Real-Time Water Quality Deployment Report

Rattling Brook Network

March 16, 2018 to April 25, 2018

Newfoundland Labrador

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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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

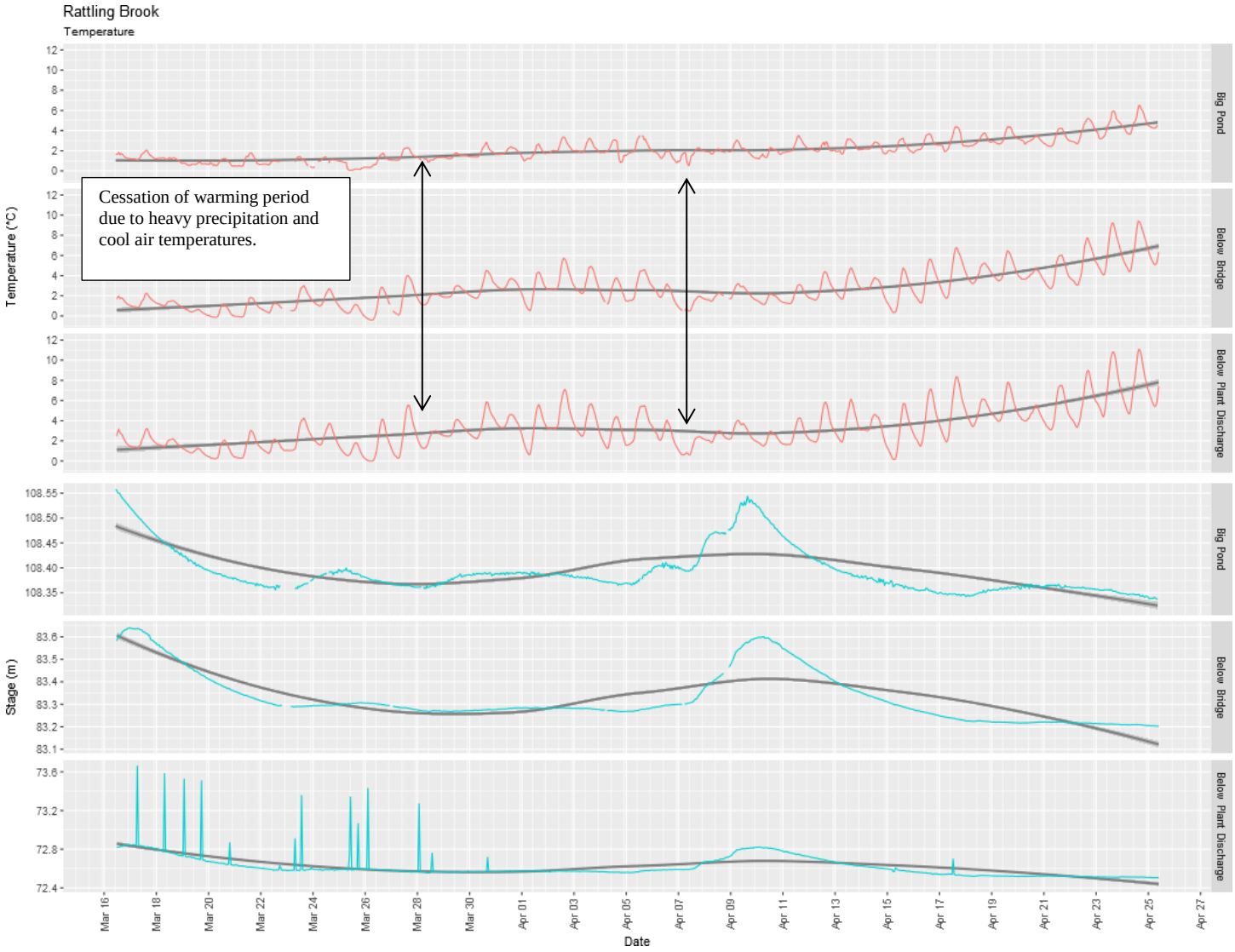
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	2018-03-16	Deployment	Excellent	Fair	Excellent	Excellent	Poor
	2018-04-25	Removal	Poor	Poor	Fair	Good	Excellent
Rattling Brook below Bridge	2018-03-16	Deployment	Good	Good	Excellent	Fair	Poor
	2018-04-25	Removal	Good	Good	Good	Excellent	Good
Rattling Brook below Plant Discharge	2018-03-16	Deployment	Excellent	Excellent	Excellent	Excellent	Marginal
	2018-04-25	Removal	Excellent	Good	Good	Excellent	Excellent

- Some QAQC rankings were seen to substantially degrade from the beginning to the end of the deployment period (i.e. temperature and pH at Big Pond) while others improved, especially turbidity at all stations. For turbidity, this indicates that the QAQC sonde at deployment may have had some turbidity sensor problems. For temperature and pH at Big Pond, 'Poor' rankings may indicate that the placement of the QAQC sonde during removal may not have been as comparable to the Field sonde as assumed.

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	2.10	1.94	0.05	6.54
Below Bridge	2.67	2.32	-0.41	9.40
Below Plant Discharge	3.27	2.92	0.00	11.10

- Gradual water temperature increases are observed at each station during this deployment period with a mid-deployment cooling trend from March 28th to March 30th and April 7th to April 10th related to heavy precipitation during cool air temperatures.

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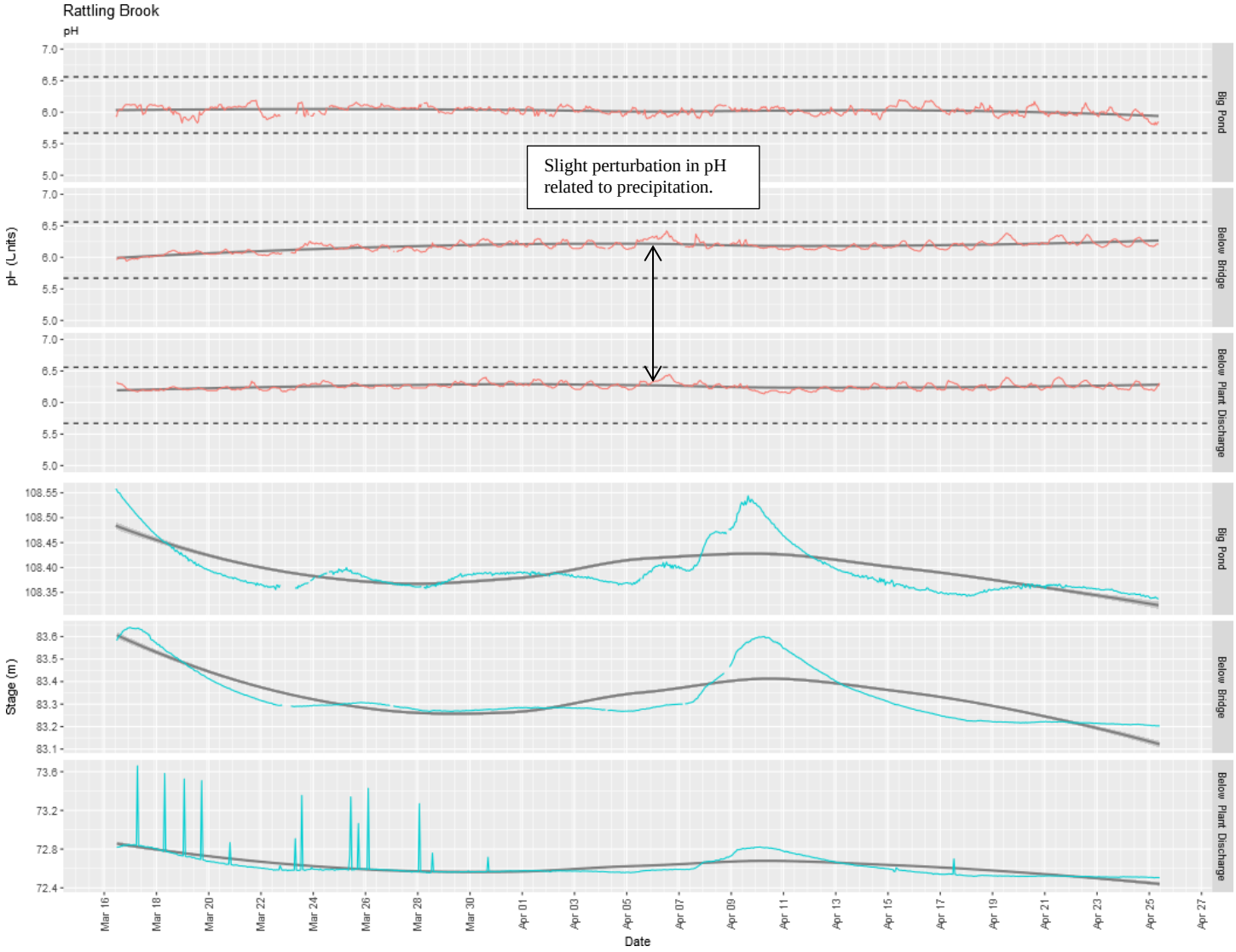
pH

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	6.03	6.03	5.80	6.20
Below Bridge	6.17	6.18	5.94	6.42
Below Plant Discharge	6.26	6.25	6.14	6.44

- All pH values were found to be between the Site Specific Guidelines outlined by dashed lines in the figure above. No major trends were observed during the deployment period – only occasional disturbances concurrent with heavy precipitation.

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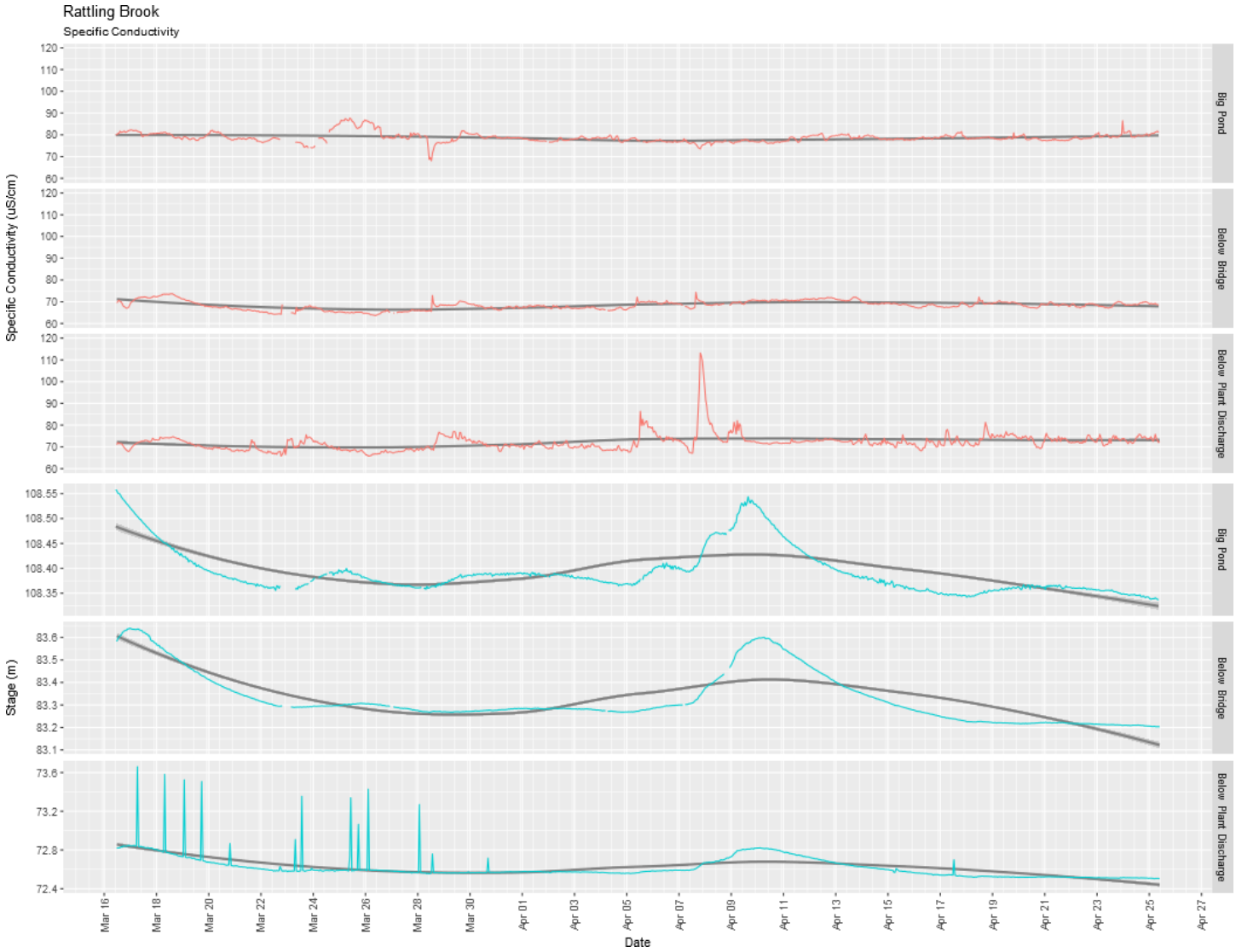
Specific Conductivity

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	78.7	78.5	68.0	87.7
Below Bridge	68.4	68.4	63.7	74.4
Below Plant Discharge	72.1	71.9	65.7	113.2

- Fluctuations in specific conductivity at Bridge and Plant Discharge stations generally appears to be related to unsettled weather conditions, especially precipitation. Additionally, fluctuations at Bridge station are lesser in magnitude than fluctuations observed at Plant Discharge station. This is likely due to additional inputs into the river system between Bridge and Plant Discharge stations.

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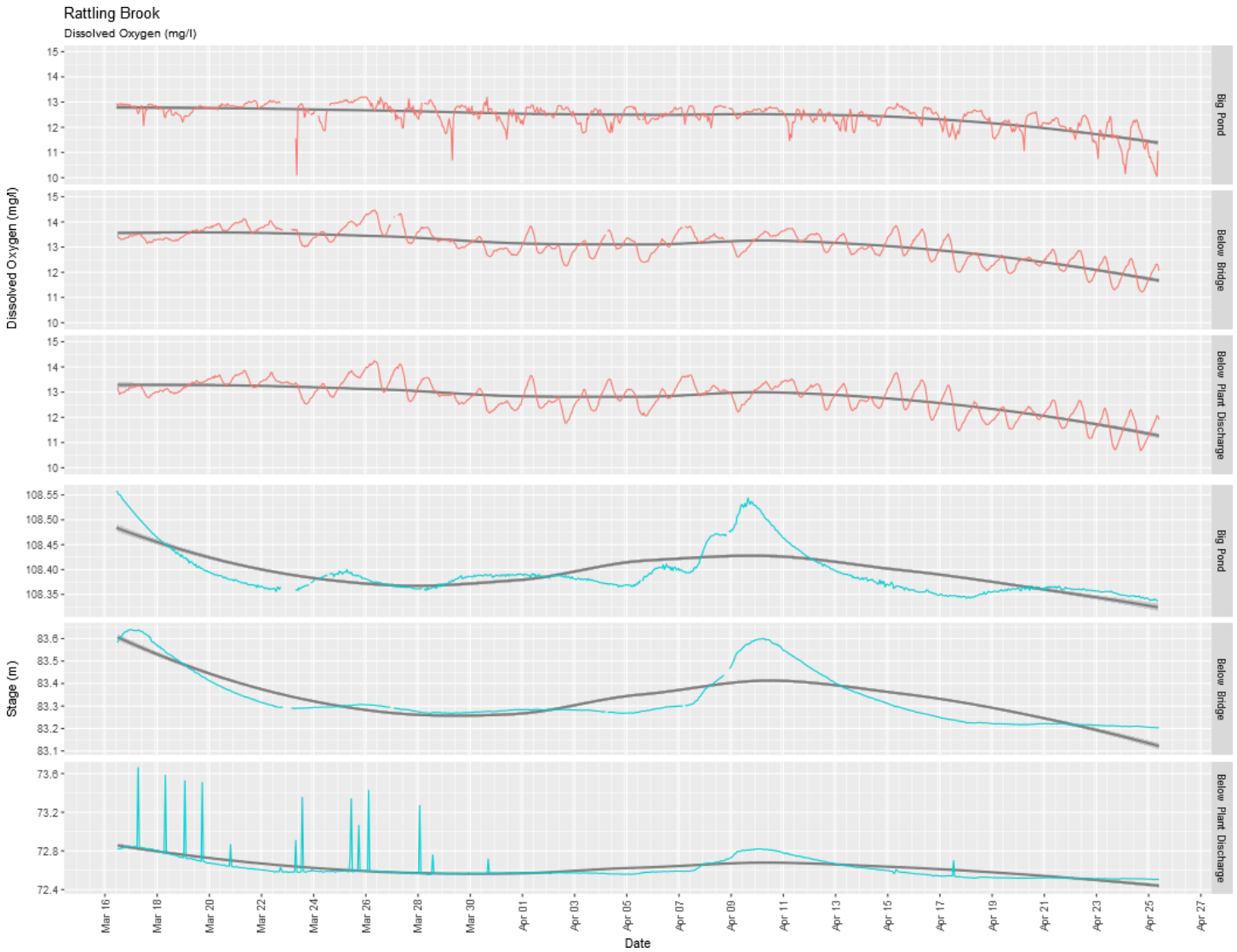
Dissolved Oxygen

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	12.45	12.55	10.05	13.20
Below Bridge	13.10	13.21	11.23	14.47
Below Plant Discharge	12.80	12.90	10.67	14.24

- Dissolved oxygen levels trended downwards at each station over the course of the deployment period as water temperatures increased, but especially following March 16th to April 25th. All values were found to be above the CCME guidelines of 9.5 mg/l for early life stages of aquatic life, as expected for the time of year.

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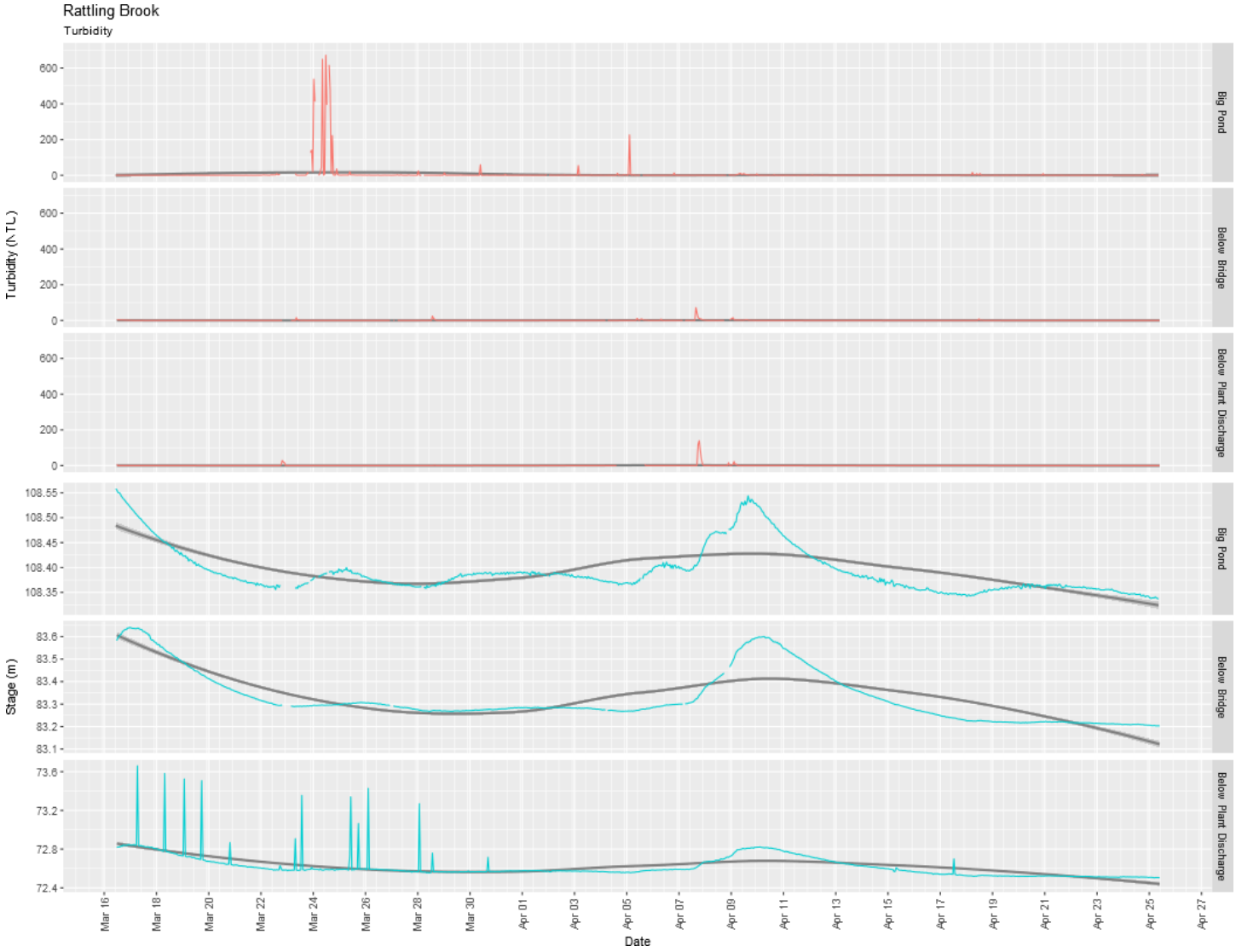
Turbidity

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	5.7	0.2	0.0	672.0
Below Bridge	0.5	0.0	0.0	72.2
Below Plant Discharge	0.6	0.0	0.0	139.3

- A turbidity event lasting from late March 23rd to the evening of March 24th at Big Pond is likely related to an unseasonably warm day with a max temperature of 10°C compared to the previous day's max temperature of -0.4°C. Unsettled, gusty weather, combined with newly inundated ground and high snowmelt, likely resulted in rough water conditions and stirred up sediments.
- Turbidity levels downstream at Bridge and Plant Discharge stations were comparatively low.

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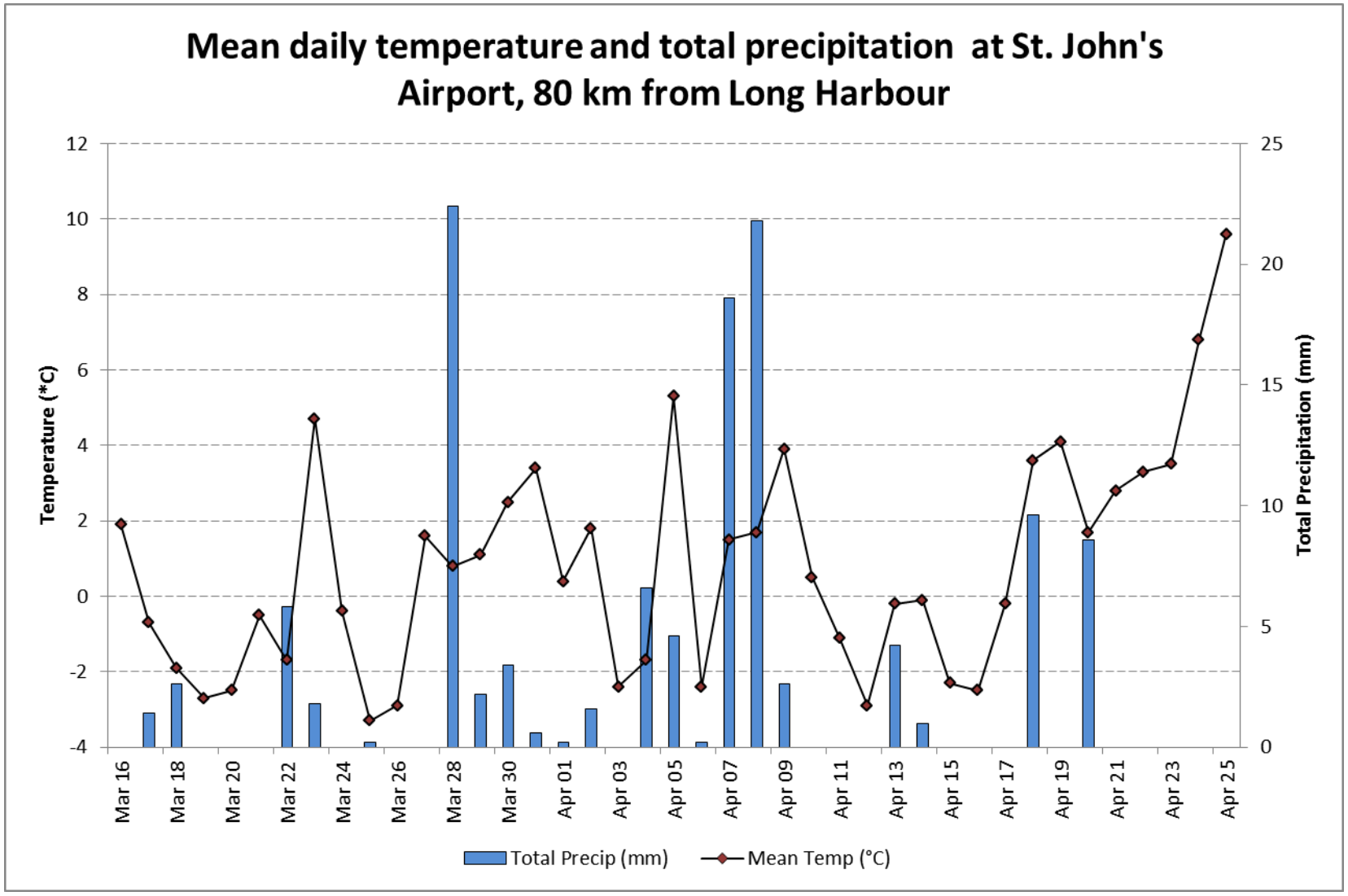
Appendix


Mean daily temperature and total precipitation at St. John's Airport, 80 km from Long Harbour
Temperature (*C)
Total Precipitation (mm)
12
10
8
6
4
2
0
-2
-4
25
20
15
10
5
0
Mar 16
Mar 18
Mar 20
Mar 22
Mar 24
Mar 26
Mar 28
Mar 30
Apr 01
Apr 03
Apr 05
Apr 07
Apr 09
Apr 11
Apr 13
Apr 15
Apr 17
Apr 19
Apr 21
Apr 23
Apr 25
Total Precip (mm)
Mean Temp (°C)