Real-Time Water Quality Deployment Report

Rattling Brook Network

April 26, 2018 to July 5, 2018

Newfoundland Labrador

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

Real-Time Water Quality Deployment Report

Rattling Brook Network

2018-04-26 to 2018-07-05

General

- Department of Municipal Affairs and Environment staff monitors 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 (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

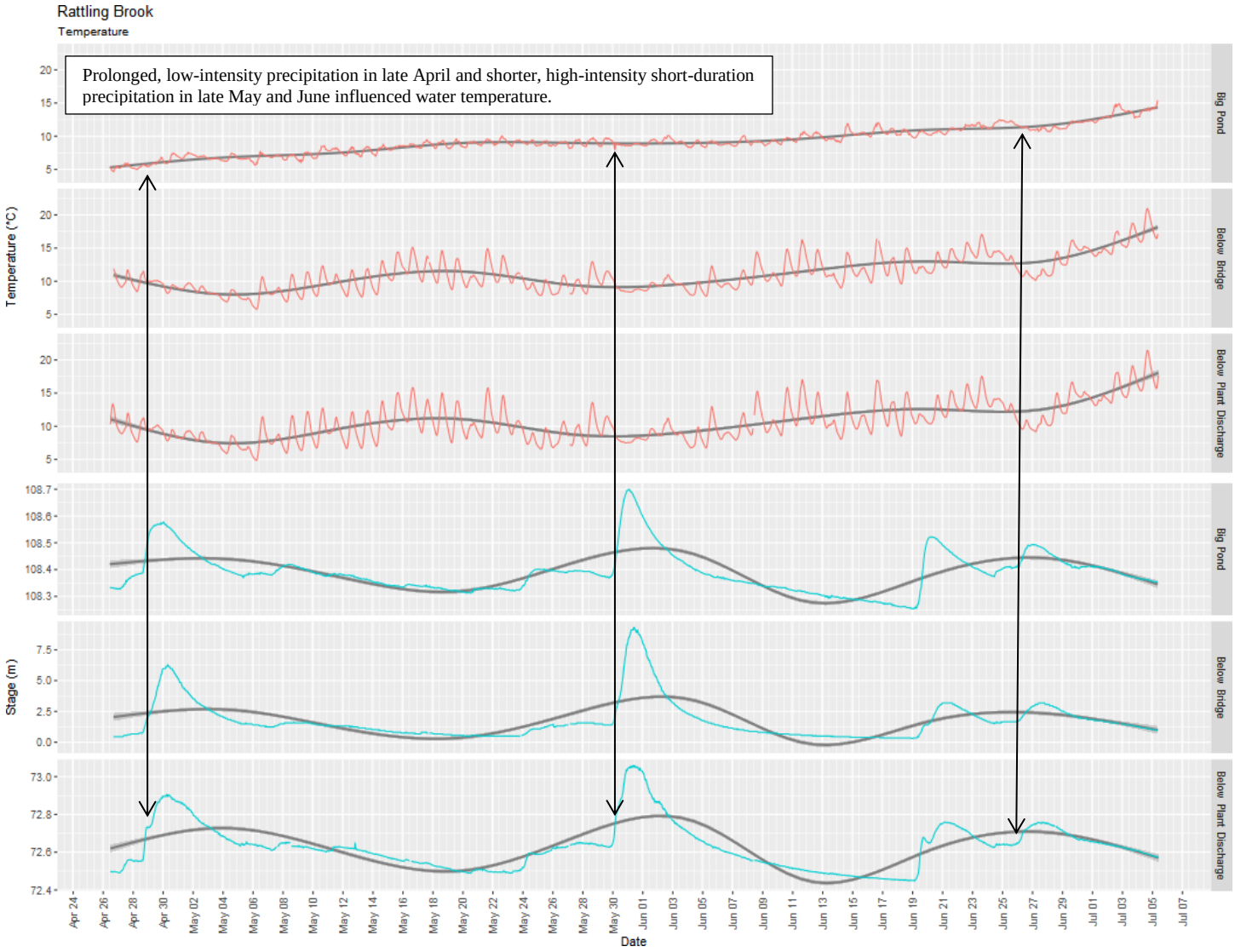
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	April 26, 2018	Deployment	Good	Fair	Excellent	Excellent	Excellent
	July 5, 2018	Removal	NA	Fair	Marginal	Good	Excellent
Rattling Brook below Bridge	April 26, 2018	Deployment	Good	Excellent	Excellent	Excellent	Excellent
	July 5, 2018	Removal	NA	Excellent	Good	Excellent	Excellent
Rattling Brook below Plant Discharge	April 26, 2018	Deployment	Good	Excellent	Good	Excellent	Excellent
	July 5, 2018	Removal	NA	Poor	Excellent	Good	Excellent

- Temperature rankings were unexpectedly negative at each station during removal operations, suggesting a discrepancy between the QAQC and Field sondes. On inspection, it appears that the Field Sonde was reading more than 1^{o}C higher at each station.
- A “Poor” QAQC ranking was observed during removal at Plant Discharge station. As seen in the deployment figure for pH, it appears that the pH sensor for that equipment faced substantial 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.



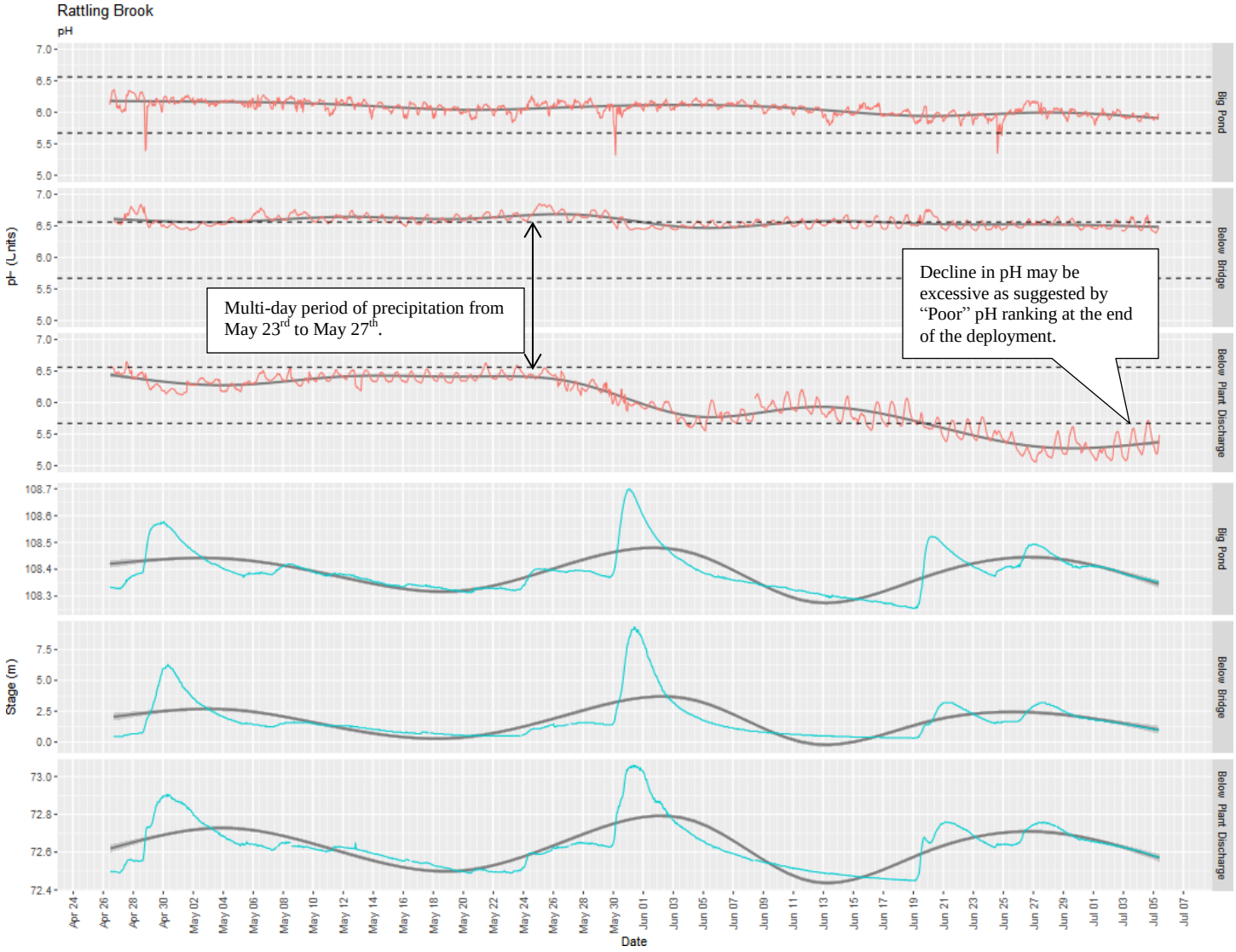
Station	Mean	Median	Min	Max
Big Pond	9.23	9.08	4.68	15.42
Below Bridge	11.08	10.65	5.79	20.96
Below Plant Discharge	10.68	10.12	4.86	21.43

- Water temperatures increased similarly at each monitoring station over the course of the deployment period with three notable periods of influence from precipitation outlined by arrows above.

*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.



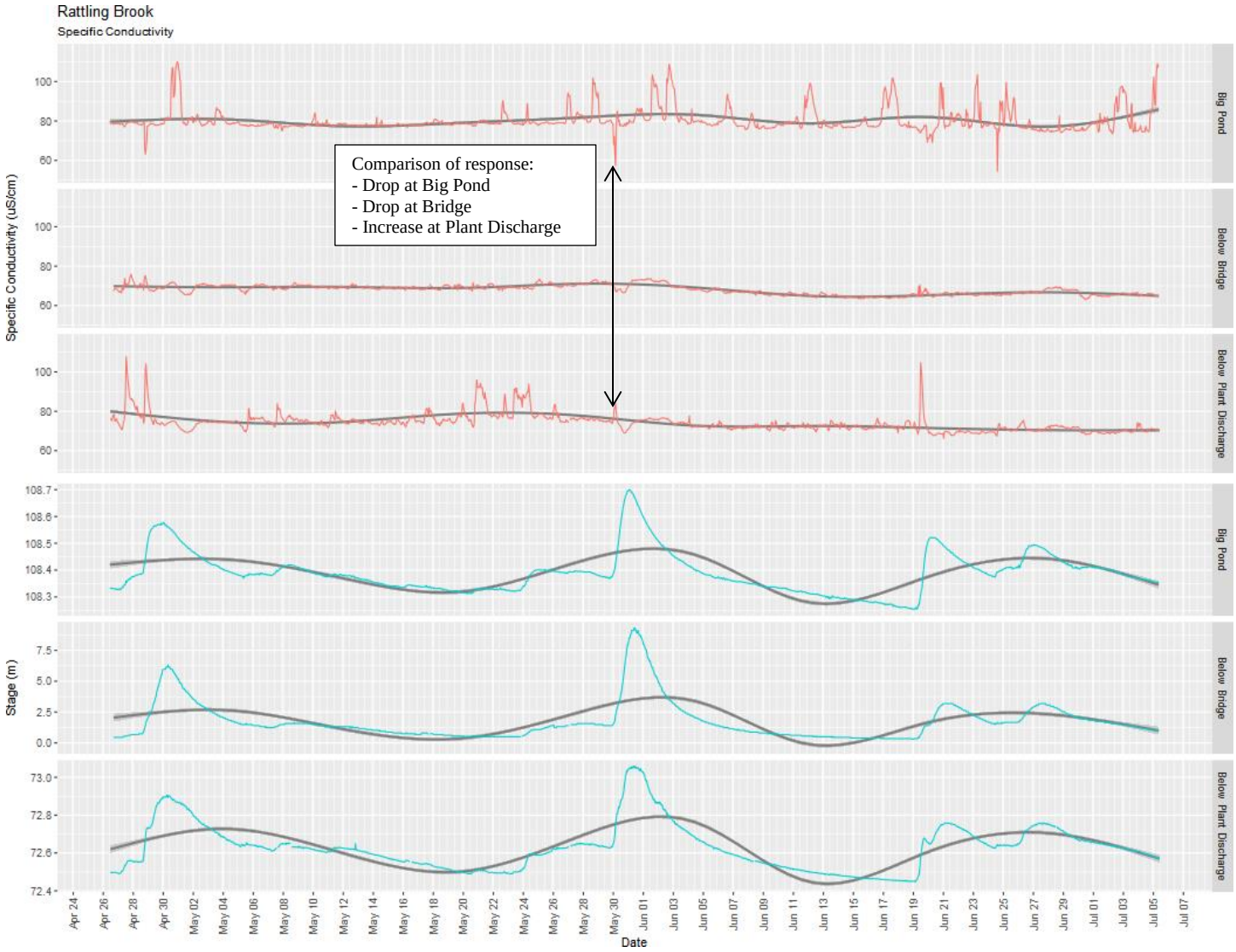
Station	Mean	Median	Min	Max
Big Pond	6.06	6.07	5.32	6.36
Below Bridge	6.57	6.56	6.39	6.85
Below Plant Discharge	5.99	6.07	5.06	6.65

- A mid-deployment decline in pH was observed at Bridge and Plant Discharge stations shortly after the start of a multi-day precipitation event (May 23 - May 27). This decline was much more prominent at Plant Discharge than Bridge station – where pH levels fell below the lower site-specific guidelines (dashed lines).
- Big Pond station tends to show short and rapid drops in pH during precipitation events. These were not observed at the river stations.

*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 25°C to allow comparison across variable temperatures.



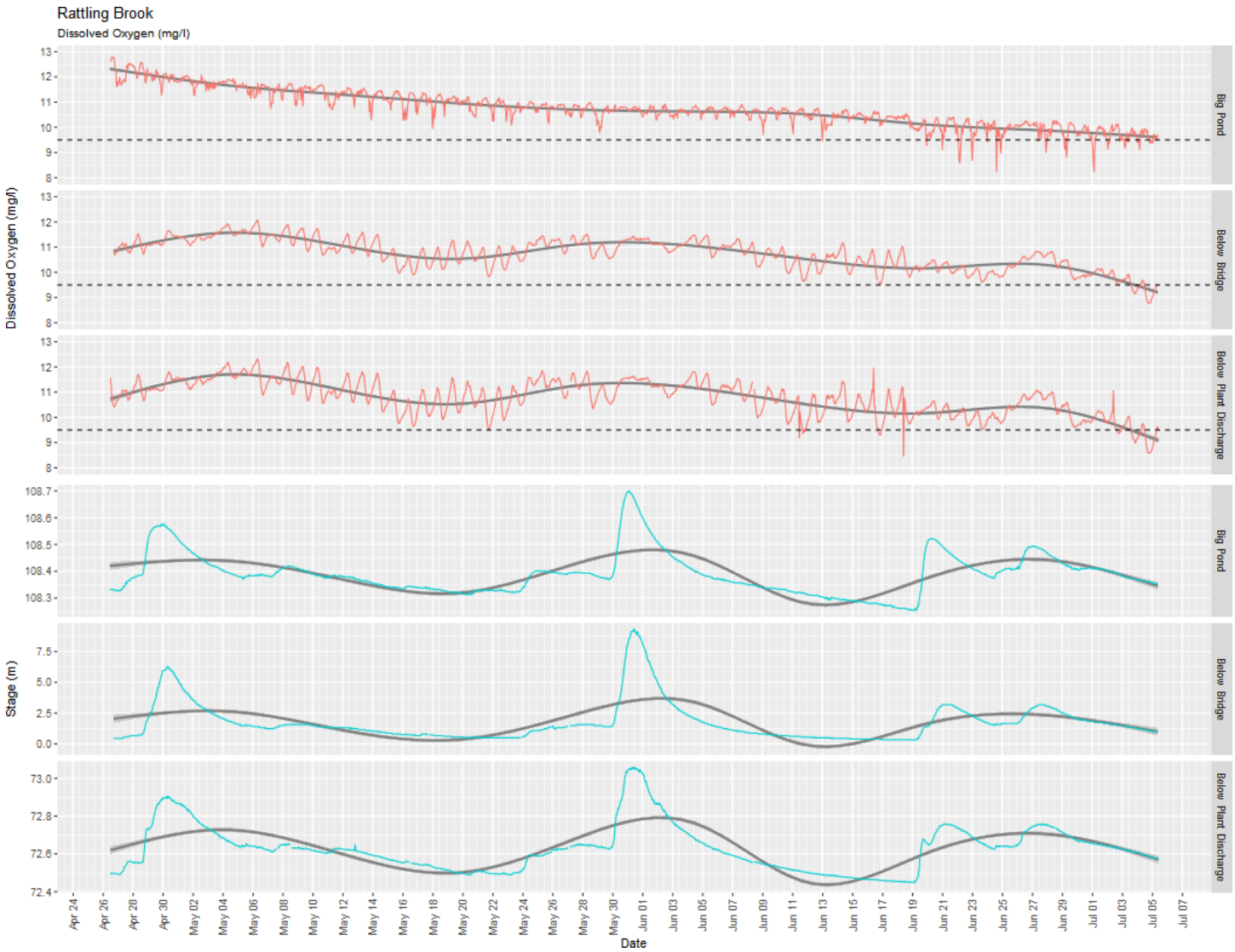
Station	Mean	Median	Min	Max
Big Pond	80.2	78.6	54.5	110.1
Below Bridge	68.0	68.4	63.0	76.0
Below Plant Discharge	74.2	73.7	66.2	107.7

- Specific conductivity levels at the end of the deployment period were found to be lower than those recorded at the beginning of the deployment period for all monitoring stations indicating an overall downward trend over the deployment period.

*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.



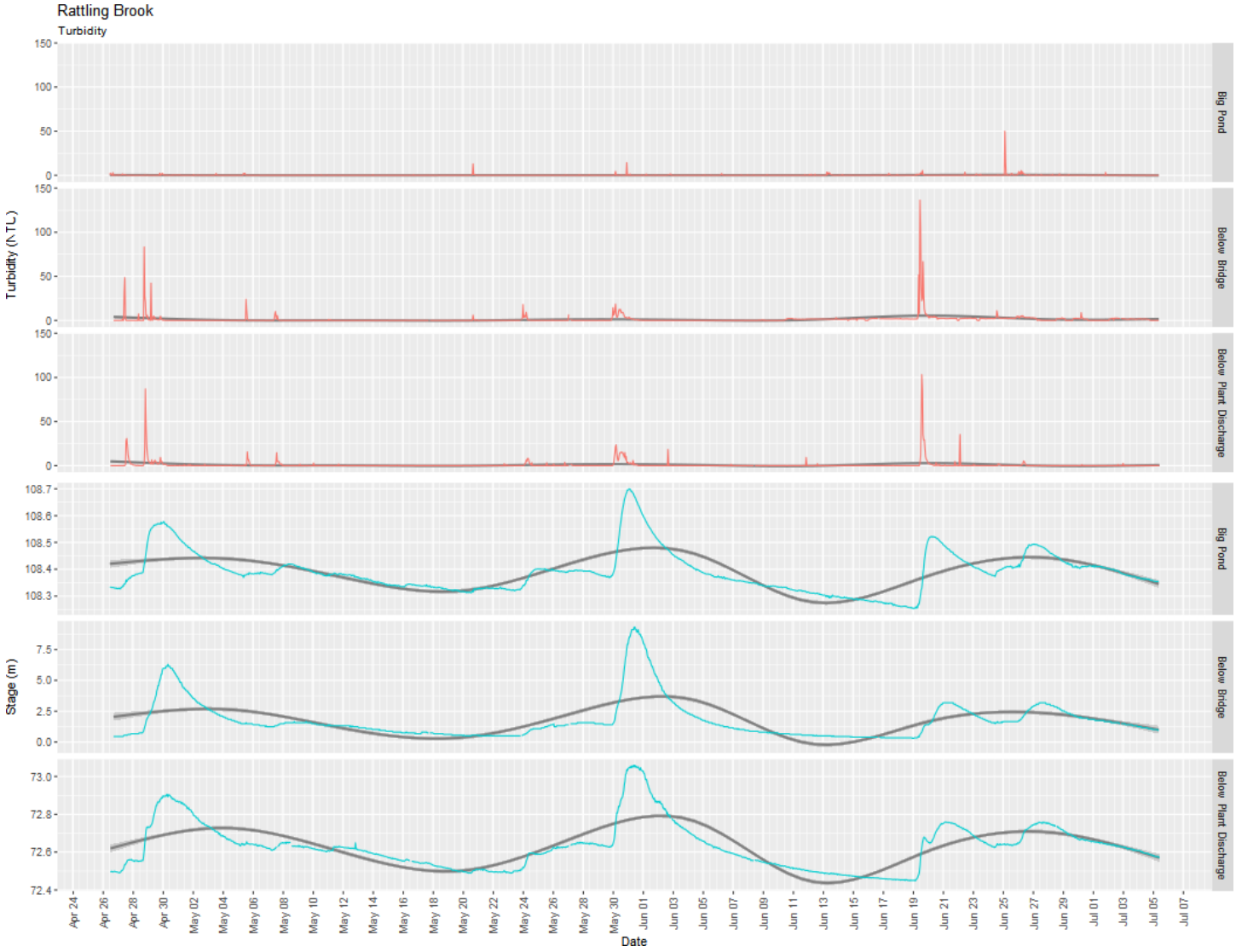
Station	Mean	Median	Min	Max
Big Pond	10.74	10.69	8.24	12.78
Below Bridge	10.72	10.79	8.77	12.07
Below Plant Discharge	10.77	10.84	8.46	12.32

- As expected, dissolved oxygen decreased from the beginning to the end of the deployment period due to the rise in water temperature. DO levels fell below the upper CCME guideline of 9.5 mg/l (dashed line) for the protection of early life stage organisms as expected for the time of year.

*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.

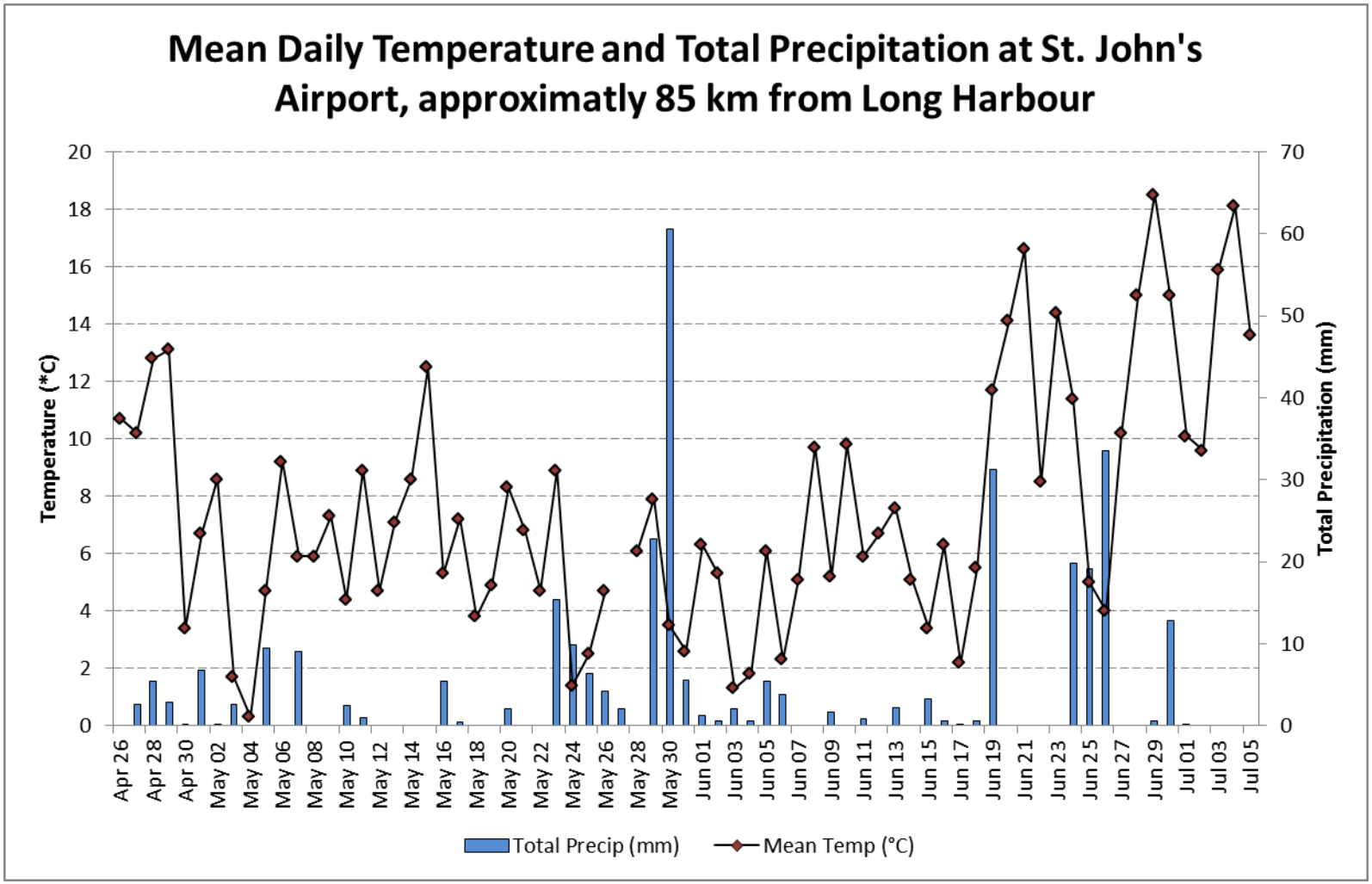


Station	Mean	Median	Min	Max
Big Pond	0.2	0.0	0.0	49.9
Below Bridge	1.4	0.0	0.0	136.5
Below Plant Discharge	0.8	0.0	0.0	103.1

- All three monitoring stations presented median turbidity values of 0.0 NTU with periodic and short-term peaks that resolved within a few hours. Longer turbidity events were associated with longer and more substantial precipitation events.

*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 Airport, approximatly 85 km from Long Harbour
Temperature (*C)
Total Precipitation (mm)
0
2
4
6
8
10
12
14
16
18
20
0
10
20
30
40
50
60
70
Apr 26
Apr 28
Apr 30
May 02
May 04
May 06
May 08
May 10
May 12
May 14
May 16
May 18
May 20
May 22
May 24
May 26
May 28
May 30
Jun 01
Jun 03
Jun 05
Jun 07
Jun 09
Jun 11
Jun 13
Jun 15
Jun 17
Jun 19
Jun 21
Jun 23
Jun 25
Jun 27
Jun 29
Jul 01
Jul 03
Jul 05
Total Precip (mm)
Mean Temp (°C)