Real-Time Water Quality Deployment Report

Rattling Brook Network

July 6, 2018 to August 30, 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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2018-07-06 to 2018-08-30

General

- Department of Municipal Affairs and Environment staff monitors the real-time web pages consistently.
- A failure of the turbidity sensor at Plant Discharge station towards the latter part of the deployment resulted in partial removal of turbidity data.
- 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

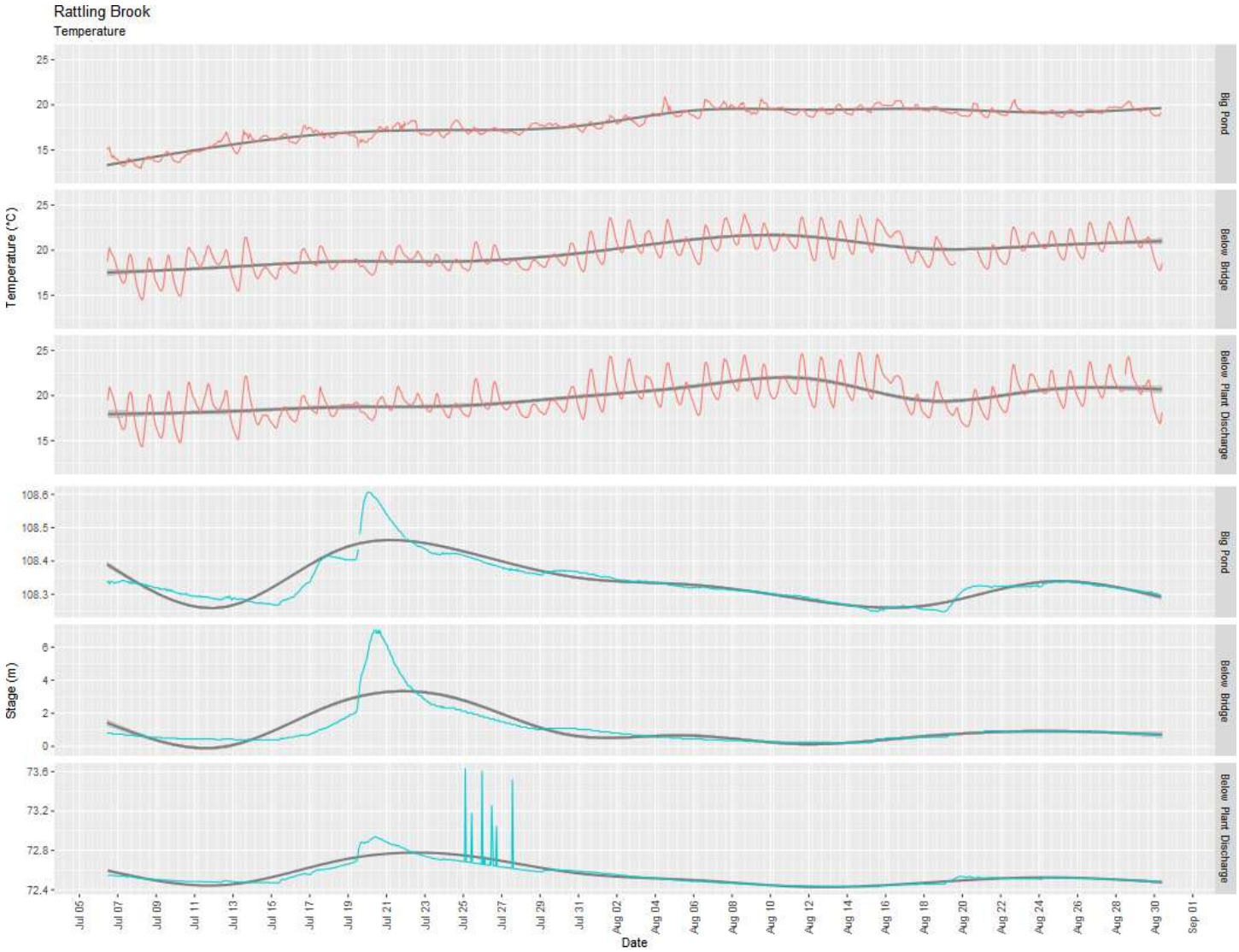
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	July 6, 2018	Deployment	Good	Excellent	Good	Fair	Excellent
	August 30, 2018	Removal	Excellent	Excellent	Good	Fair	Excellent
Rattling Brook below Bridge	July 6, 2018	Deployment	Good	Excellent	Good	Excellent	Excellent
	August 30, 2018	Removal	Good	Excellent	Good	Fair	Excellent
Rattling Brook below Plant Discharge	July 6, 2018	Deployment	Excellent	Excellent	Good	Good	Excellent
	August 30, 2018	Removal	Good	Good	Good	Fair	Poor

- A ranking of “Poor” was observed at Rattling Brook below Plant Discharge due to a mid-deployment sensor failure.

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	17.92	18.48	12.94	20.87
Below Bridge	19.75	19.57	14.46	23.98
Below Plant Discharge	19.78	19.61	14.35	24.77

- Water temperatures had an overall increase during this deployment period, but the annual high temperature was likely reached by the second week of August before heavy rain occurred (22.4 mm). Following that influx of cool water, temperatures did not recover to previous levels.

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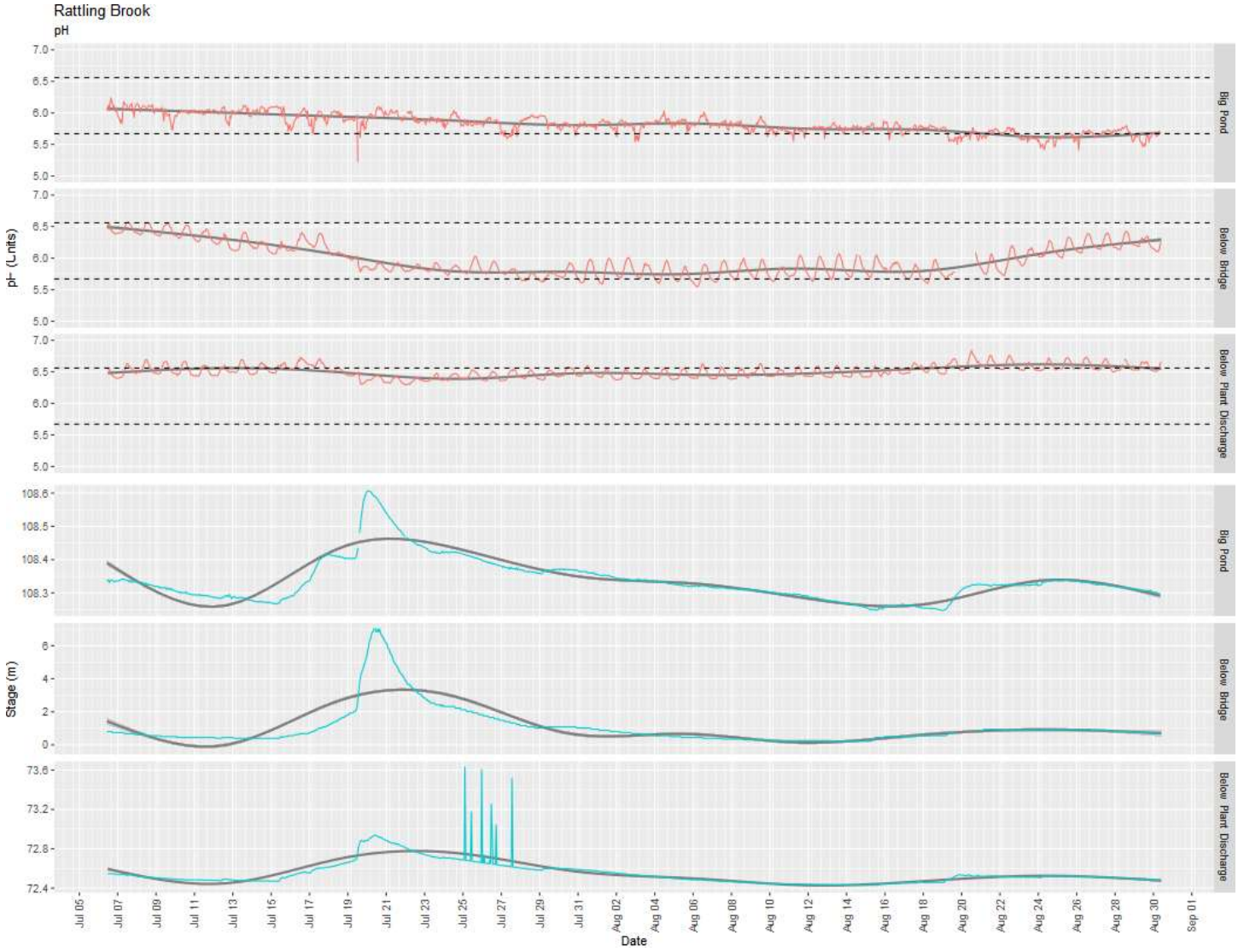
pH

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	5.82	5.81	5.22	6.24
Below Bridge	5.97	5.90	5.55	6.57
Below Plant Discharge	6.51	6.50	6.29	6.84

- pH levels at each station were close to one another during this deployment period but differing trends were observed; pH at Big Pond declined, Bridge fell and recovered, and Plant Discharge was steady. These differences will be monitored closely into the next deployment period.

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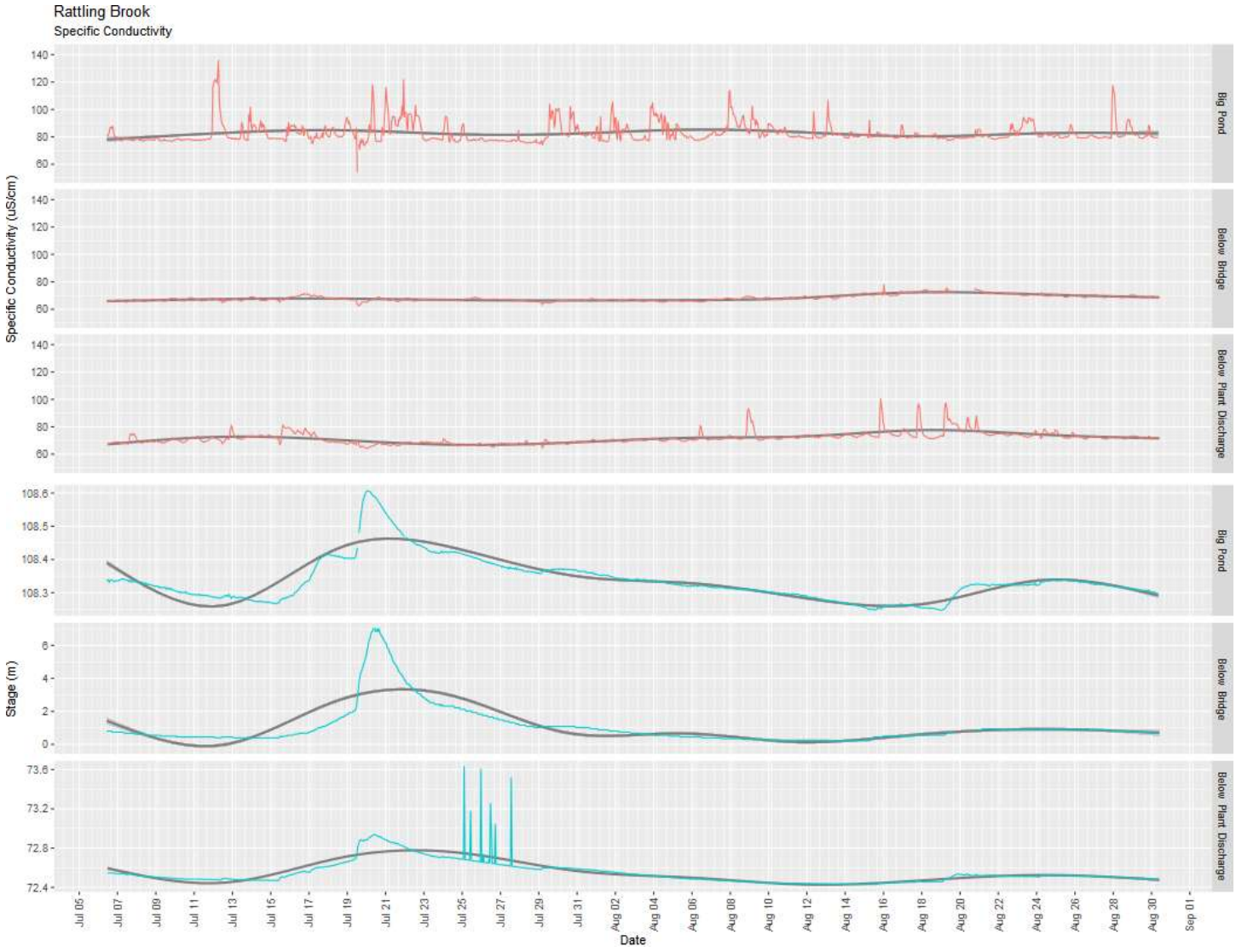
Specific Conductivity

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	82.7	80.3	54.2	135.8
Below Bridge	68.1	67.5	62.5	77.9
Below Plant Discharge	71.7	71.3	64.3	100.3

- Specific conductivity was highly variable at Big Pond station during this deployment period but with no obvious up- or downward trends from early July to late August. Likewise, no substantial up- or downward trend was observed at Bridge and Plant Discharge stations.

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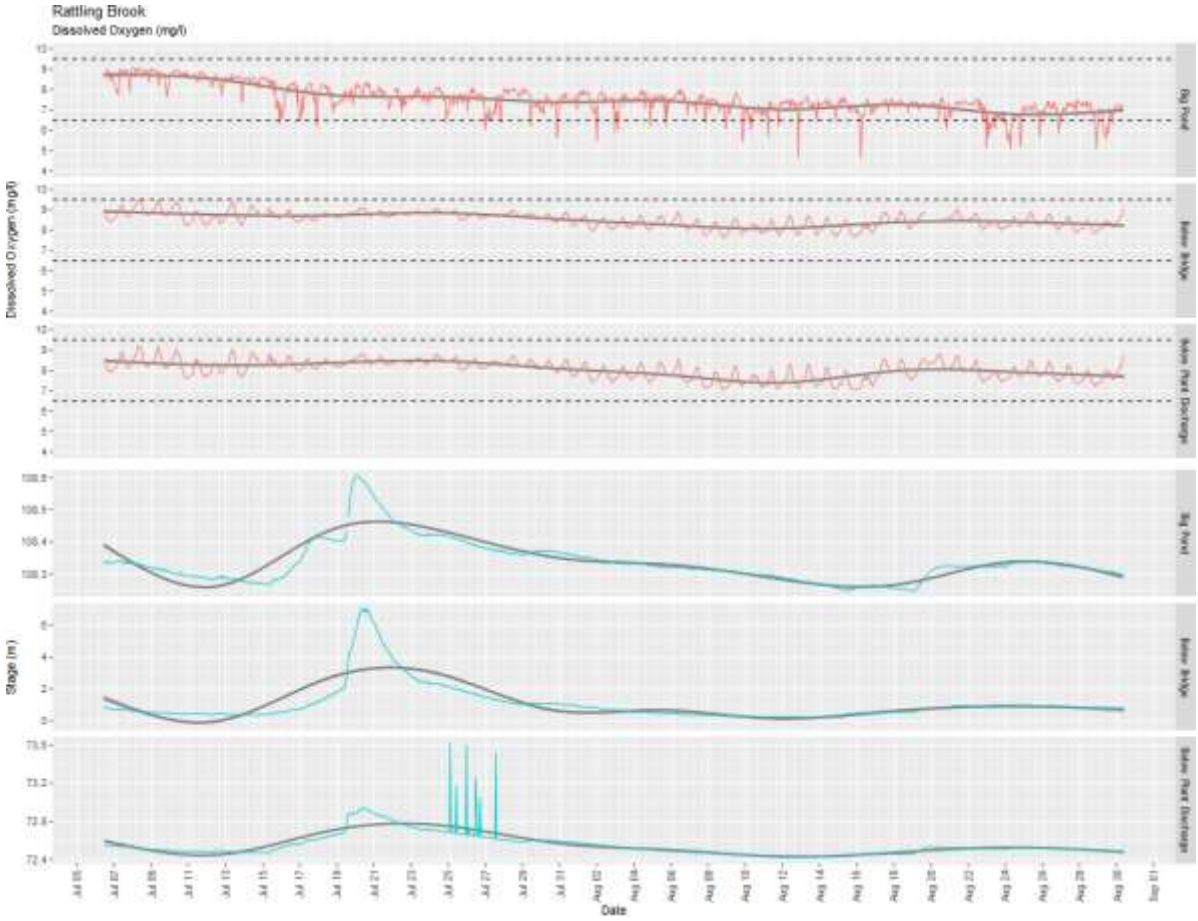
Dissolved Oxygen

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	7.51	7.44	4.60	9.10
Below Bridge	8.51	8.54	7.64	9.51
Below Plant Discharge	8.04	8.10	7.03	9.21

- As expected, warm water temperatures saw dissolved oxygen concentrations decline at Big Pond, Bridge, and Plant Discharge stations. All dissolved oxygen levels at Bridge and Plant Discharge stations were found to be above the minimum CCME guideline for the protection of early life stage aquatic biota.
- DO levels at Big Pond station, however, showed substantial plunges in dissolved oxygen concentrations, especially overnight. This may be linked to the elevated water levels at Big Pond and the newly inundated soils. As organic matter decomposes, oxygen levels can be expected to fall, especially during calm periods without wave action (reduced aeration) and during the night (reduced oxygen from photosynthesis).

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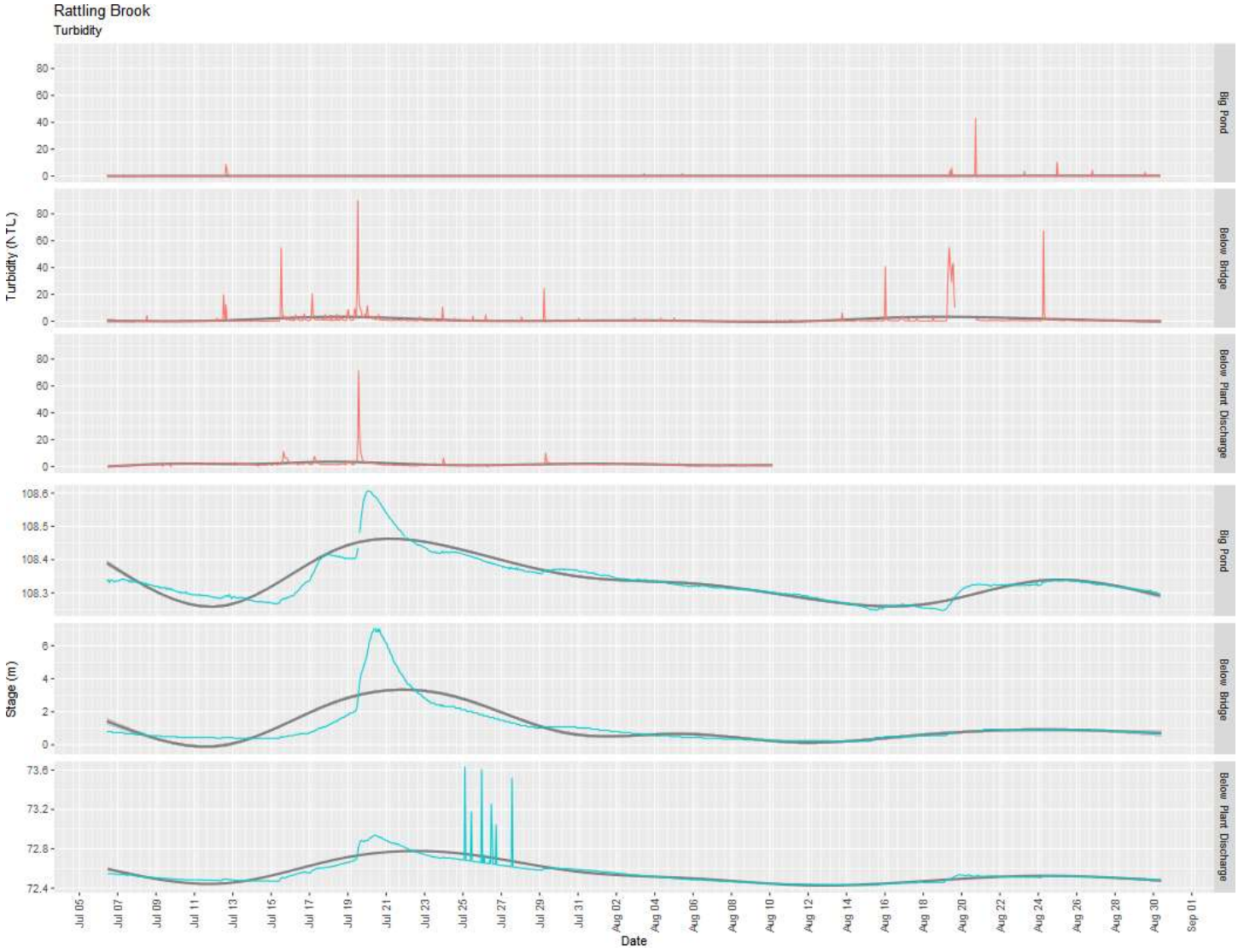
Turbidity

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	0.1	0.0	0.0	42.9
Below Bridge	1.1	0.3	0.0	89.9
Below Plant Discharge	1.7	1.4	0.0	71.2

- Turbidity levels were found to be near or at background levels at all monitoring stations. Periodic spikes in turbidity are associated with concurrent weather events.

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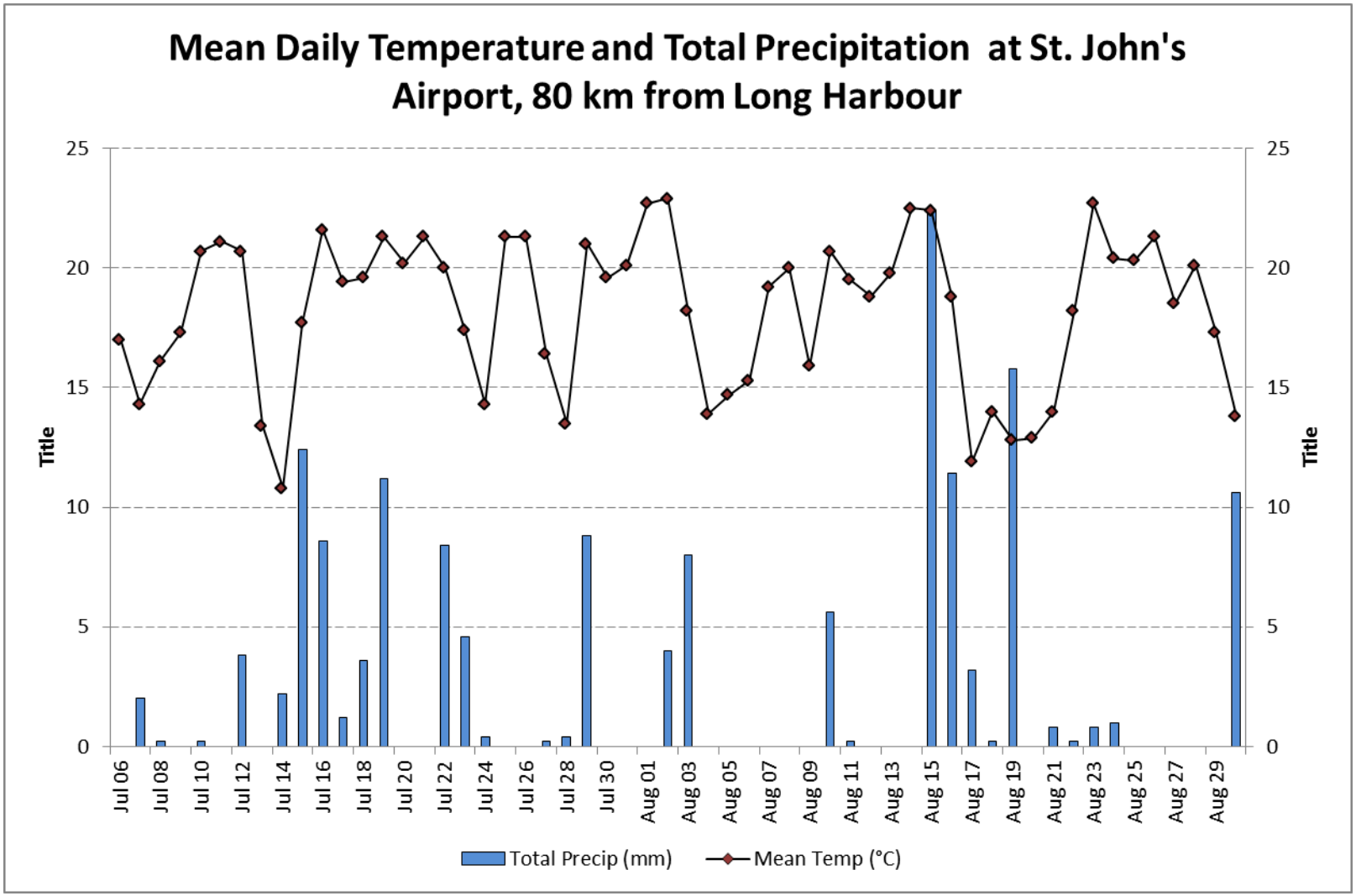
Appendix


Mean Daily Temperature and Total Precipitation at St. John's Airport, 80 km from Long Harbour
Title
Title
25
20
15
10
5
0
Jul 06
Jul 08
Jul 10
Jul 12
Jul 14
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Aug 19
Aug 21
Aug 23
Aug 25
Aug 27
Aug 29
Total Precip (mm)
Mean Temp (°C)