Real-Time Water Quality Deployment Report

Rattling Brook Network

August 21, 2015 to October 8, 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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2015-08-21 to 2015-10-08

General

- Department of Environment and Conservation staff monitors the real-time web pages consistently.
- A cable fault caused a communication dropout at Bridge station from August 24th until September 2nd when the cable was replaced and a temporary Hydrolab was deployed to finish the deployment.
- Increased beaver activity between Bridge and Plant Discharge stations may be showing a change in character of water quality events. Whereas previous turbidity events at Plant Discharge station were of higher variability and magnitude than Bridge station, the reverse appears to be happening since water flow has slowed along portions of the river. A slower water velocity may allow for increased sediment dropout.
- 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

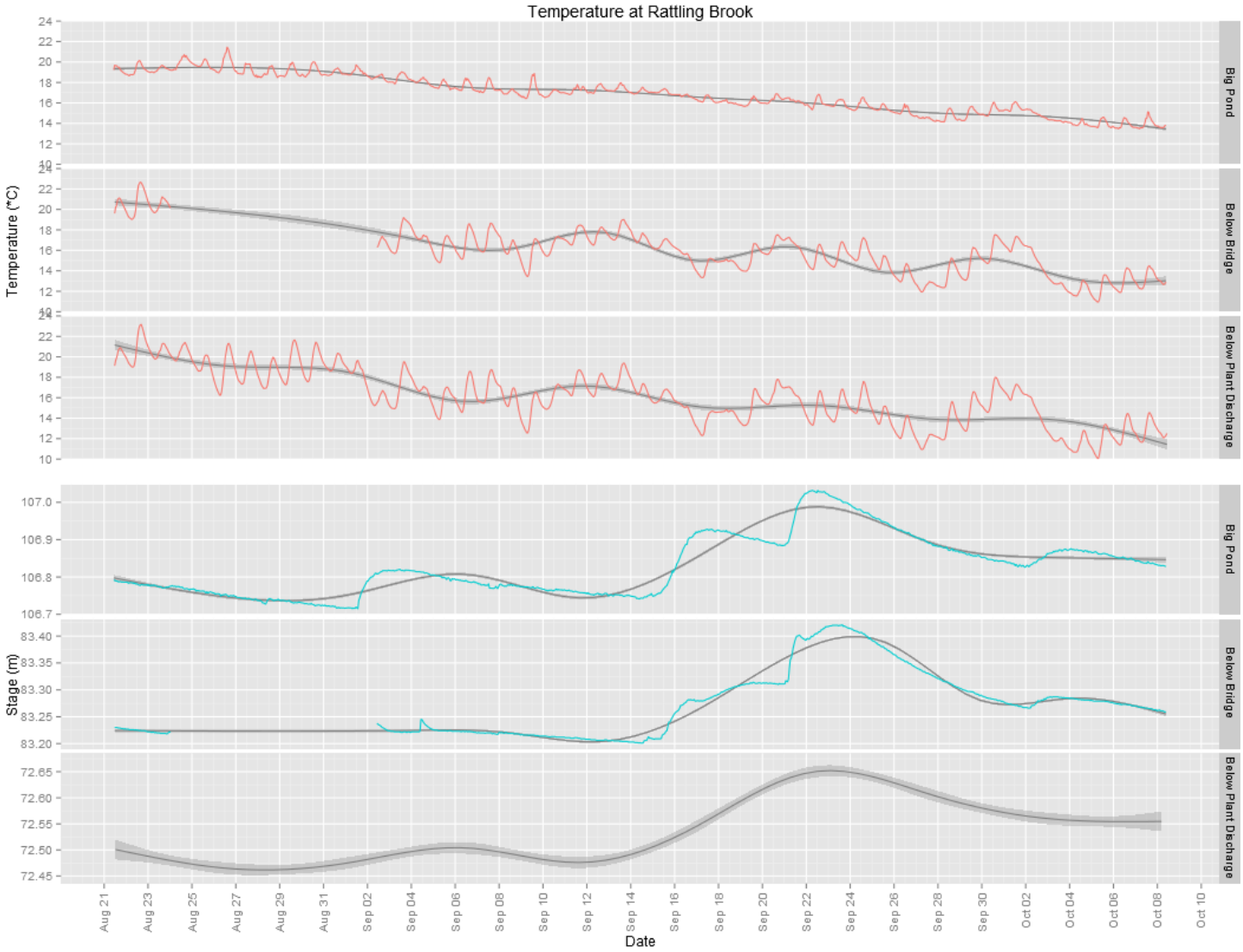
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	August 21, 2015	Deployment	Excellent	Excellent	Excellent	Excellent	Excellent
	October 8, 2015	Removal	Good	Good	Good	Excellent	Excellent
Rattling Brook below Bridge	August 21, 2015	Deployment	Good	Excellent	Excellent	Excellent	Excellent
	October 8, 2015	Removal	Excellent	Marginal	Fair	Excellent	Fair
Rattling Brook below Plant Discharge	August 21, 2015	Deployment	Excellent	Excellent	Excellent	Excellent	Excellent
	October 8, 2015	Removal	Excellent	Excellent	Good	Excellent	Excellent

- QAQC rankings for Rattling Brook below Bridge are calculated from the replacement Hydrolab deployed following the cable fault. The replacement Hydrolab was almost due for a refit and may not have been producing high quality data.

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	16.88	16.91	13.45	21.46
Below Bridge	15.74	15.86	10.95	22.69
Below Plant Discharge	16.10	16.18	10.07	23.18

- Water temperatures declined throughout the deployment period with occasional short-term warming periods. Temperatures are expected to decline into the fall and winter months before reaching their low points in mid-January

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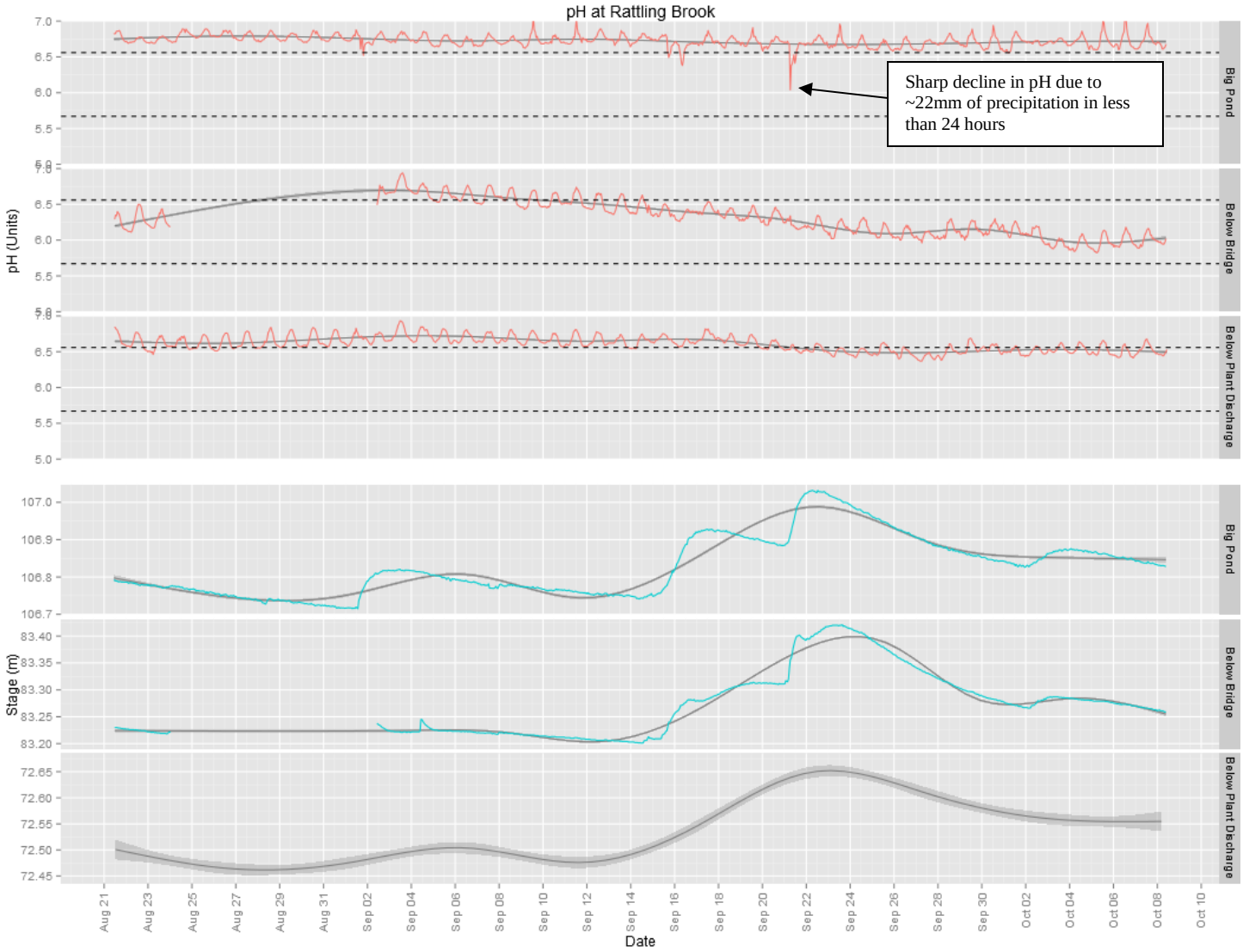
pH

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	6.73	6.72	6.04	7.07
Below Bridge	6.31	6.29	5.82	6.94
Below Plant Discharge	6.61	6.60	6.37	6.93

- pH levels at Bridge and Plant Discharge stations fell slightly following precipitation in early and late September. Increased rainwater inflow into the river has a tendency to cause pH levels to fall slightly. Big Pond pH level remained stable throughout the deployment.

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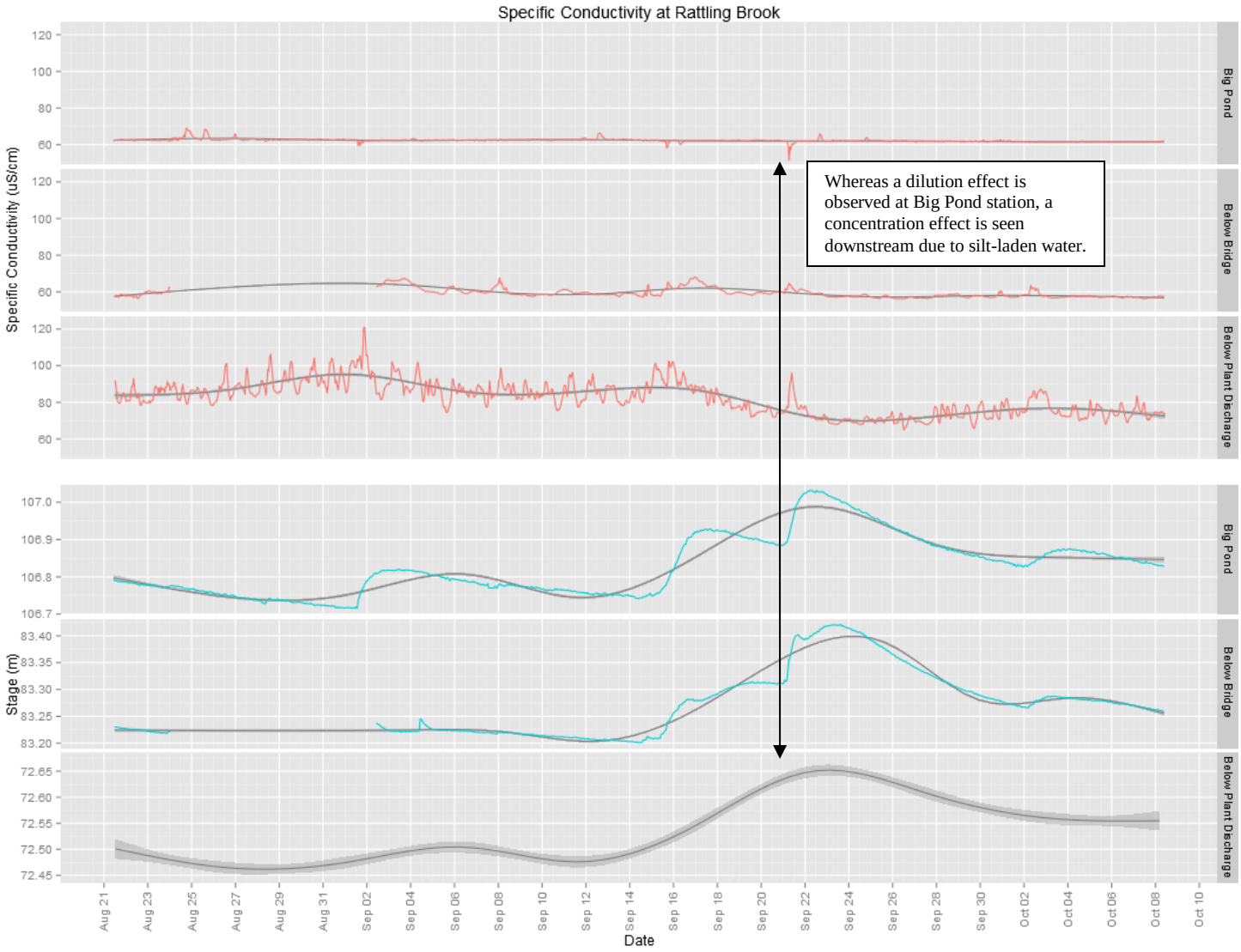
Specific Conductivity

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	62.3	62.3	51.6	69.1
Below Bridge	59.3	58.6	56.1	68.1
Below Plant Discharge	82.2	82.2	64.9	121.0

- Like pH, there was a slight decline in specific conductivity at Bridge and Discharge station because of freshwater inflow due to precipitation. Rainfall tends to be relatively free of dissolved solids and causes a short-term dilution effect on the river, pushing conductivity down. However, it is common to see a short term dilution effect at Big Pond and a concentration effect downstream where rain mixes with stream water.

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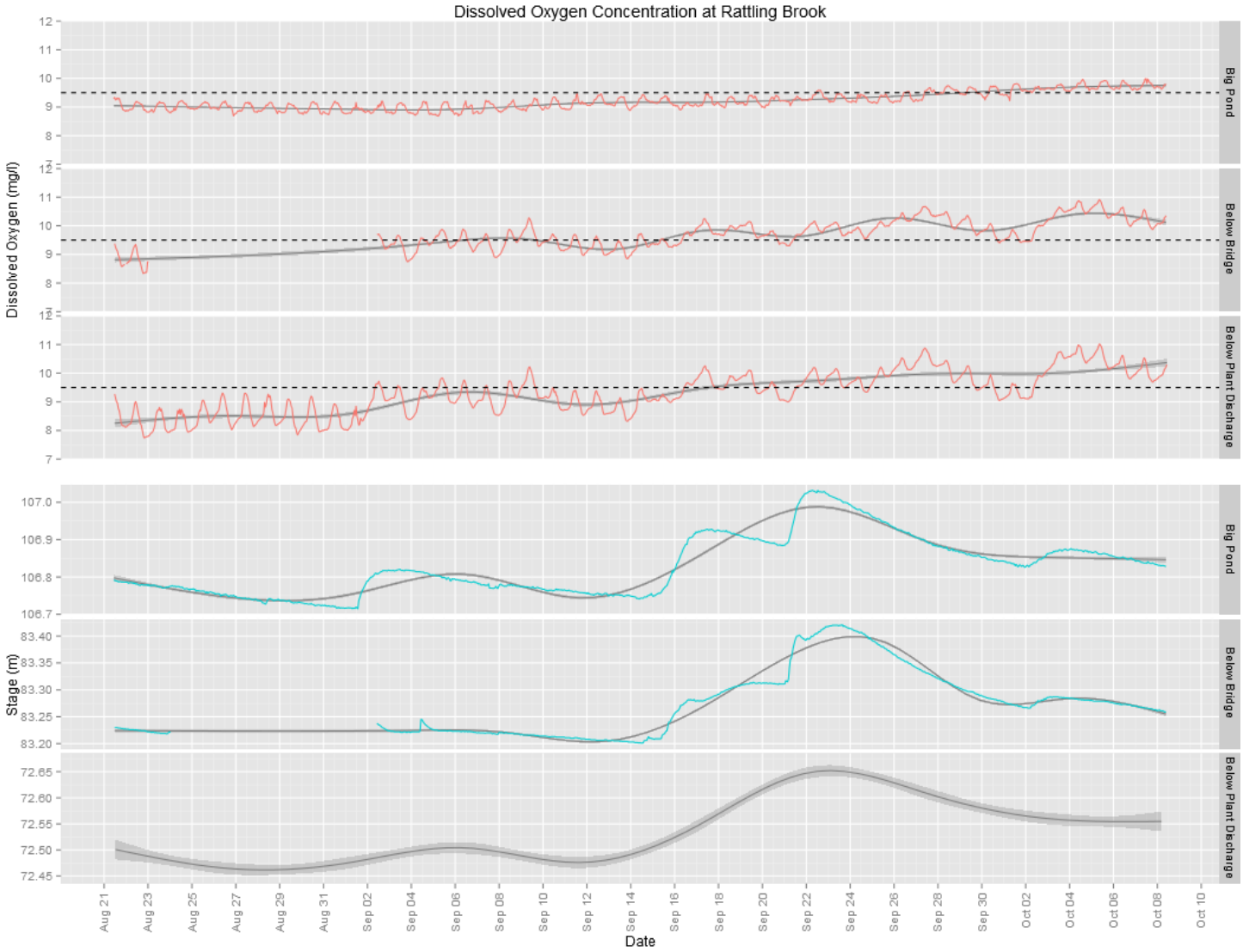
Dissolved Oxygen

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	9.21	9.16	8.68	9.99
Below Bridge	9.74	9.72	8.34	10.92
Below Plant Discharge	9.31	9.30	7.75	11.02

- Dissolved oxygen concentration increases with a decrease in water temperature. As such, DO levels were seen to increase throughout the deployment period and will continue to do so until around mid-January. At the end of the deployment, all stations were showing values within the CCME Guidelines.

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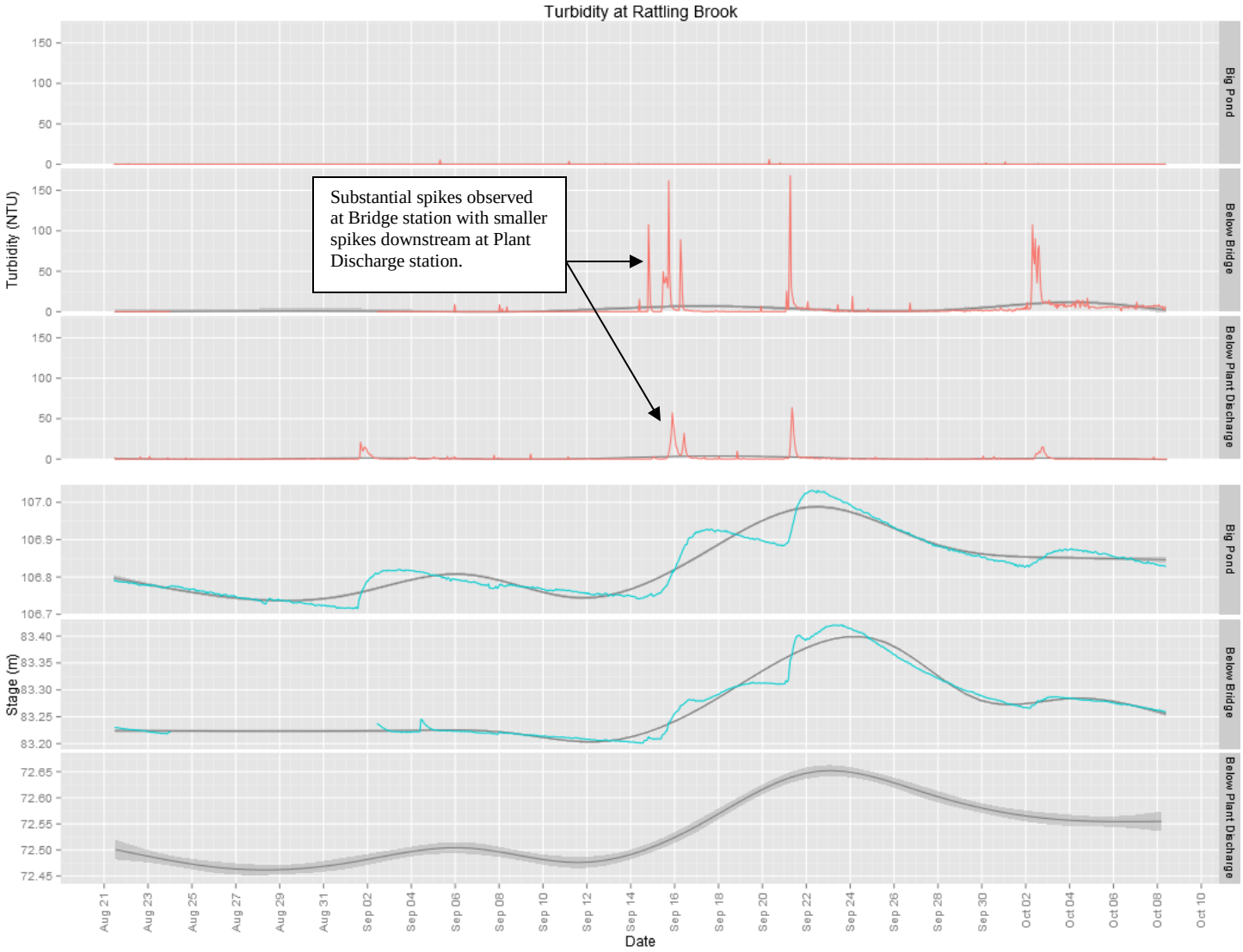
Turbidity

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	0.0	0.0	0.0	5.9
Below Bridge	3.7	0.2	0.0	168.1
Below Plant Discharge	1.0	0.0	0.0	63.6

- Turbidity levels were generally low across the Rattling Brook network except for a few instances of spikes occurring during precipitation events. Peaks observed at Bridge station were more substantial than those at Plant Discharge station.

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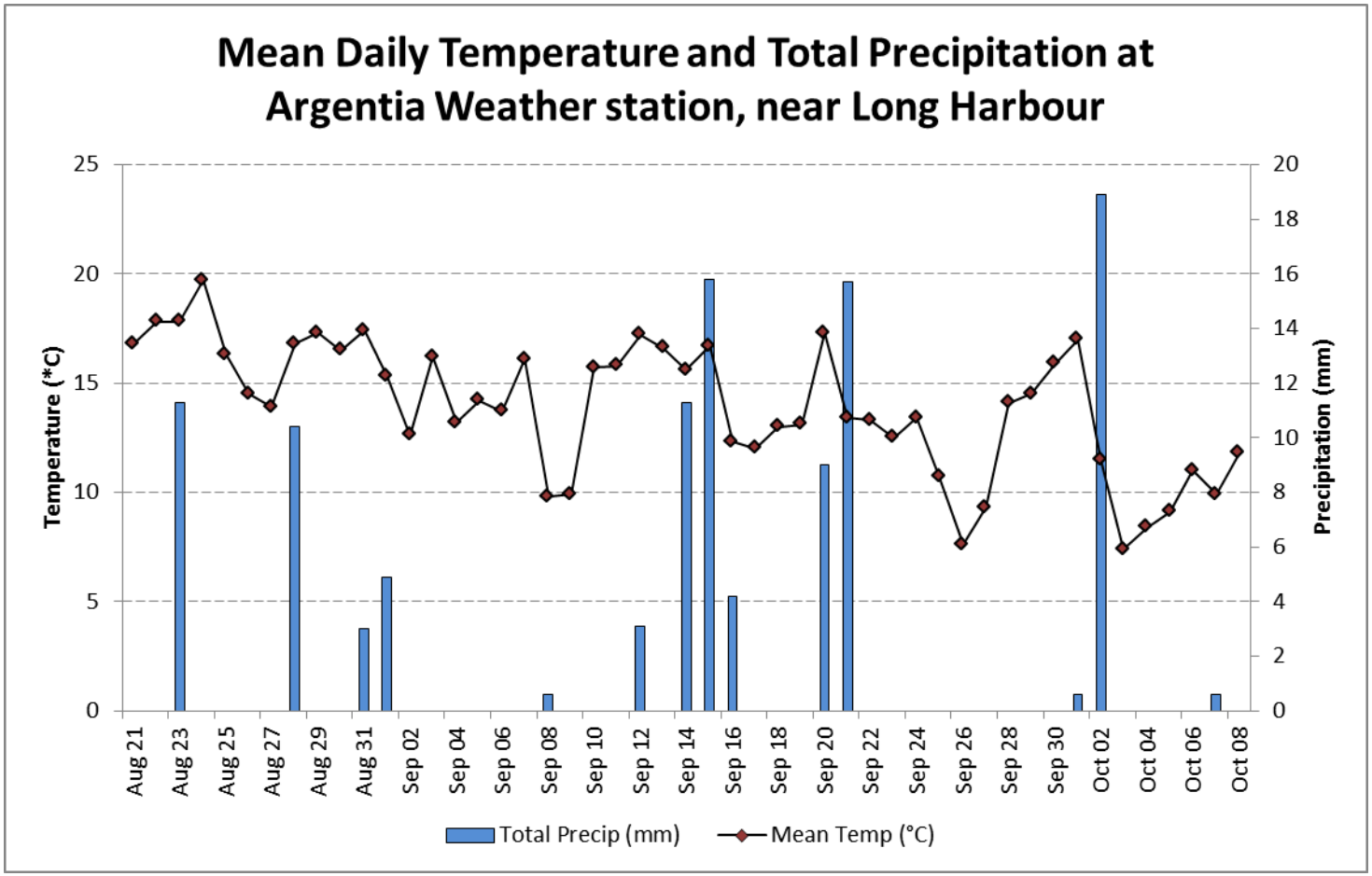
Appendix



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