

Real-Time Water Quality Deployment Report

Rattling Brook Network

March 24, 2016 to April 28, 2016



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.
- Monitoring operations at Big Pond station were suspended during this deployment period due to late-winter ice conditions. Monitoring will likely resume during the next deployment period.
- 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 (http://www.ec.gc.ca/rhc-wsc/)*.

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				
			Temperature	pН	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	Instrument removed due to ice conditions.						
Rattling Brook below Bridge	2016-03-24	Deployment	Good	Good	Excellent	Good	Good
	2016-04-28	Removal	Good	Good	Excellent	Excellent	Excellent
Rattling Brook below Plant Discharge	2016-03-24	Deployment	Good	Excellent	Excellent	Marginal	Good
	2016-04-28	Removal	Good	Excellent	Excellent	Excellent	Excellent

Table 1: Qualitative QAQC Ranking

• A "Marginal" QAQC ranking was applied to the dissolved oxygen comparison at Plant Discharge station during deployment. An "Excellent" ranking at removal indicates that this is not likely related to a sensor issue.

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 throughout the deployment period with two periods of decline around April 4th and 20th. Early April saw several days of heavy precipitation and some sub-zero temperatures. Later April saw an unusually large snowfall (mostly not reflected in the Appendix) ranging from 40 50 cm in some areas.
- Water temperatures are expected to increase through August.

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 levels at Bridge and Discharge stations were above the Site-Specific Guidelines at deployment time. pH declined at Bridge station, though remained relatively stable at Discharge station.
- Diurnal cycling began to increase noticeably at Bridge station towards the end of the deployment as water temperatures increased to >10°C and biological productivity ramps up in response to spring conditions.

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 peaked during the initial deployment as spring freshet pushed dissolved solids through the river system. Following the low-point observed around April 5th at Bridge and Discharge stations, a slow rise was subsequently observed.
- Conductivity at Discharge station is substantially higher and more variable than conductivity levels observed at Bridge station.

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 concentrations at Bridge and Discharge stations began to decline from their annual maxima to their annual summer minima as water temperatures increase. All values are still above CCME guidelines of 9.5 mg/l for early life stage aquatic organisms.

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.



• Turbidity levels were low during much of the deployment period at both stations, with median values close to zero. Early in the deployment period, a number of high-value peaks in turbidity were observed in relation to spring melt and precipitation. Events became less frequent towards late April.

Appendix



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