Real-Time Water Quality Deployment Report

Rattling Brook Network

July 20, 2017 to August 31, 2017

Newfoundland Labrador

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

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General

- Department of Municipal Affairs and Environment staff monitors the real-time web pages consistently.
- pH data at Plant Discharge station showed a long-duration decline from the beginning to end of deployment, suggesting a loss of calibration for the sensor. Data is included in this report for visualization purposes only.
- During construction of a dam at the outflow of Big Pond, a temporary coffer dam has been put in place. As a result, water level is unusually high at Big Pond for this time of year.
- 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.

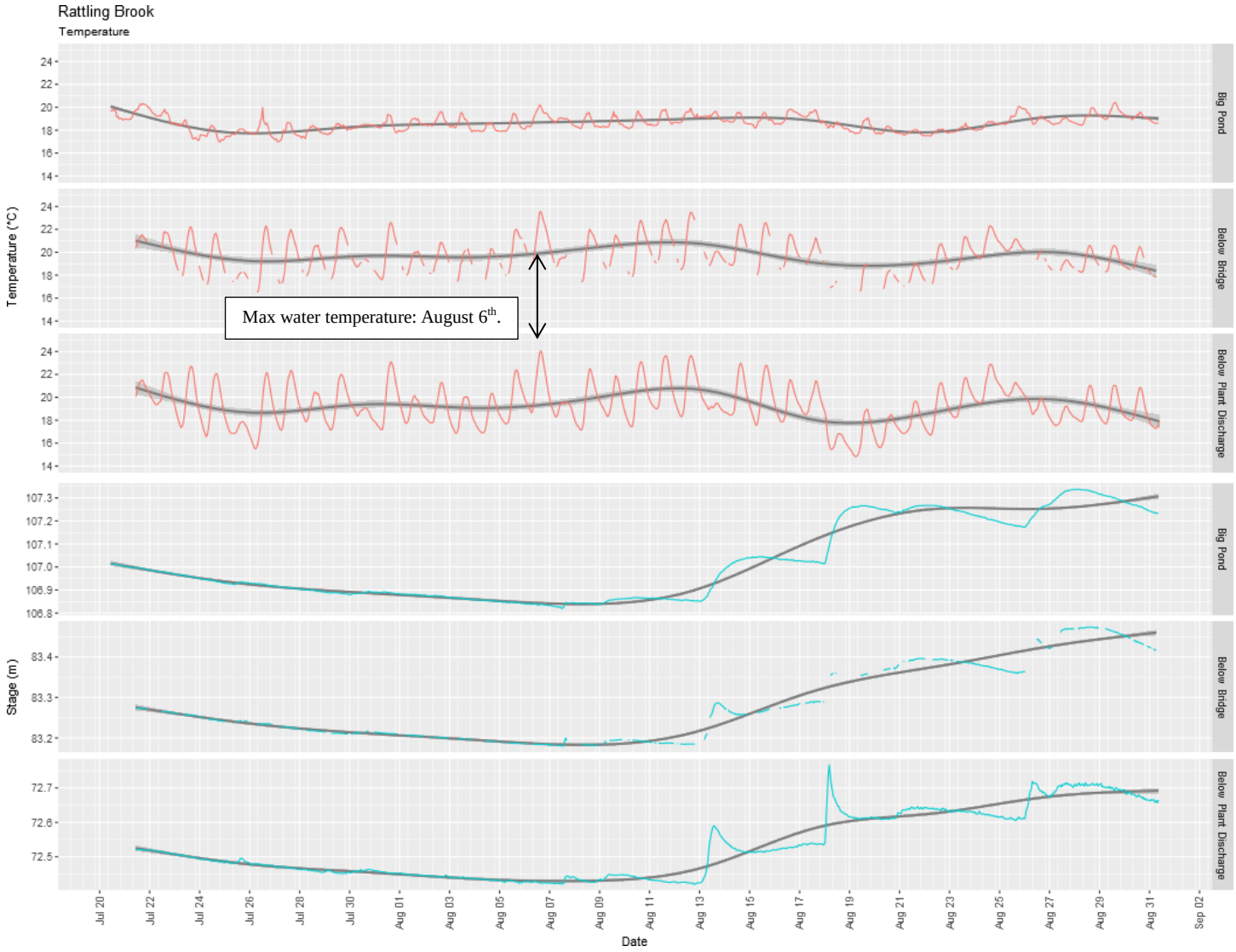
Table 1: Qualitative QAQC Ranking

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	July 20, 2017	Deployment	Good	Excellent	Excellent	Excellent	Excellent
	August 31, 2017	Removal	Good	Good	Good	Excellent	Excellent
Rattling Brook below Bridge	July 21, 2017	Deployment	Excellent	Excellent	Excellent	Excellent	Excellent
	August 31, 2017	Removal	Excellent	Good	Excellent	Excellent	Excellent
Rattling Brook below Plant Discharge	July 21, 2017	Deployment	Excellent	Excellent	Good	Excellent	Excellent
	August 31, 2017	Removal	Excellent	Fair	Excellent	Excellent	Excellent

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.



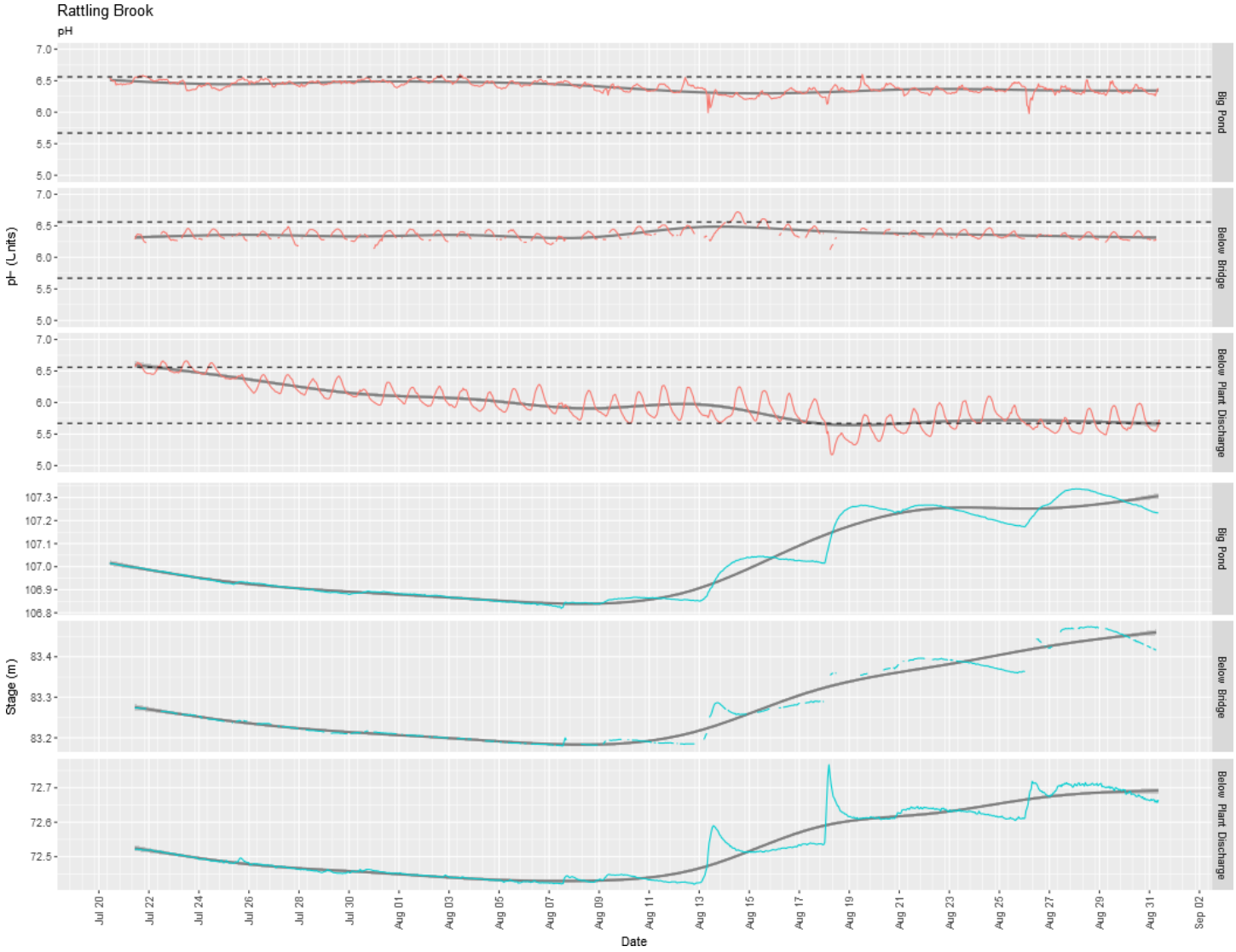
Station	Mean	Median	Min	Max
Big Pond	18.61	18.57	16.96	20.41
Below Bridge	19.74	19.67	15.87	23.55
Below Plant Discharge	19.27	19.13	14.83	24.07

- Maximum annual water temperature appears to have been reached on August 6th for Bridge and Plant Discharge stations, while Big Pond may have peaked later on August 30th. During this deployment, regardless of the annual peak, temperatures were mostly stable. A slight downward trend may be evident towards August 29th into 31st as temperatures cool into September.

*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	6.40	6.41	5.98	6.60
Below Bridge	6.37	6.36	6.12	6.72
Below Plant Discharge	5.96	5.93	5.17	6.66

- pH at Big Pond and Bridge stations were mostly stable during this deployment period with a slight decline at Big Pond and a slight rise at Bridge station until August 13th (during heavy precipitation).
- Plant Discharge exhibited a decline throughout the deployment period, likely due to a loss of calibration just after deployment.

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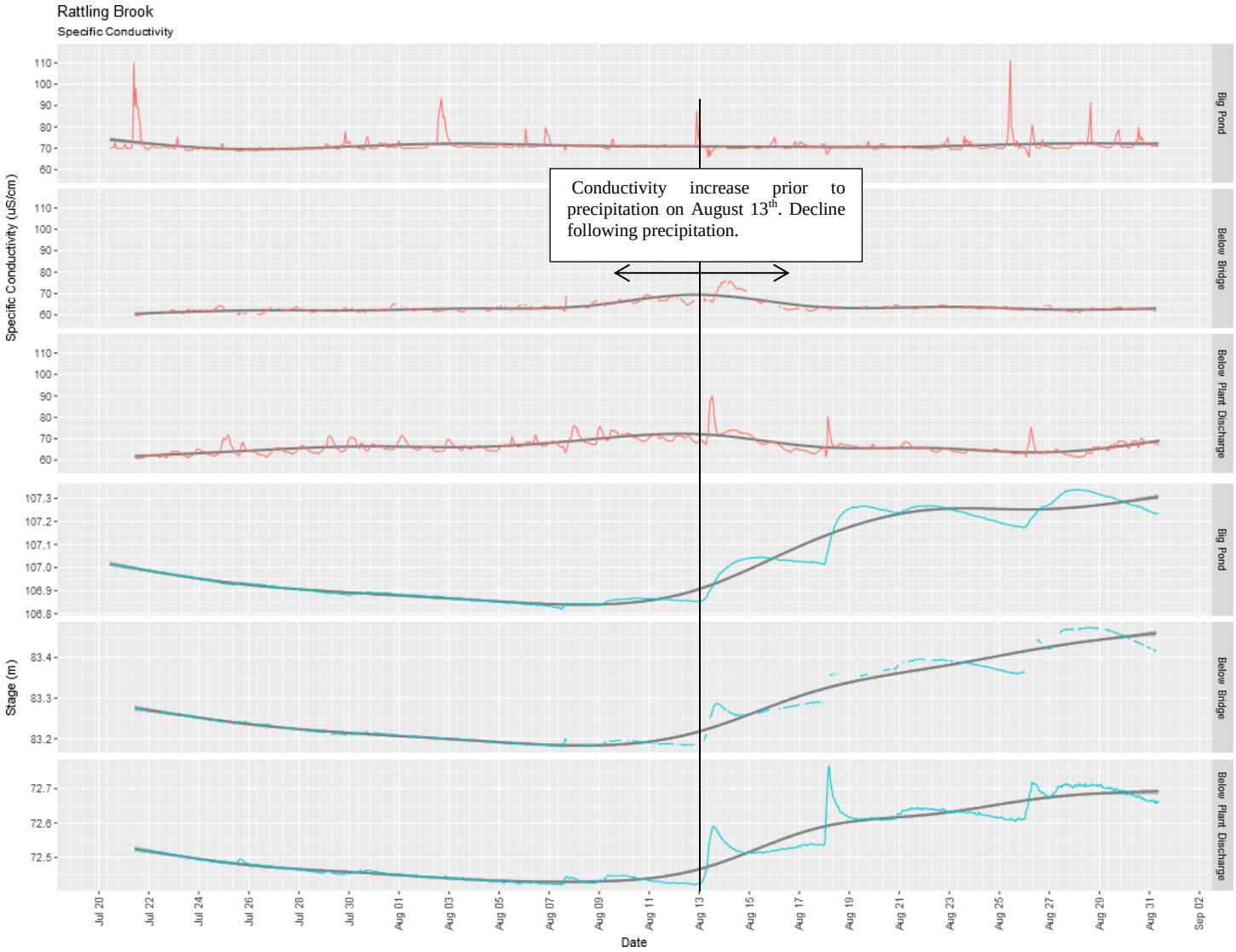
Specific Conductivity

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	71.2	70.6	65.8	110.9
Below Bridge	63.7	63.0	59.6	75.9
Below Plant Discharge	66.5	65.8	60.7	90.0

- From July 21st to August 13th, conductivity increased slightly at Bridge and Plant Discharge stations just before ~30mm of precipitation fell. Heavy precipitation resulted in a drop in conductivity and a substantial rise in stage level.

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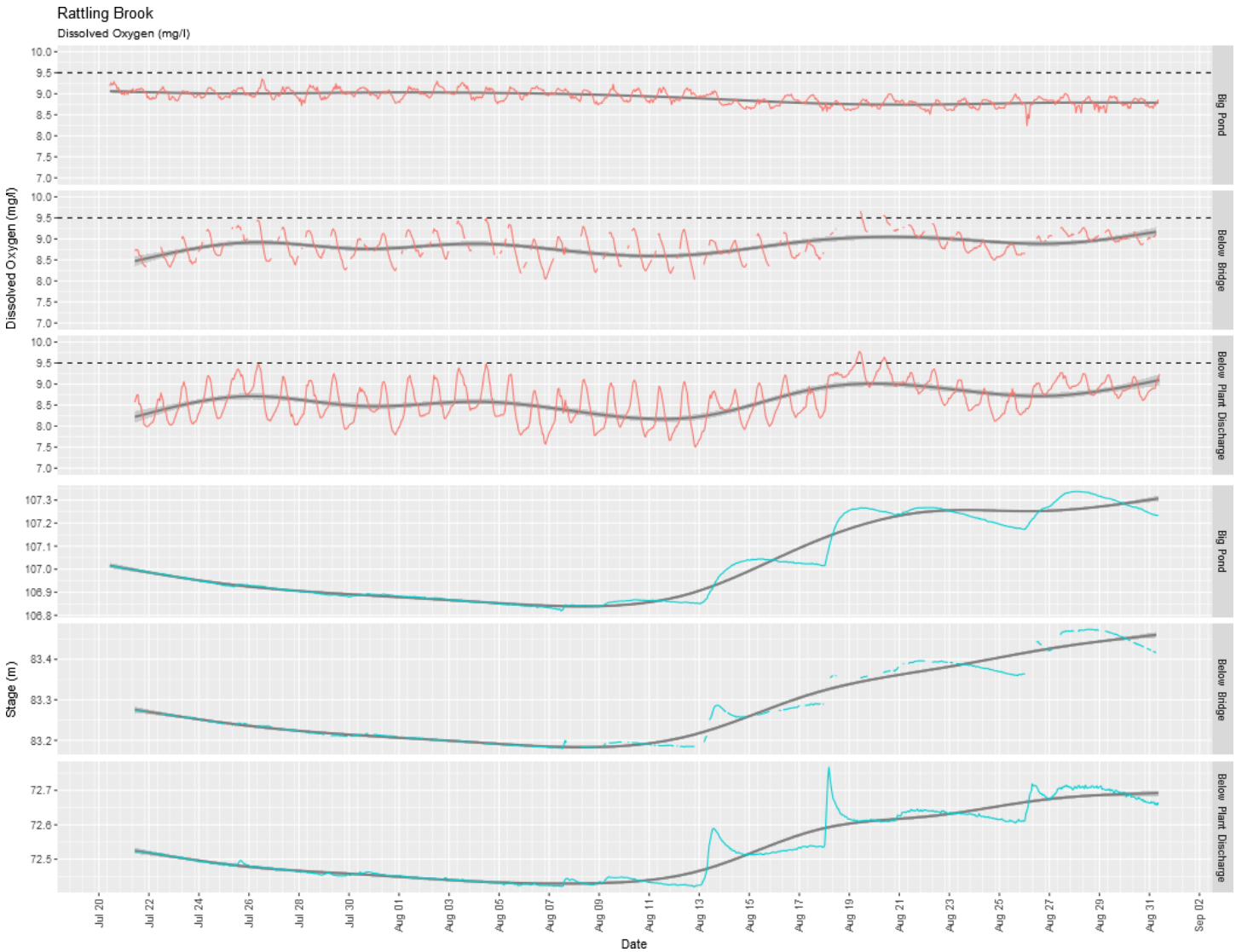
Dissolved Oxygen

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	8.91	8.91	8.24	9.35
Below Bridge	8.84	8.85	7.98	9.66
Below Plant Discharge	8.61	8.64	7.50	9.77

- Much like temperature, dissolved oxygen levels were largely stable during this deployment interval with some suggestion of a rising trend towards September – as expected with the decrease in water temperature.

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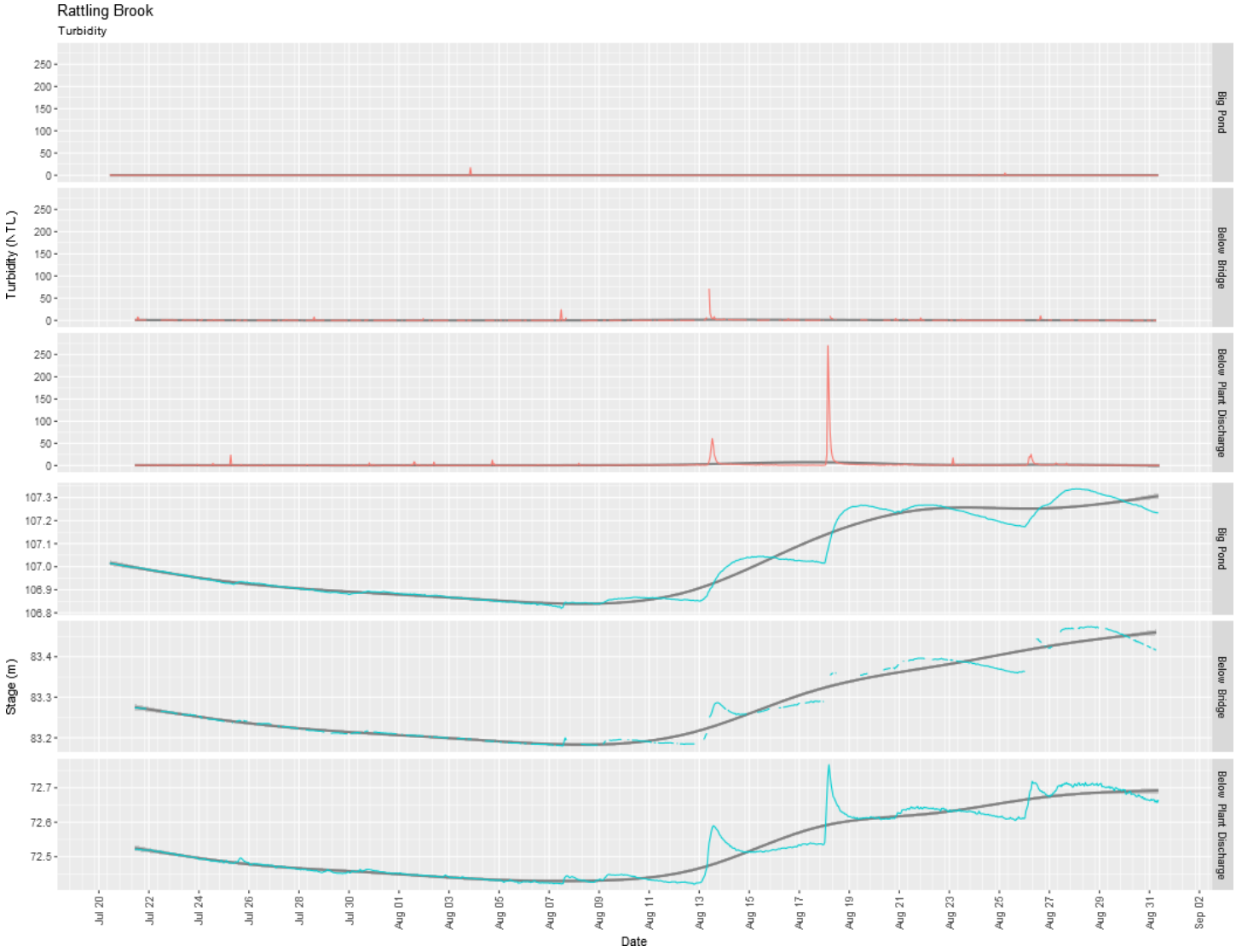
Turbidity

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	17.1
Below Bridge	0.7	0.1	0.0	71.6
Below Plant Discharge	2.1	0.8	0.1	270.0

- Scattered turbidity events were observed in relation to precipitation and stage level rises. Otherwise, turbidity levels were low at all three stations from July 21st to August 31st.

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Appendix

- Note: The weather station at Argentia has failed to report reliable weather since April. As a result, St. John's airport weather is used as a potential explanation of variability in water quality.