Real-Time Water Quality Deployment Report

Rattling Brook Network

August 2, 2022 to September 7, 2022

Newfoundland Labrador

Government of Newfoundland & Labrador
Department of Environment and Climate Change
Water Resources Management Division
St. John's, NL, A1B 4J6 Canada

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2022-08-02 to 2022-09-07

General

- Department of Environment and Climate Change 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

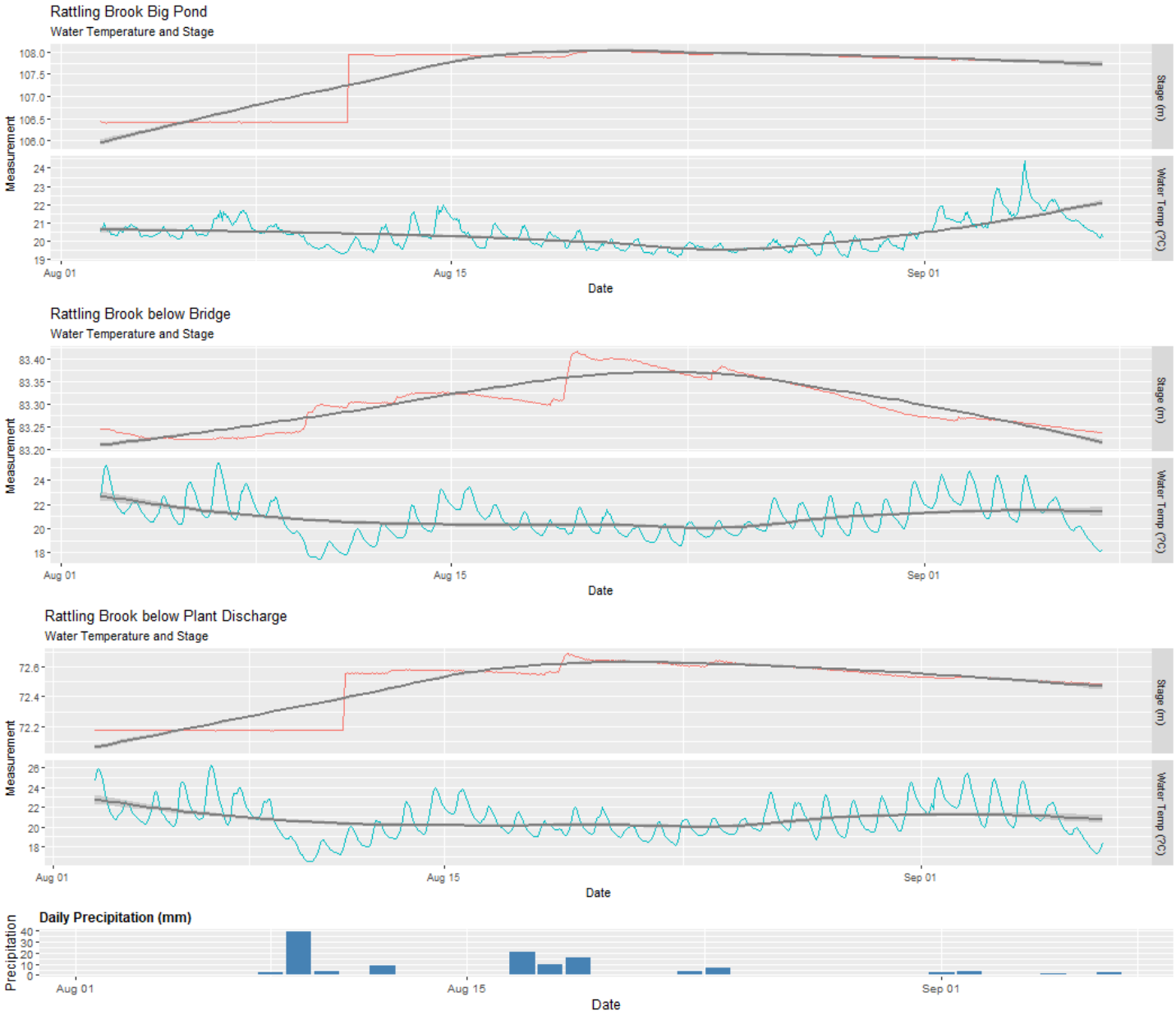
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	August 2	Deployment	Good	Excellent	Poor	Excellent	Poor
	September 7	Removal	Excellent	Fair	Good	Excellent	Excellent
Rattling Brook below Bridge	August 2	Deployment	Excellent	Excellent	Excellent	Excellent	Excellent
	September 7	Removal	Excellent	Good	Fair	Excellent	Excellent
Rattling Brook below Plant Discharge	August 2	Deployment	Excellent	Good	Excellent	Excellent	Excellent
	September 7	Removal	Excellent	Good	Good	Excellent	Excellent

- During the weekend of January 7th, the Vale weather station was compromised during a wind event. As data is currently suspect, this report utilizes weather data at St. John's West, 78kms NE of Long Harbour.
- During deployment, Big Pond Conductivity ranked 'Poor'. The field sonde read 68.3 while the QA/QC sonde read 82.0 (µS/cm). This 'Poor' ranking is possibly a result of the location of the QA/QC sonde deployed in a disturbed area where sediment suspended into the water column. Big Pond Turbidity ranked 'Poor' due to sediment suspension during deployment.

- 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	24.39	19.13	20.24	20.36
Below Bridge	25.40	17.47	20.73	20.89
Below Plant Discharge	26.24	16.52	20.61	20.78

- Water temperature fluctuated with weekly air temperatures at all stations during this deployment.

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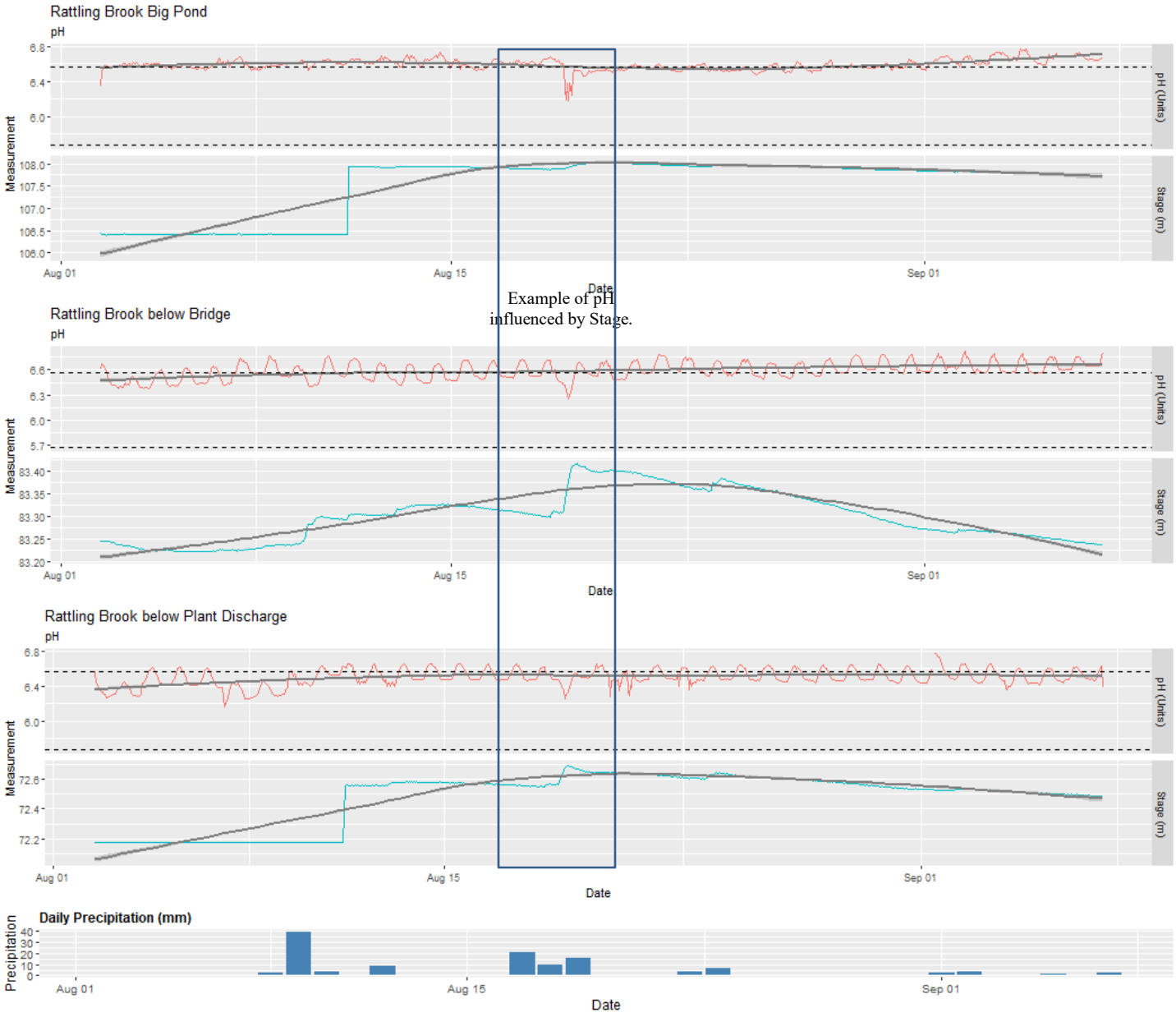
pH

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.



Example of pH influenced by Stage.

Station	Max	Min	Median	Mean
Big Pond	6.77	6.18	6.59	6.59
Below Bridge	6.82	6.25	6.59	6.59
Below Plant Discharge	6.77	6.17	6.49	6.50

- pH values were generally consistent with the majority of values within the site-specific guidelines (5.67-6.56 pH Units).

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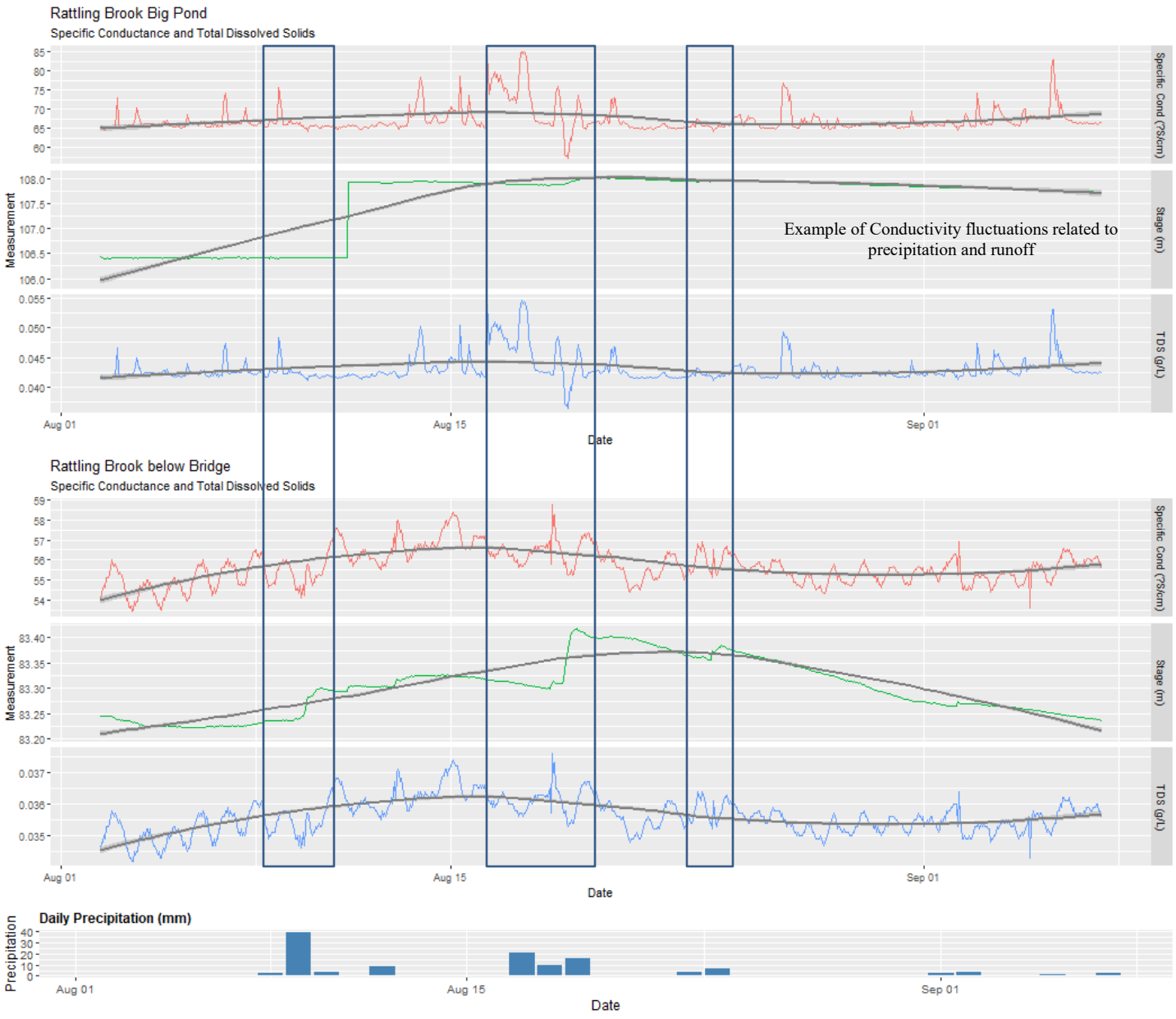
Specific Conductivity

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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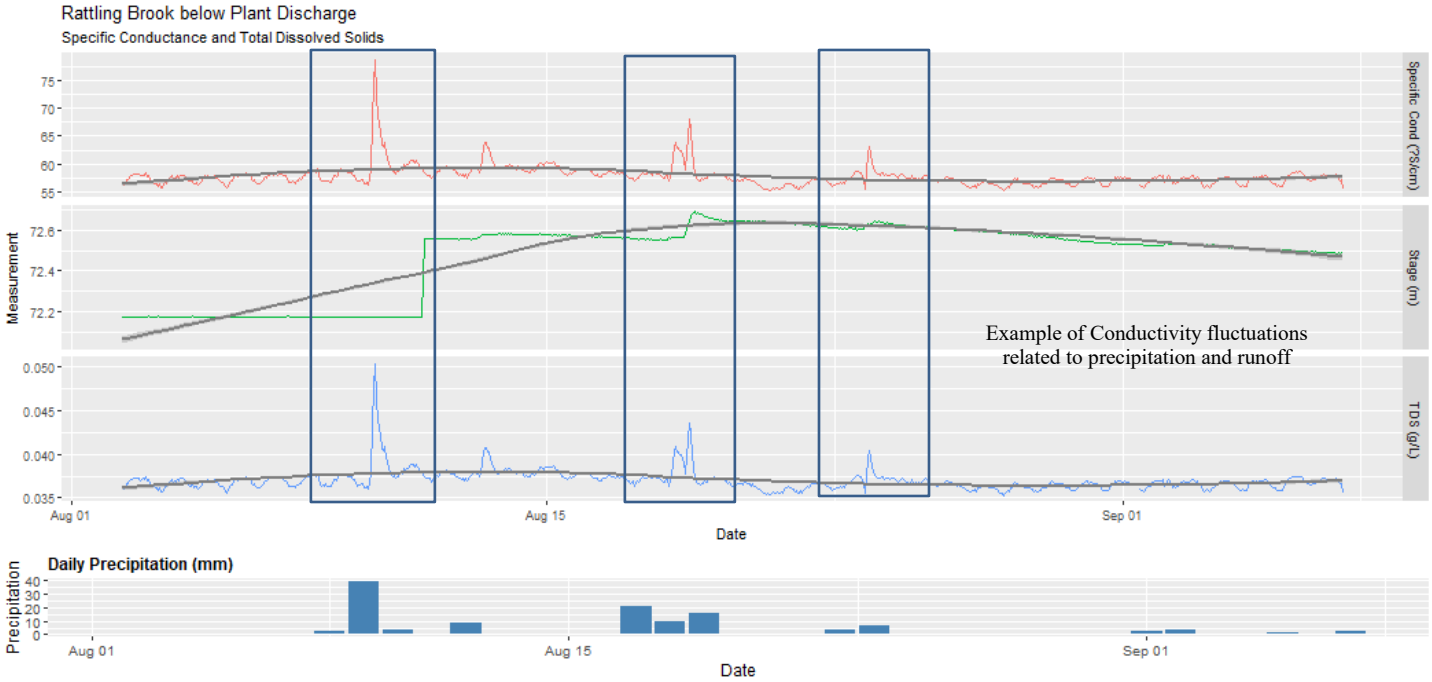

Station	Max	Min	Median	Mean
Big Pond	85.2	57.1	66.2	67.3
Below Bridge	58.8	53.4	55.6	55.7
Below Plant Discharge	78.7	55.2	57.6	57.9

- Specific conductivity was relatively stable at all stations. There were peaks at Plant Discharge stations throughout the deployment that could be attributed to low water levels in the river and precipitation. Variation in conductivity at Big Pond station may be due to wave/wind action stirring sediments around the instrument.

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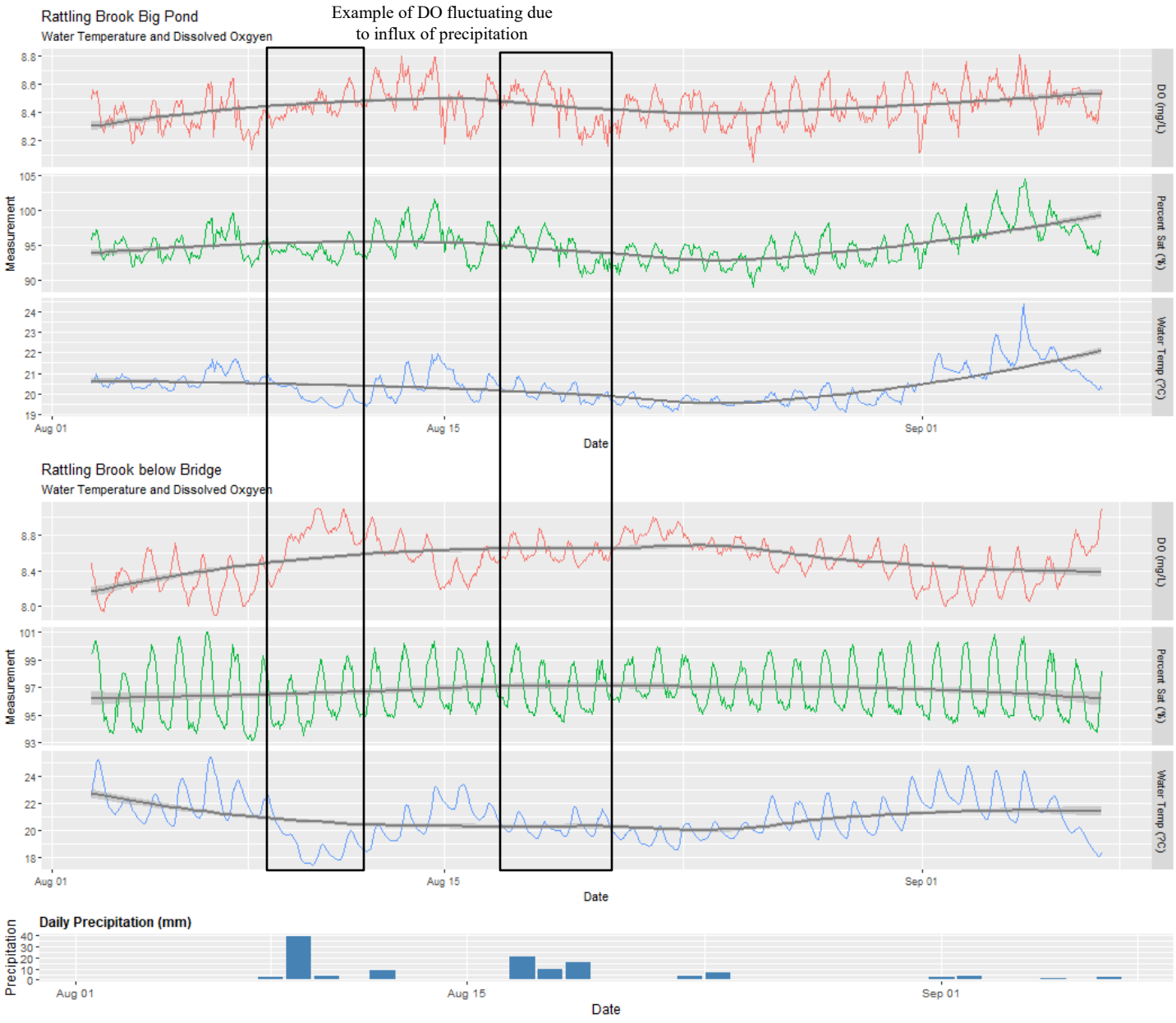
Dissolved Oxygen

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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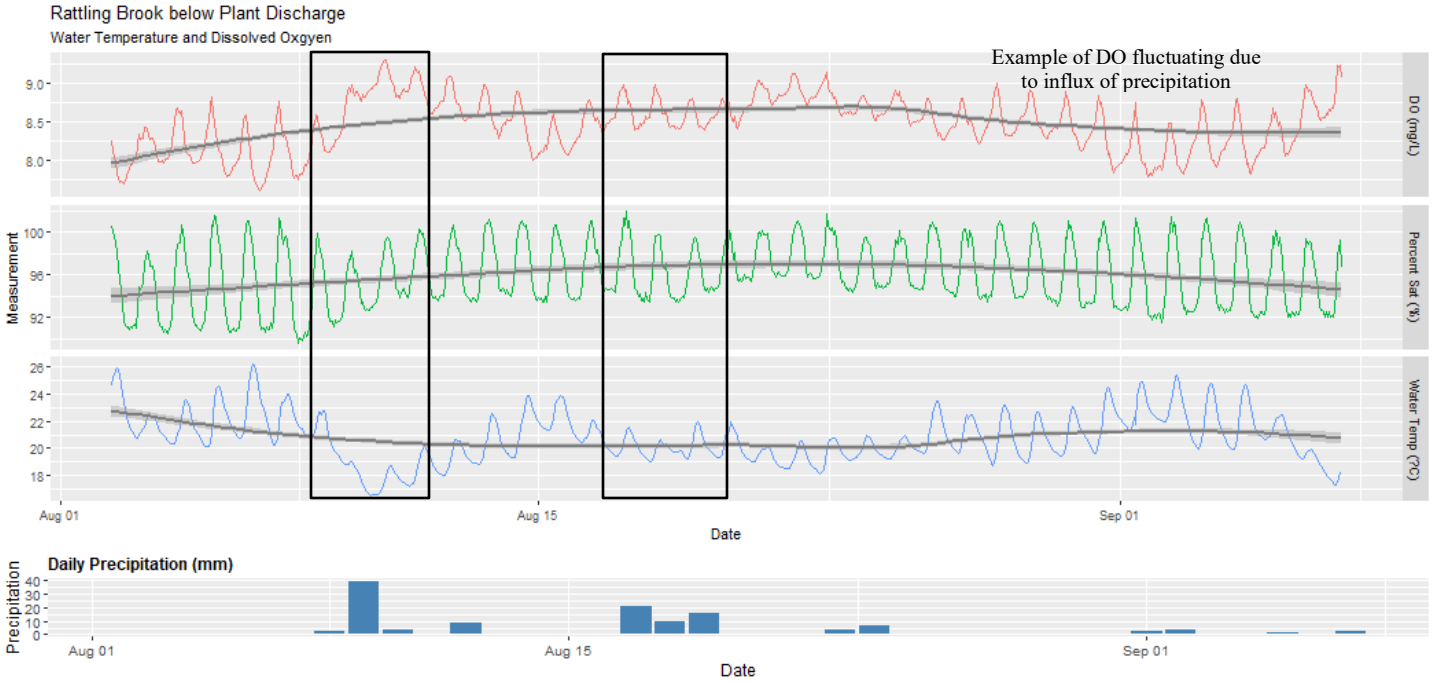

Station	Max	Min	Median	Mean
Big Pond	8.81	8.05	8.45	8.44
Below Bridge	9.11	7.90	8.54	8.52
Below Plant Discharge	9.30	7.60	8.50	8.47

- During this deployment, as water temperature was high and water levels were low, dissolved oxygen values were low due to a reduction in saturation levels and the natural inverse relationship between oxygen and water temperature.
- During this deployment, all measurements were above the CCME dissolved oxygen guideline of 6.5 mg/L for the protection of cold-water biota other life stages.

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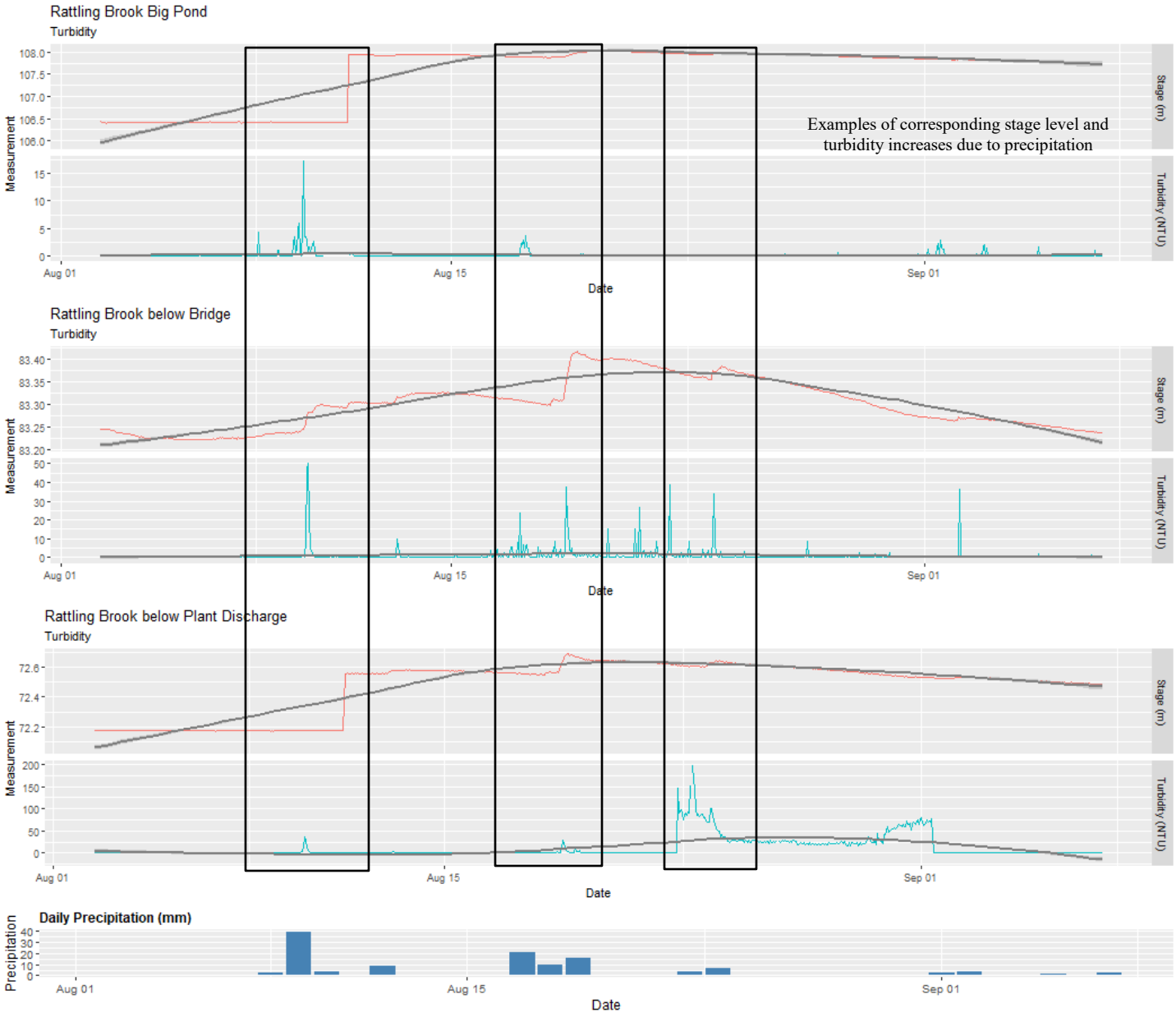
Turbidity

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	17.3	0.0	0.0	0.1
Below Bridge	50.2	0.0	0.0	0.0
Below Plant Discharge	197.0	0.0	0.0	11.3

- Turbidity levels were low during this deployment period with variation only observed during precipitation events at Below Bridge and Plant Discharge stations.

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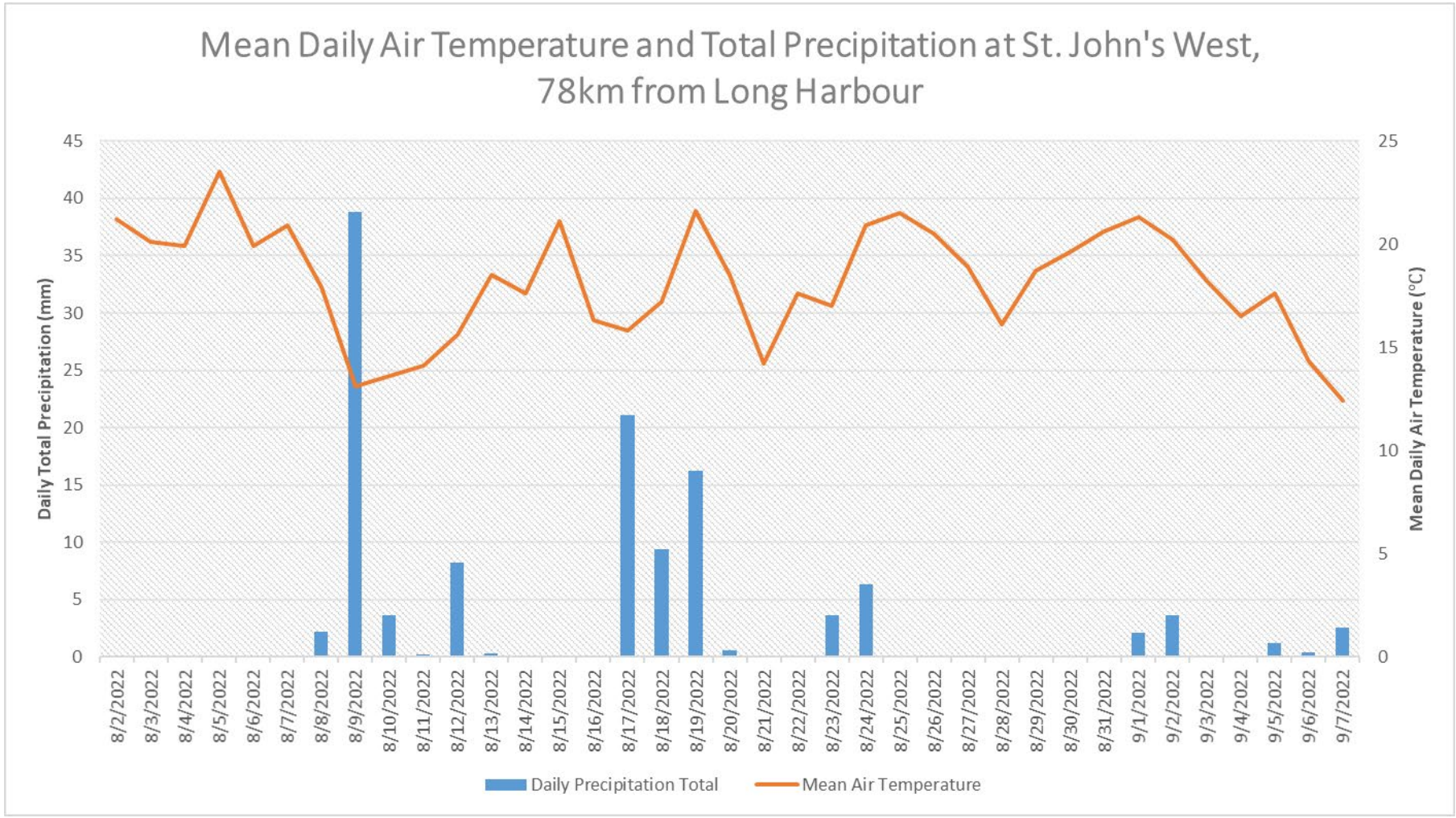
Appendix


Mean Daily Air Temperature and Total Precipitation at St. John's West, 78km from Long Harbour
Daily Total Precipitation (mm)
Mean Daily Air Temperature (°C)
0
5
10
15
20
25
30
35
40
45
0
5
10
15
20
25
8/2/2022
8/3/2022
8/4/2022
8/5/2022
8/6/2022
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9/2/2022
9/3/2022
9/4/2022
9/5/2022
9/6/2022
9/7/2022
Daily Precipitation Total
Mean Air Temperature