

Real-Time Water Quality Deployment Report

Rattling Brook Network

September 9th, 2014 to October 23rd, 2014



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.
- The deployment period in this instance was 43 days, as opposed to the standard 30 days, due to scheduling conflicts.
- Hurricane Gonzalo rolled thorugh the area on October 19th and resulted in approximately 39 mm of precipitation at Argentia weather station. This was the most significant impact on water quality events during the deployment period though the effects were relatively small compared to other major storms such as Hurricane Igor in 2010.

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	рН	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	2014-09-10	Deployment	Excellent	Excellent	Excellent	NA	NA
	2014-10-23	Removal	Excellent	Good	Excellent	Excellent	Excellent
Rattling Brook below Bridge	2014-09-10	Deployment	Good	Excellent	Excellent	NA	NA
	2014-10-23	Removal	Good	Good	Excellent	Excellent	Excellent
Rattling Brook below Plant Discharge	2014-09-10	Deployment	Excellent	Good	Excellent	NA	NA
	2014-10-23	Removal	Excellent	Excellent	Excellent	Excellent	Excellent

 Table 1: Qualitative QAQC Ranking

• Note: QAQC dissolved oxygen and turbidity probes were non-functional during deployment due to suspected battery failure. Rankings were "Excellent" for both dissolved oxygen and turbidity at removal time, indicating initial rankings were likely within acceptable ranges.

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 declined at all three stations during this deployment period, with Big Pond and Plant Discharge stations retaining warmer water than Bridge station – due to the moderating effects of Big Pond and Murphy's Gully upstream of Plant Discharge. рΗ

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.



A declining pH is often observed from mid-to-late fall as aquatic metabolism slows, and carbon dioxide uptake slows. At Big Pond and Plant Discharge stations, most pH values were found to be above the Site Specific Guidelines (SSGs) delineated by dashed lines in the graphs above (5.67 – 6.56 units). Most values within Bridge station were within the SSGs.

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 remained stable for most of the deployment period at each station, but with a definite peak event from October 19th to approximately October 21st. This was in response to the Category 1 Hurricane Gonzalo which passed through the area at that time.

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.



 As expected, due to falling water temperatures, dissolved oxygen concentrations increased throughout the deployment period outlined. By the end of the deployment period, all values were found to be above the CCME Guideline of 9.5 mg/l for the protection of early life stage cold-water biota.

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.



 Isolated turbidity events punctuated a deployment period that was otherwise generally without major turbidity events. Hurricane Gonzalo resulted in minor and short-duration events between October 19th and 21st.

Appendix



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