Real-Time Water Quality Deployment Report

Rattling Brook Network

October 12, 2018 to December 05, 2018

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

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2018-10-12 to 2018-12-05

General

- Department of Municipal Affairs and Environment 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 (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.

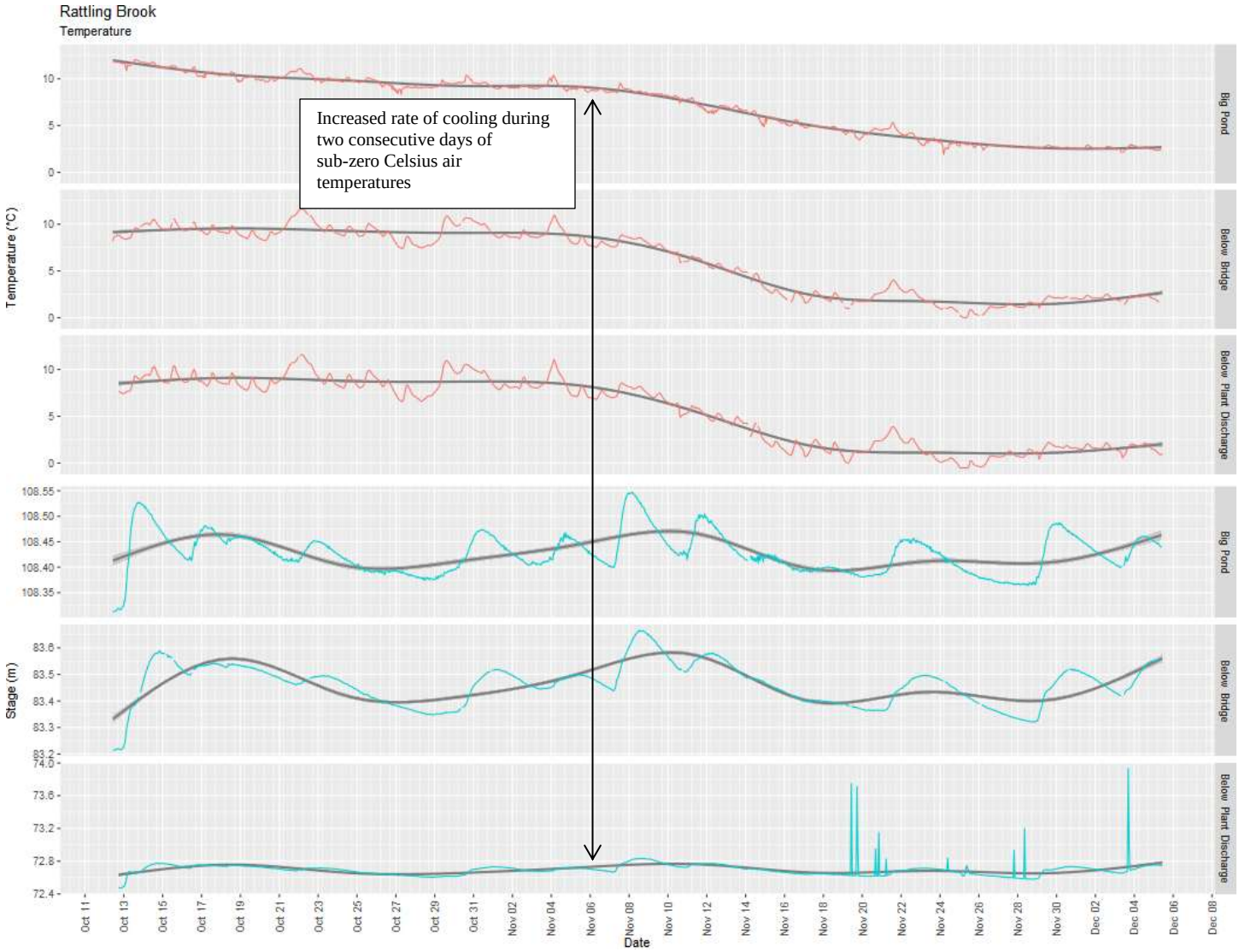
Table 1: Qualitative QAQC Ranking

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	October 12, 2018	Deployment	Excellent	NA	Excellent	Excellent	Excellent
	December 5, 2018	Removal	Excellent	Good	Excellent	Fair	Excellent
Rattling Brook below Bridge	October 12, 2018	Deployment	Excellent	Fair	Excellent	Fair	Excellent
	December 5, 2018	Removal	Excellent	Excellent	Excellent	Poor	Good
Rattling Brook below Plant Discharge	October 12, 2018	Deployment	Fair	Excellent	Excellent	Excellent	Excellent
	December 5, 2018	Removal	Fair	Good	Good	Marginal	Good

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.



Station	Mean	Median	Min	Max
Big Pond	7.15	8.54	1.92	12.03
Below Bridge	6.06	7.66	0.00	11.66
Below Plant Discharge	5.49	6.97	-0.53	11.58

- Similar trends were observed in temperature at each station during this deployment period: temperatures slowly declining until a more rapid cooling trend following two consecutive days of cold air temperatures on November 5th and 6th.
- Water temperatures at Big Pond were generally warmer than those at Bridge and Plant Discharge stations.

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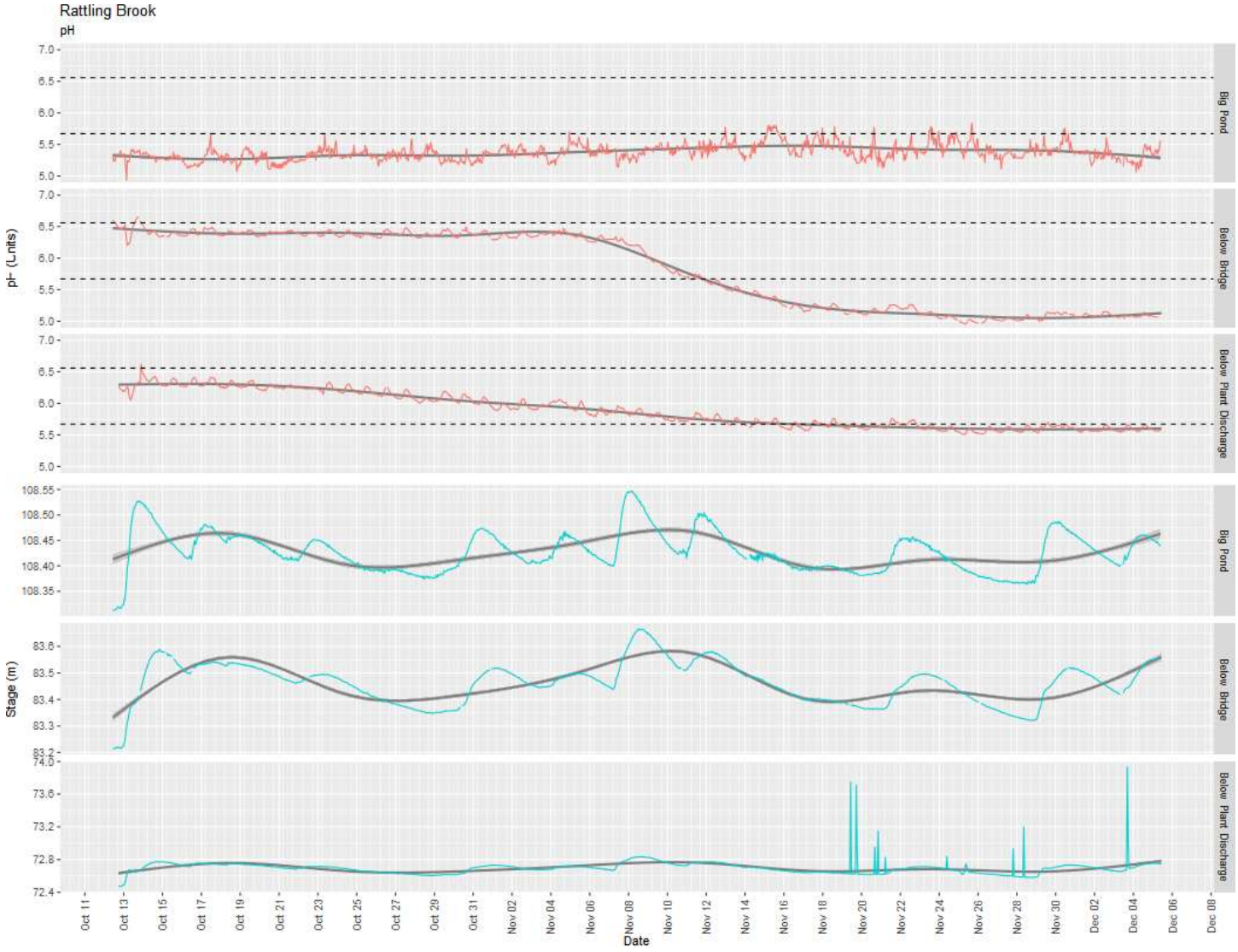
pH

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.



Station	Mean	Median	Min	Max
Big Pond	5.37	5.36	4.93	5.84
Below Bridge	5.83	6.20	4.96	6.65
Below Plant Discharge	5.89	5.83	5.51	6.62

- pH levels at Big Pond were largely stable during this deployment period and were found to be consistently below the site specific guidelines for Rattling Brook. pH levels were seen to dip substantially at the downstream Bridge and Plant Discharge stations in response to two different weather events: Bridge on November 7th after about 25 mm of precipitation and Plant Discharge earlier on October 20th/21st.

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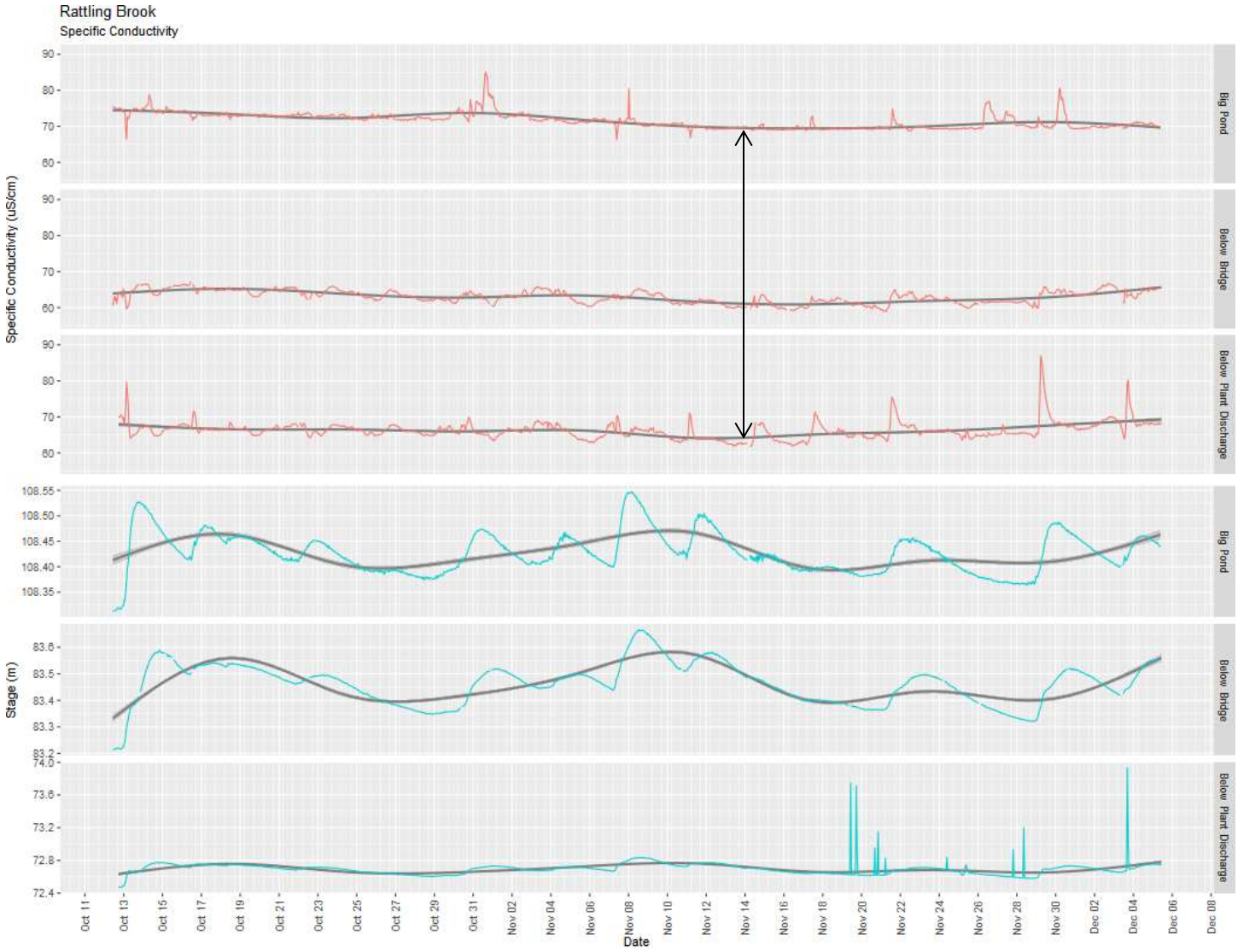
Specific Conductivity

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.



Station	Mean	Median	Min	Max
Big Pond	71.6	71.4	66.3	85.1
Below Bridge	63.0	63.1	58.9	67.1
Below Plant Discharge	66.3	66.1	61.8	87.0

- A slight downward trend was seen at all three stations from deployment until mid-November. At this time, Big Pond remained relatively static while Bridge and Plant Discharge stations indicated a slight increase. Cross referencing with the weather (see appendix) indicates that November 15th was the first date where mean air temperature is below freezing. Increasing conductivity may be related to ice control.

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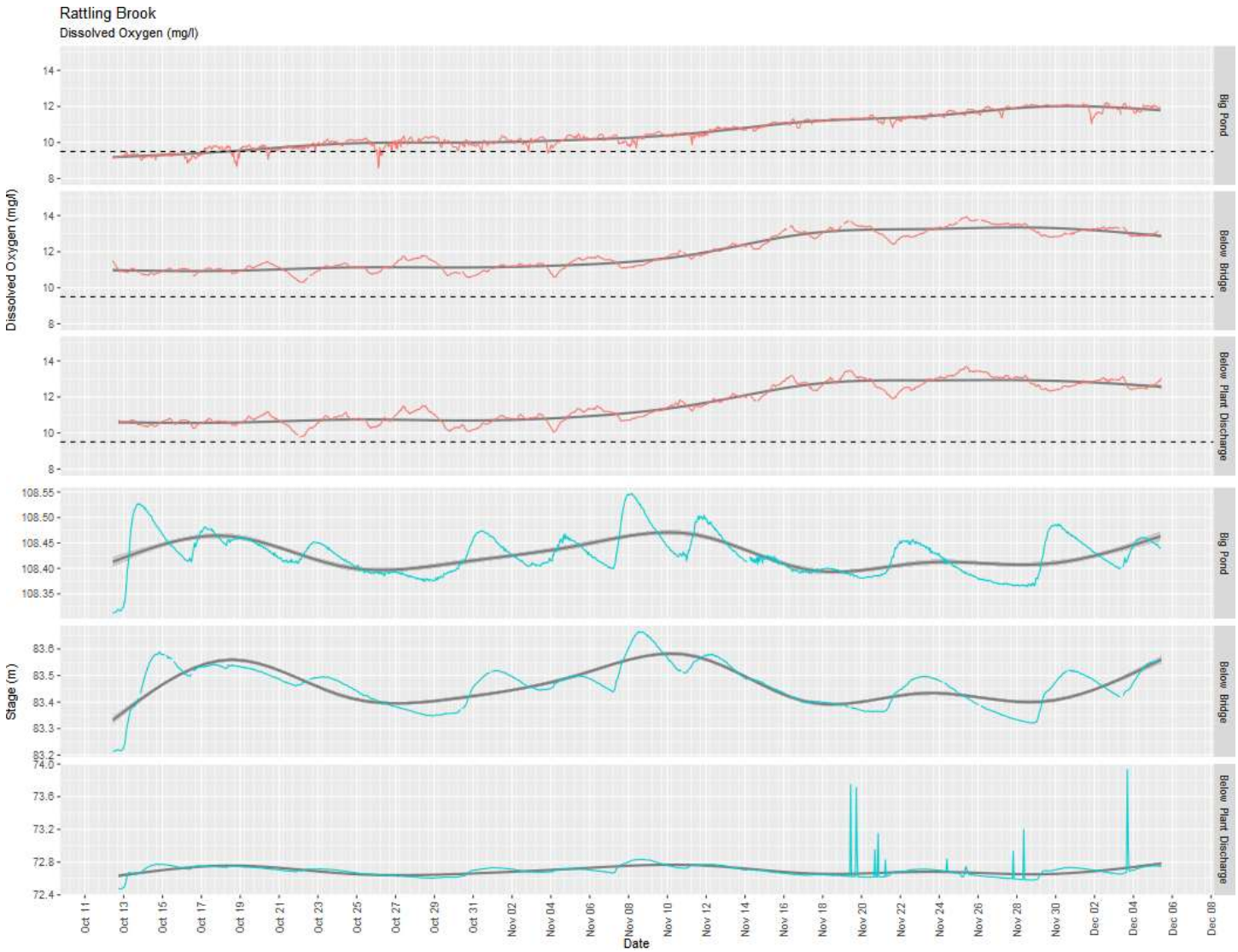
Dissolved Oxygen

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.



Station	Mean	Median	Min	Max
Big Pond	10.59	10.36	8.59	12.20
Below Bridge	11.98	11.63	10.29	13.95
Below Plant Discharge	11.63	11.32	9.78	13.69

- Dissolved oxygen values climbed consistently during this deployment period as water temperatures declined. Almost all values were found to be above the CCME guidelines for the protection of aquatic biota.

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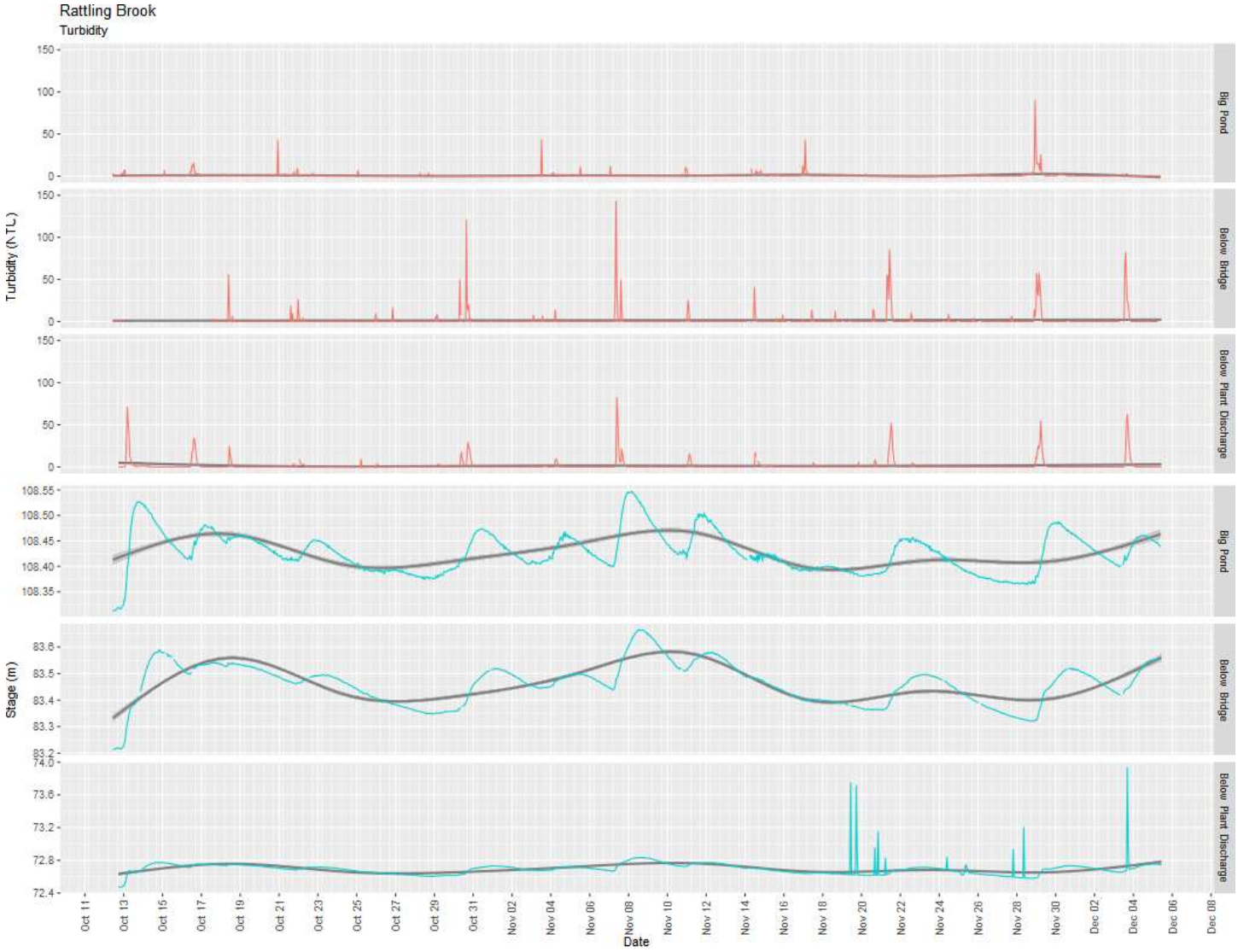
Turbidity

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.



Station	Mean	Median	Min	Max
Big Pond	0.9	0.2	0.0	90.1
Below Bridge	1.6	0.0	0.0	142.5
Below Plant Discharge	1.5	0.0	0.0	82.2

- A sensor blockage occurred at Bridge station from October 15th to 17th, resulting in a prolonged period of highly variable turbidity. This data was removed.
- Turbidity levels were generally low but frequent turbidity events of short duration were observed at each station. These events occurred in conjunction with stage level rises and precipitation.

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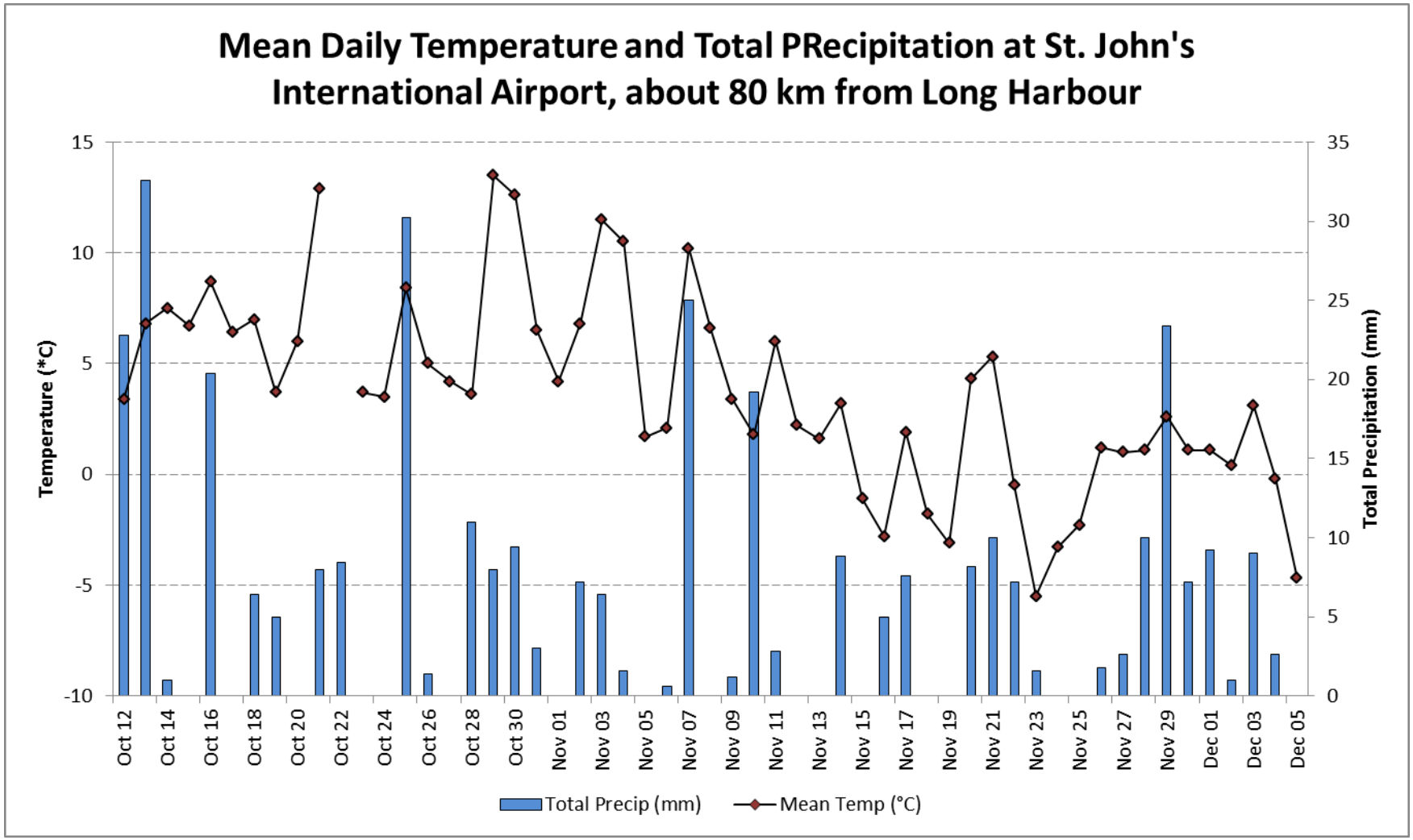
Appendix


Mean Daily Temperature and Total PRecipitation at St. John's International Airport, about 80 km from Long Harbour
Temperature (*C)
Total Precipitation (mm)
15
10
5
0
-5
-10
35
30
25
20
15
10
5
0
Oct 12
Oct 14
Oct 16
Oct 18
Oct 20
Oct 22
Oct 24
Oct 26
Oct 28
Oct 30
Nov 01
Nov 03
Nov 05
Nov 07
Nov 09
Nov 11
Nov 13
Nov 15
Nov 17
Nov 19
Nov 21
Nov 23
Nov 25
Nov 27
Nov 29
Dec 01
Dec 03
Dec 05
Total Precip (mm)
Mean Temp (°C)