Real-Time Water Quality Deployment Report

Rattling Brook Network

December 23, 2014 to February 5, 2015

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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2014-12-23 to 2015-02-05

General

- Department of Environment and Conservation 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

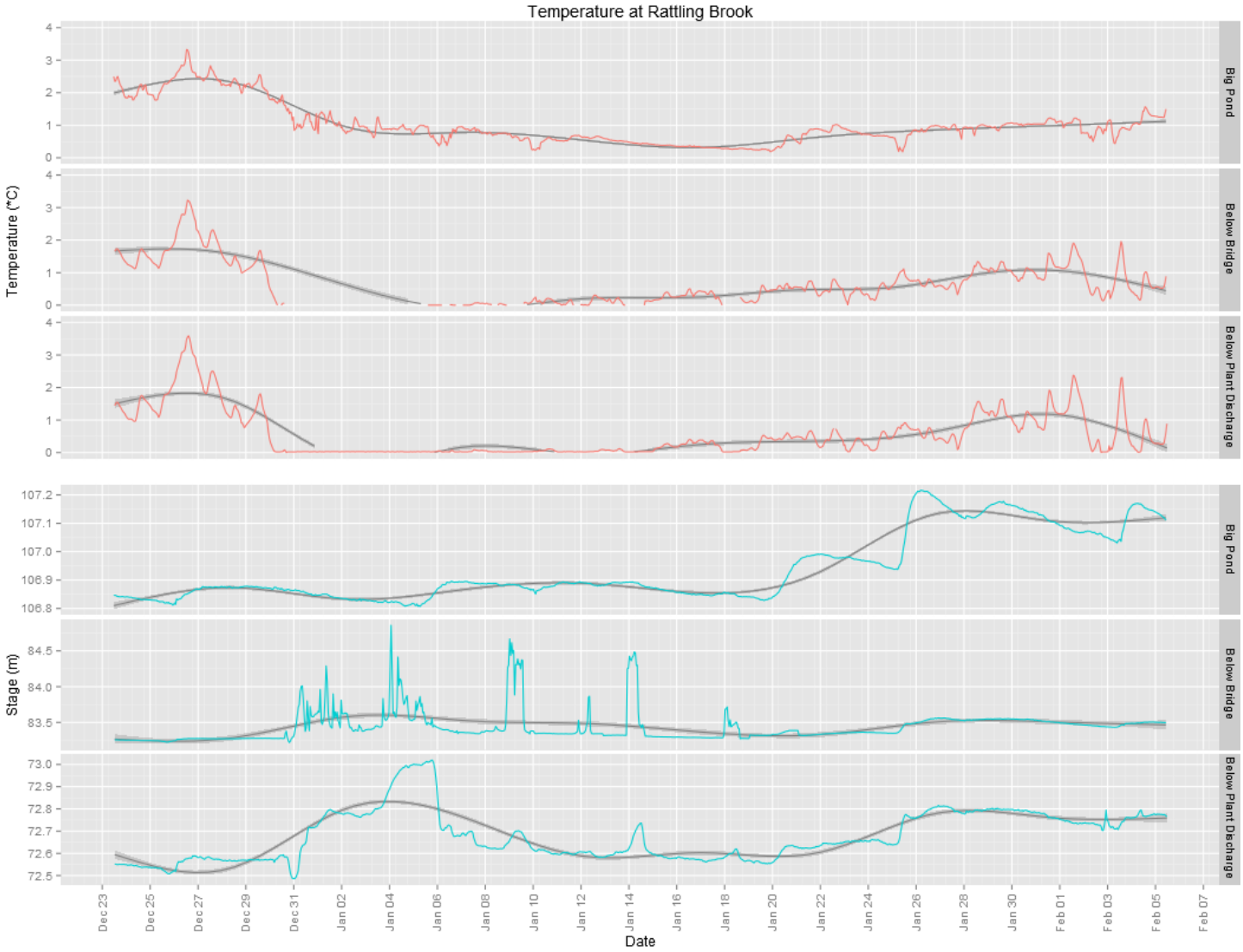
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	December 23, 2014	Deployment	Excellent	NA	Excellent	Excellent	Excellent
	February 5, 2015	Removal	Good	Excellent	Good	Fair	Excellent
Rattling Brook below Bridge	December 23, 2014	Deployment	Excellent	NA	Excellent	Good	Fair
	February 5, 2015	Removal	Excellent	Excellent	Excellent	Excellent	Excellent
Rattling Brook below Plant Discharge	December 23, 2014	Deployment	Excellent	Good	Excellent	Excellent	Excellent
	February 5, 2015	Removal	Good	Excellent	Excellent	Good	Excellent

- The pH probe on the QAQC instrument was taking a long time to stabilize at Big Pond and Bridge stations during Deployment. pH Ranking was omitted.

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.

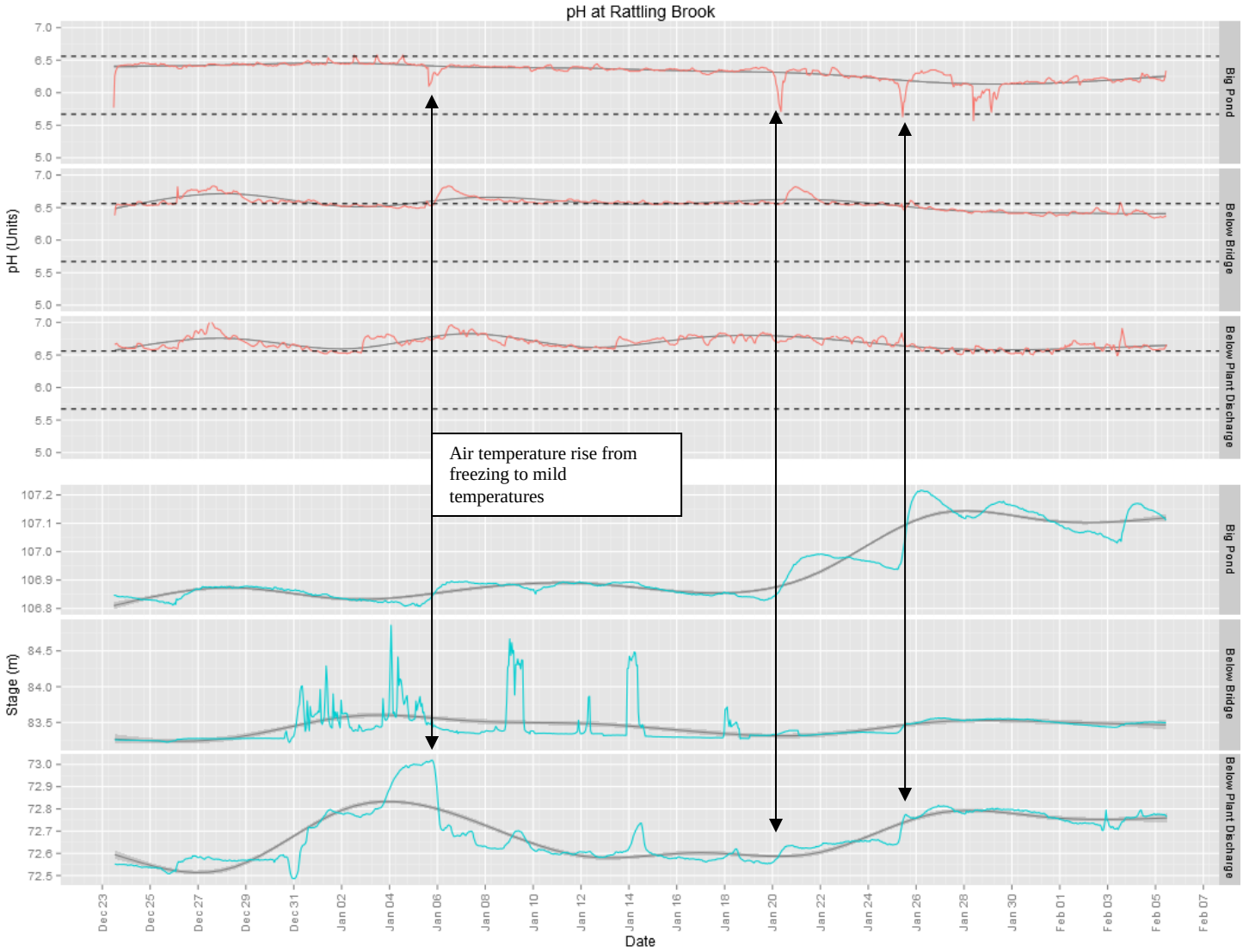


Station	Mean	Median	Min	Max
Big Pond	1.00	0.87	0.18	3.33
Below Bridge	0.56	0.38	-0.03	3.23
Below Plant Discharge	0.55	0.26	0.00	3.59

- Temperatures were lowest at Bridge and Plant Discharge stations during the week from December 30th to January 6th while it was January 20th before Big Pond reached its lowest temperature for the deployment.

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.

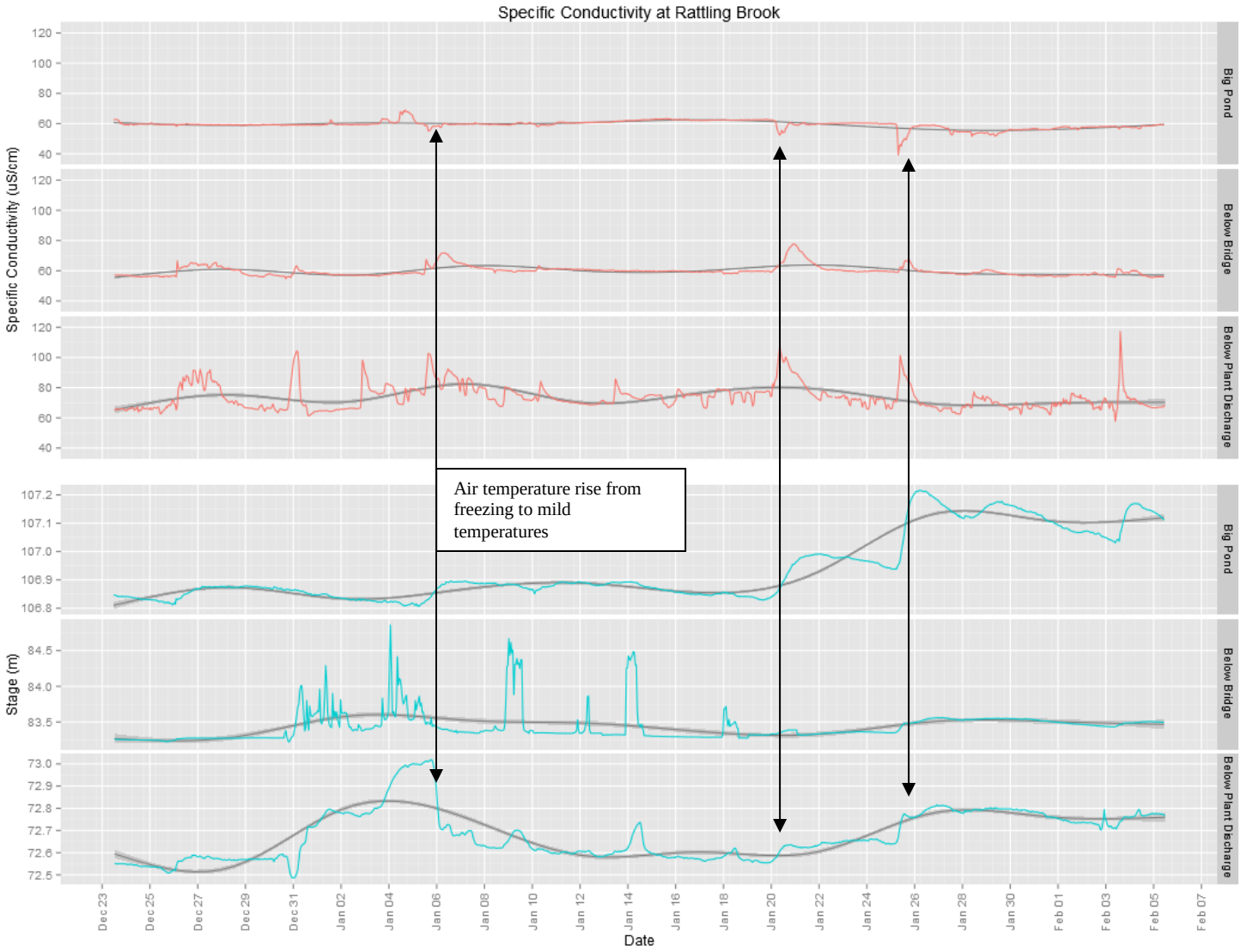


Station	Mean	Median	Min	Max
Big Pond	6.32	6.36	5.57	6.58
Below Bridge	6.56	6.56	6.34	6.83
Below Plant Discharge	6.68	6.67	6.49	7.02

- pH levels tended to be near the top of the Site Specific Guidelines (SSGs, dashed lines) at Bridge and Discharge stations. Big Pond tended to be somewhat more acidic, though still falling within the SSGs.

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.

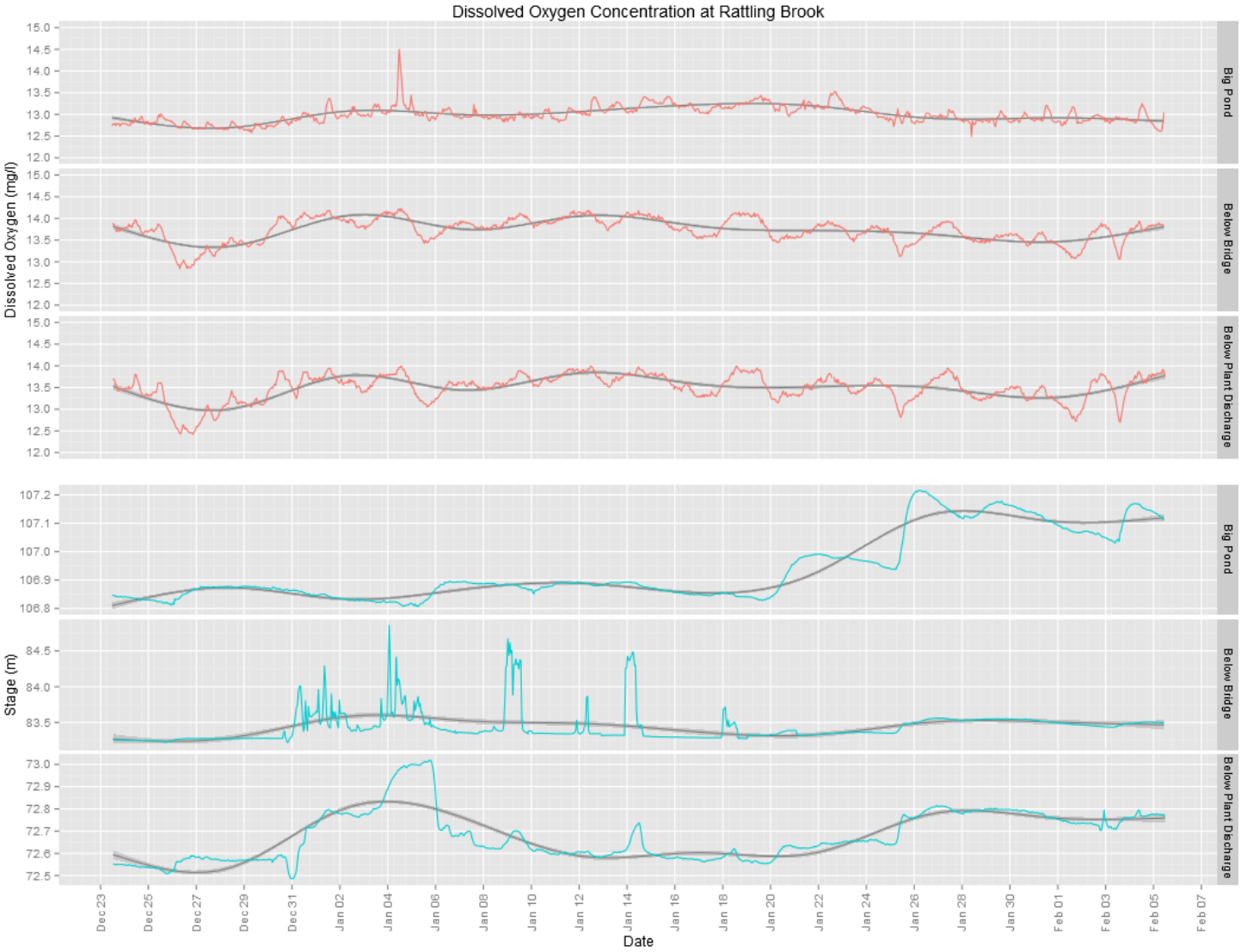


Station	Mean	Median	Min	Max
Big Pond	59.3	59.4	39.1	69.1
Below Bridge	59.9	59.5	54.7	77.8
Below Plant Discharge	73.6	72.0	57.8	117.2

- Several instances of conductivity drops at Big Pond station with concurrent conductivity increases downstream are presented in the figure above. The mechanism of action appears to be a dilution effect upstream and a concentration effect downstream due to inflow laden with dissolved solids.

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.

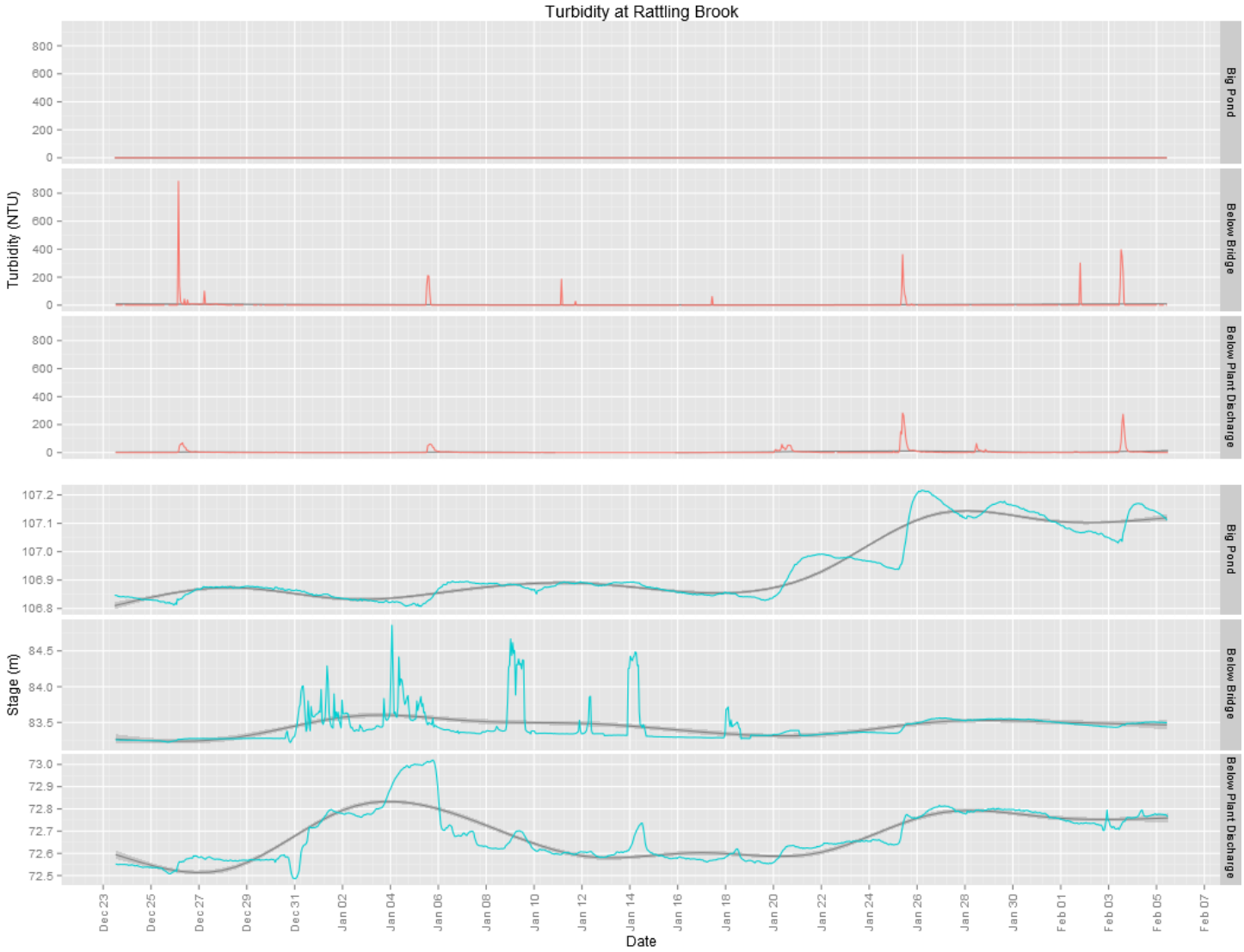


Station	Mean	Median	Min	Max
Big Pond	12.99	12.96	12.49	14.50
Below Bridge	13.73	13.77	12.84	14.23
Below Plant Discharge	13.49	13.54	12.42	14.00

- Dissolved oxygen saturations were found to be far above the minimum CCME Guideline of 9.5 mg/l O_2. Oxygen levels are typically highest this time of the year in response to low water temperatures.

Turbidity

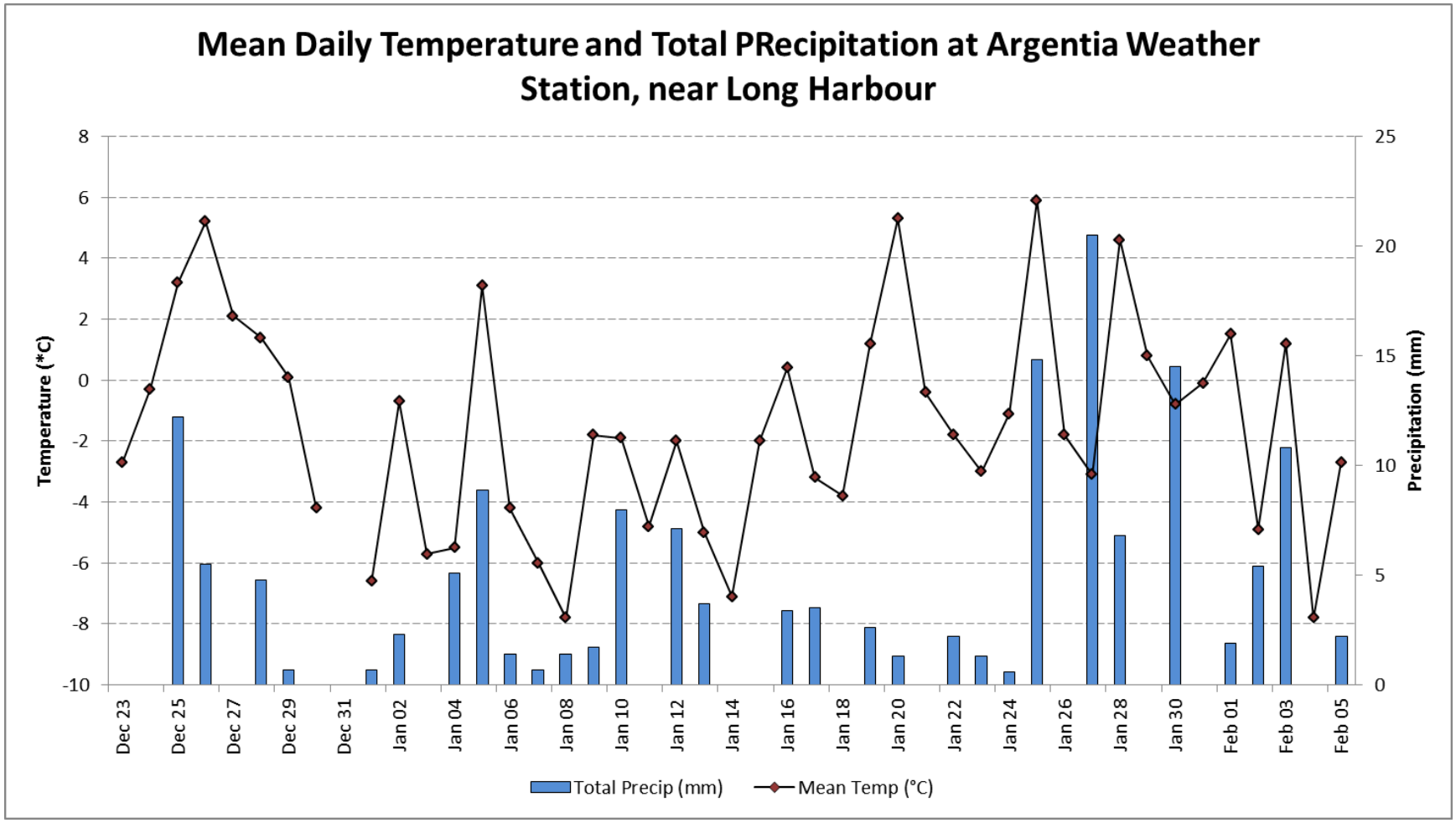
Turbidity is typically caused by fine suspended solids such as silt, clay, or organic material. Consistently high levels of turbidity tend to block sunlight penetration into a waterbody, discouraging plant growth. High turbidity can also damage the delicate respiratory organs of aquatic animals and cover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



Station	Mean	Median	Min	Max
Big Pond	0.0	0.0	0.0	0.6
Below Bridge	4.5	0.0	0.0	886.0
Below Plant Discharge	4.1	0.0	0.0	282.5

- Some instances of turbidity spikes were observed at Bridge and Plant Discharge stations, though the events tended to be of short duration. Turbidity events at Bridge and Discharge stations tended to occur when air temperature were greater than 0^{o}C.

Appendix



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