Real-Time Water Quality Deployment Report

Rattling Brook Network

March 8, 2019 to April 17, 2019

Newfoundland Labrador

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

Newfoundland Labrador

Real-Time Water Quality Deployment Report
Rattling Brook Network
2019-03-08 to 2019-04-17

General

- Department of Municipal Affairs and Environment staff monitor the real-time web pages consistently.
- The reporting interval for Rattling Brook Big Pond in this report is a continuation of the deployment that began in December 2018. For convenience and comparative purposes, only the portion concurrent with Bridge and Plant Discharge deployment periods is considered in this report.
- During maintenance work on March 7th at Rattling Brook below Plant Discharge station, it was determined that water levels were far too low for a successful redeployment on March 8th. It was decided to wait for a melting event to reduce the level of ice cover and raise water levels. Normally, additional cable would be extended into the river channel, but this was not an option due to the snow cover. Deployment proceeded on March 15th.
- 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

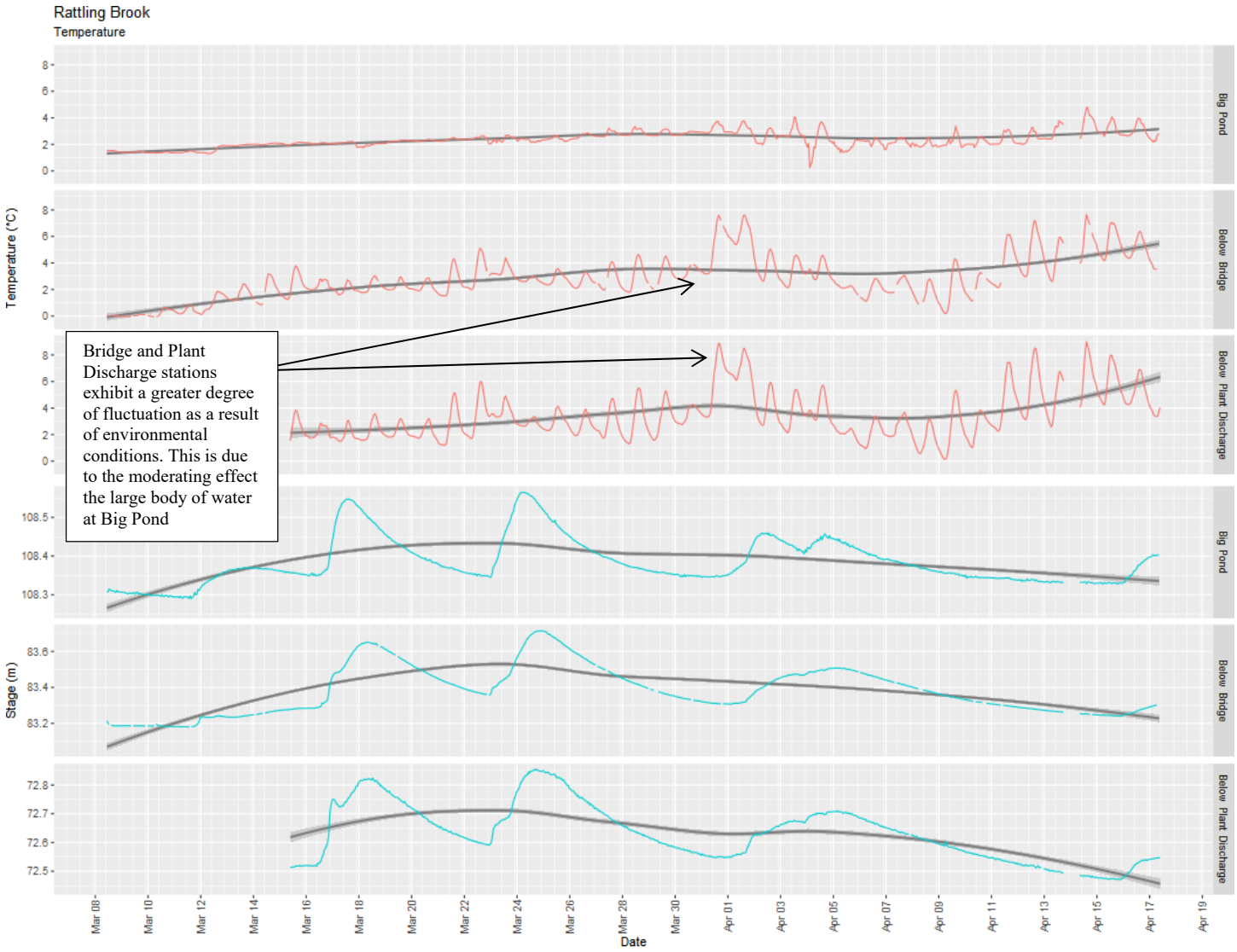
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	2019-03-08	Continued	NA	NA	NA	NA	NA
	2019-04-17	Removal	Marginal	Good	Good	Excellent	Excellent
Rattling Brook below Bridge	2019-03-08	Deployment	Excellent	Good	Fair	Excellent	Excellent
	2019-04-17	Removal	Excellent	Marginal	Good	Excellent	Excellent
Rattling Brook below Plant Discharge	2019-03-15	Deployment	Excellent	Good	Good	Excellent	Excellent
	2019-04-17	Removal	Excellent	Poor	Good	Excellent	Excellent

- Since the deployment at Rattling Brook Big Pond began in December 2018, no QAQC rankings could be calculated for March 8th.
- 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.



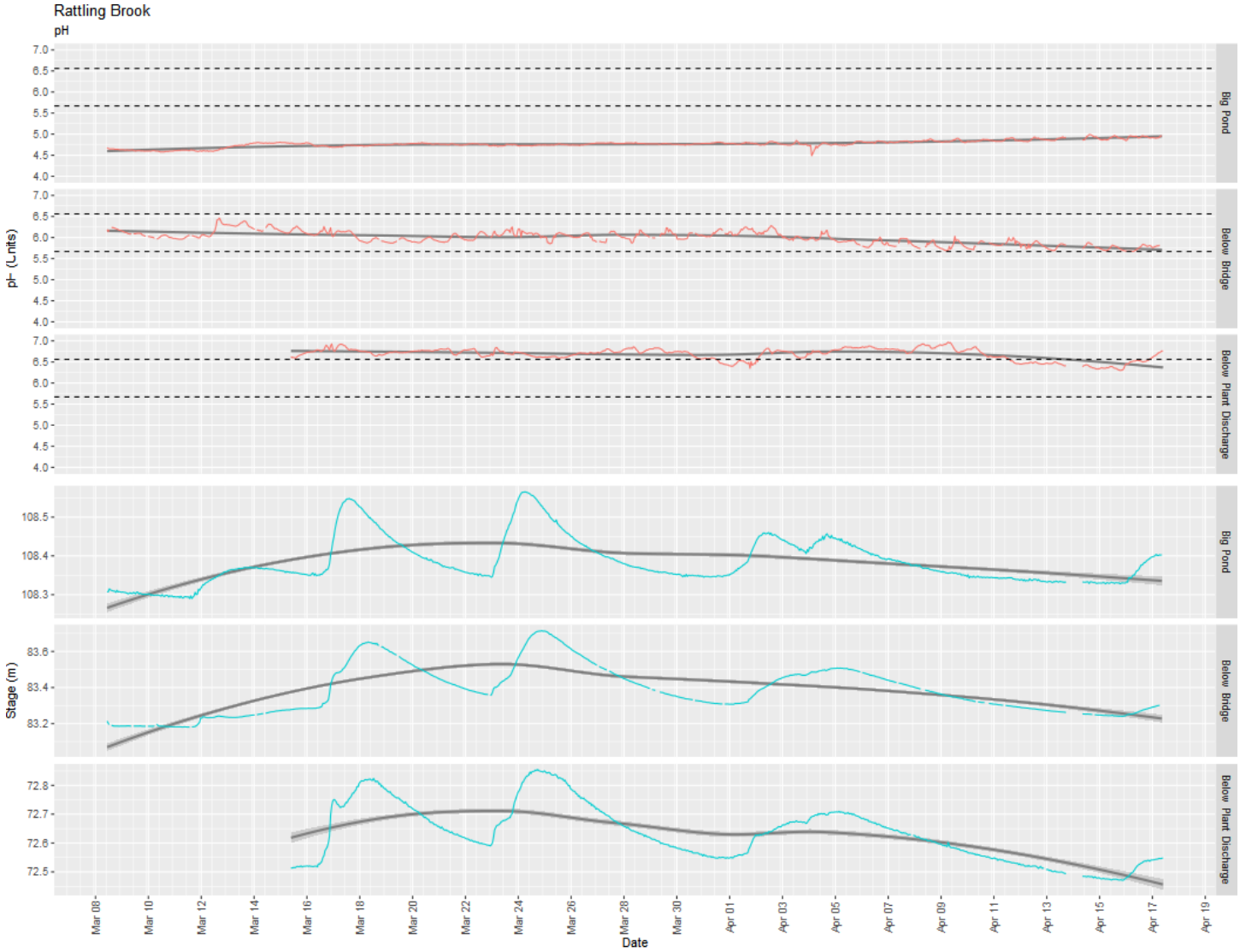
Station	Mean	Median	Min	Max
Big Pond	2.35	2.29	0.25	4.80
Below Bridge	2.82	2.63	-0.05	7.64
Below Plant Discharge	3.45	3.06	0.14	9.00

- Water temperatures at all stations indicated an upward trend as spring progressed. Bridge and Plant Discharge stations exhibited a resumption of diurnal cycling to a much larger degree than Big Pond station. This is likely due to the depth of cold water at Big Pond station.

*All hydrometric data is provisional and is subject to correction. Please consult Water survey of Canada for finalized data and interpretation.

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.



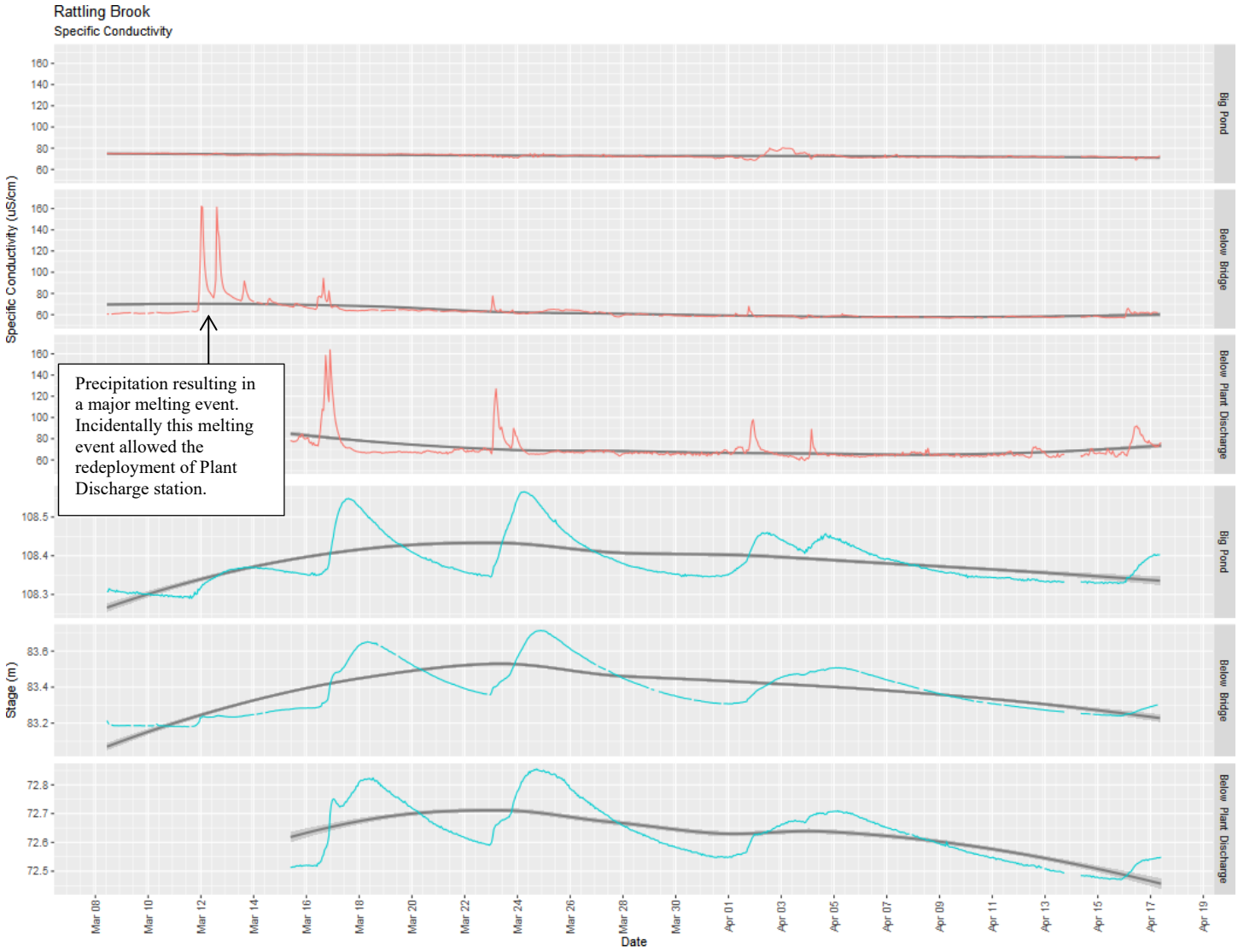
Station	Mean	Median	Min	Max
Big Pond	4.77	4.77	4.49	4.99
Below Bridge	5.99	6.00	5.67	6.46
Below Plant Discharge	6.68	6.72	6.30	6.97

- pH didn't show major deviations at any station during this deployment period, though slow downward trends were observed at Bridge and Plant Discharge stations towards the latter part of the deployment period. pH was consistently below site specific guidelines (SSGs) at Big Pond station and within or just above SSGs at Bridge and Plant Discharge stations.
- A resumption of diurnal pH cycling is especially evident at Bridge station.

*All hydrometric data is provisional and is subject to correction. Please consult Water survey of Canada for finalized data and interpretation.

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 25ºC to allow comparison across variable temperatures.



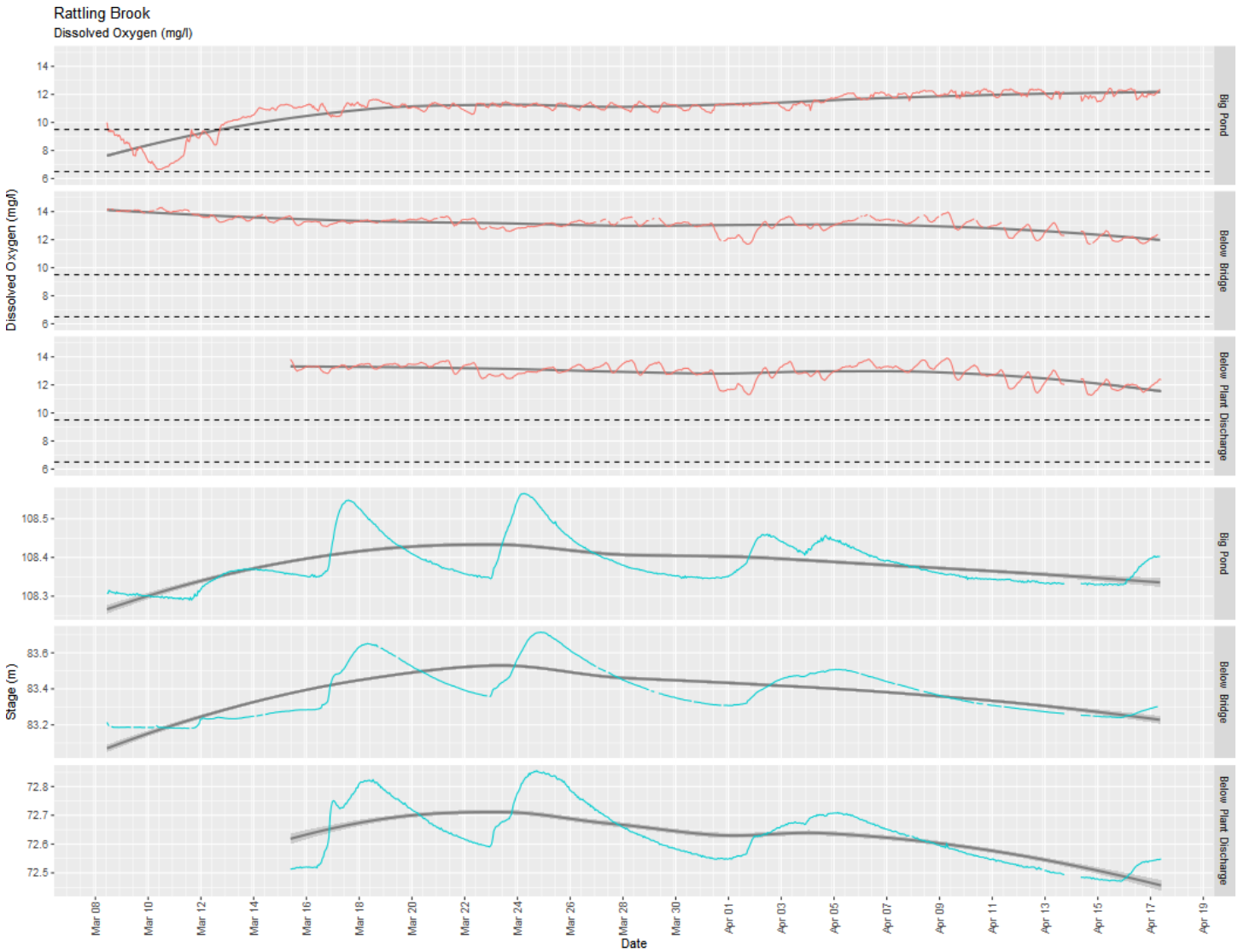
Station	Mean	Median	Min	Max
Big Pond	73.0	73.0	68.7	80.3
Below Bridge	62.9	61.1	56.3	162.2
Below Plant Discharge	69.2	66.7	59.4	163.8

- No major trends were seen in specific conductivity at any station during this deployment period, although there were some peaks observed in relation to environmental events. Additional peaks should be expected during the wet spring season.

*All hydrometric data is provisional and is subject to correction. Please consult Water survey of Canada for finalized data and interpretation.

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.



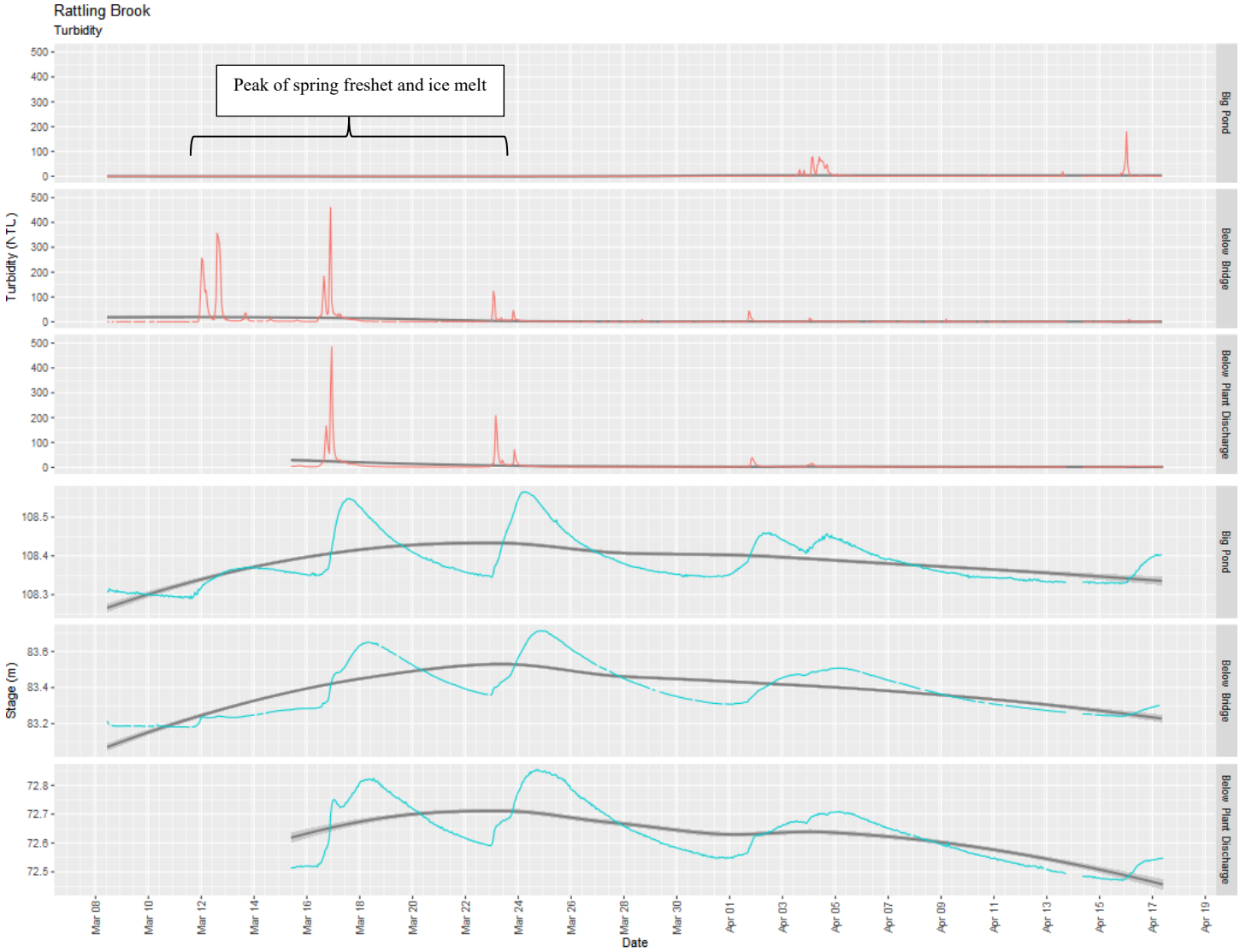
Station	Mean	Median	Min	Max
Big Pond	11.07	11.28	6.65	12.43
Below Bridge	13.13	13.22	11.68	14.29
Below Plant Discharge	12.90	13.04	11.26	13.91

- A period of low- DO was observed at Big Pond station in early March before a rebound brought levels above the CCME guidelines in mid-March. This likely corresponded with the opening of ice at Big Pond allowing the resumption of atmospheric gas exchange.

*All hydrometric data is provisional and is subject to correction. Please consult Water survey of Canada for finalized data and interpretation.

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.

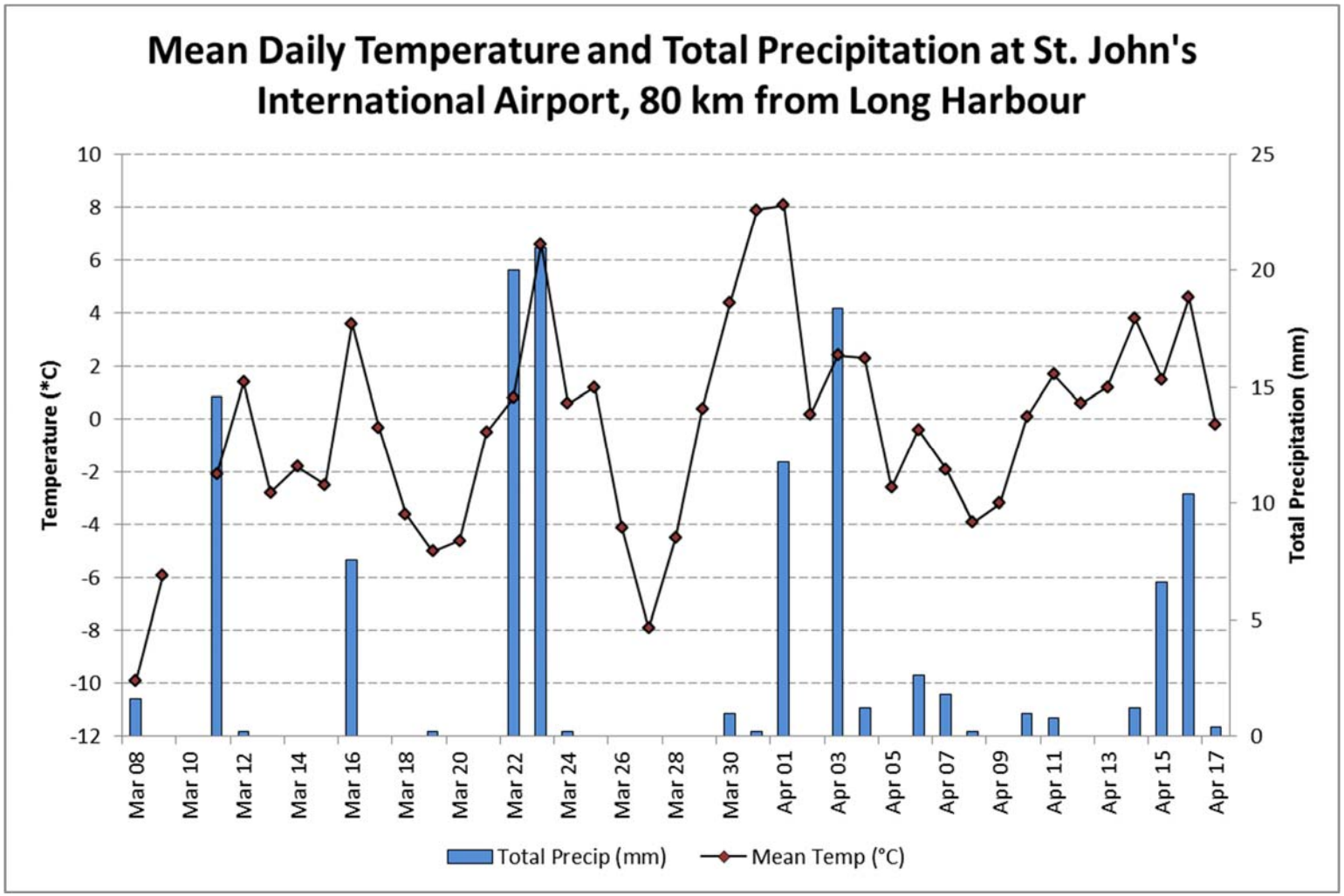


Station	Mean	Median	Min	Max
Big Pond	1.5	0.0	0.0	180.0
Below Bridge	6.9	0.7	0.0	460.0
Below Plant Discharge	6.0	1.7	1.0	485.0

- Turbidity levels were low during this reporting period, especially at Big Pond station. Downstream at Bridge and Plant Discharge stations, turbidity events in excess of 400 NTU were observed, especially during the peak of spring freshet – due to the recession of ice cover and mobilisation of previously-frozen silt and sediments.

*All hydrometric data is provisional and is subject to correction. Please consult Water survey of Canada for finalized data and interpretation.

Appendix


Mean Daily Temperature and Total Precipitation at St. John's International Airport, 80 km from Long Harbour
Temperature (*C)
Total Precipitation (mm)
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
25
20
15
10
5
0
Mar 08
Mar 10
Mar 12
Mar 14
Mar 16
Mar 18
Mar 20
Mar 22
Mar 24
Mar 26
Mar 28
Mar 30
Apr 01
Apr 03
Apr 05
Apr 07
Apr 09
Apr 11
Apr 13
Apr 15
Apr 17
Total Precip (mm)
Mean Temp (°C)