

Real-Time Water Quality Deployment Report

Rattling Brook Network

July 23, 2015 to August 20, 2015



Government of Newfoundland & Labrador Department of Environment and Conservation Water Resources Management Division St. John's, NL, A1B 4J6 Canada



General

- Department of Environment and Conservation staff monitors the real-time web pages consistently.
- Hydrometric data included in this report is provisional and used only for illustrative purposes. Corrected and finalized data may be retrieved from the Water Survey of Canada website (<u>http://www.ec.gc.ca/rhc-wsc/)*</u>.
- Cable damage caused a station outage at Bridge station on August 13, 2015 until the end of deployment. QAQC rankings could not be calculated during removal because of this issue.
- The QAQC sonde would not connect during removal at Plant Discharge station. QAQC rankings could not be calculated.

Maintenance and Calibration of Instrument

- As part of the Quality Assurance and Quality Control protocol (QAQC), an assessment of the reliability of data recorded by an instrument is made at the beginning and end of the deployment period. The procedure is based on the approach used by the United States Geological Survey.
 - Upon deployment, a QA/QC Sonde is temporarily deployed *in situ*, adjacent to the Field Sonde. Depending on the degree of difference between each parameter from the Field and QAQC sondes a qualitative rank is assigned (See Table 1). The possible ranks, from most to least desirable, are: Excellent, Good, Fair, Marginal, and Poor. A grab sample is also taken for additional confirmation of conditions at deployment and to allow for future modelling studies.
 - At the end of a deployment period, a freshly cleaned and calibrated QAQC Sonde is placed *in situ*, adjacent to the Field Sonde. Values are compared between all parameters and differences are ranked for placement in Table 1.

Station	Date	Action	Comparison Ranking				
Station			Temperature	рН	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big	July 24, 2015	Deployment	Good	Good	Good	Excellent	Excellent
Pond	August 20, 2015	Removal	Excellent	Good	Excellent	Excellent	Excellent
Rattling Brook below Bridge	July 23, 2015	Deployment	Good	Good	Good	Good	Excellent
	August 20, 2015	Removal	NA	NA	NA	NA	NA
Rattling Brook below Plant Discharge	July 23, 2015	Deployment	Excellent	Fair	Good	Excellent	Excellent
	August 20, 2015	Removal	NA	NA	NA	NA	NA

Table 1:	Qualitative	QAQC	Ranking
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Data Interpretation

Temperature

Water Temperature is a major factor used to describe water quality. Temperature has major implications on both the ecology and chemistry of a water body, governing processes such as the metabolic rate of aquatic plants and animals and the degree of dissolved oxygen saturation.



Water temperature increased into late August across all stations. Water temperatures at removal are likely
very near the expected annual maxima as September is a cooling season and waters will begin to chill into
fall.

Station	Mean	Median	Min	Max
Big Pond	16.87	17.14	14.32	19.87
Below Bridge	17.20	16.85	13.31	22.47
Below Plant Discharge	18.01	18.21	13.23	23.25

pН

pH is used to give an indication of the acidity or basicity of a solution. A *pH* of 7 denotes a neutral solution while lower values are acidic and higher values are basic. Technically, the *pH* of a solution indicates the availability of protons to react with molecules dissolved in water. Such reactions can affect how molecules function chemically and metabolically.



pH was near the upper range of the Site Specific Guidelines (dashed lines) for Big Pond and Discharge stations. Bridge station was near the mid-range of the guidelines for much of the deployment. As water temperature and incoming sunshine levels decrease into fall, pH levels may become slightly more acidic as metabolic activity in the river system declines.

Station	Mean	Median	Min	Max
Big Pond	6.53	6.53	6.33	6.73
Below Bridge	6.31	6.32	5.73	6.70
Below Plant Discharge	6.66	6.67	6.45	6.87

Specific Conductivity

Conductivity relates to the ease of passing an electric charge – or resistance – through a solution. Conductivity is highly influenced by the concentration of dissolved ions in solution: distilled water has zero conductivity (infinite resistance) while salty solutions have high conductivity (low resistance). Specific Conductivity is corrected to 25° C to allow comparison across variable temperatures.



• Specific Conductivity was stable at Big Pond and Bridge stations during this deployment period whereas a steady increase was seen at Plant Discharge station. This increase might be related to the discharge of settling pond effluent into the river channel after a wet July.

Station	Mean	Median	Min	Max
Big Pond	61.2	61.1	59.5	66.9
Below Bridge	57.9	57.7	56.5	67.6
Below Plant Discharge	81.2	80.8	68.7	105.1

Dissolved Oxygen

Dissolved oxygen is a metabolic requirement of aquatic plants and animals. The concentration of oxygen in water depends on many factors, especially temperature – the saturation of oxygen in water is inversely proportional to water temperature. Oxygen concentrations also tend to be higher in flowing water compared to still, lake environments. Low oxygen concentrations can give an indication of excessive decomposition of organic matter or the presence of oxidizing materials.



• Dissolved oxygen values fell below the CCME guideline for the protection of early life stage biota for much of the month at all three stations. Normally this occurs in early July; however, cooler weather has kept concentrations high later into the summer. Oxygen levels will rise in the fall as temperatures decrease.

Station	Mean	Median	Min	Max
Big Pond	9.42	9.42	8.97	9.89
Below Bridge	9.44	9.49	8.44	10.45
Below Plant Discharge	8.70	8.68	7.59	10.14

Turbidity

Turbidity is typically caused by fine suspended solids such as silt, clay, or organic material. Consistently high levels of turbidity tend to block sunlight penetration into a waterbody, discouraging plant growth. High turbidity can also damage the delicate respiratory organs of aquatic animals and cover spawning areas.



• A few turbidity events were observed at Bridge and Plant Discharge stations during the deployment period and were generally in relation to heavy rainfall on August 10th and 14th.

Station	Mean	Median	Min	Max
Big Pond	0.0	0.0	0.0	7.6
Below Bridge	0.7	0.3	0.0	38.8
Below Plant Discharge	0.7	0.0	0.0	44.6

Appendix



Prepared by: Ryan Pugh Department of Environment and Conservation Water Resources Management Division Phone: 709.729.1681 Fax: 709.729.3020