

Real-Time Water Quality Deployment Report Rattling Brook Network

December 2, 2011 to January 12, 2012



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General

- Department of Environment and Conservation staff monitors the real-time web pages consistently.
- Some QAQC rankings at removal were not calculated due to a sensor problem with the QAQC instrument.
- The graph for pH at Rattling Brook below Plant Discharge was excluded from this report due to unreasonably high values from deployment time to removal.

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	December 2, 2011	Deployment	Good	Good	Excellent	Excellent	Excellent
	January 12, 2012	Removal	Excellent	NA	Good	NA	Excellent
Rattling Brook below Bridge	December 1, 2011	Deployment	Excellent	Good	Good	Excellent	Poor
	January 12, 2012	Removal	Excellent	NA	Marginal	NA	Good
Rattling Brook below Plant Discharge	December 2, 2011	Deployment	Excellent	Poor	Excellent	Excellent	Excellent
	January 12, 2012	Removal	Excellent	NA	Good	NA	Poor

Table 1: Qualitative QAQC Ranking

• Note: pH readings on the QAQC sonde were unreasonably low during the removal and no pH rankings could be derived. The LDO sensor was also non-functional on the QAQC sonde used during removal because of the lack of a battery pack on the instrument.



Data Interpretation

Rattling Brook Big Pond

Figure 1: Water Temperature at Rattling Brook Big Pond from December 2, 2011 to January 12, 2012



Water Temperature and Stage Level

Water temperature descended consistently throughout the deployment period from a high of 5.04 to a low of 0.07°C (median value: 1.48°C).





Water pH and Stage Level

- pH was found to be near the upper range of the site-specific guideline of 6.56 for much of the deployment period. Values ranged from 6.52 to 6.06 with a median value of 6.41. A minor downward trend in pH is observed throughout the deployment period.
- The minimum pH value occurred on December 7th at 1930 following nearly 30 mm of precipitation.

Figure 3: Specific Conductivity at Rattling Brook Big Pond from December 2, 2011 to January 12, 2012



Specific Conductivity of Water and Stage Level

 Specific conductivity did not show any particular upward or downward trend throughout the deployment period. Conductivity ranged from 42.4 to 52.0 μS/cm with a median value of 45.1 μS/cm.

Figure 4: Dissolved Oxygen at Rattling Brook Big Pond from December 2, 2011 to January 12, 2012



Dissolved Oxygen Concentration and Saturation

- Dissolved oxygen concentration generally increased from December 2nd to January 12th as water temperature fell. Oxygen saturation, meanwhile, was mostly static without showing any particular trend. All values were above the CCME Guidelines for the Protection of Early and Other Life Stages.
- Concentration values ranged from 11.90 to 14.42 mg/l with a median value of 12.92 mg/l.

Figure 5: Turbidity at Rattling Brook Big Pond from December 2, 2011 to January 12, 2012



Water Turbidity and Stage Level

• Turbidity at Rattling Brook Big Pond was highly variable, but of low magnitude. Turbidity fell between 0.0 and 6.6 NTU with a median value of 0.0 NTU.

Rattling Brook below Bridge

Figure 6: Water Temperature at Rattling Brook below Bridge from December 1, 2011 to January 12, 2012



Water Temperature and Stage Level

Water temperatures fell from a high of 6.81°C at deployment to a low of -0.03°C. Declining water temperatures reached the freezing point on December 21st at 1:30 am (-0.02°C). At removal time on January 12th, 2012, noticeable amounts of frazzle ice had formed on the submerged low-head weir near Bridge station.

Figure 7: pH at Rattling Brook below Bridge from December 1, 2011 to January 12, 2012



Water pH and Stage Level

No major trend in pH was identified during this deployment period at Bridge station. Values fell between 6.33 and 6.76 units with a median of 6.44. 103 instances of pH values greater than the Site Specific Guideline of 6.56 were noted. This represents approximately 10.2% of all readings – as expected given the 90th percentile method of guideline generation.

Figure 8: Specific Conductivity at Rattling Brook below Bridge from December 1, 2011 to January 12, 2012



Specific Conductivity of Water and Stage Level

Specific conductivity was found to increase over the course of the deployment period and ranged from a low of 34.4 to a high of 51.4 µS/cm (median value: 38.8 µS/cm).





Dissolved Oxygen Concentration and Saturation

- All dissolved oxygen saturation and concentration values were found to be far above the minimum CCME Guidelines for the protection of Early and Other Life Stage cold water guidelines. Concentration values fell between 11.48 to 13.63 mg/l (median value: 13.06 mg/l).
- A clear increasing trend is present with declining water temperatures.

Figure 10: Turbidity at Rattling Brook below Bridge from December 1, 2011 to January 12, 2012



Water Turbidity and Stage Level

- During this deployment period, a baseline turbidity value of approximately 3 NTU was observed. A downward trend is noticed in the data due to a major peak at deployment time falling away as time passes.
- Values ranged from 2.4 to 126.7 NTU with a median value of 3.9 NTU.

Rattling Brook below Plant Discharge





Water Temperature and Stage Level

From December 2 to January 12, water temperature decreased from a high of 6.38°C to a low of 0.01°C (median value: 1.09°C).

Figure 12: Specific Conductivity at Rattling Brook below Plant Discharge from December 2, 2011 to January 12, 2012



Specific Conductivity of Water and Stage Level

- Specific conductivity increased slightly over the deployment period from a low of 42.2 to a high of 72.2 μ S/cm (median value: 52.4 μ S/cm).
- Conductivity is punctuated with a series of peaks and valleys that frequently occur in conjunction with stage level fluctuations. Changes in water level can result in a diluting or concentrating effect on dissolved ions in the water channel affecting conductivity.

Figure 13: Dissolved Oxygen at Rattling Brook below Plant Discharge from December 2, 2011 to January 12, 2012



Dissolved Oxygen Concentration and Saturation

 Dissolved oxygen values were found to be far above the minimum CCME Guidelines for the Protection of Early and Other Life Stage Cold Water Biota. Concentration values fell between 11.72 mg/l and increased to a maximum value of 14.33 mg/l (median value: 13.59 mg/l).

Figure 14: Turbidity at Rattling Brook below Plant Discharge from December 2, 2011 to January 12, 2012



Water Turbidity and Stage Level

- Fouling of the turbidity sensor from December 11th onward resulted in unreasonably high turbidity recordings that were not consistent with actual river conditions. Erroneous data was suppressed from the graph above.
- Turbidity values were recorded between 0.4 and 521.0 NUT with a median value of 2.8 NTU.
- Many turbidity events were associated with increases in stage level, owing to precipitation. Three events, in
 particular, are pointed out in the figure above.

Conclusions

- An issue with the QAQC sonde pH sensor did not allow for the calculation of quality rankings for pH at removal time for the three stations. Additionally, a pH sensor problem on the Field sonde for Plant Discharge station resulted in a month of faulty data.
- No particular water quality issues have been identified warranting concern for this deployment period.

Mean Daily Temperature and Total Precipitation at Argentia Weather Station near Long Harbour 15 45 40 10 35 30 (mm) 25 20 20 15 15 15 5 Temp (C) 0 -5 10 -10 5 -15 0 Jan 12 Dec 3 Dec 11 Dec 13 Dec 15 Dec 19 Dec 23 Dec 25 Dec 29 Jan 4 Jan 6 Jan 8 Jan 10 Dec 1 Dec 5 Dec 7 Dec 9 Dec 17 Dec 21 Dec 27 Dec 31 Jan 2 ■ Total Precip (mm) → Mean Temp (°C)

Appendix

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