# Real-Time Water Quality Deployment Report

## Rattling Brook Network

**April 23, 2020 to June 10, 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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2020-04-23 to 2020-06-10

## General

- Department of Municipal Affairs and Environment staff monitor 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 (https://wateroffice.ec.gc.ca/index_e.html)*.

## 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**

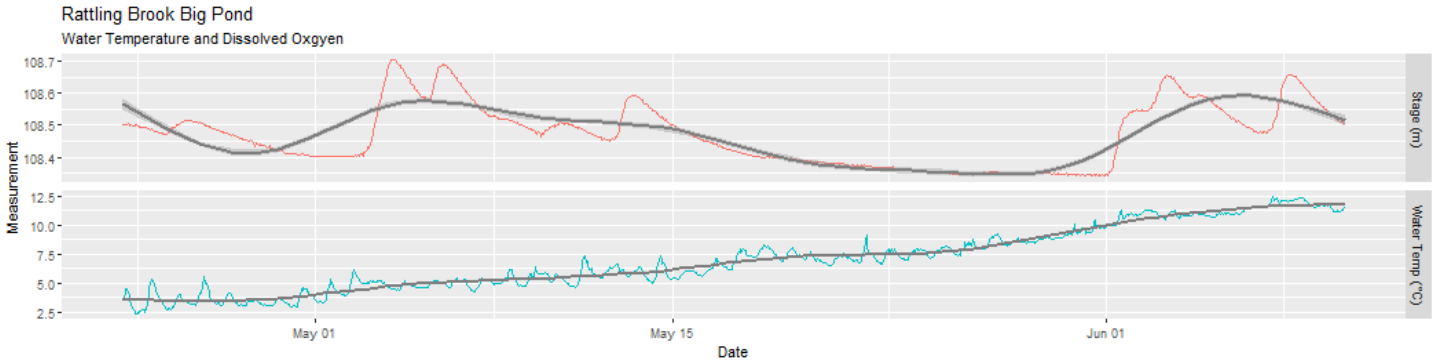
| Station | Date | Action | Comparison Ranking | | | | |
|---|---|---|---|---|---|---|---|
| | | | Temperature | pH | Conductivity | Dissolved Oxygen | Turbidity |
| Rattling Brook Big Pond | April 23 | Deployment | Excellent | Good | Good | Fair | Good |
| | June 10 | Removal | Excellent | Fair | Good | Good | Excellent |
| Rattling Brook below Bridge | April 23 | Deployment | Good | Excellent | Poor | Good | Excellent |
| | June 10 | Removal | Good | Marginal | Poor | Excellent | Excellent |
| Rattling Brook below Plant Discharge | April 23 | Deployment | Excellent | Excellent | Good | Good | Excellent |
| | June 10 | Removal | Excellent | Poor | Good | Good | Poor |

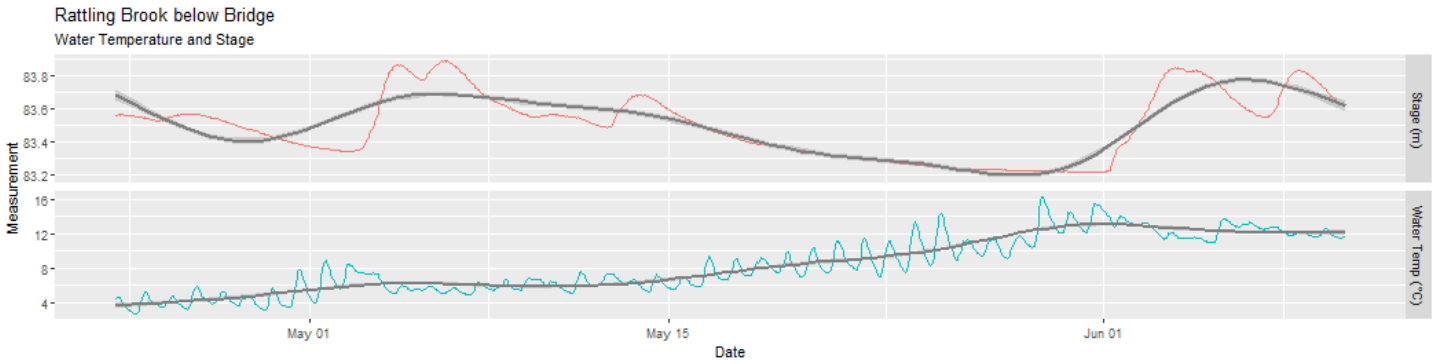
- Conductivity was ranked ‘Poor’ at Below Bridge station during deployment. Sonde will be tested at the lab for sensor issues.
- During removal, ‘Poor’ rankings for pH and turbidity were calculated at Plant Discharge station. pH was possibly due to calibration drift, while turbidity values were possibly due to a combination of high flow and sediment disturbance while placing the QA/QC sonde.

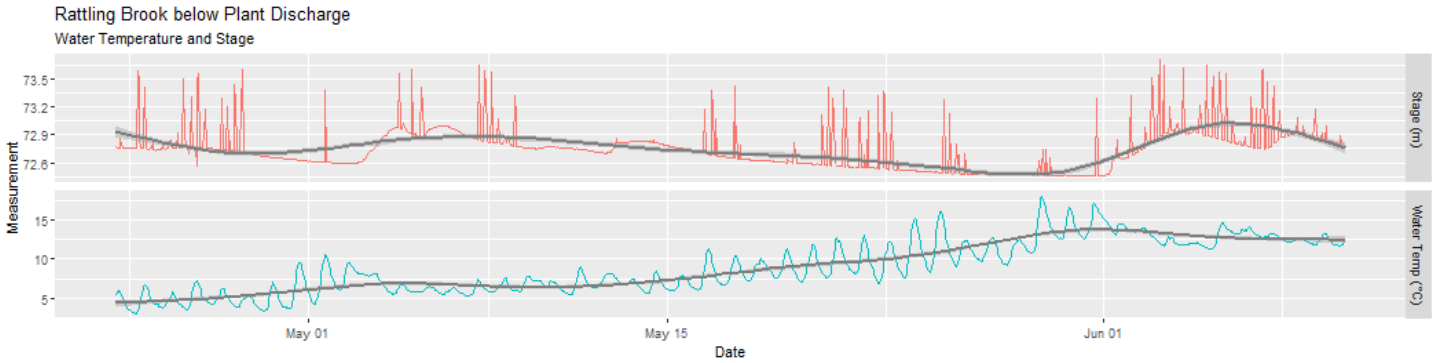
- Data Interpretation

## 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 | Max | Min | Median | Mean |
|---|---|---|---|---|
| Big Pond | 12.47 | 2.36 | 6.78 | 7.03 |
| Below Bridge | 16.27 | 2.67 | 7.57 | 8.38 |
| Below Plant Discharge | 17.96 | 3.03 | 8.17 | 8.99 |

Water temperature trend lines for both stations show diurnal pattern, related to air temperatures during this deployment period. All stations show values plateauing near end of the deployment as water continues to warm into summer.

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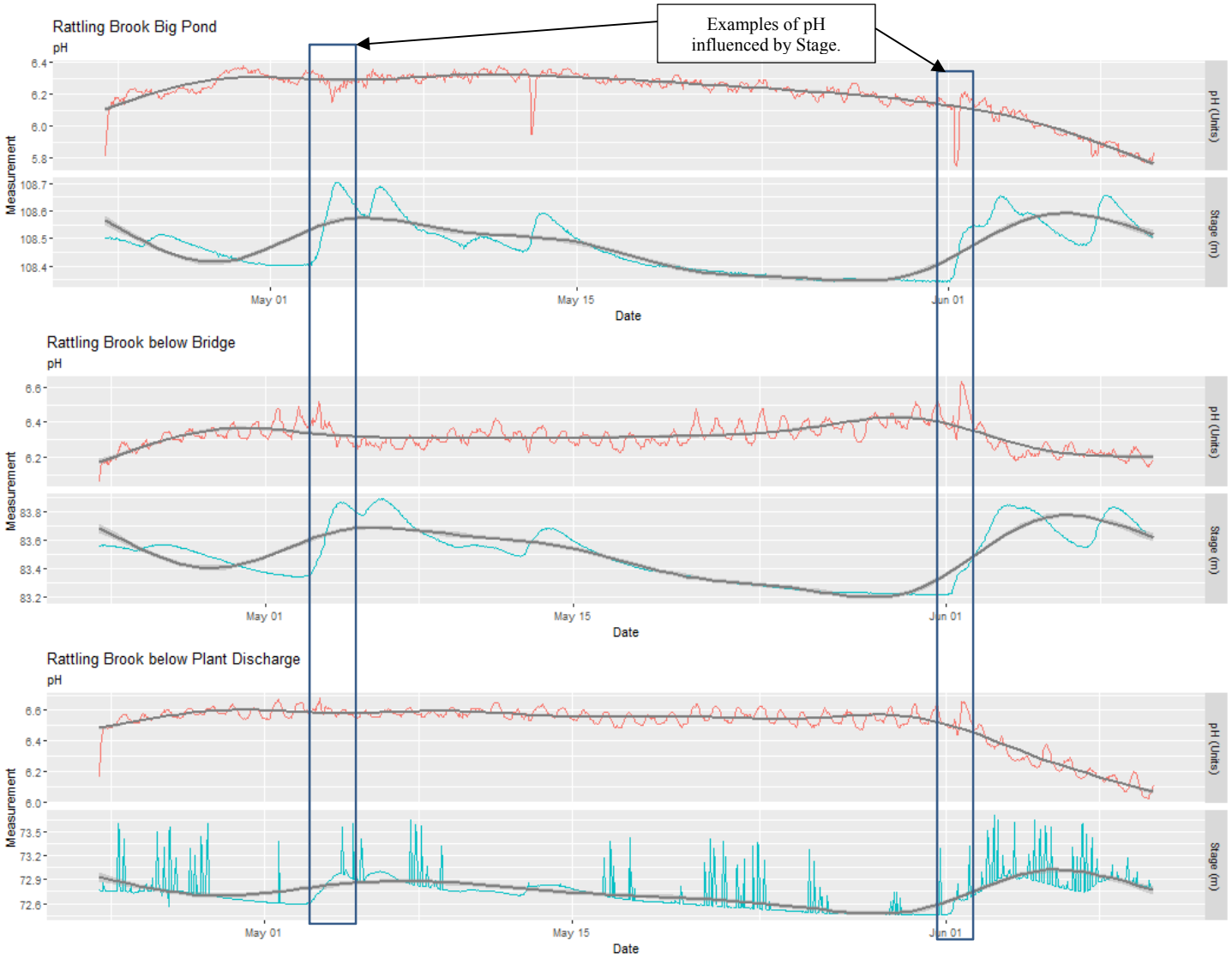
## pH

*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 | Max | Min | Median | Mean |
|---|---|---|---|---|
| Big Pond | 6.38 | 5.75 | 6.25 | 6.21 |
| Below Bridge | 6.63 | 6.06 | 6.32 | 6.32 |
| Below Plant Discharge | 6.68 | 6.02 | 6.56 | 6.51 |

- pH values were consistent over the deployment period and fell mainly within site-specific guidelines (5.67-6.56 pH Units). Variations in measurement are a result of precipitation and runoff.

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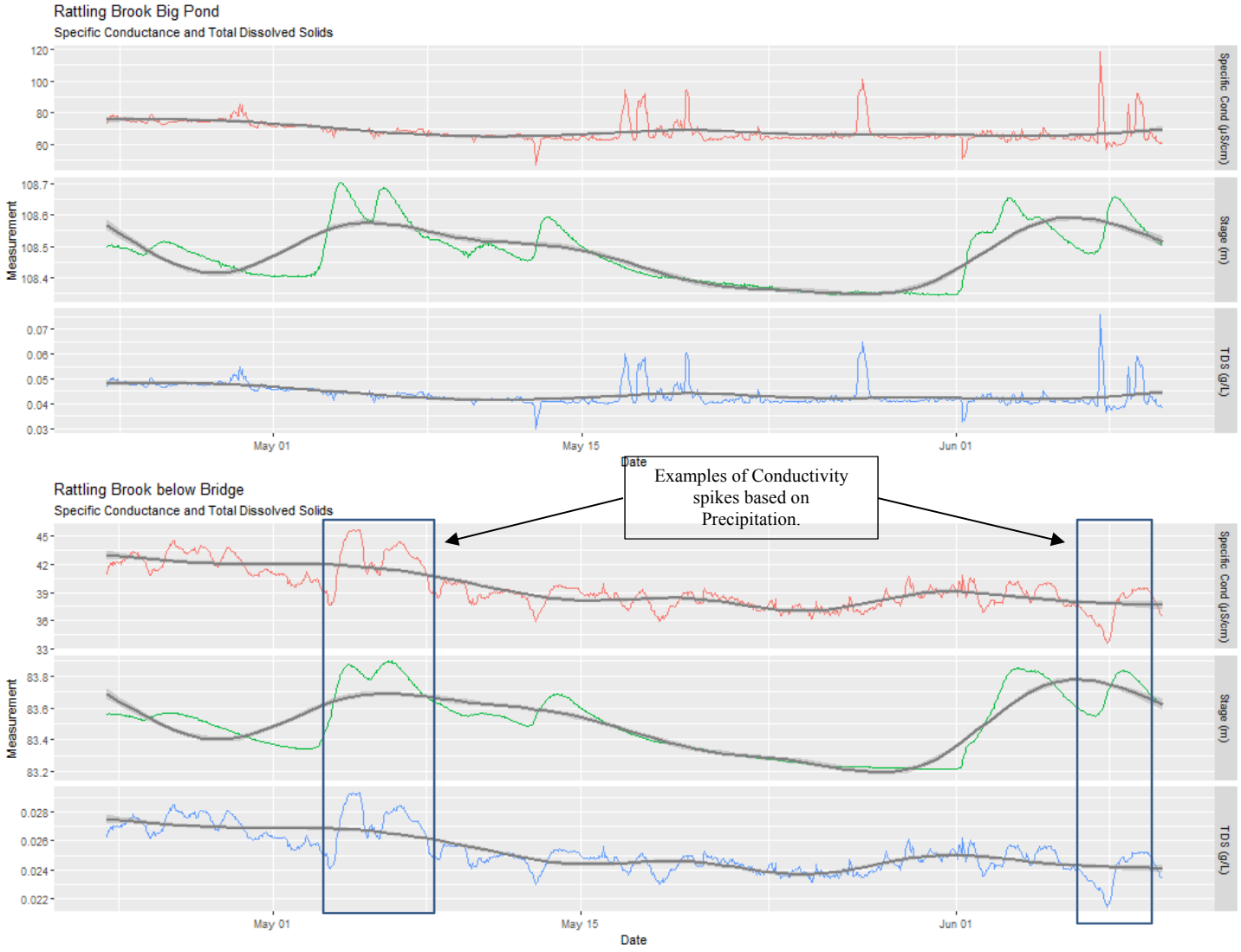
## Specific Conductivity

*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.*

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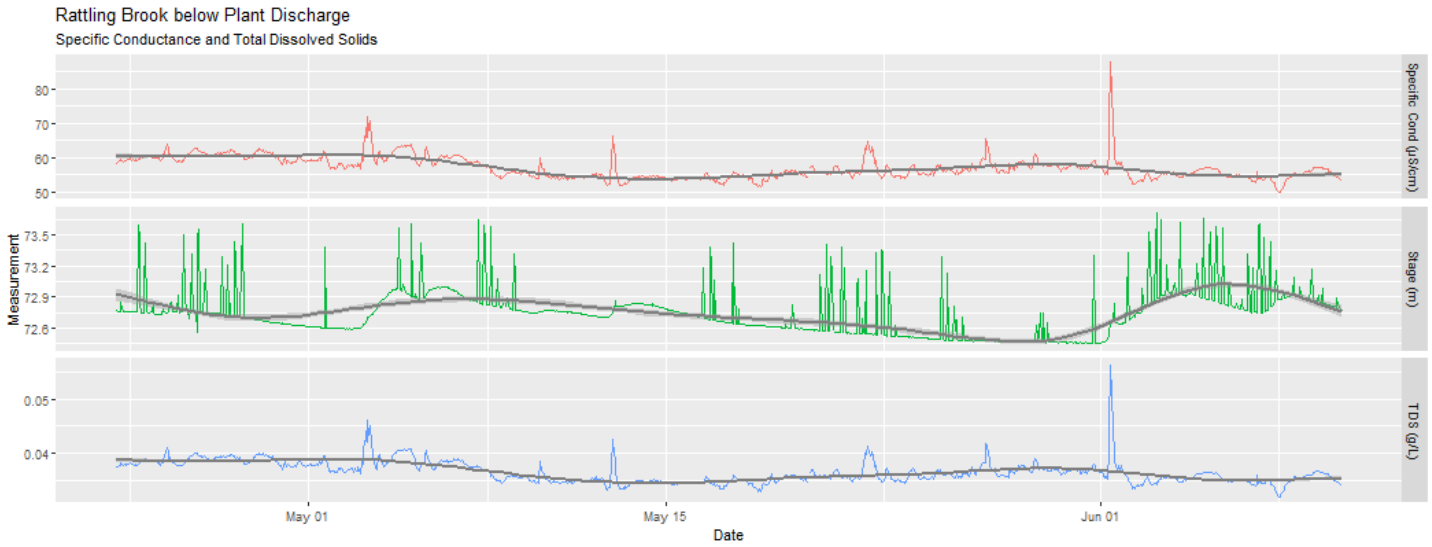


| Station | Max | Min | Median | Mean |
|---|---|---|---|---|
| Big Pond | 118.8 | 46.8 | 65.8 | 68.2 |
| Below Bridge | 45.7 | 33.6 | 39.0 | 39.5 |
| Below Plant Discharge | 87.9 | 49.9 | 56.4 | 57.0 |

- During the deployment period, specific conductivity ranged from 46.8 µs/cm to 118.8 µs/cm at Big Pond, 33.6 µs/cm to 45.7 µs/cm at Below Bridge and from 49.9 µs/cm to 87.9 µs/cm at Plant Discharge.
- Fluctuations in Specific Conductivity are generally related to variations in Stage caused by precipitation.

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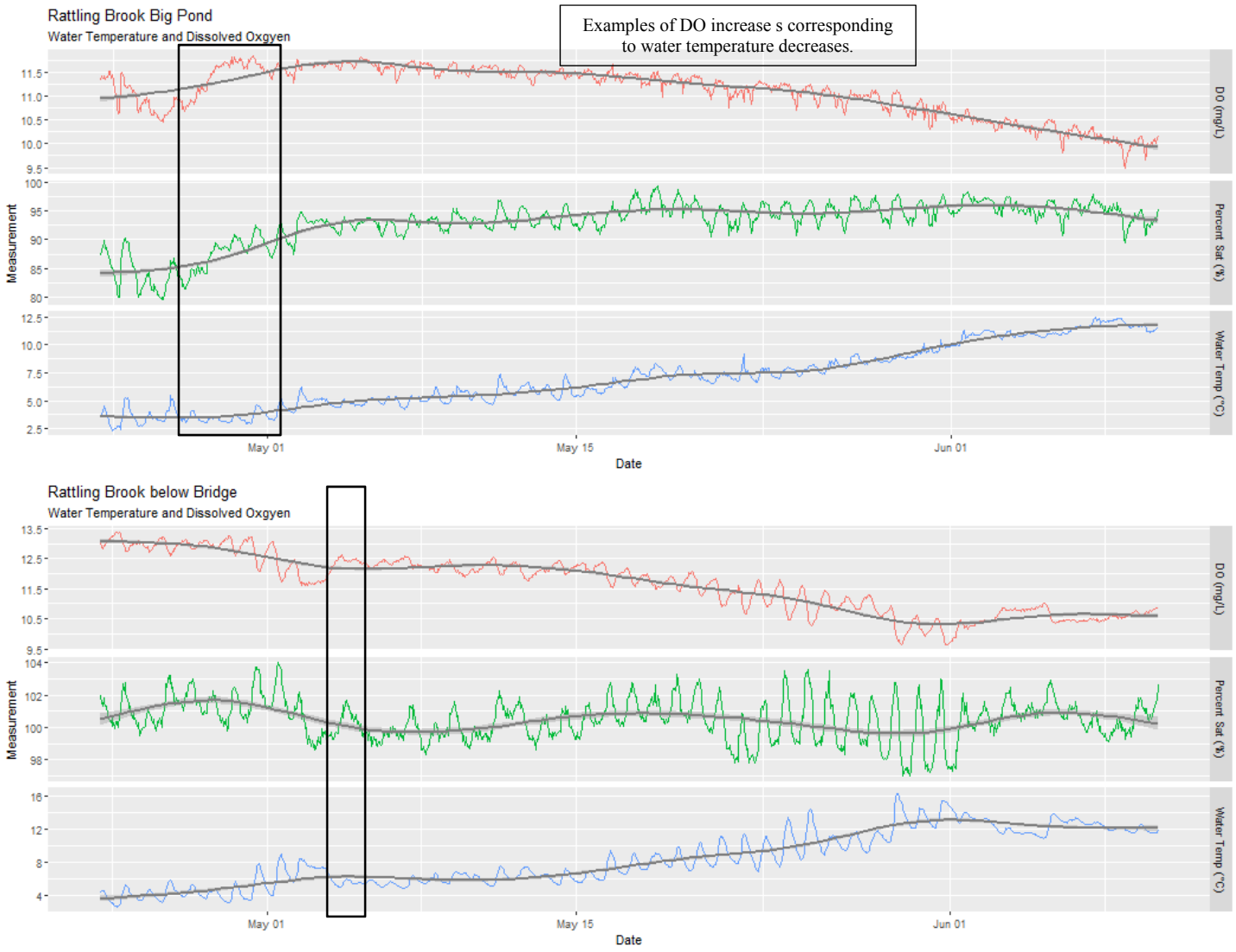
## Dissolved Oxygen

*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.*

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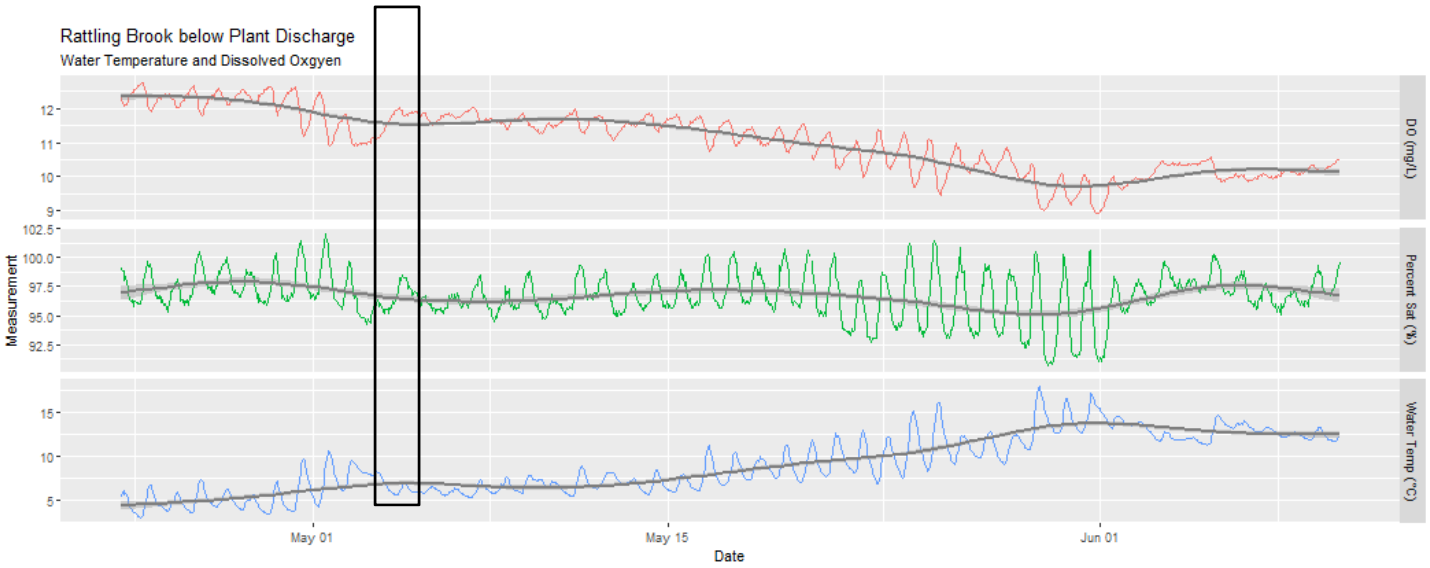


| Station | Max | Min | Median | Mean |
|---|---|---|---|---|
| Big Pond | 11.86 | 9.48 | 11.25 | 11.10 |
| Below Bridge | 13.39 | 9.63 | 11.79 | 11.65 |
| Below Plant Discharge | 12.76 | 8.92 | 11.19 | 11.05 |

- DO was relatively stable over the deployment period and showing obvious diurnal trends that correlate to the temperature trends.
- During this deployment period, all values were above the minimum CCME Aquatic Guideline for other life stages (6.5 mg/l) and near or above the minimum guideline set for cold-water biota during early life stages (9.5 mg/l).

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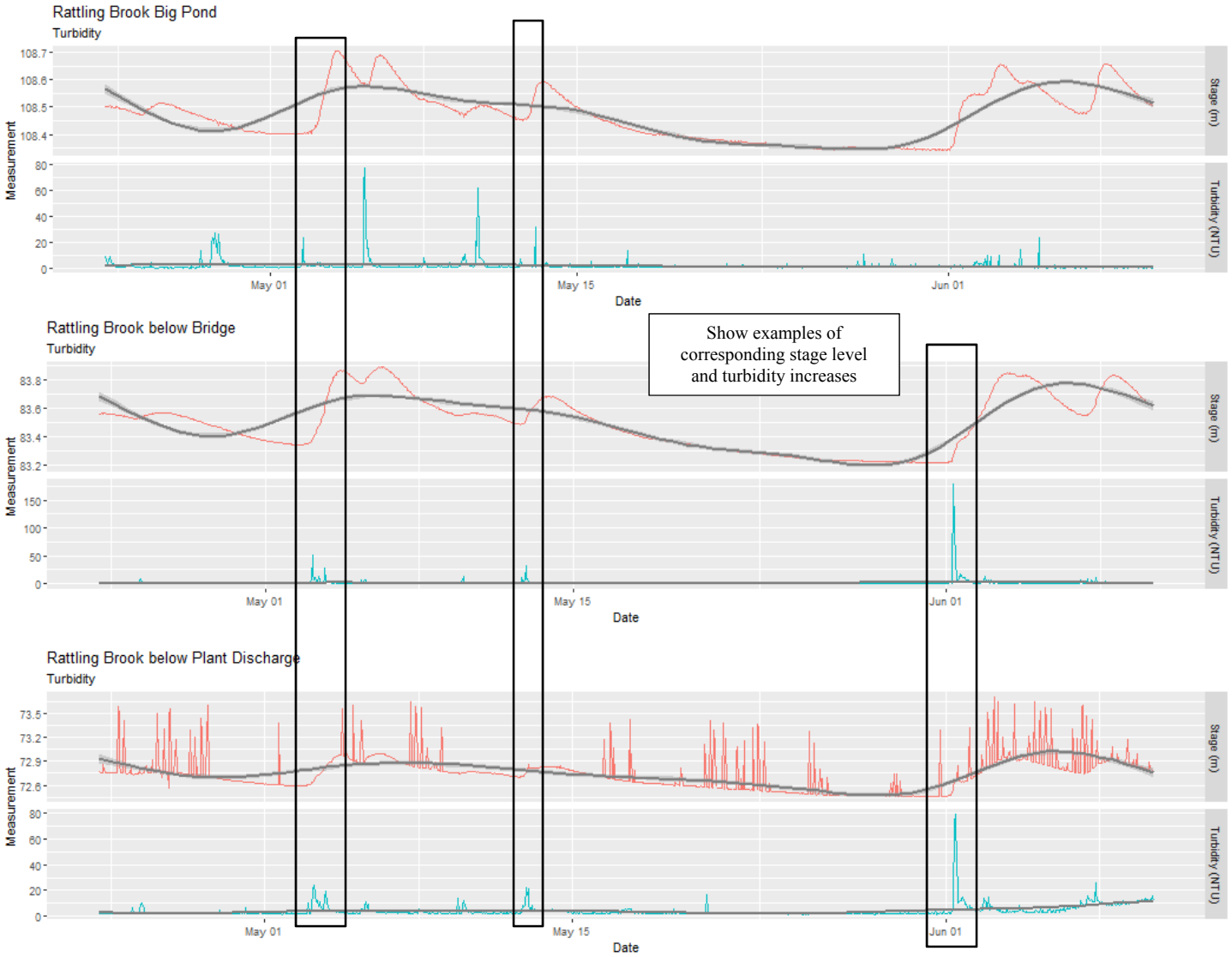
## Turbidity

*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 | Max | Min | Median | Mean |
|---|---|---|---|---|
| Big Pond | 77.5 | 0.1 | 0.6 | 1.6 |
| Below Bridge | 178.9 | 0.0 | 0.0 | 0.9 |
| Below Plant Discharge | 78.9 | 1.4 | 2.6 | 4.1 |

- During the deployment period covered by this report, turbidity values ranged from 0.1 NTU to 77.5 NTU at Big Pond, 0.0 NTU to 178.9 NTU at Below Bridge and from 1.4 NTU to 78.9 NTU at Plant Discharge.
- Both Below Bridge and Plant Discharge stations experienced a significant spike June 1-2nd which is most likely related to increase in flow from precipitation events.

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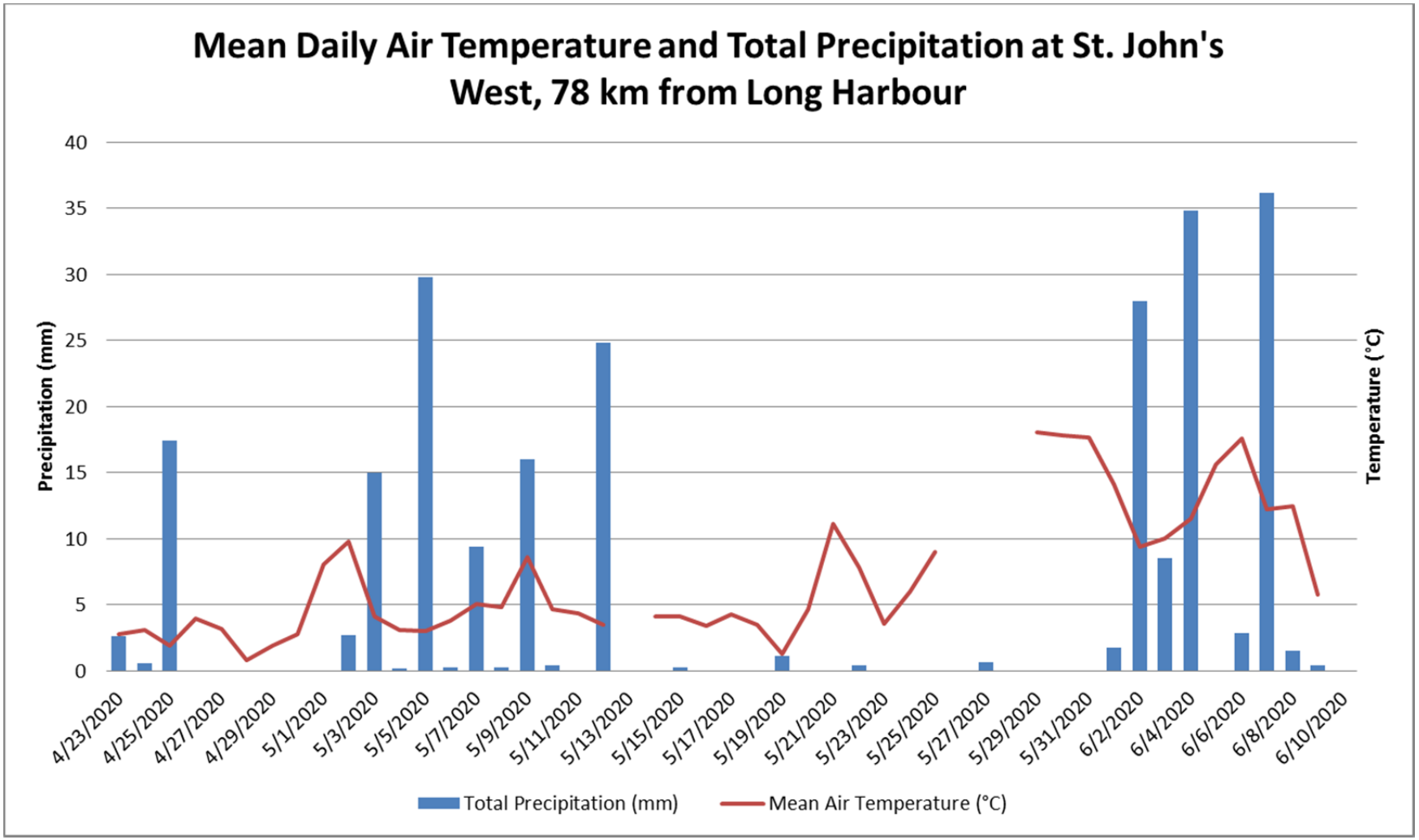
## Appendix


Mean Daily Air Temperature and Total Precipitation at St. John's West, 78 km from Long Harbour
Precipitation (mm)
Temperature (°C)
0
5
10
15
20
25
30
35
40
4/23/2020
4/25/2020
4/27/2020
4/29/2020
5/1/2020
5/3/2020
5/5/2020
5/7/2020
5/9/2020
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5/15/2020
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5/27/2020
5/29/2020
5/31/2020
6/2/2020
6/4/2020
6/6/2020
6/8/2020
6/10/2020
Total Precipitation (mm)
Mean Air Temperature (°C)