Real-Time Water Quality Deployment Report

Rattling Brook Network

October 24, 2014 to November 20, 2014

Newfoundland Labrador

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

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General

- This deployment report spans a period of 26 days during which there were no communication dropouts observed. No adverse events were observed.
- Department of Environment and Conservation staff monitors the real-time web pages consistently.

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

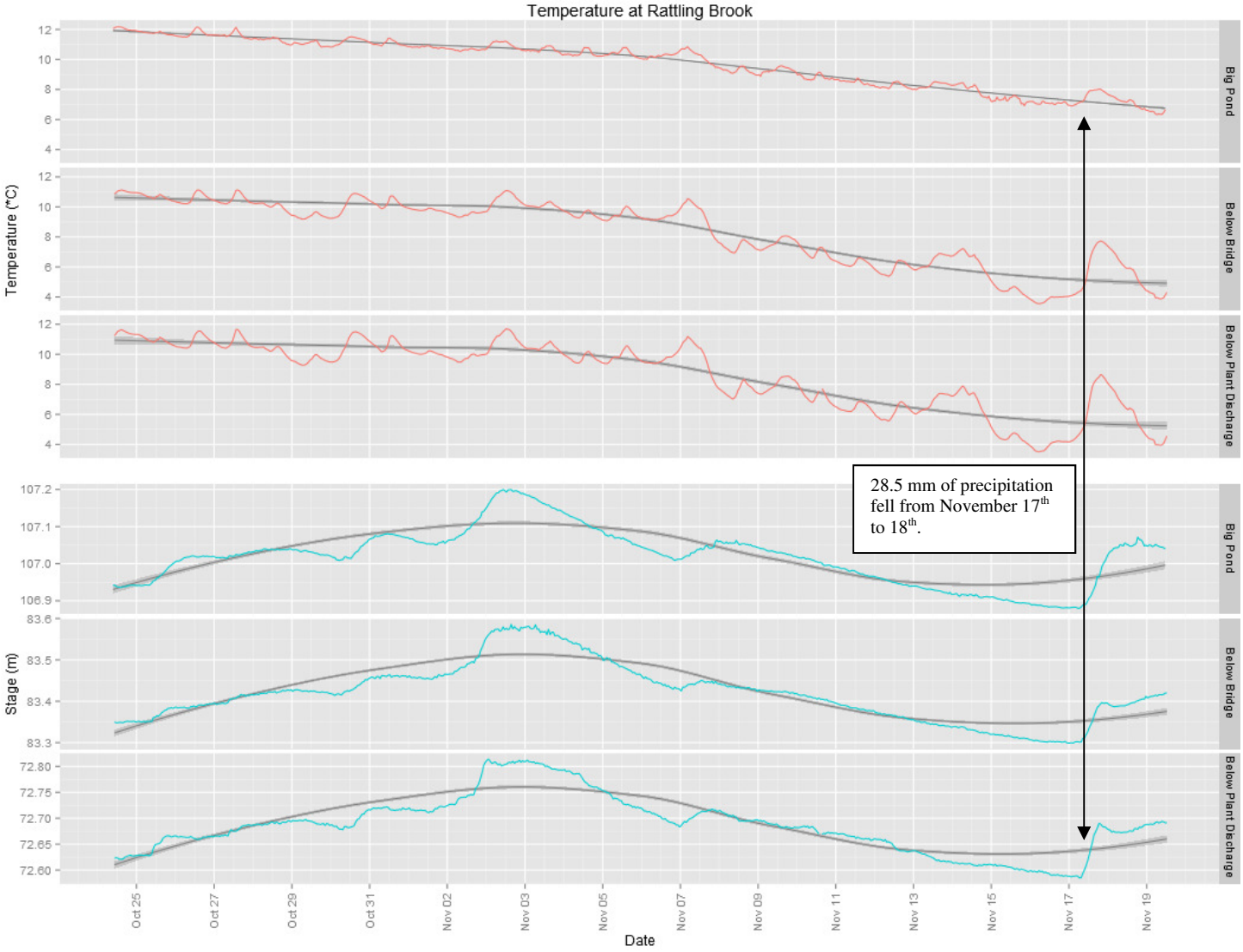
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	October 24, 2014	Deployment	Excellent	Excellent	Excellent	Excellent	Excellent
	November 20, 2014	Removal	Excellent	Excellent	Excellent	Excellent	Excellent
Rattling Brook below Bridge	October 24, 2014	Deployment	Good	Excellent	Excellent	Excellent	Excellent
	November 20, 2014	Removal	Good	Good	Excellent	Excellent	Excellent
Rattling Brook below Plant Discharge	October 24, 2014	Deployment	Excellent	Excellent	Excellent	Excellent	Excellent
	November 20, 2014	Removal	Good	Excellent	Excellent	Excellent	Excellent

- All QAQC rankings were found to be “Good” or “Excellent” at deployment and removal time.

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.

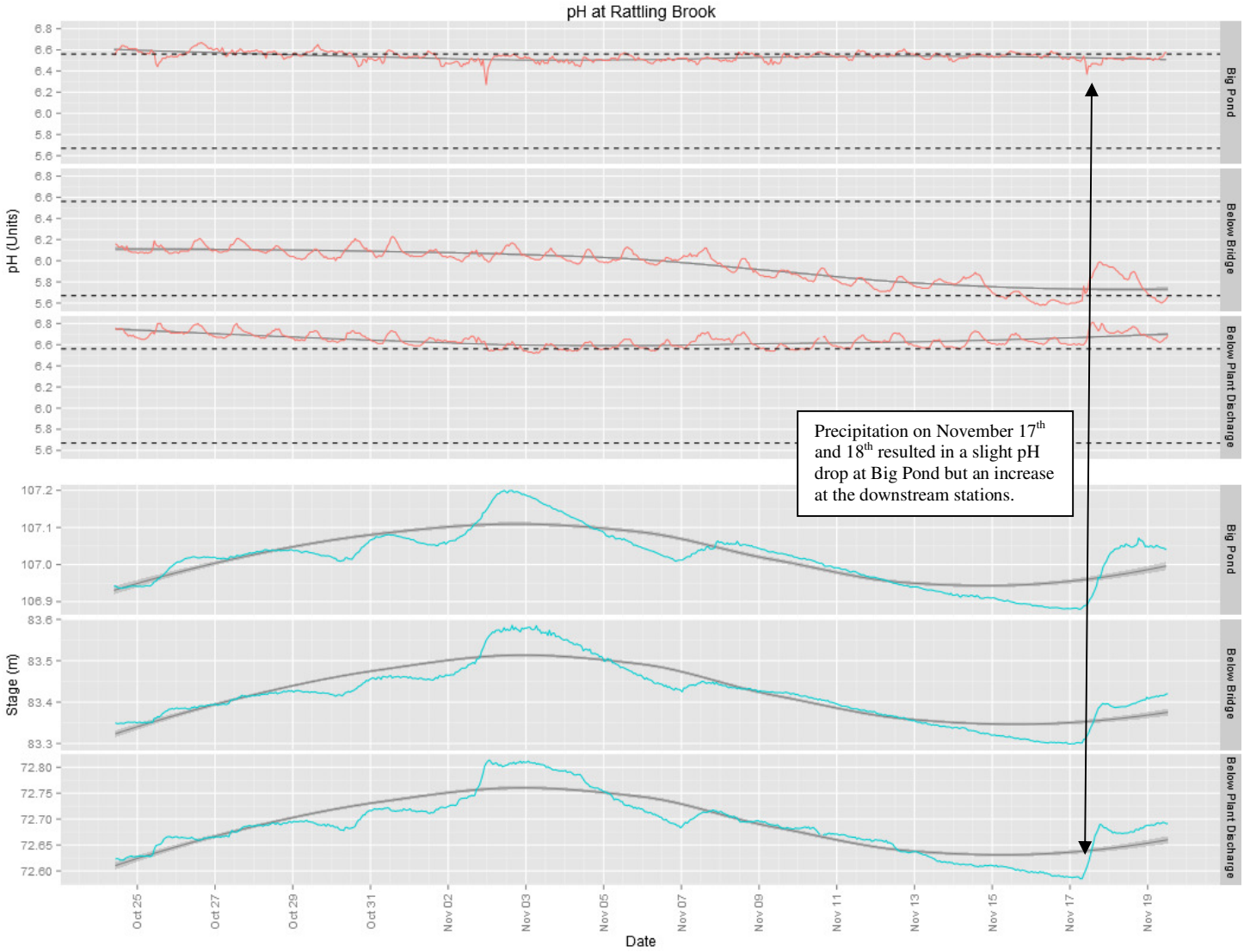


Station	Variable	Mean	Median	Min	Max
Big Pond	Temperature (C)	9.75	10.32	6.33	12.18
Below Bridge	Temperature (C)	8.30	9.31	3.56	11.13
Below Plant Discharge	Temperature (C)	8.62	9.54	3.51	11.71

- Each station showed a decline in temperature towards annual low temperatures. As expected, Big Pond water temperature tended to be more stable with less daily variation and changes attributable to weather events.

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.

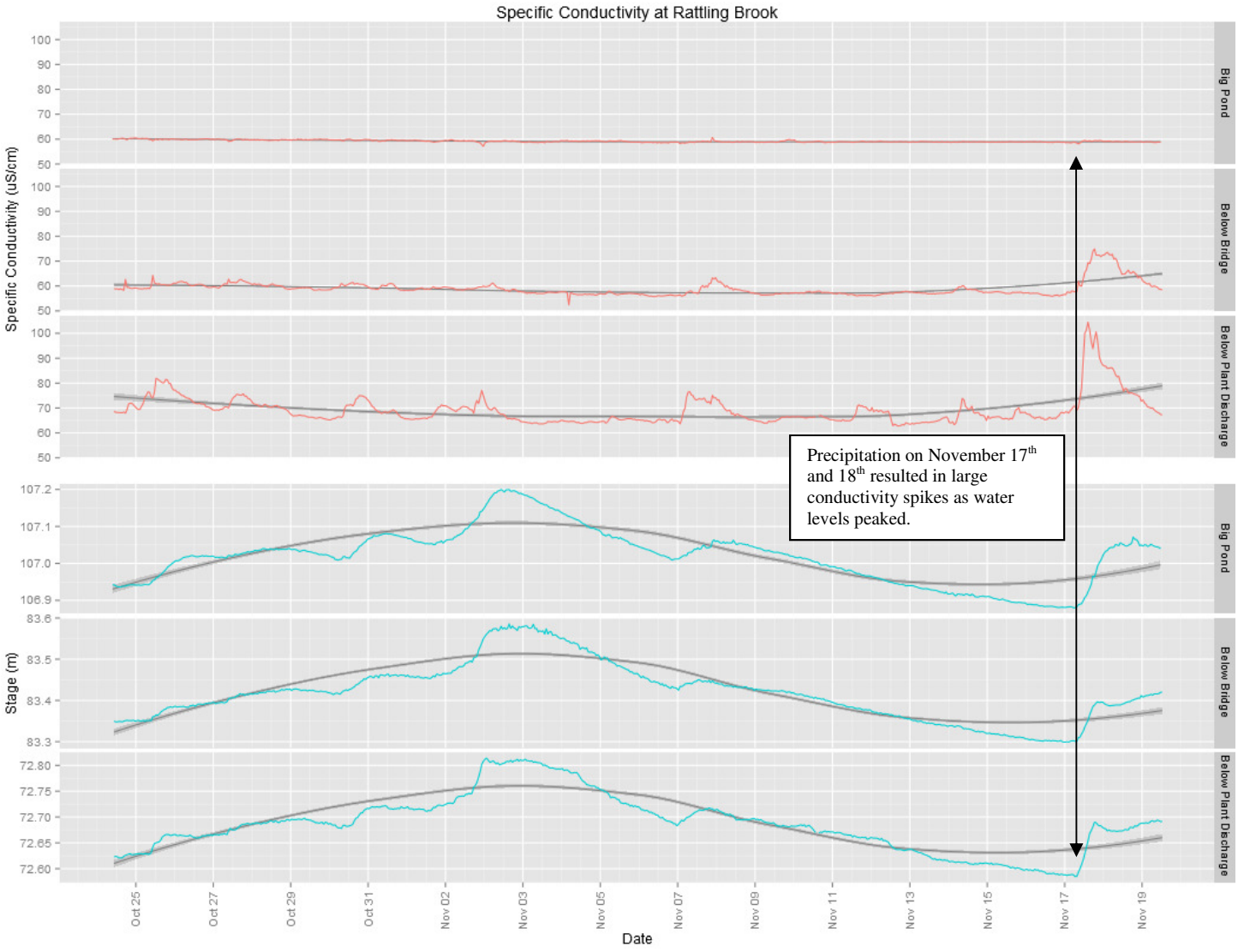


Station	Variable	Mean	Median	Min	Max
Big Pond	pH (Units)	6.54	6.53	6.27	6.67
Below Bridge	pH (Units)	5.95	6.01	5.58	6.23
Below Plant Discharge	pH (Units)	6.64	6.64	6.52	6.81

- Black dashed lines indicate the Site Specific Guidelines (SSGs) of 5.67 to 6.56 units. Big Pond station was found to be stable near the upper limits of the guidelines. Plant Discharge station remained slightly above the SSGs for the duration of the deployment, whereas Bridge station was found to be within the guidelines for most of the deployment period.

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.

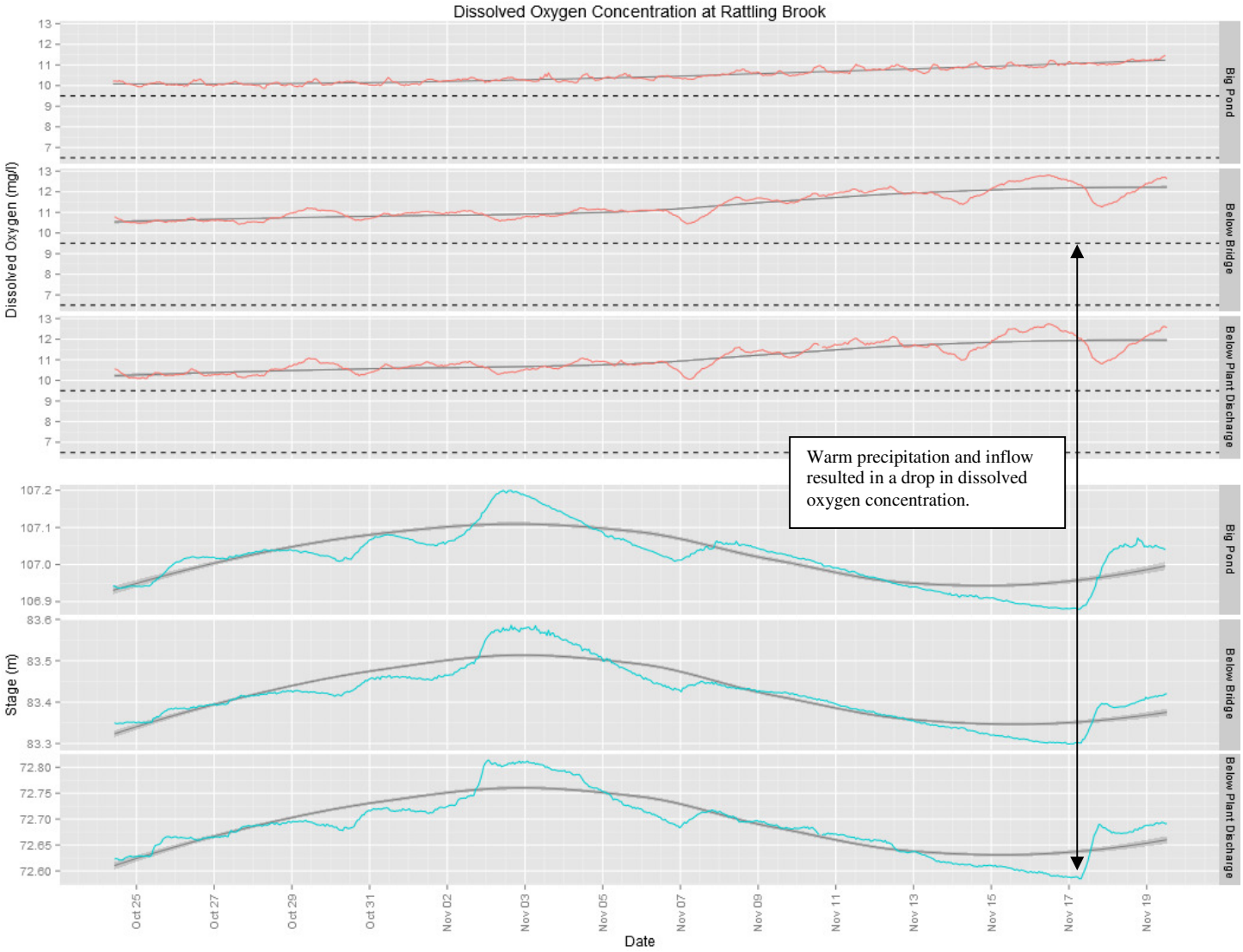


Station	Variable	Mean	Median	Min	Max
Big Pond	Conductivity (uS/cm)	59.2	59.1	57.1	60.7
Below Bridge	Conductivity (uS/cm)	59.0	58.4	52.4	75.0
Below Plant Discharge	Conductivity (uS/cm)	69.1	67.5	62.8	104.5

- Specific conductivity was stable at Big Pond station and only varied by 3.6 uS/cm throughout the deployment period. The downstream stations showed a larger degree of variance, however.

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.

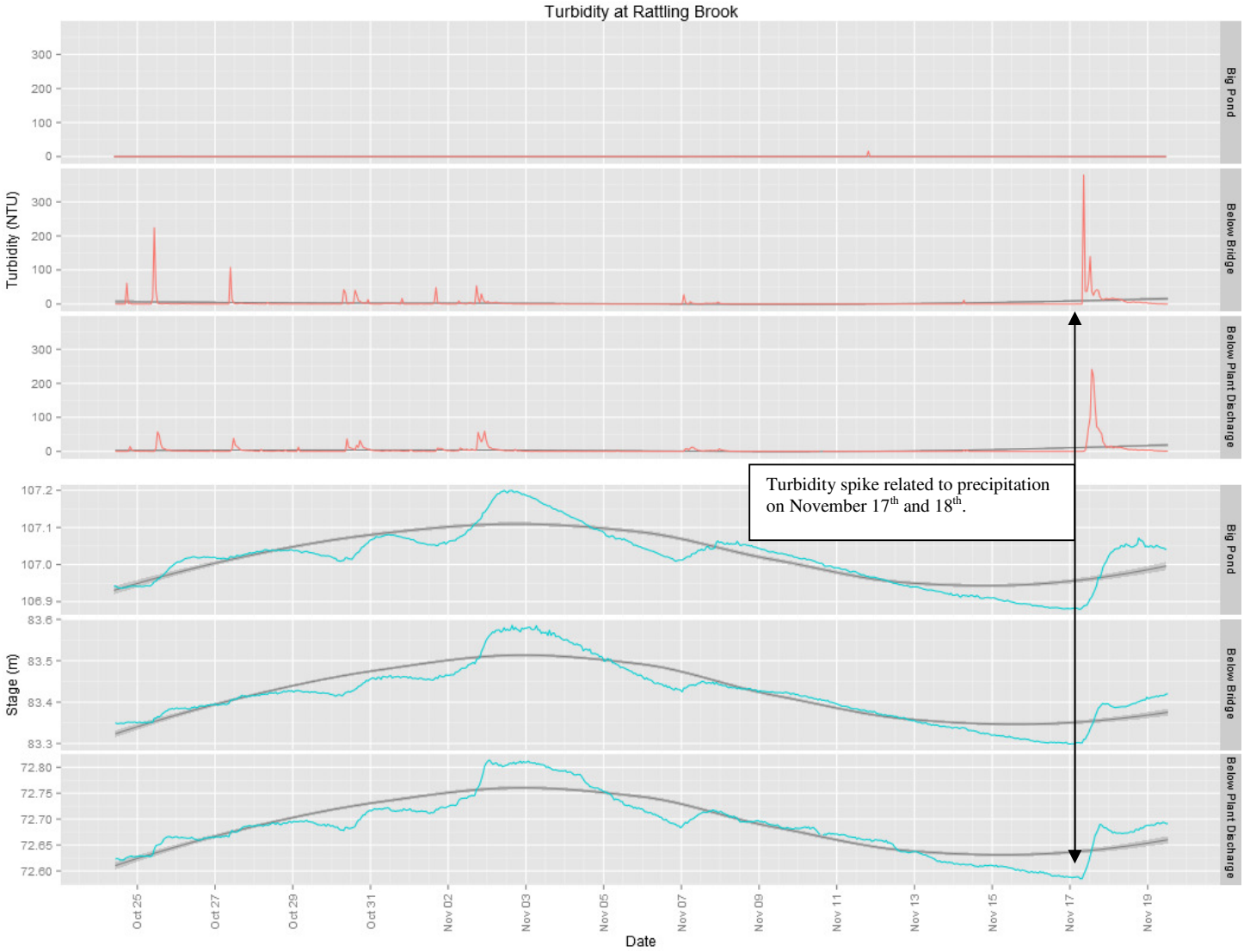


Station	Variable	Mean	Median	Min	Max
Big Pond	DO (mg/l)	10.49272308	10.4	9.87	11.48
Below Bridge	DO (mg/l)	11.32464615	11.1	10.42	12.81
Below Plant Discharge	DO (mg/l)	11.07345146	10.87	10.05	12.74

- Dissolved oxygen concentrations increased at all three Rattling Brook stations as water temperatures cooled into the fall. All values were greater than the CCME guideline of 9.5 mg/l DO for the protection of early life stage cold water biota (black dashed lines). Concentrations are expected to remain high until spring 2015.

Turbidity

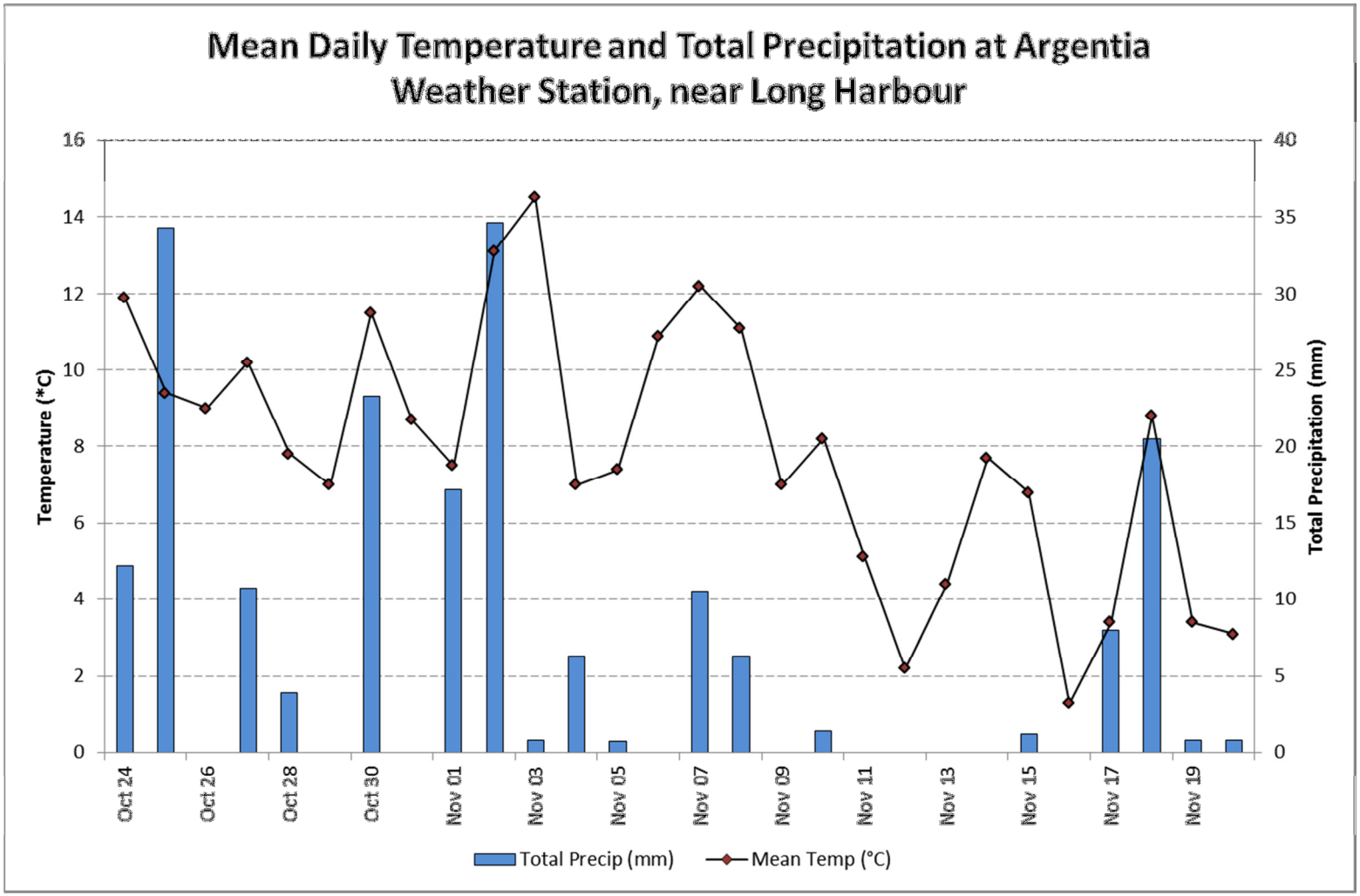
Turbidity is typically caused by fine suspended solids such as silt, clay, or organic material. Consistently high levels of turbidity tend to block sunlight penetration into a waterbody, discouraging plant growth. High turbidity can also damage the delicate respiratory organs of aquatic animals and cover spawning areas.



Station	Variable	Mean	Median	Min	Max
Big Pond	Turb (NTU)	0.0	0.0	0.0	15.9
Below Bridge	Turb (NTU)	3.4	0.0	0.0	378.9
Below Plant Discharge	Turb (NTU)	4.0	0.0	0.0	241.3

- A few instances of turbidity events were observed during this deployment period and were generally related to precipitation events. Thirteen turbidity alerts (> 40 NTU) were received from Bridge station while 14 were received from Plant Discharge station during this deployment period.

Appendix



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