Real-Time Water Quality Deployment Report

Rattling Brook Network

November 3, 2016 to January 5, 2017

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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2016-11-03 to 2017-01-05

General

- Department of Environment and Climate Change staff monitors the real-time web pages consistently.
- A gradual calibration drift in the turbidity sensor at Big Pond station leveled off at nearly 30 NTU. This data has been removed from the long term record, however, with the drift corrected it presents a useful indication of variability during the deployment period.
- A battery failure at Plant Discharge station resulted in transmission loss from December 11th to 20th.
- 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

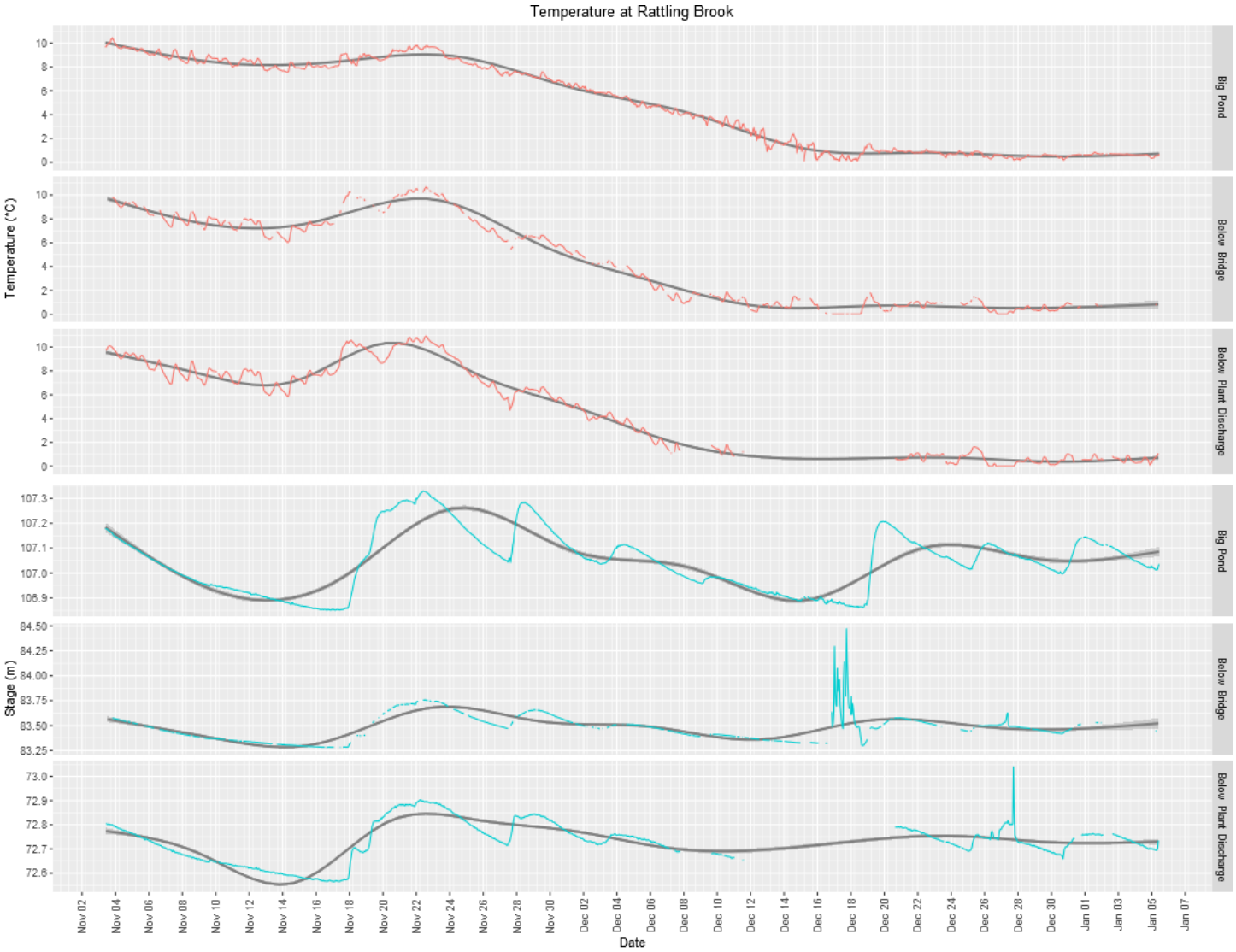
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	November 3, 2016	Deployment	Good	Excellent	Excellent	Excellent	Excellent
	January 5, 2016	Removal	Fair	Poor	Fair	Excellent	NA
Rattling Brook below Bridge	November 3, 2016	Deployment	Good	Excellent	Excellent	Excellent	Good
	January 5, 2016	Removal	Good	Good	Good	Excellent	Poor
Rattling Brook below Plant Discharge	November 3, 2016	Deployment	Good	Excellent	Excellent	Excellent	Excellent
	January 5, 2016	Removal	Excellent	Good	Good	Excellent	Good

- A “Poor” QAQC Ranking was achieved for pH at Big Pond station during removal. This was likely due to a pH sensor drift occurring during the deployment period.
- A “Poor” QAQC Ranking was also achieved for turbidity at Below Bridge station during removal. Since turbidity was high at the time (Field Sonde = 81.6 NTU, QAQC Sonde = 42.5 NTU), it is possible that the variability was due to highly-localized phenomena or differing orientation of the sonde in the river.

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	4.86	5.27	0.07	10.44
Below Bridge	4.49	4.50	0.00	10.67
Below Plant Discharge	5.08	6.10	-0.01	10.92

- Throughout this deployment period, water temperatures fell to the expected winter minima by mid-December. During maintenance on January 5 approximately 8.9 cm of ice was encountered at Big Pond station.

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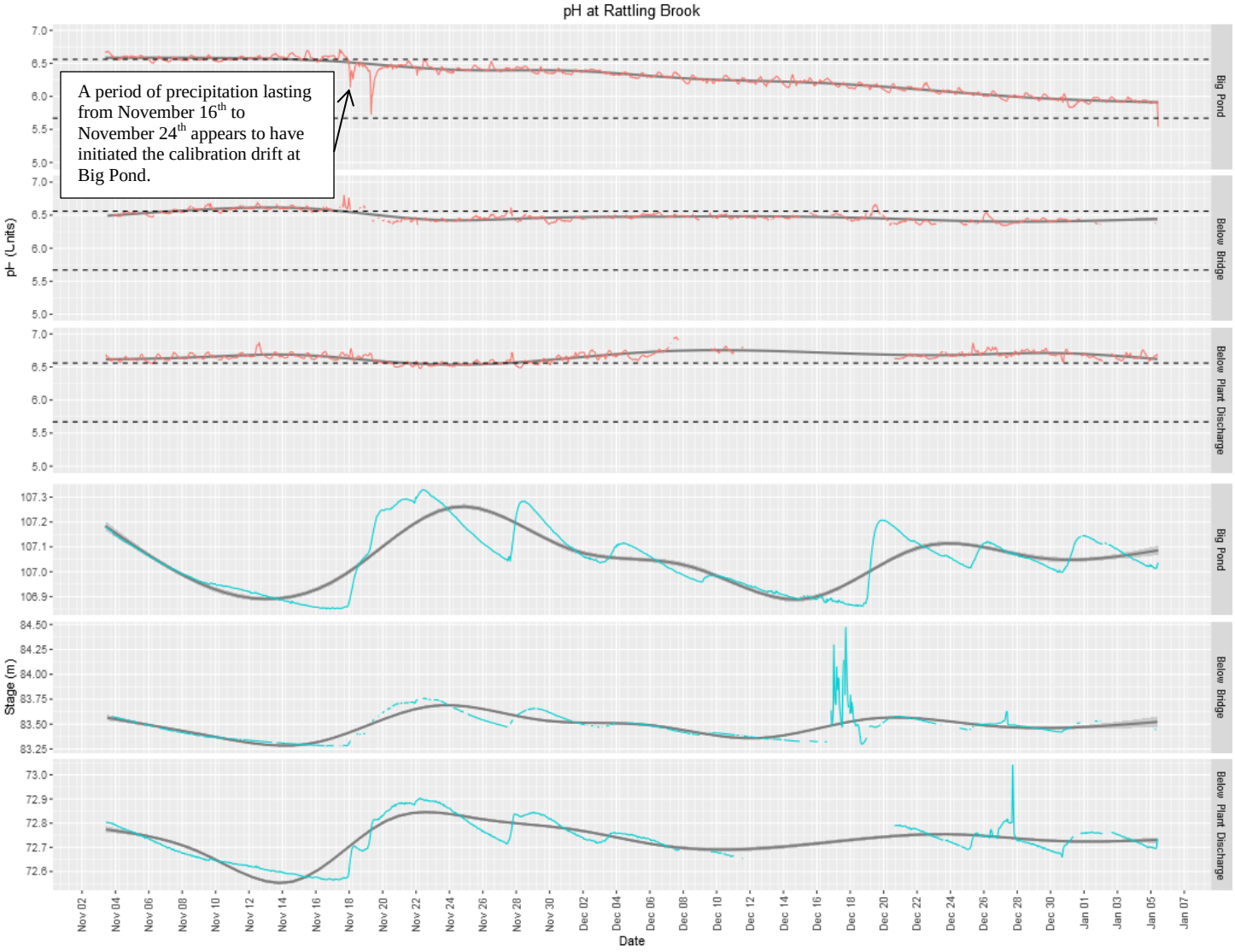
pH

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	Mean	Median	Min	Max
Big Pond	6.30	6.33	5.54	6.71
Below Bridge	6.48	6.47	6.34	6.80
Below Plant Discharge	6.65	6.65	6.48	6.95

- pH was relatively stable at Bridge and Plant Discharge stations during the deployment period with a slow decline observed at Big Pond station, likely due to calibration drift.
- Most pH values at Below Bridge and Plant Discharge stations were found to be at or slightly above the Site Specific Guidelines (dashed lines).

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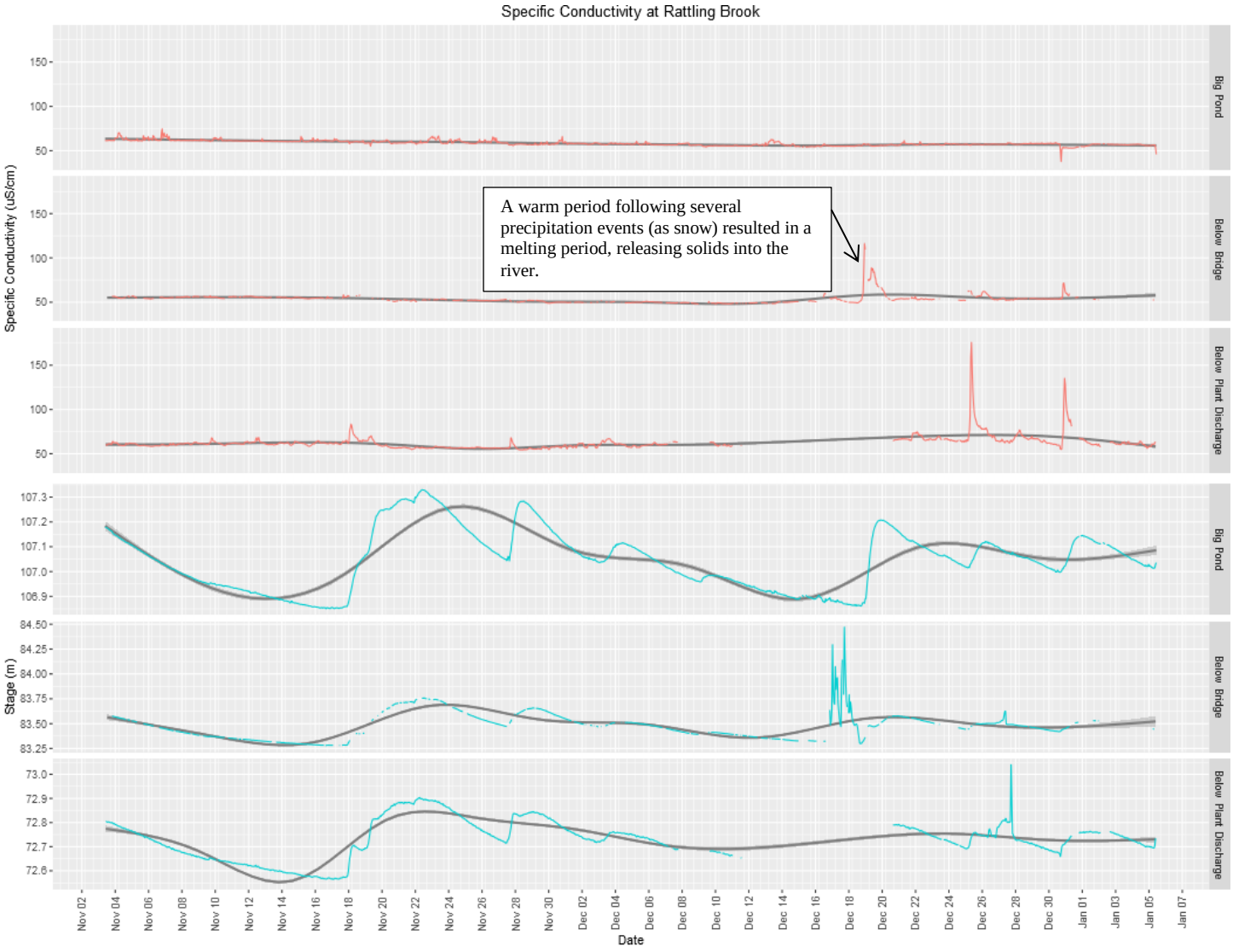
Specific Conductivity

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.



Station	Mean	Median	Min	Max
Big Pond	58.4	57.9	37.6	74.6
Below Bridge	53.5	53.1	47.3	116.2
Below Plant Discharge	62.4	61.1	54.3	175.9

- Conductivity, like pH, was mostly stable over the course of the deployment period with no substantial up or downward trend. A few instances of conductivity events were coincident with thawing periods and precipitation releasing solids into the river channel.

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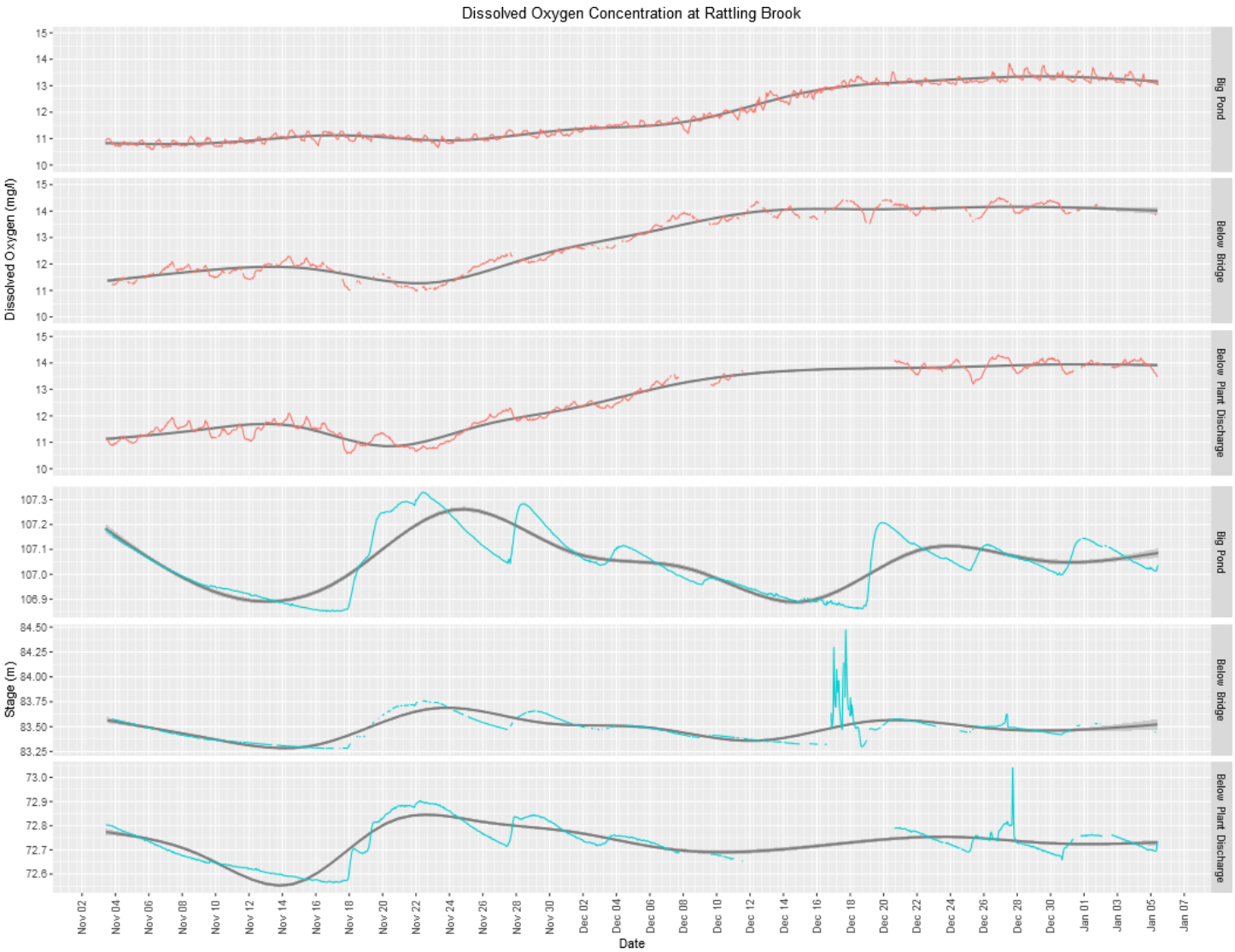
Dissolved Oxygen

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 the presence of oxidizing materials.



Station	Mean	Median	Min	Max
Big Pond	11.91	11.49	10.59	13.84
Below Bridge	12.82	12.61	10.97	14.51
Below Plant Discharge	12.38	12.01	10.57	14.31

- Dissolved oxygen levels reached their typical winter maxima by mid-December. All values were found to be above the CCME minimum level of 9.5 mg/l for cold water biota.

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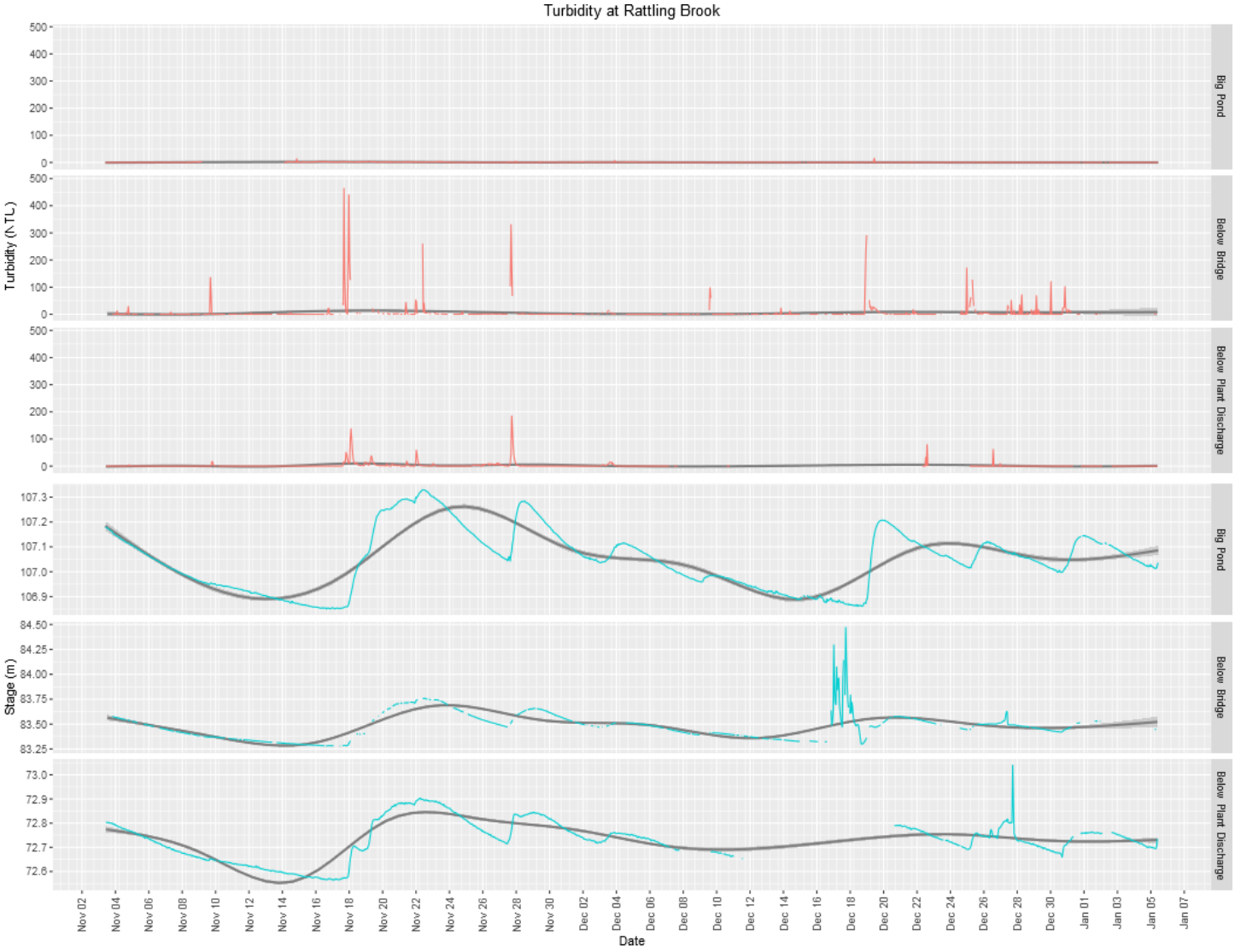
Turbidity

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	Mean	Median	Min	Max
Big Pond	0.5	0.0	0.0	15.0
Below Bridge	5.7	0.0	0.0	464.0
Below Plant Discharge	2.3	0.0	0.0	184.9

- Mean and median values were found to be 0.0 NTU for each station during this deployment period with periodic short-term turbidity events reaching 464 NTU and 185 NTU at Bridge and Plant Discharge stations, respectively. Such events are usually related to flow and water level perturbations. No trend was observed at either station.

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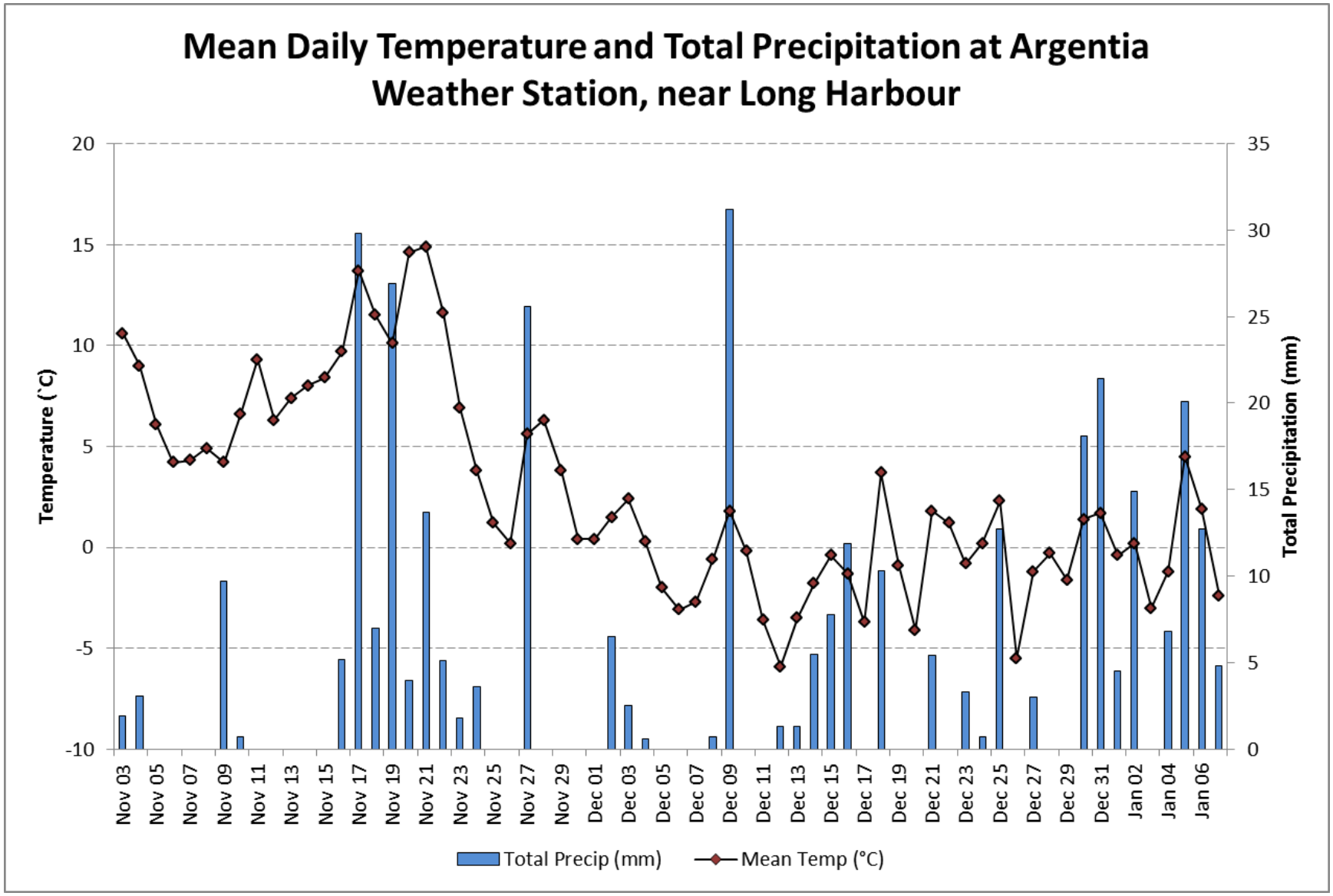
Appendix


Mean Daily Temperature and Total Precipitation at Argentia Weather Station, near Long Harbour
Temperature (`C)
Total Precipitation (mm)
20
15
10
5
0
-5
-10
35
30
25
20
15
10
5
0
Nov 03
Nov 05
Nov 07
Nov 09
Nov 11
Nov 13
Nov 15
Nov 17
Nov 19
Nov 21
Nov 23
Nov 25
Nov 27
Nov 29
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Dec 15
Dec 17
Dec 19
Dec 21
Dec 23
Dec 25
Dec 27
Dec 29
Dec 31
Jan 02
Jan 04
Jan 06
Total Precip (mm)
Mean Temp (°C)