Real-Time Water Quality Deployment Report

Rattling Brook Network

December 8. 2020 to Jan 12, 2021

Newfoundland Labrador

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

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2020-12-08 to 2021-01-12

General

- Department of Environment, Climate Change and Municipalities 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

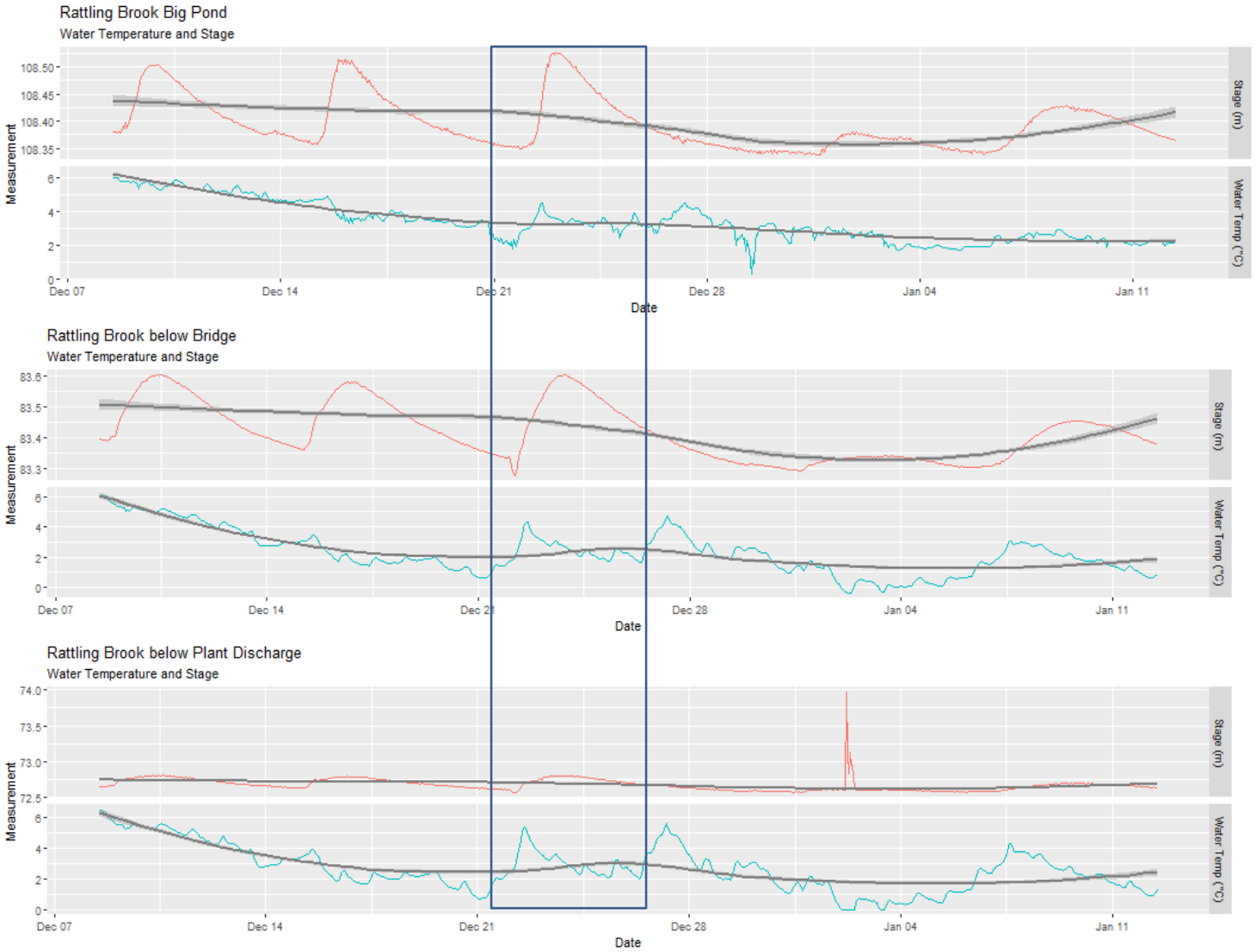
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	December 8	Deployment	Excellent	Fair	Marginal	Excellent	Excellent
	January 12	Removal	Good	Excellent	Poor	Excellent	Excellent
Rattling Brook below Bridge	December 8	Deployment	Good	Fair	Excellent	Fair	Excellent
	January 12	Removal	Good	Fair	Good	Excellent	Excellent
Rattling Brook below Plant Discharge	December 8	Deployment	Excellent	Excellent	Good	Excellent	Excellent
	January 12	Removal	Excellent	Marginal	Good	Fair	Excellent

- The Big Pond Conductivity sensor ranked ‘Poor’ during removal. The field sonde read 58.9 while the QA/QC sonde read 109.5 (µS/cm). During the deployment of the newly calibrated sonde roughly 15 minutes after the removal that sonde measured 56.6 (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.

- 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	6.00	0.25	3.13	3.31
Below Bridge	6.09	-0.39	2.02	2.27
Below Plant Discharge	6.52	-0.04	2.45	2.66

- As trend lines show, water temperatures steadily declined the first half of deployment before plateauing for the remainder of the deployment.

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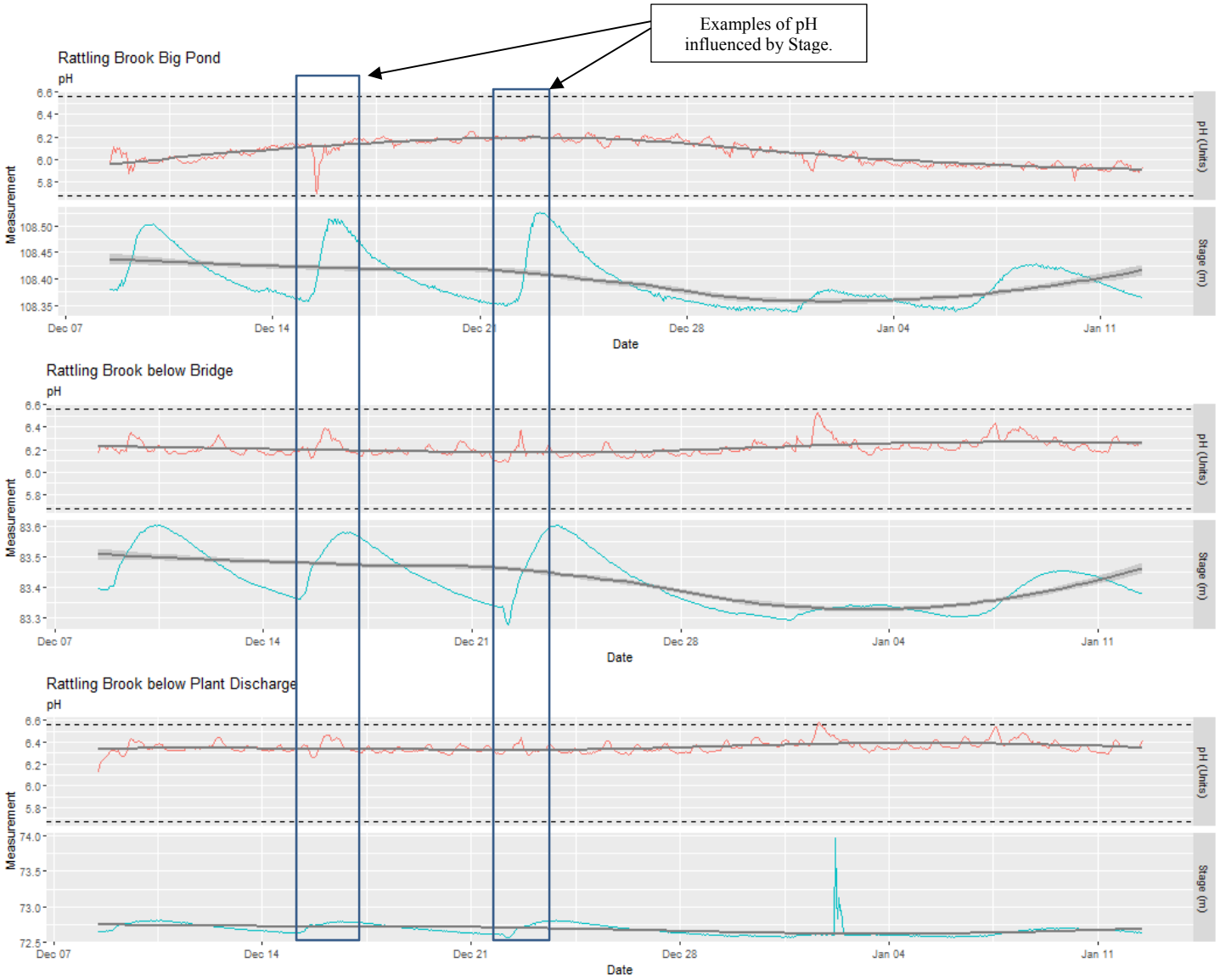
pH

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.



Station	Max	Min	Median	Mean
Big Pond	6.25	5.69	6.07	6.06
Below Bridge	6.53	6.09	6.21	6.22
Below Plant Discharge	6.58	6.12	6.35	6.36

- pH values were consistent over the deployment period and the majority were within the site-specific guidelines (5.67-6.56 pH Units).

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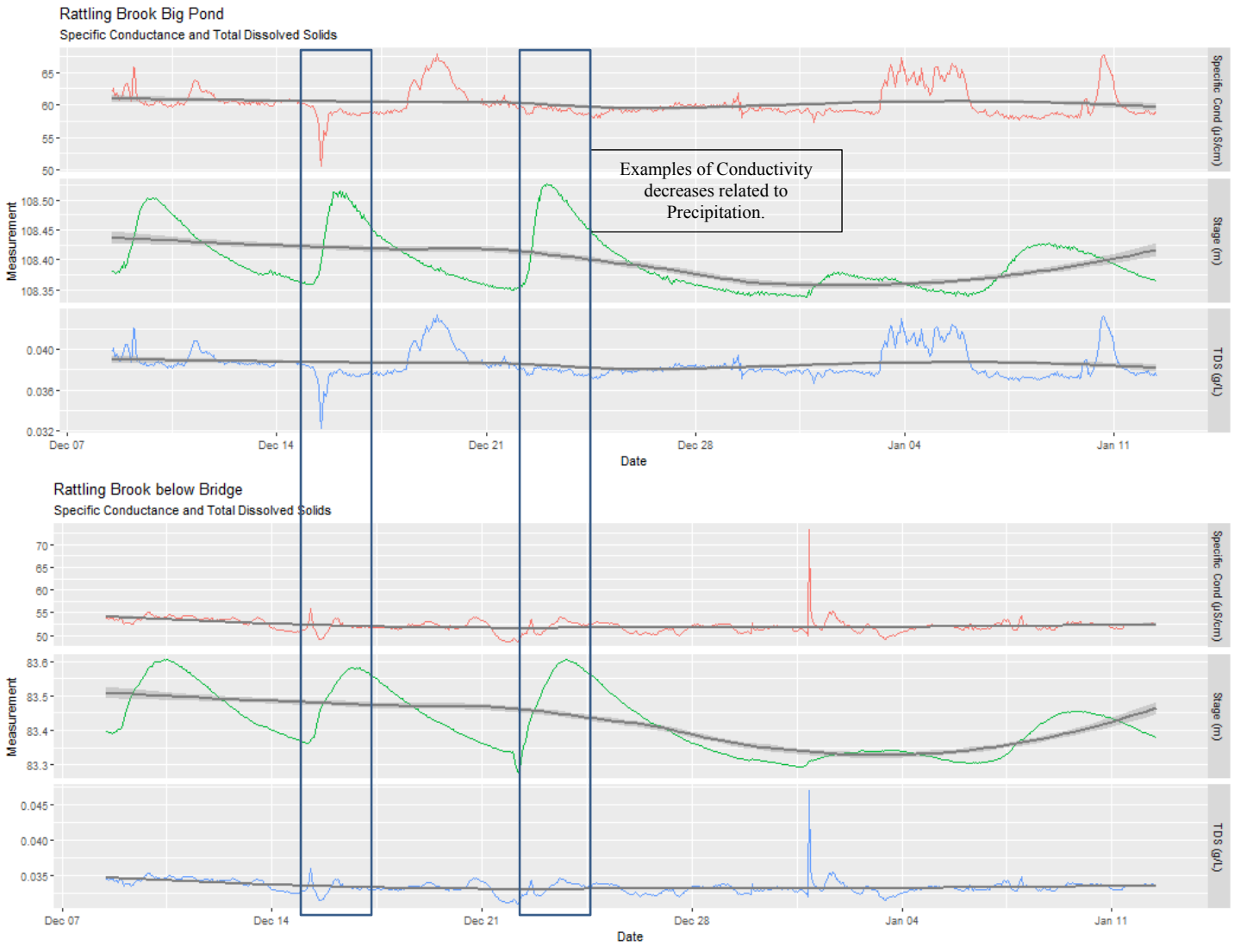
Specific Conductivity

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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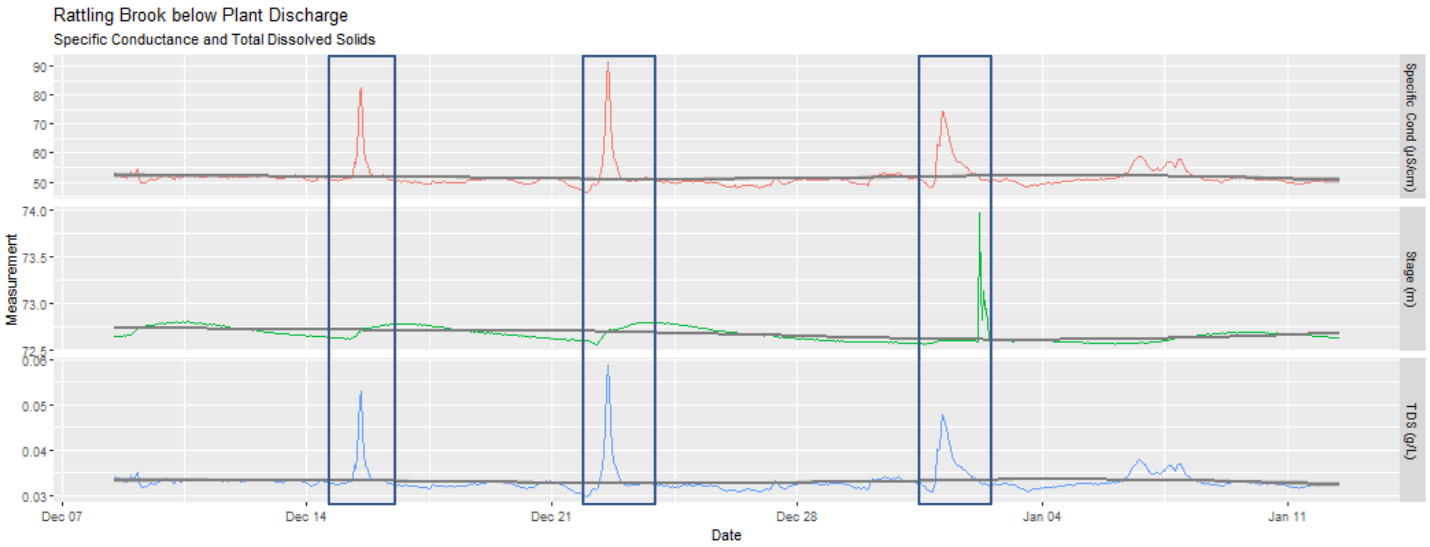

Station	Max	Min	Median	Mean
Big Pond	67.9	50.5	59.6	60.3
Below Bridge	73.4	48.5	52.0	52.1
Below Plant Discharge	91.7	46.3	50.8	51.6

- During the deployment period, specific conductivity ranged from 50.5 µs/cm to 67.9 µs/cm at Big Pond, 48.5 µs/cm to 73.4 µs/cm at Below Bridge and from 46.3 µs/cm to 91.7 µs/cm at Plant Discharge.
- Specific conductivity was relatively stable at all stations during this deployment period with few fluctuations due to variations in Stage caused by precipitation or snow melt.

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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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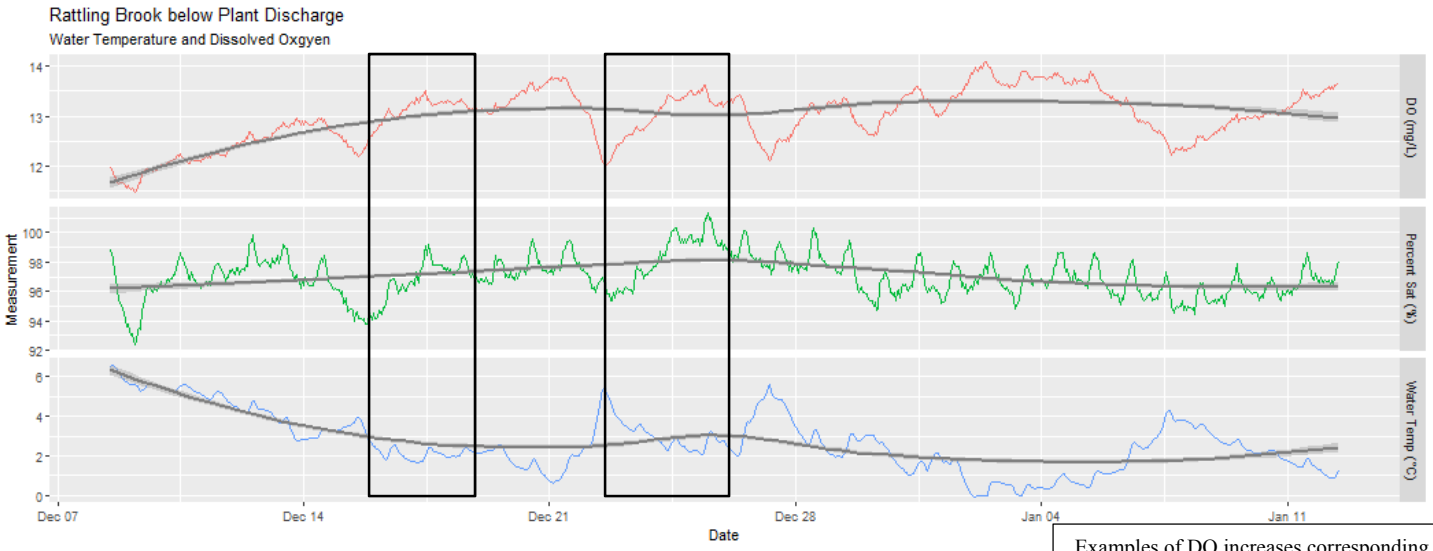

Examples of DO increases corresponding to water temperature decreases.

Station	Max	Min	Median	Mean
Big Pond	13.27	11.43	12.35	12.32
Below Bridge	14.36	11.81	13.43	13.35
Below Plant Discharge	14.10	11.46	13.07	12.99

- As expected, cooler water temperatures caused dissolved oxygen concentrations to increase at each monitoring station.
- During this deployment period, all values remained above the minimum CCME Aquatic Guideline for other life stages (6.5 mg/l) and for cold water biota (9.5 mg/l).

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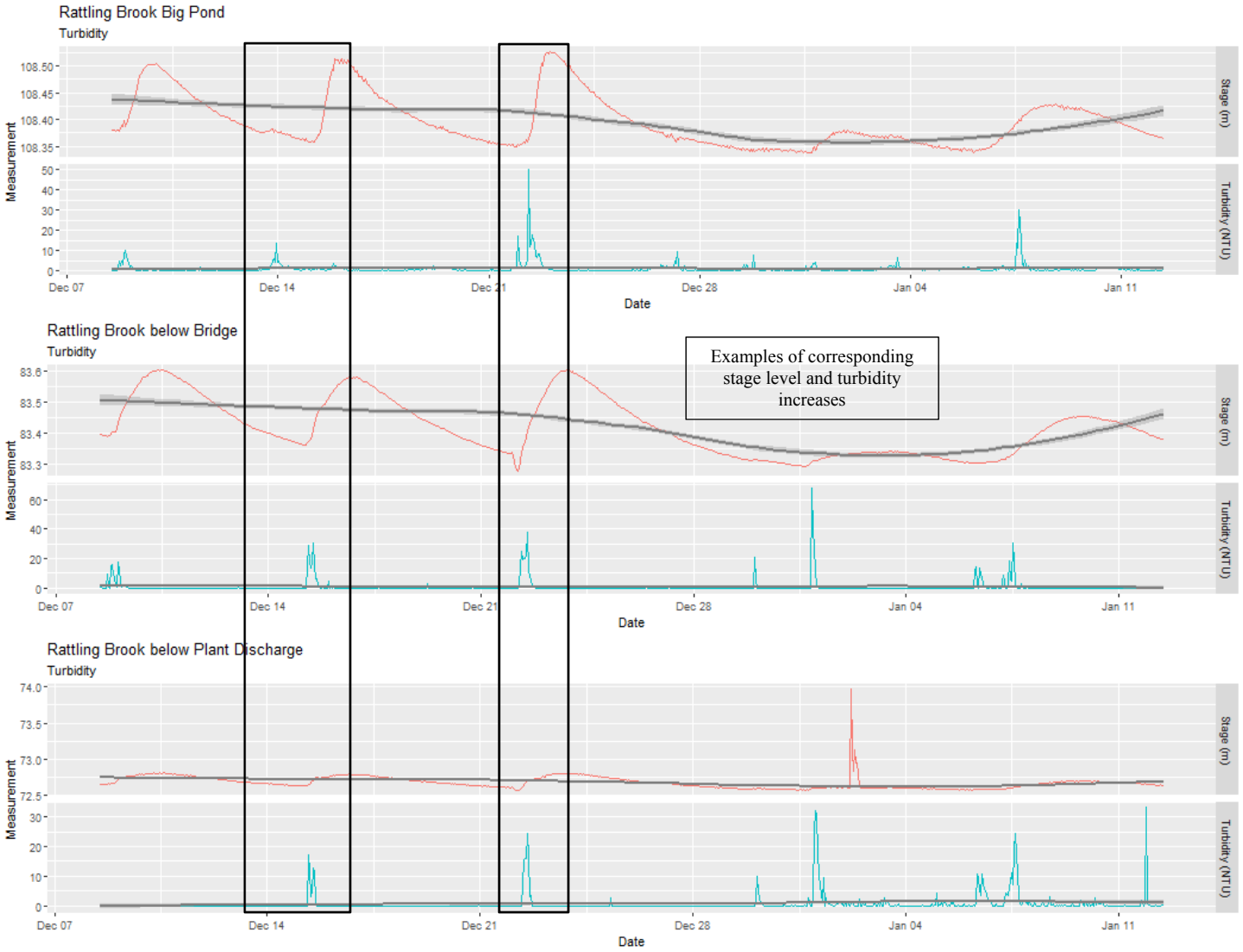
Turbidity

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	50.0	0.0	0.3	1.0
Below Bridge	67.6	0.0	0.0	0.9
Below Plant Discharge	33.3	0.0	0.0	0.7

- During the deployment period covered by this report, turbidity values ranged from 0.0 NTU to 50.0 NTU at Big Pond, 0.0 NTU to 67.6 NTU at Below Bridge and from 0.0 NTU to 33.3 NTU at Plant Discharge.
- Most turbidity peaks are associated with precipitation events and stage level increases.

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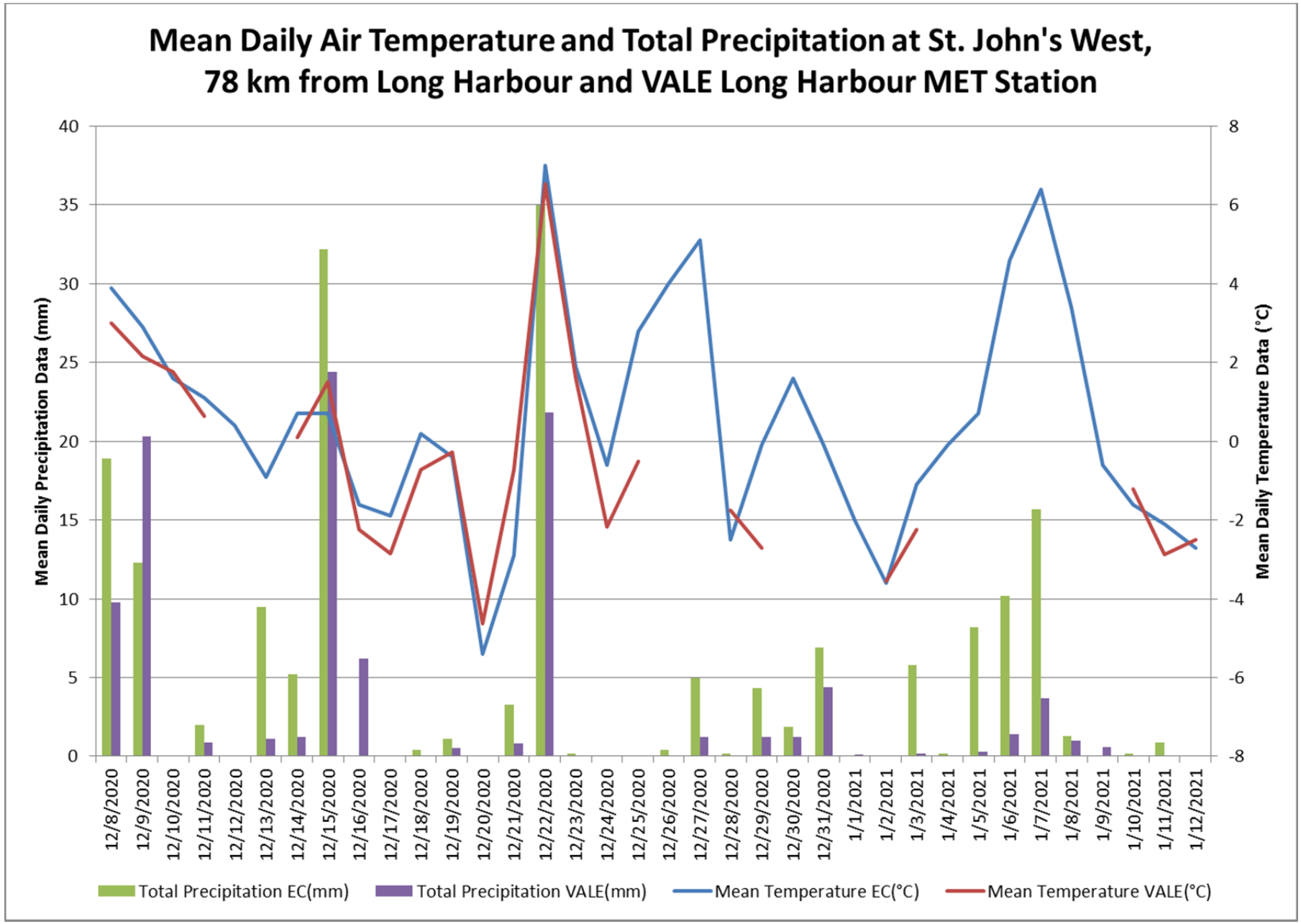
Appendix


Mean Daily Air Temperature and Total Precipitation at St. John's West, 78 km from Long Harbour and VALE Long Harbour MET Station
Mean Daily Precipitation Data (mm)
Mean Daily Temperature Data (°C)
40
35
30
25
20
15
10
5
0
8
6
4
2
0
-2
-4
-6
-8
12/8/2020
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1/9/2021
1/10/2021
1/11/2021
1/12/2021
Total Precipitation EC(mm)
Total Precipitation VALE(mm)
Mean Temperature EC(°C)
Mean Temperature VALE(°C)