Water Quality Data Notes
(June 2019)

Disclaimer:

The water quality data set has been made available as soon being received from the laboratory and reviewed. All Data have been verified and validated according to Environment Canada procedures (Su, Glozier, Abbasi, 2018; http://environmentalmonitoring.alberta.ca/resources/standards-and-protocols/), however, further quality assurance and quality control procedures may result in minor differences between what is available at present and what is stored in future in the authoritative record in Environment and Climate Change Canada's ACBIS database.

Notes:

1) Valid method variables (VMV) code (e.g., 108712) is provided in the second row for each variable along with the application pretreatment code for the test (see Table A for pretreatment code definitions).
2) Detection Limit – in each "Flag" column a cell with an "L" or "R" indicates that the numerical result in the data column immediately to the right is below the VMV code method detection limit (L) or the laboratory reporting (R) limit for that test.

Table A – Pretreatment code attached to VMV:

Pretreatment Code	Pretreatment Description
G	Field Filtered and Preserved
P	Preserved
D	Field Filtered
F	Field Analyzed
E	Estimated Method or Value
C	Centrifuged
L	Laboratory Analyzed
R	Replicated Median of a Number of Samples
S	In Situ

3) Non-numeric codes located in the flag column pertain to the numerical value in the data column immediately to the right (see Table B for definitions).

Table B – Non numeric codes in FLAG columns:

FLAG_CODE	FLAG_CODE_DESCRIPTION
L	Value is less than the VMV code method detection limit
R	Value is less than the laboratory reporting limit
Q	Reported value is questionable – see below for more detail

Q – examples of these flags include but are not limited to –

- Q flag on field values generally indicate an issue encountered and noted in the field with instruments or sampling conditions
- Q flag on low or high values within a parameter data set indicate that although the value is on either end of the data distribution it is not an unexpected value based on other data for that variable within the study.

Most although not all general Q flags within the data set described above have recently been updated with more relevant/explicable flags as described below:

QA Flag	Flag Description
Sum	Value qualified because filtered fraction is greater than unfiltered fraction
EventL	Value qualified as a result of a lab occurrence or contamination issue
EventF	Value qualified as a result of a field contamination issue
RangeL	Value qualified since concentration is greatly below the expected range - improbable
RangeH	Value qualified since concentration is greatly above the expected range - improbable
Ion	Value qualified due to ion imbalance
Blank	Value qualified because blank has had a significant impact on a data value
Rep	Value qualified because replicate samples do not agree
SpikeF	Value considered biased since method recovery of field spike is unacceptable
SpikeL	Value considered biased since method recovery of lab spike is unacceptable
SurL	Value qualified since surrogate recoveries are low and value below expected range
SurH	Value qualified since surrogate recoveries are high and value above expected range
Noise	Value qualified since noisy baseline precludes quantitative assessment
Error	Value qualified for miscellaneous reasons

4) Analytical Methods for Total and Dissolved Metal Notes:
   a. In some samples, water quality samples have been analyzed with two different analytical methods for dissolved and total metals. The "In-Bottles Digestion ICP-MS" schema (aka Metals 34) is consistent with other Environment and Climate Change Canada water quality monitoring standards across the country, and with historical data in the oil sands area, particularly at M9 on the Athabasca River (a long-term site downstream of the oil sands). The more recent "Modified EPA 200.8 ICP-MS" schema (aka Metals 45), was initiated specifically for the Integrated Monitoring Plan for the Oil Sands in the late 2011 by Environment and Climate Change Canada NLET laboratories, and uses a more aggressive digestion process in lab analyses. Most JOOSM WQ components adopted the newly proposed "Modified EPA 200.8" schema. However, to both maintain consistency within all WQ monitoring components and to determine comparability with historical data, both the metals schemas were used to analyze water samples for the long-term WQ programs in the Athabasca River mainstem and EGA.

Until sufficient information is available on the comparability of these methods in the oil sands area, it is recommended that the data not be combined in statistical analyses and most importantly that only the "In-Bottle Digestion" schema is used for comparative purposes with historic (pre 2011) Environment and Climate Change Canada Water Quality Monitoring records. Where data from both schemas are available, it is provide in separate tabs labeled "Metals In-Bottle Digest" and "Metals-Modified EPA 200.8"in the data files.

b. Sample Types are described below and there are appropriateness for sampling is determined by several factors including; objectives of the sampling program, recommendations of JOSM, and habitat specific conditions.

c. Where data is not provided for a parameter grouping for single sample this is due to a sample specific field or shipping issue (e.g., sample bottle leaked in transit) whereby the sample could not be analyzed.

Sample_Type	Sample_Type Description
Discrete Sample	Whole water samples collected at midstream in a well-mixed zone at 10 to 30 cm below the water surface. Ensure that the water upstream has not been disturbed and that arms –length is outside the bow wave created by standing in the stream. Use long rubber gloves.
Integrated Sample	A simple depth integrated sample involves filling the sample bottle with water from the range of depths at ta sampling location from surface to ear bottom in such a manner as to obtain a representative sample of water from the entire water column. In large rivers this is usually conducted with a device called a weighted sampling iron which is lowered with a clean opened bottle into the river, allowed to sink down to near bottom and then raised at a rate aimed to achieve a full sample bottle just as it returns to the surface.
Duplicate Sample	Two samples of any type in sequential order and indicated as rep 1, rep 2.
Triplicate Sample	Three samples of any type in sequential order and indicated as rep 1, rep 2, rep 3.
Equal Volume Transect Composite	A composite sample composed of vertical-integrated sampling at the mid-point of each equal-width increment (Panel vertical) across the transect. The individual volumes of water from the panel verticals across the transect, which will be equal for each panel, verticals across the transect, which will be equal for each panel, are placed in a churn, mixed and the composite water sample drawn. Non-isokinetic sampling methods are used when the velocity of flow is less than the minimum velocity requirement for an isokinetic sampler, and when extreme cold renders

	isokinetic samplers inoperable (these two factors normally occur in winter under ice). The Equal Width increment method divides the transect across the river into panels of equal width, with verticals, where water samples are taken, located in the midpoint of each width increment. The precise location of panel verticals is dependent on the river discharge. This method is particularly applicable to sand-bed, braided rivers where the channel morphometry is subject to change.
Isokinetic Transect Composite-EWI	A sample is isokinetic when it is collected with an intake velocity equivalent to the stream velocity. This is normally done with and isokinetic sampler, using the intake nozzle size appropriate to the flow, as defined by U.S. Geological Survey isokinetic sampling methods. The isokinetic transect composite (EWI) is a composite sample composed of isokinetic depth-integrated sampling at the midpoint of each equal-width increment (panel vertical) across the transect, using an isokinetic sampler. The individual water samples from the panel verticals across the transect, which will vary in volume depending on the flow in that particular panel, are placed in a churn, mixed, and the composite water sample drawn. WEI stands for Equal Width Increment. The Equal Width increment method divides the transect across the river into panels of equal width, with verticals, where water samples are taken, located in the midpoint of each width increment. The precise location of panel verticals is dependent on the river discharge. This method is particularly applicable to sand-bed, braided rivers where the channel morphometry is subject to change.

5) Non-numeric codes located in the numerical value column indicate the reason a numerical value is not reported (see Table C for definitions).

Table C – Non-numeric codes in data value columns:

Non-numeric Code	Non-numeric Code Description
DE	Depleted
IS	Insufficient sample
FC	Field Contamination
SI	Suspected Interference
LC	Lab Contamination
NR	Not received
BR	Broken in Transit
DS	Destroyed in lab
NV	No value

TNTC	Too numerous to count
DV	Value deleted
TC	Test cancelled
NA	Not applicable
NC	Not calculatable
PM	Prereq.t missing

6) Units are included for each VMV parameter in row 3

Parameter Unit	Description
DEG C	Degrees Celsius
µS/CM	Microsiemens per centimeter
PH	PH units
UG/L	Micrograms per litre
MG/L	Milligrams per litre
NG/L	Nanograms per litre
NTU	Nephalometric turbidity units
REL UNITS	Relative units
%	Percent

7) Change of VMV codes for field measurements

The following “previously” used VMV codes in earlier OS data releases have been replaced in the most recent data release (2019) with new national VMV codes for national consistency. There is no change in field sampling technique.

Variable name	VMV codes used in previous data releases	National VMV codes in current data release
SPECIFIC CONDUCTANCE (F)	2041	109027
TEMPERATURE WATER (F)	2061	109028
TURBIDITY (F)	2081	110001
PH (F)	10301	109026