for SDG 1132615

List of Acronyms, Abbreviations, and definitions

|  |  |
| --- | --- |
| Abbreviation | Definition |
| ADEC | Alaska Department of Environmental Conservation |
| CLP | C**ontract Laboratory Program** |
| COC | Chain of Custody |
| DOC | Dissolved Organic Carbon |
| EPA | Environmental Protection Agency |
| ICP | Inductively coupled plasma |
| LCS | Laboratory control sample |
| LL | Low level |
| MDL | Minimum detection limit |
| MS | Matrix spike |
| MSD | Matrix spike duplicate |
| NFG | National Functional Guidelines |
| QAPP | Quality assurance project plan |
| QC | Quality control |
| RL | Reporting limit |
| RPD | Relative percent difference |
| SDG | Sample delivery group |
| SM | Standard Method |
| TDS | Total dissolved solids |
| TKN | Total Kjeldahl nitrogen |
| TOC | Total organic carbon |
| TSS | Total suspended solids |

# Introduction

Tetra Tech, Inc. conducted data validation of the analytical results for 14 water samples (including one field blank, one field duplicate, and one trip blank) collected at project river mile (PRM) 187.2 (Susitna at Watana Dam) on June 24, 2013. Analytical results from these samples were provided in sample delivery group (SDG) 1132615 (Table 1.1-1). Data were collected as part of the Susitna-Watana Hydroelectric Project (Project). SGS North American, Inc. (an ADEC certified and ISO17025 and DOD ELAP accredited laboratory) conducted all analyses.

# Parameters Measured

The samples were analyzed for alkalinity by Standard Methods 21st Edition (SM21) 2320B, ammonia (NH3) by SM21 4500-NH3 G, dissolved hardness by SM21 2340B, total and dissolved low-level (LL) mercury by EPA 1631E, dissolved organic carbon (DOC) by SM 5310B, total and dissolved LL metals by EPA 200.8, nitrate/nitrite by 4500NO3-F, pH by 4500 H B, total phosphorus (TP) and soluble reactive phosphorus (SRP) by 4500P-B,E, total Kjeldahl nitrogen (TKN) by 4500-N D, total dissolved solids (TDS) by SM21 2540C, total suspended solids (TSS) by SM21 2540D, and turbidity by SM21 2130B.

# Laboratory Performance Evaluation

## Data Qualifiers

Analytical data were evaluated in general accordance with the EPA C**ontract Laboratory Program (CLP) National Functional Guidelines (NFG) for Inorganic Superfund Data Review (January 2010)** data validation guidance document and the *Quality Assurance Project Plan for Water Quality and Mercury Monitoring Program for the Susitna-Watana Hydroelectric Project Water Quality Study Susitna River, Southcentral Alaska* (the QAPP) (March 2014)**.** Table 3.1-1 summarizes a list of qualifiers that may have been used for the validation of this data package:

# Data Evaluation

Data were evaluated based on parameters including in the following sections.

## Data Completeness

SDG No. 1132615 was complete as submitted.

## Sample Preservation, Receipt, and Holding Times

Sample preservation, receipt, and holding times were acceptable with the following exceptions. Two of the coolers arrived at the laboratory at temperatures of -2.9 and -0.1 degrees Celsius (ºC), below the QAPP-specified temperature range of 0 to 6 ºC. One or more sample containers for samples WQSWB142.3RT, WQSWB142.3RD and WQSWB142.3LT contained ice. No sample containers were broken. Results for the samples transported in the cooler that was -0.1 ºC were not qualified, since they were only slightly out of compliance. Detected results for samples transported in the cooler that was -2.9 ºC were qualified as estimated and possibly biased low (J-). This qualification applies to samples WQSWB142.3RT (only dissolved mercury), WQSWB142.3RB, WQSWB142.3MT, WQSWB142.3RD, WQSWB142.3LT, and WQSWB142.3LB. Not detected results for samples transport in the cooler that was -2.9 ºC were qualified as estimated (UJ). This impacted the total mercury result for samplesWQSWB142.3RT.

## Laboratory and Field Blanks

One of the method blanks associated with the total nitrate/nitrite analysis contained total nitrate/nitrite below the reporting limit (RL). All associated results were non-detects so no data were qualified. The method blank result associated with the turbidity analyses was equal to the RL. All associated sample results, except for the field blank, were greater than 10 times the blank concentration, so were not qualified. The turbidity result for field blank sample WQSWB118.6FB was qualified as estimated and possibly biased high (J+). One of the method blanks associated with the dissolved TOC analysis had a result below the RL. Dissolved TOC results for sample WQSWB118.6FB were less than the RL, so was flagged as not detected (U). Both method blanks associated with the TP analysis had detected results below the RL. All associated sample results, except the field blank, were greater than 10 times the blank results, so were not qualified. The TP result for field blank sample WQSWB118.6FB was qualified as not detected (U).

Field blank sample WQSWB118.6FB was collected in the field by pouring analyte-free water through new sampling equipment (i.e., tubing, filters) to assess the potential for contamination during sample collection. It was analyzed for total LL metals, dissolved LL metals and hardness, total and dissolved LL mercury, turbidity, alkalinity, TDS, TSS, pH, TKN, ammonia, total nitrate/nitrite, TP, dissolved organic carbon (DOC), and SRP. The total LL metals analysis revealed copper and iron below RLs and manganese and zinc above RLs. The dissolved LL metals analysis revealed arsenic, barium, iron, and manganese below RLs. Detected associated results above RLs but less than 10 times the blank results were qualified as estimated and possibly biased high (J+). Detected associated results below RLs were qualified as not detected (U). Field blank analysis for total mercury, dissolved mercury, TP, and DOC had detected results below RLs. However, all had been qualified as not detected (U) due to method or trip blank contamination so further qualification was unnecessary. Turbidity results for the field blank were below RLs and TDS and TSS above RLs. Associated detected results below RLs were qualified as not detected (U). Associated detected results above RLs but less than 10 times the field blank results were qualified as estimated and possibly biased high (J+). Field blank associated qualifications are listed on Table 4.3-1.

The trip blank associated with the low level mercury analysis contained mercury below the RL. Associated detected mercury results less than the RL were qualified as not detected (U). Detected mercury results above RLs but less than 10x the blank result were qualified as estimated and possibly biased high (J+). The dissolved mercury results for samples WQSWB142.3RB, WQSWB142.3MT, WQSWB142.3RD, WQSWB142.3LT, WQSWB142.3LB, WQSWB118.6LT, WQSWB118.6LB, WQSWB118.6MT, WQSWB118.6MB, WQSWB118.6RT, WQSWB118.6RB, and field blank WQSWB118.6FB and the total mercury result for field blank WQSWB118.6FB were qualified as not detected (U).

## Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSD analyses were performed on sample WQSWB118.6LB. Percent recoveries and relative percent differences were within quality control (QC) limits with the following exceptions. For the total metals analysis, arsenic, barium, calcium, copper, iron, lead, magnesium, manganese, nickel, vanadium, and zinc were recovered from the MS below the QAPP-specified QC limit and arsenic, barium, copper, iron, lead, manganese, nickel, vanadium, and zinc were recovered from the MSD below the QAPP-specified QC limit. For barium, calcium, iron, magnesium, manganese, nickel and vanadium, the sample concentration was greater than four times the spiked amount, overwhelming the spiking solution, so no qualifications were applied. Also, total zinc results for samples WQSWB142.3RT, WQSWB142.3RB, WQSWB142.3MT, WQSWB142.3RD, WQSWB142.3LT, and WQSWB142.3LB were already qualified as estimated with a possible high bias (J+) due to field blank contamination, so were not qualified further. The remaining total metals results were qualified as shown in Table 4.4-1. The project-specific MS for the TP analysis was recovered above the QC limit. All detected TP results were rejected as unusable (R) due to suspect matrix interference (Table 4.4-1). One or more MSs for the total nitrate/nitrite and DOC analyses exceeded QC criteria, but were performed on non-project samples so were not considered for this verification effort.

## Laboratory Duplicate Sample Analysis

Laboratory duplicate relative percent differences (RPDs) for the various analyses were within specified quality control (QC) limits with the following exceptions. One of the turbidity laboratory duplicate RPDs (15.4) exceeded the QAPP-specified QC limit of 10, but the other duplicate RPD didn’t. Neither exceeded the laboratory QC limit of 20. No data were qualified. Two of three TDS laboratory duplicate RPDs exceeded the QC limit of 5. TDS results for the associated samples were qualified as estimated (J). This impacted samples WQSWB142.3RB, WQSWB142.3MT, WQSWB142.3RD, WQSWB142.3LT, WQSWB142.3LB, WQSWB118.6LT, WQSWB118.6LB, WQSWB118.6MT, and WQSWB118.6FB. The remaining TDS results had been qualified as estimated with a high bias (J+) because of field blank contamination so were not qualified further.

## Spike Sample Analysis

Post digestion spikes were performed successfully for all samples due to matrix interference.

## ICP Serial Dilution

No inductively coupled plasma (ICP) serial dilution results were provided in the data package.

## Field Duplicates

Field duplicate pair WQSWB142.3RT and WQSWB142.3RD were analyzed for alkalinity, NH3, dissolved hardness, total and dissolved LL mercury, DOC, total and dissolved LL metals, nitrate/nitrite, pH, TP, SRP, TKN, TDS, TSS, and turbidity. RPDs were within QAPP-specified control limits except for those identified in Table 4.8-1.

## Laboratory Control Sample (LCS) and LCS Duplicates (LCSD)

All LCS and LCSD percent recoveries and RPDs were within the QC limits.

## Sample Dilution

Some of the samples were diluted to place the results within the calibration range and/or to minimize matrix interferences. Dilutions are summarized on Table 4.10-1.

## Re-extraction and Re-analysis

No re-extraction or reanalysis was required for the samples analyzed within this SDG.

## Analyte Quantitation and Reported Detection Limit

Sample results below the calibration range, or less than the RL but greater than the MDL, were qualified as estimated (flagged J), unless previously qualified due to other QC exceedances.

## Overall Assessment of Data

The overall quality of this data package was acceptable. No results required rejection for this SDG. The analytical results were qualified as indicated in the above sections for QC exceedances. All data can be used as qualified.

# Literature Cited

U.S. Environmental Protection Agency. 2010. National Functional Guidelines for Inorganic Superfund Data Review. Office of Superfund Remediation and Technology Innovation. Document USEPA-540-R-10-011.

# Tables

Table 1.1‑1. Sample and Laboratory IDs for SDG 1132615

|  |  |  |
| --- | --- | --- |
|  | **Sample ID** | **Laboratory ID** |
| **Samples:** | WQSWB142.3RT  WQSWB142.3RB  WQSWB142.3MT  WQSWB142.3LT  WQSWB142.3LB  WQSWB118.6LT  WQSWB118.6LB  WQSWB118.6MT  WQSWB118.6MB  WQSWB118.6RT  WQSWB118.6RB | 1132615001 and 1132615007  1132615002 and 1132615008  1132615003 and 1132615009  1132615005 and 1132615011  1132615006 and 1132615012  1132615013 and 1132615023  1132615014 and 1132615024  1132615018 and 1132615025  1132615019 and 1132615026  1132615020 and 1132615027  1132615021 and 1132615028 |
| **Field Duplicates:** | WQSWB142.3RD (duplicate of WQSWB142.3RT) | 1132615004 and 1132615010 |
| **Field Blank:** | WQSWB118.6FB | 1132615022 and 1132615029 |
| **Trip Blank:** | LL Hg Trip Blank | 1132615030 |

Table 3.1-1. Data Qualifier Definitions

|  |  |
| --- | --- |
| J = | The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample. |
| J+ = | The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may be biased high. |
| J- = | The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may be biased low. |
| NJ = | The analysis indicates the presence of an analyte that has been “tentatively identified” and the associated value is the approximate concentration of the analyte in the sample. |
| R = | The sample result is rejected as unusable due to serious deficiencies in one or more quality control (QC) criteria. The analyte may or may not be present in the sample. |
| U = | The analyte was analyzed for, but was not detected at or above the associated value (reporting limit [RL]). |
| UJ = | The analyte was analyzed for, but was not detected at or above the associated value (RL), which is considered approximate due to deficiencies in one or more QC criteria. |

Table 4.3-1. Qualifiers Associated with Method Blanks

| **Analyte** | **Qualifier** | **Affected Samples** |
| --- | --- | --- |
| Turbidity | J+ | WQSWB118.6FB |
| Total Organic Carbon | U | WQSWB118.6FB |
| Total Phosphorus | U | WQSWB118.6FB |

Table 4.3-2. Qualifiers Associated with Field Blanks

| **Analyte** | **Qualifier** | **Affected Samples** |
| --- | --- | --- |
| Total Zinc | J+ | WQSWB142.3RT, WQSWB142.3RB, WQSWB142.3MT, WQSWB142.3RD, WQSWB142.3LT, and WQSWB142.3LB |
| Total Dissolved Solids | J+ | WQSWB142.3RT, WQSWB118.6MB, WQSWB118.6RT, WQSWB118.6RB, |
| Total Nitrate/Nitrite | U | WQSWB142.3RT |
| Dissolved Arsenic | J+ | WQSWB142.3RT, WQSWB142.3RB, WQSWB142.3MT, WQSWB142.3RD, WQSWB142.3LT, and WQSWB142.3LB, WQSWB118.6LT, WQSWB118.6LB, WQSWB118.6MT, WQSWB118.6MB, WQSWB118.6RT, and WQSWB118.6RB |
| Dissolved Iron | J+ | WQSWB142.3RT, WQSWB142.3RB, WQSWB142.3MT, WQSWB142.3RD, WQSWB142.3LT, and WQSWB142.3LB, WQSWB118.6LT, WQSWB118.6LB, WQSWB118.6MT, WQSWB118.6MB, WQSWB118.6RT, and WQSWB118.6RB |

Table 4.4-1. Qualifiers Associated with MS/MSD Results

| **Analyte** | **Qualifier** | **Affected Samples** |
| --- | --- | --- |
| Total Arsenic | J- | WQSWB142.3RT, WQSWB142.3RB, WQSWB142.3MT, WQSWB142.3RD, WQSWB142.3LT, and WQSWB142.3LB, WQSWB118.6LT, WQSWB118.6LB, WQSWB118.6MT, WQSWB118.6MB, WQSWB118.6RT, and WQSWB118.6RB |
| Total Copper, Total Lead, and Total Zinc | J | WQSWB118.6LT, WQSWB118.6LB, WQSWB118.6MT, WQSWB118.6MB, WQSWB118.6RT, and WQSWB118.6RB |
| Total Arsenic and Total Lead | UJ | WQSWB118.6FB |
| Total Zinc | J | WQSWB118.6FB |
| Total Phosphorus | R | WQSWB142.3RT, WQSWB142.3RB, WQSWB142.3MT, WQSWB142.3RD, WQSWB142.3LT, and WQSWB142.3LB, WQSWB118.6LT, WQSWB118.6LB, WQSWB118.6MT, WQSWB118.6MB, WQSWB118.6RT, and WQSWB118.6RB |

Table 4.8-1. Field Replicate RPDs that Exceed Quality Control Criteria and Action

|  |  |  |
| --- | --- | --- |
| **Analyte** | **Relative Percent Difference (RPD)** | **Action** |
| Dissolved Cobalt | 50 | Both results were qualified as estimated (J/UJ). |
| Dissolved Iron | 21 | No data were qualified since the RPD only exceeds QC criterion by 1 (21 verses 20) and both results were < 5 times the RL. |
| Total Mercury | 200 | Both results were qualified as estimated (J/UJ). |
| Dissolved Mercury | 181 | Both results were qualified as estimated (J/UJ). |
| Soluble Reactive Phosphorus | 200 | Both results were qualified as estimated (J/UJ) |
| Total Suspended Solids | 7 | Both results were qualified as estimated (J/UJ) |

Field duplicate sample pair includes samples WQSWB142.3RT and WQSWB142.3RT

Table 4.10-2. Sample Dilutions

|  |  |  |
| --- | --- | --- |
| **Analysis** | **Dilution Factor** | **Samples** |
| Dissolved and Total Metals | 2.5 | WQSWB142.3RT, WQSWB142.3LT, and WQSWB118.6FB |
| Turbidity | 20 | WQSWB142.3RT, WQSWB142.3RB, WQSWB142.3MT, WQSWB142.3RD, WQSWB142.3LT, WQSWB142.3LB, WQSWB118.6LT, WQSWB118.6LB, WQSWB118.6MT, WQSWB118.6MB, WQSWB118.6RT, and WQSWB118.6RB |
| Total Nitrate/Nitrite | 10 | WQSWB142.3RT, WQSWB142.3RB, WQSWB142.3RD, WQSWB142.3LB, WQSWB118.6LT, WQSWB118.6MT, WQSWB118.6MB, WQSWB118.6RT, WQSWB118.6RB, and WQSWB118.6FB |
| Total Phosphorus | 5 | WQSWB142.3RT, WQSWB142.3RB, WQSWB142.3MT, WQSWB142.3RD, WQSWB142.3LT, WQSWB142.3LB, WQSWB118.6LT, WQSWB118.6LB, WQSWB118.6MT, WQSWB118.6MB, WQSWB118.6RT, and WQSWB118.6RB |
| Total and Dissolved Metals (except Iron) | 2.5 | WQSWB142.3RB, WQSWB142.3MT, WQSWB142.3RD WQSWB142.3LB, WQSWB118.6LT, and WQSWB118.6MT |
| Total Iron | 100 | WQSWB142.3RB, WQSWB142.3MT, WQSWB142.3RD, and WQSWB142.3LB, |
| Total Nitrate/Nitrite | 20 | WQSWB142.3MT, WQSWB142.3LT, and WQSWB118.6LB |
| Dissolved Metals | 2.5 | WQSWB142.3RB, WQSWB142.3MT, WQSWB142.3RD, WQSWB142.3LT, WQSWB142.3LB, WQSWB118.6LT, WQSWB118.6LB, WQSWB118.6MT, WQSWB118.6MB, WQSWB118.6RT, and WQSWB118.6RB |
| Total Iron | 200 | WQSWB118.6LT, WQSWB118.6MT |
| Total Metals (except Barium, Calcium, Iron, Manganese, and Nickel) | 2.5 | WQSWB118.6LB |
| Total Barium, Calcium, Iron, Manganese, and Nickel | 200 | WQSWB118.6LB |
| Total Metals (except Barium and Iron) | 2.5 | WQSWB118.6MB and WQSWB118.6RT |
| Total Barium and Iron | 200 | WQSWB118.6MB and WQSWB118.6RT |
| Total Metals (except Barium, Iron, and Manganese) | 2.5 | WQSWB118.6RB |
| Total Barium, Iron, and Manganese | 200 | WQSWB118.6RB |

ATTACHMENT A: Analytical results with Hand-Entered data qualifiers for SDG 1132615

ATTACHMENT B: chain-of Custody DOCUMENTATION for sdg 1132615