Real-Time Water Quality Deployment Report

Rattling Brook Network

April 20, 2017 to June 8, 2017

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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2017-04-20 to 2017-06-08

General

- Department of Municipal Affairs and Environment staff monitors the real-time web pages consistently.
- Weather data from the nearby Placentia weather station was not available for this deployment period for comparative purposes. Instead, weather data from St. John's International Airport was included as this is the closest Environment Canada station to the Rattling Brook network.
- 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

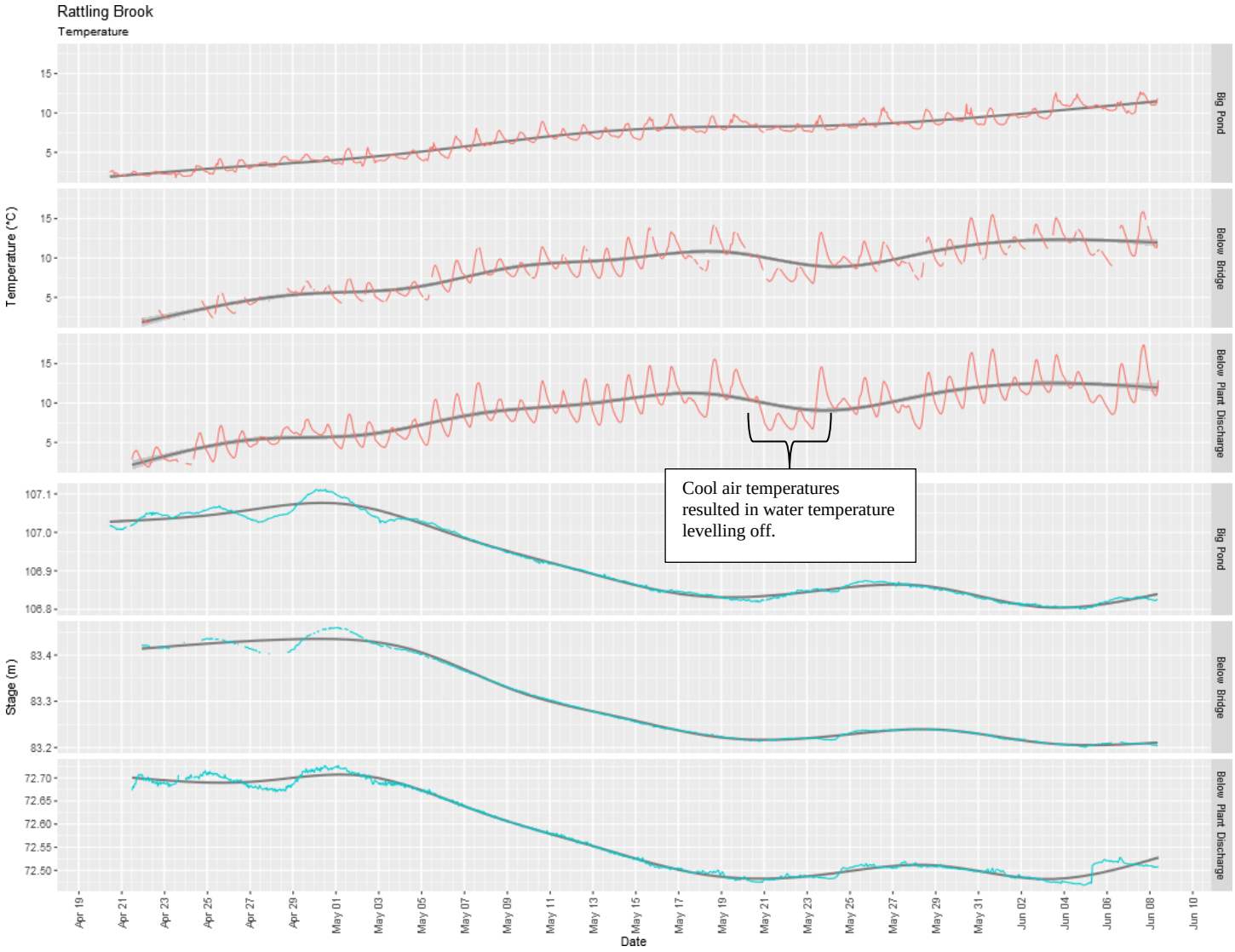
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	April 20, 2017	Deployment	NA	NA	NA	NA	NA
	June 8, 2017	Removal	Excellent	Excellent	Excellent	Excellent	Excellent
Rattling Brook below Bridge	April 21, 2017	Deployment	NA	NA	NA	NA	NA
	June 8, 2017	Removal	Good	Fair	Good	Excellent	Good
Rattling Brook below Plant Discharge	April 21. 10:55	Deployment	NA	NA	NA	NA	NA
	April 8, 2017	Removal	Excellent	Fair	Excellent	Excellent	Marginal

- The QAQC handheld device was found to be faulty on April 20th and 21st. Because of this, QAQC rankings could not be calculated for deployment at any of the stations. This may be due to cool temperatures affecting the handheld's batteries.

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	6.96	7.72	1.78	12.68
Below Bridge	8.96	9.23	1.82	15.88
Below Plant Discharge	9.05	9.20	1.88	17.36

- Water temperature increased at all stations consistently as air temperatures rose from mid to late spring.
- A brief cessation of the warming trend was observed from May 19th to 23rd due to cool air temperatures.

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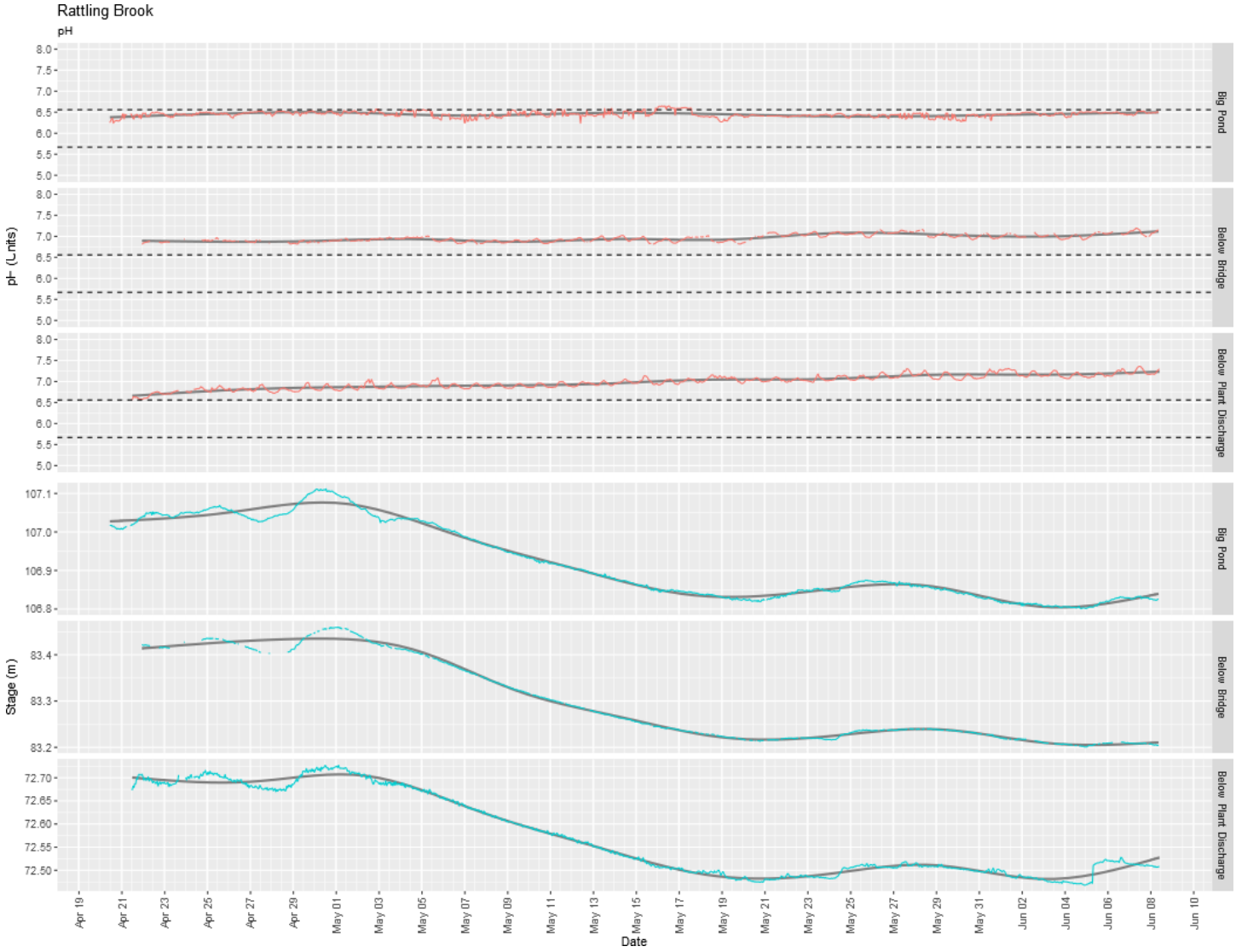
pH

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	6.45	6.45	6.24	6.65
Below Bridge	6.96	6.95	6.81	7.20
Below Plant Discharge	6.99	6.99	6.56	7.36

- pH resided near or above the upper limit of the Site Specific Guidelines (SSGs, dashed lines) during much of this deployment period and showed a rising trend towards mid-June. This rise in pH is likely associated with an increase in biological activity reducing the concentration of carbon dioxide in the water column.

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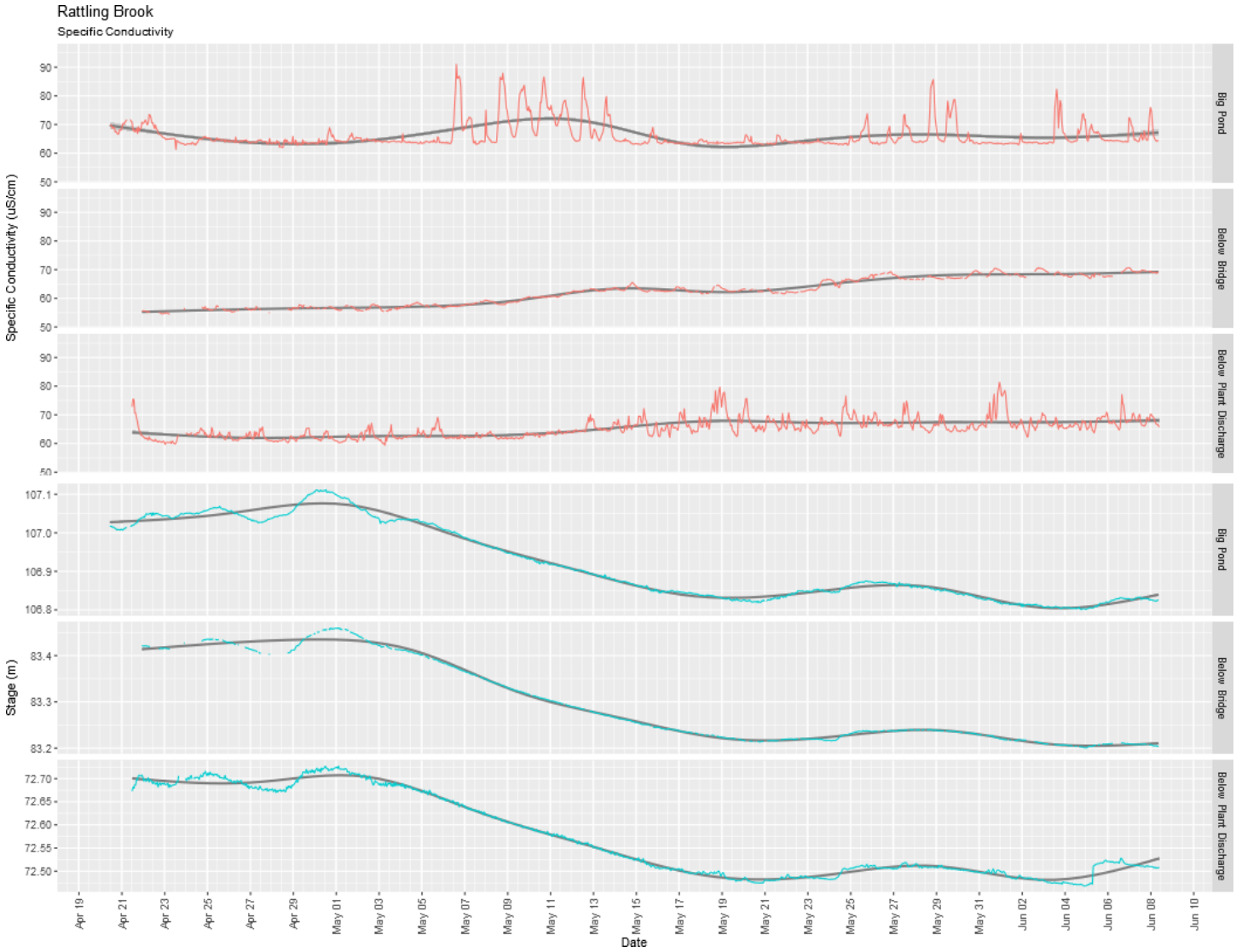
Specific Conductivity

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	66.1	64.2	61.3	91.0
Below Bridge	62.5	62.6	54.5	70.8
Below Plant Discharge	65.3	64.8	59.4	81.4

- Specific conductivity increased at each station over the course of the deployment period with occasional periods of instability – especially at Bridge and Plant Discharge station. These periods of instability may be associated with weather events.

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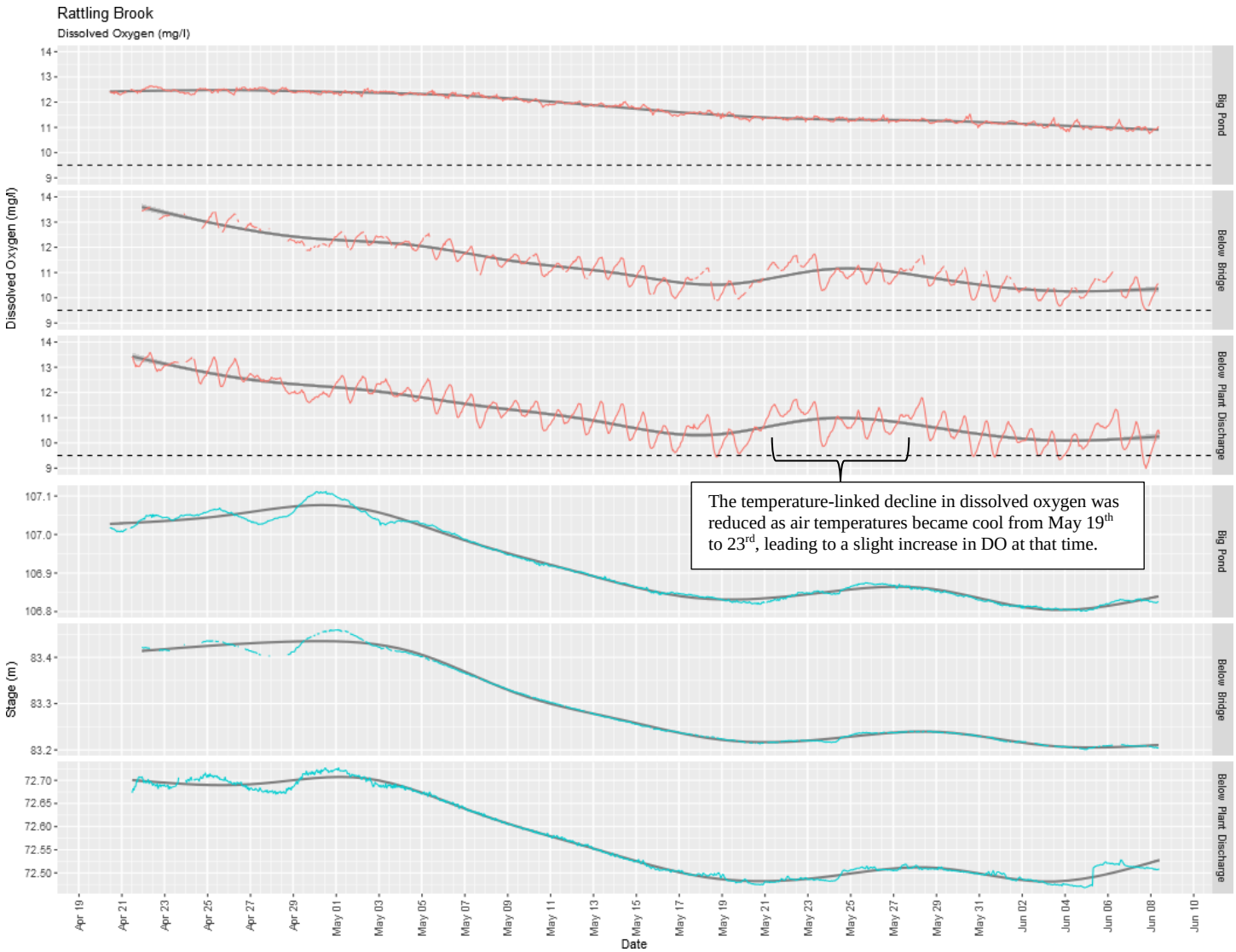
Dissolved Oxygen

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	11.78	11.80	10.75	12.65
Below Bridge	11.27	11.14	9.50	13.60
Below Plant Discharge	11.19	11.08	8.99	13.59

- Dissolved oxygen concentrations at Big Pond and Bridge station remained at or above the CCME guideline of 9.5 mg/l (dashed line) for the deployment period. Only a few instances of values less than 9.5 mg/l were recorded at Plant Discharge station.

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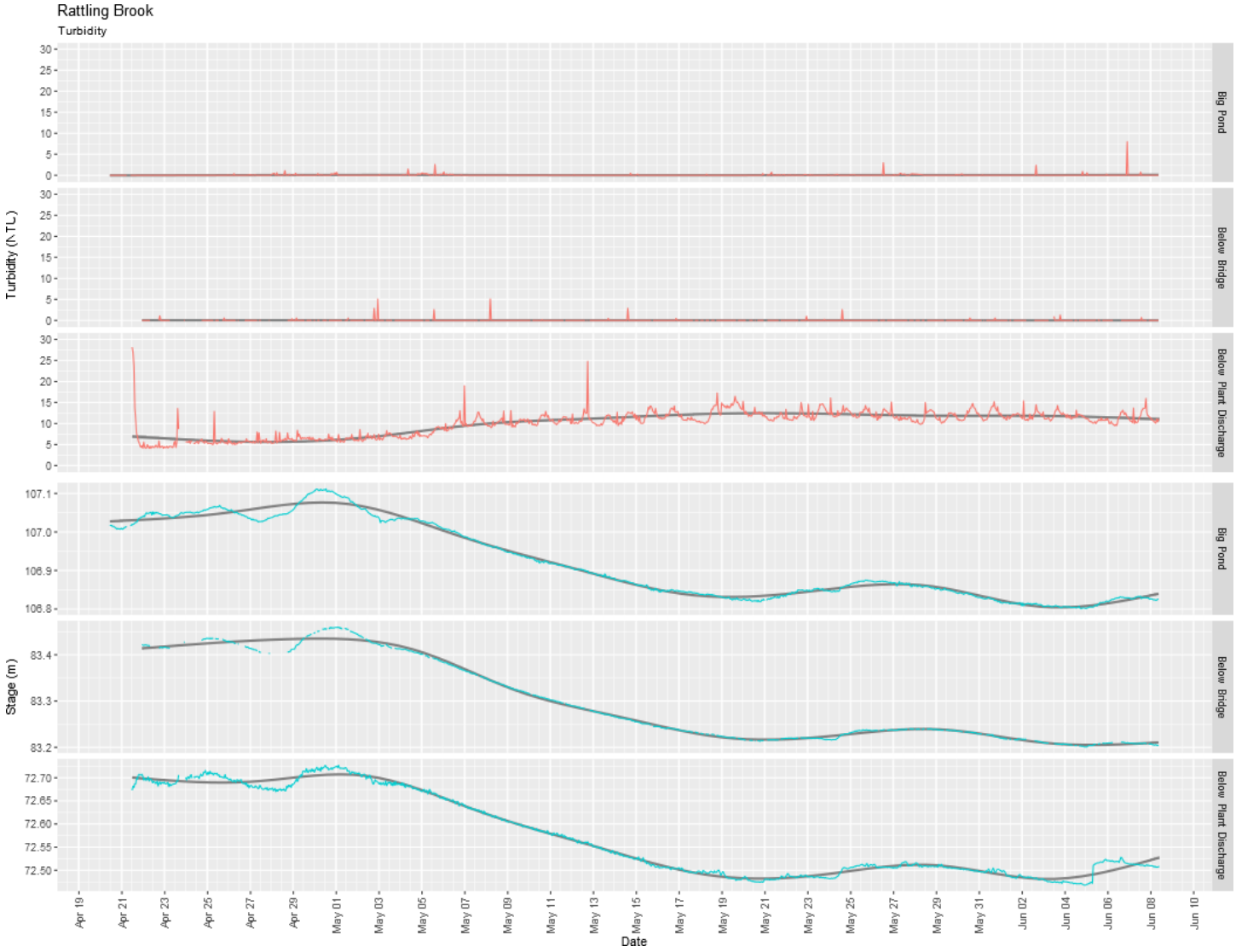
Turbidity

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	0.0	0.0	0.0	8.0
Below Bridge	0.0	0.0	0.0	5.1
Below Plant Discharge	10.1	10.8	4.1	28.2

- Turbidity levels were low at Big Pond and Bridge stations with occasional low-level events that quickly resided. Turbidity levels at Plant Discharge appear to have been fouled from the beginning to end of the deployment period (resulting in "marginal" QAQC ranking). Although the levels are likely up to 10 NTU above actual levels, variability appears to be within reason for the station. Turbidity data is left for visualisation purposes only.

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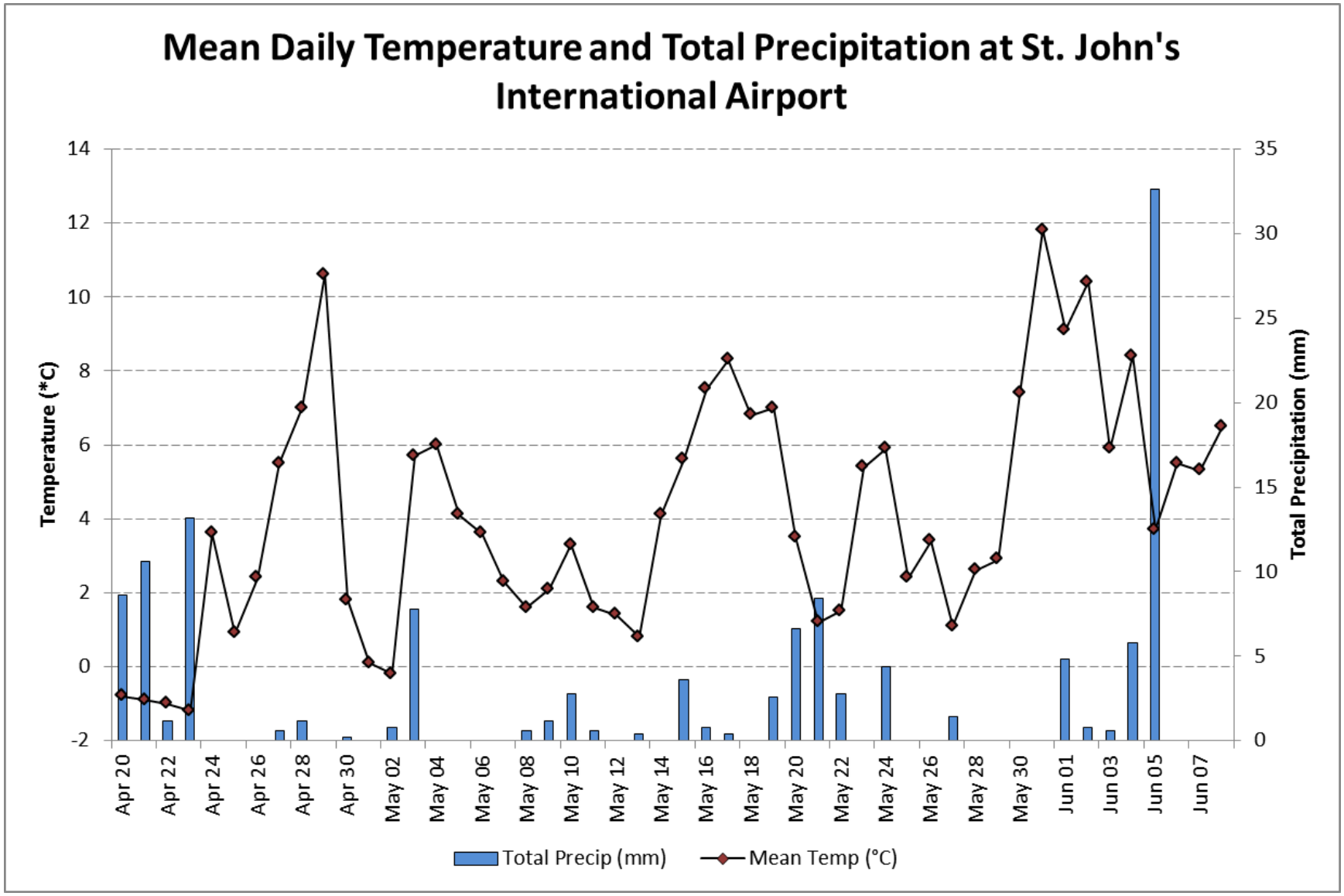
Appendix


Mean Daily Temperature and Total Precipitation at St. John's International Airport
Temperature (*C)
Total Precipitation (mm)
14
12
10
8
6
4
2
0
-2
35
30
25
20
15
10
5
0
Apr 20
Apr 22
Apr 24
Apr 26
Apr 28
Apr 30
May 02
May 04
May 06
May 08
May 10
May 12
May 14
May 16
May 18
May 20
May 22
May 24
May 26
May 28
May 30
Jun 01
Jun 03
Jun 05
Jun 07
Total Precip (mm)
Mean Temp (°C)