Real-Time Water Quality Deployment Report

Rattling Brook Network

March 4, 2020 to April 23, 2020

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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2020-03-04 to 2020-04-23

General

- Department of Municipal Affairs and Environment staff monitor the real-time web pages consistently.
- Equipment at Big Pond station was taken out for winter on January 14th but will be installed once ice conditions allow.
- 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

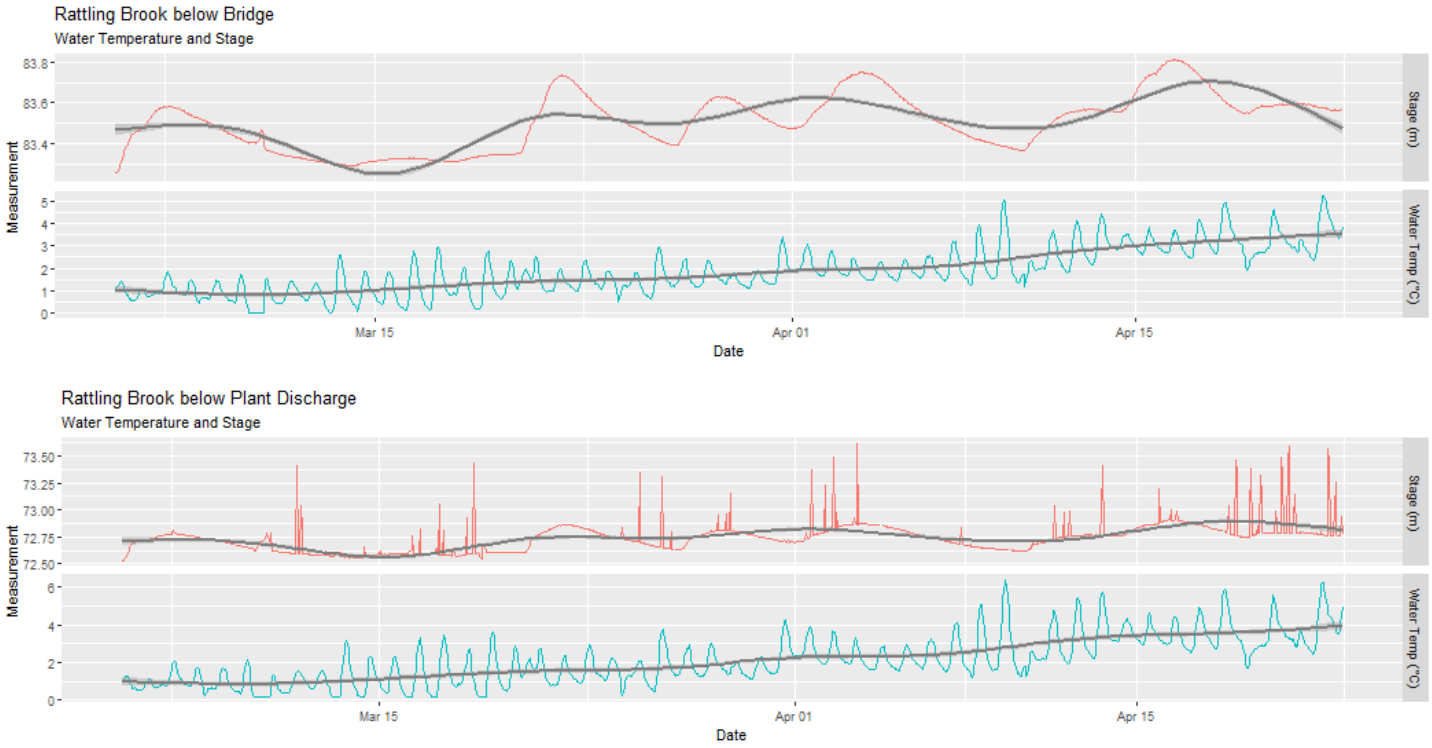
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook below Bridge	March 4, 2020	Deployment	Excellent	Good	Fair	Marginal	Excellent
	April 23, 2020	Removal	Excellent	Fair	Fair	Excellent	Excellent
Rattling Brook below Plant Discharge	March 4, 2020	Deployment	Good	Excellent	Fair	Poor	Excellent
	April 23, 2020	Removal	Excellent	Poor	Good	Fair	Excellent

- Dissolved Oxygen was ranked ‘Poor’ at Plant Discharge station during deployment. Placement of the QAQC sonde during deployment may not have been as comparable to the Field sonde as assumed.
- During removal a ‘Poor’ ranking was calculated at Discharge station possibly a result of calibration drift.

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
Below Bridge	1.89	1.72	-0.1	5.24
Below Plant Discharge	2.11	1.94	0.17	6.36

- Water temperatures trend lines for both stations show diurnal pattern based on air during this deployment period. Both show increases near end of the deployment as water warms into spring.

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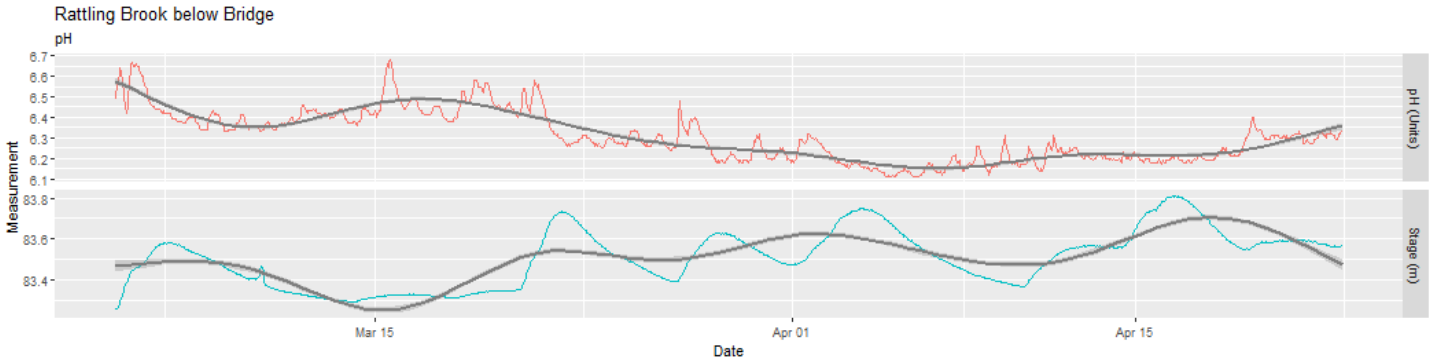
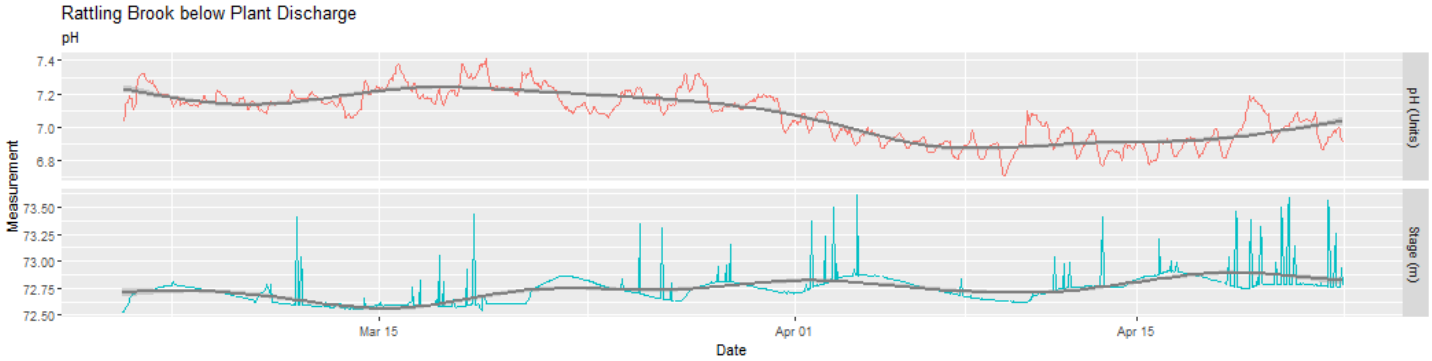
pH

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
Below Bridge	6.30	6.29	6.11	6.68
Below Plant Discharge	7.07	7.10	6.71	7.41

- pH values were stable during this deployment and fell mainly within site-specific guidelines (5.67-6.56 pH Units) at Below Bridge and Plant Discharge stations. Variations in measurement are a result of the precipitation and runoff.

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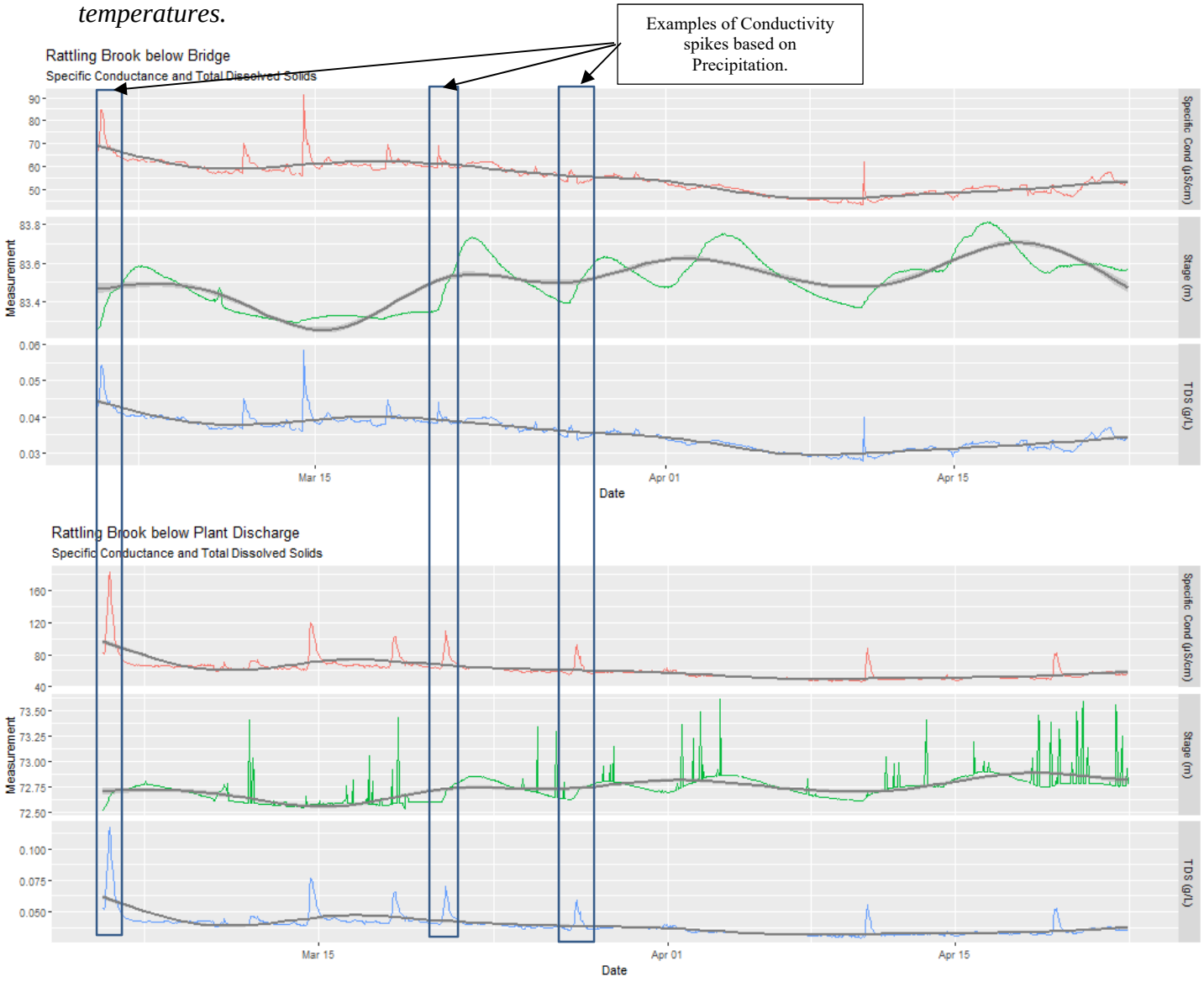
Specific Conductivity

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
Below Bridge	55.0	55.2	43.4	91.4
Below Plant Discharge	60.4	58.8	45.9	182.9

- Specific conductivity at both Bridge and Plant Discharge station showed little variability in conductivity with a presence of conductivity events relating to precipitation. The largest conductivity events were due to the cumulative effect of dissolved solids entering Rattling Brook along the length of the river.

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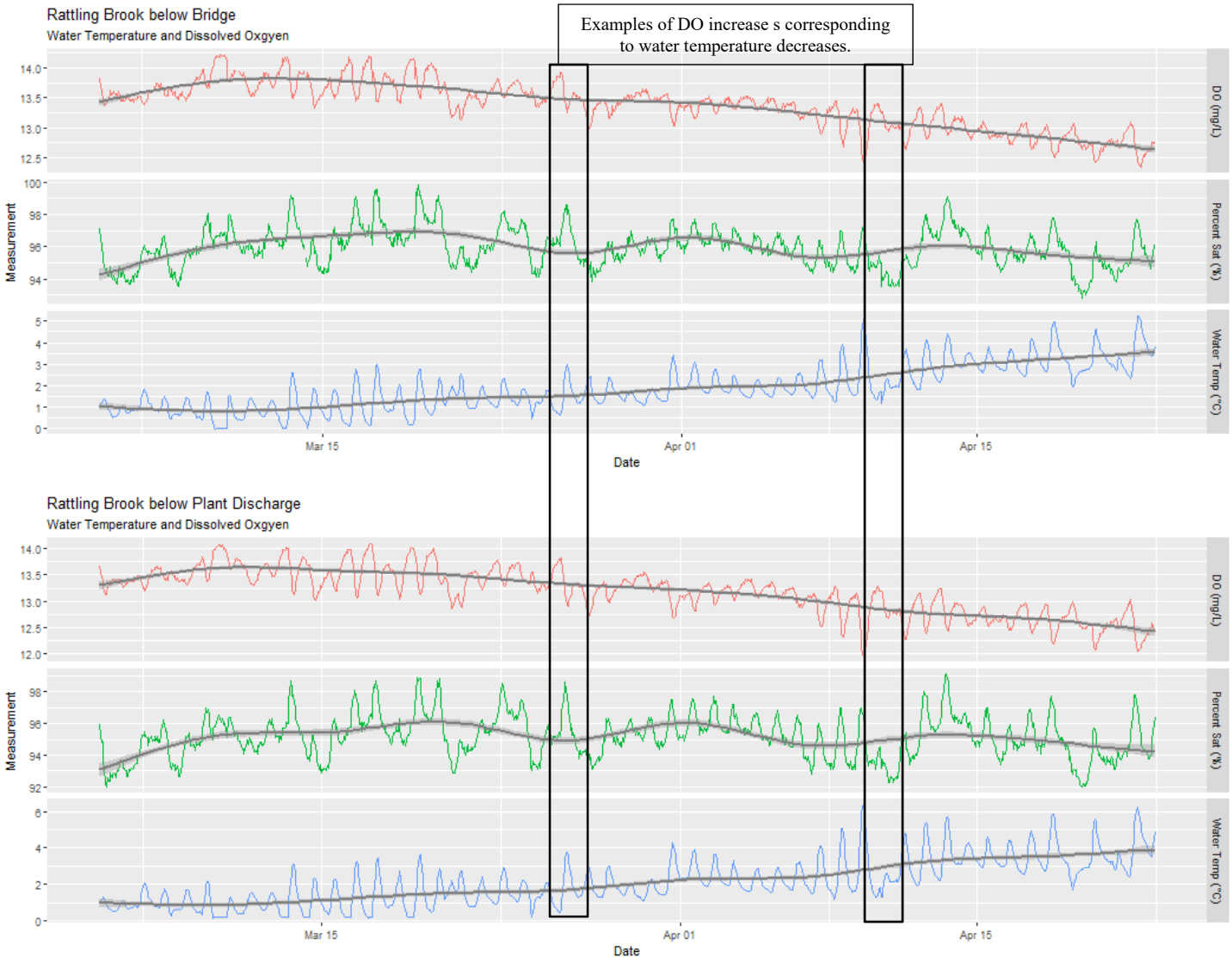
Dissolved Oxygen

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 oxidation reactions.



Station	Mean	Median	Min	Max
Below Bridge	13.37	13.42	12.34	14.22
Below Plant Discharge	13.18	13.24	11.95	14.10

- Warming water temperatures naturally lead to a decline in dissolved oxygen concentrations. During this deployment period, all values were above the minimum CCME guideline for the protection of early life stage aquatic organisms (9.5 mg/L).

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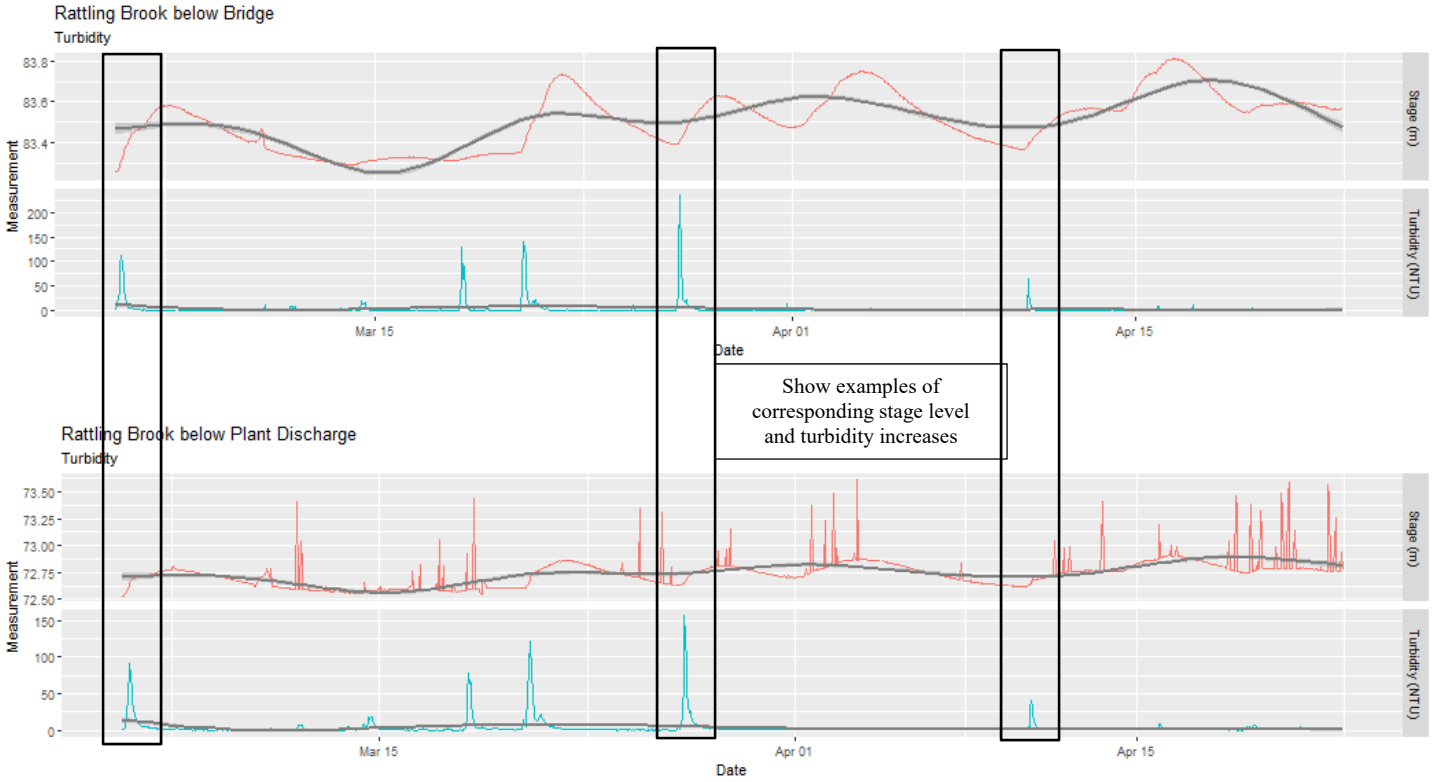
Turbidity

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
Below Bridge	2.4	0.0	0.0	235.9
Below Plant Discharge	3.4	1.0	0.2	156.9

- Turbidity events in excess of 100 NTU were observed, especially during the peak of spring freshet – due to the melting of frozen silt and sediments.

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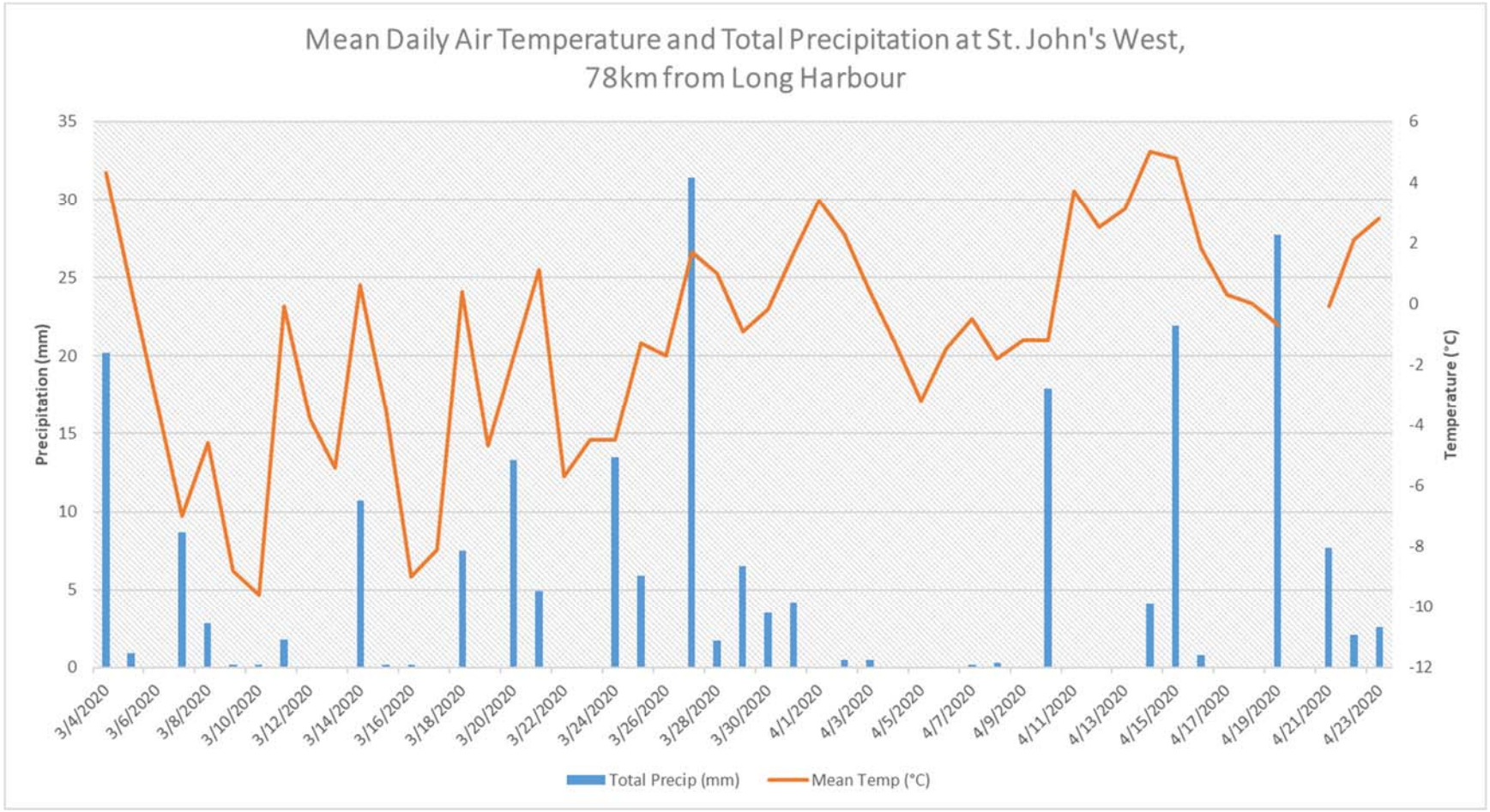
Appendix


Mean Daily Air Temperature and Total Precipitation at St. John's West, 78km from Long Harbour
Precipitation (mm)
Temperature (°C)
35
30
25
20
15
10
5
0
6
4
2
0
-2
-4
-6
-8
-10
-12
3/4/2020
3/6/2020
3/8/2020
3/10/2020
3/12/2020
3/14/2020
3/16/2020
3/18/2020
3/20/2020
3/22/2020
3/24/2020
3/26/2020
3/28/2020
3/30/2020
4/1/2020
4/3/2020
4/5/2020
4/7/2020
4/9/2020
4/11/2020
4/13/2020
4/15/2020
4/17/2020
4/19/2020
4/21/2020
4/23/2020
Total Precip (mm)
Mean Temp (°C)