Real-Time Water Quality Deployment Report

Rattling Brook Network

April 17, 2014 to May 22, 2014

Newfoundland Labrador

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

Newfoundland Labrador

Real-Time Water Quality Deployment Report
Rattling Brook Network
2014-04-17 to 2014-05-22

General

- Department of Environment and Conservation staff monitors the real-time web pages consistently.
- Rattling Brook Big Pond has been redeployed as of April 17, 2014 after an extended period of removal due to heavy, and potentially damaging, ice conditions.

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

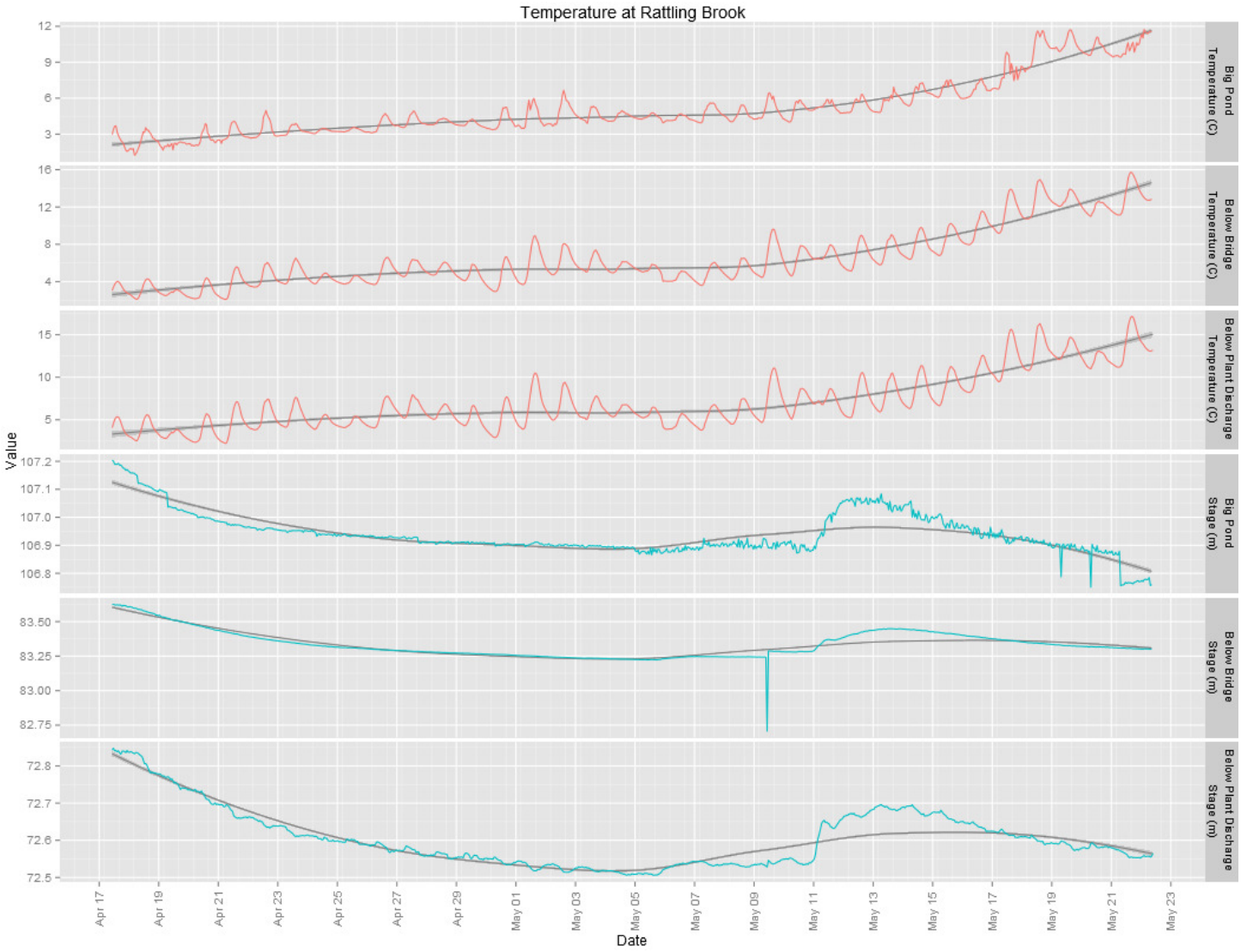
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Rattling Brook Big Pond	April 17, 2014	Deployment	Excellent	Fair	Excellent	Fair	Excellent
	May 22, 2014	Removal	Excellent	Good	Excellent	Excellent	Excellent
Rattling Brook below Bridge	April 17, 2014	Deployment	Good	Excellent	Excellent	Fair	Excellent
	May 22, 2014	Removal	Excellent	Good	Excellent	Excellent	Poor
Rattling Brook below Plant Discharge	April 17, 2014	Deployment	Excellent	Excellent	Excellent	Fair	Good
	May 22, 2014	Removal	Excellent	Good	Excellent	Excellent	Excellent

- "Poor" ranking may be related to placement of the QAQC sonde during removal. Field sonde reported 97.8 NTU at removal while QAQC sonde reported 58.5 NTU. Field observation suggests that turbidity was likely much higher than 50 NTU at the 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.

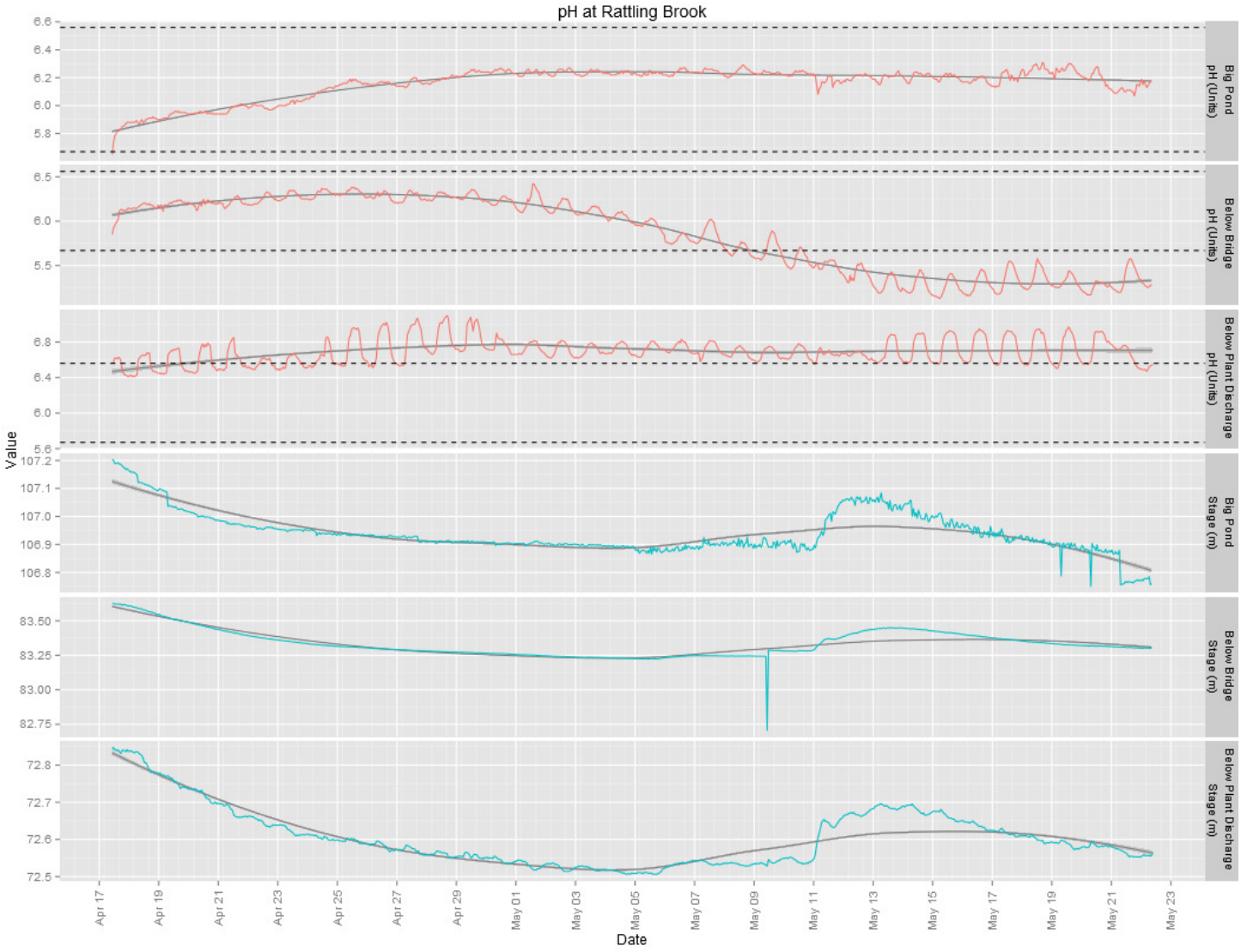


Station	Parameter	Mean	Median	Min	Max
Big Pond	Temperature (C)	5.15	4.45	1.23	11.74
Below Bridge	Temperature (C)	6.51	5.59	2.11	15.72
Below Plant Discharge	Temperature (C)	7.10	6.24	2.24	17.17

- Water temperatures increased slowly over the first two thirds of the deployment period and increased faster over the last third as average daily temperatures increased substantially in mid-May. Water temperature is seen to increase along the length of the river.

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.

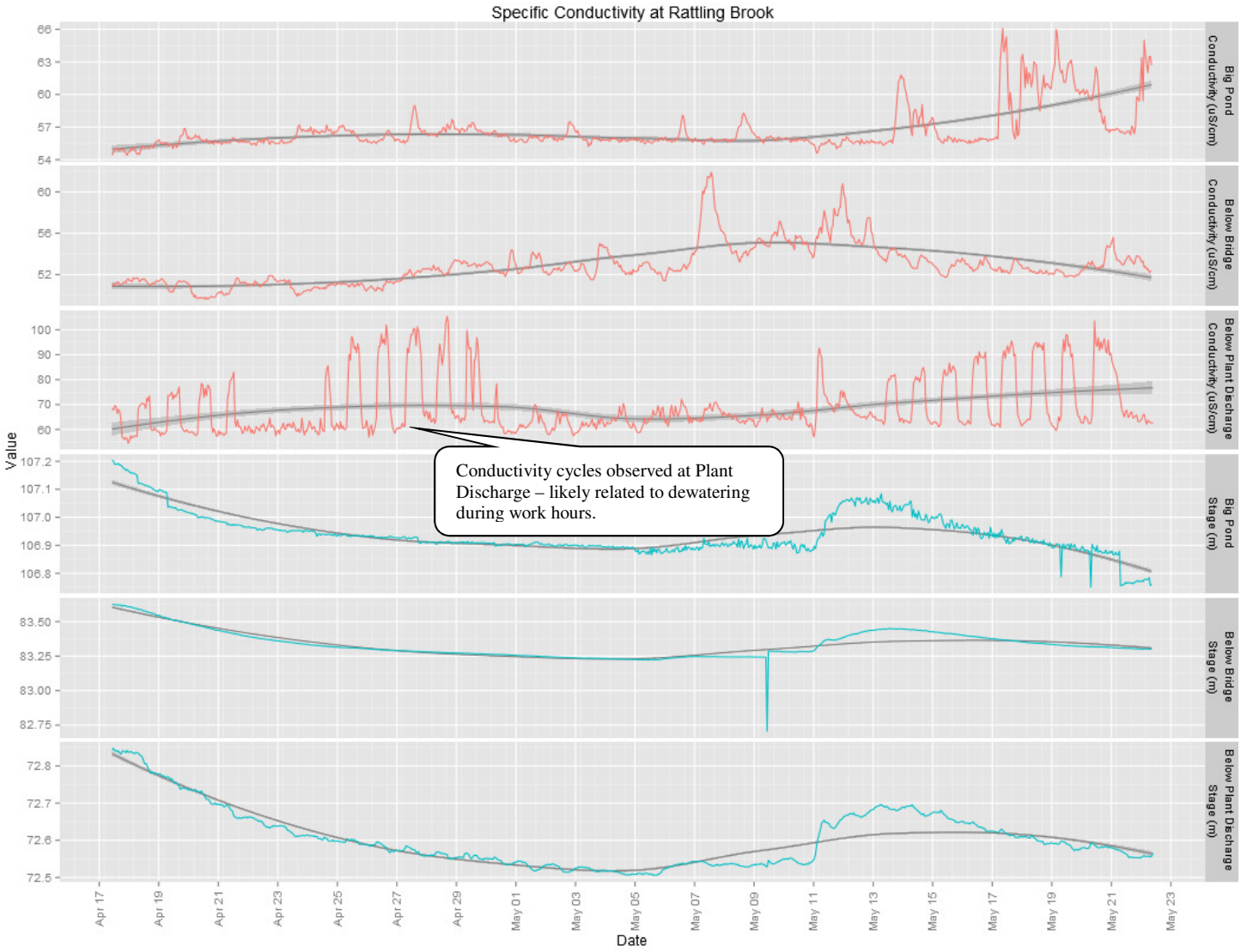


Station	Parameter	Mean	Median	Min	Max
Big Pond	pH (Units)	6.16	6.21	5.65	6.31
Below Bridge	pH (Units)	5.85	6.00	5.13	6.42
Below Plant Discharge	pH (Units)	6.69	6.68	6.41	7.10

- pH declines at Bridge station half way through the deployment period, but this is likely due to calibration drift. Values are relatively stable at both Big Pond and Plant Discharge stations. Overall, pH was generally within or just above the Site Specific Guidelines (dashed lines) for the Rattling Brook system.

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.

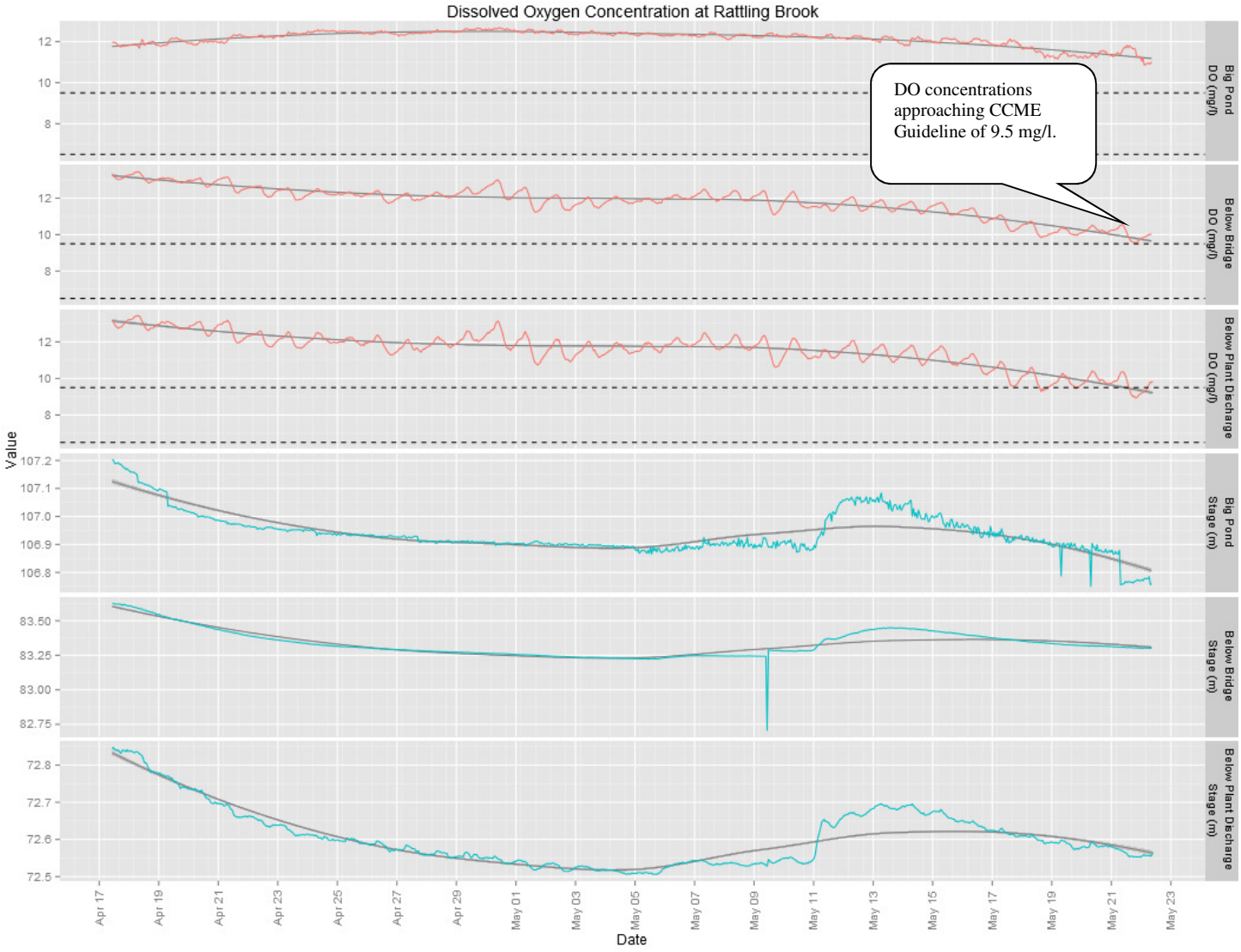


Station	Parameter	Mean	Median	Min	Max
Big Pond	Conductivity (uS/cm)	56.7	55.9	54.4	66.1
Below Bridge	Conductivity (uS/cm)	52.9	52.5	49.6	61.9
Below Plant Discharge	Conductivity (uS/cm)	68.9	64.6	54.5	105.4

- Conductivity values are typically quite variable at this time of the year due to heavy spring rainfalls and runoff from melting snow. A daily cycle of conductivity is observed at Plant Discharge station from around 7:30 am to 5:30 pm. This is reflected in concurrent fluctuations in stage level at Plant Discharge. These two factors suggest a recurring input into Rattling Brook during work hours – possibly dewatering of sedimentation ponds.

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.

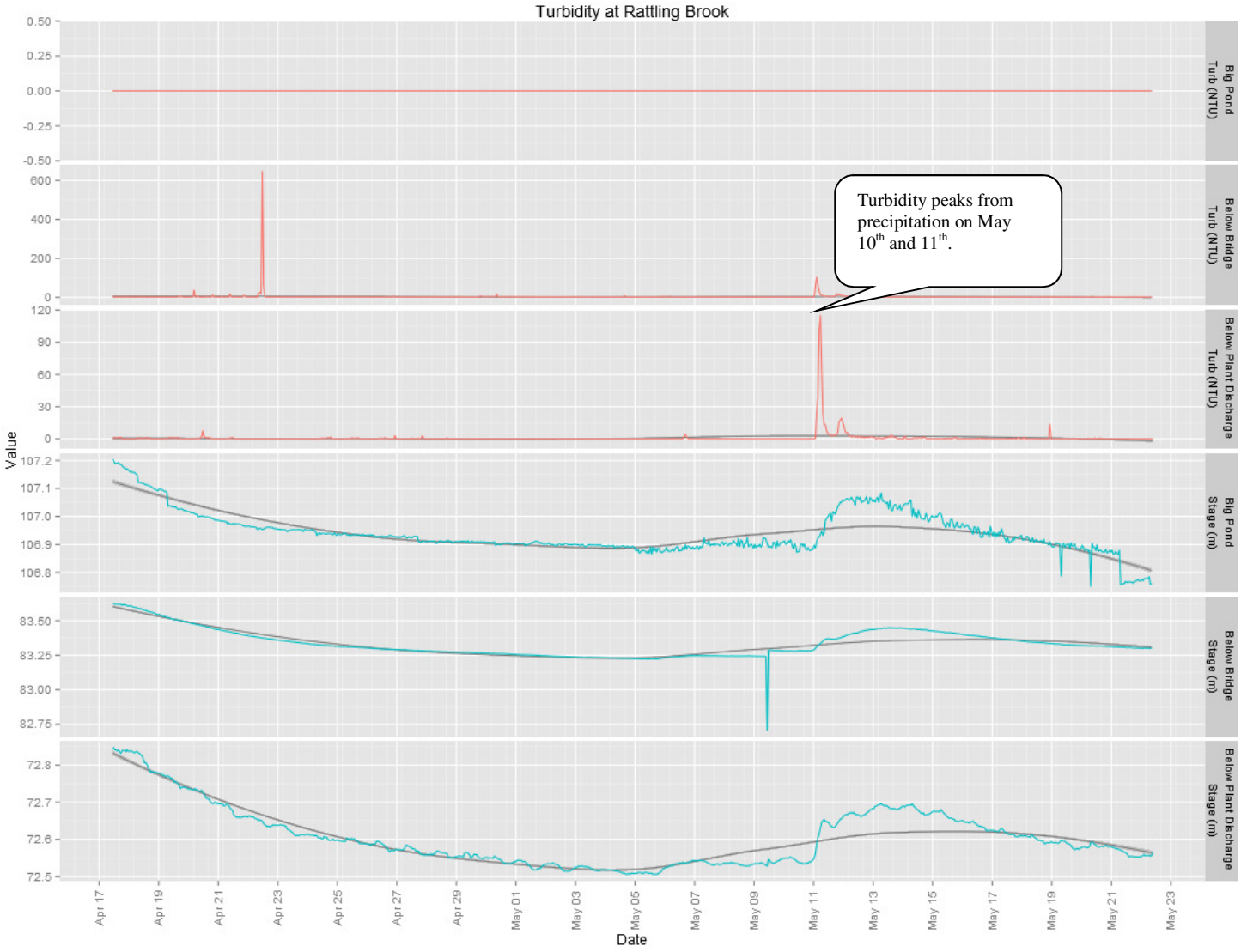


Station	Parameter	Mean	Median	Min	Max
Big Pond	DO (mg/l)	12.15	12.26	10.85	12.69
Below Bridge	DO (mg/l)	11.80	11.95	9.54	13.47
Below Plant Discharge	DO (mg/l)	11.57	11.74	8.93	13.45

- A gentle decline in oxygen concentrations began early in the deployment, concurrent with the warming trend in water temperatures. This decline is expected to continue into the late summer until late August or early September when waters begin to cool. Concentrations at Bridge and Plant Discharge stations fell below the 9.5 mg/l CCME Guideline for the protection of early life stage cold water biota on May 21st.

Turbidity

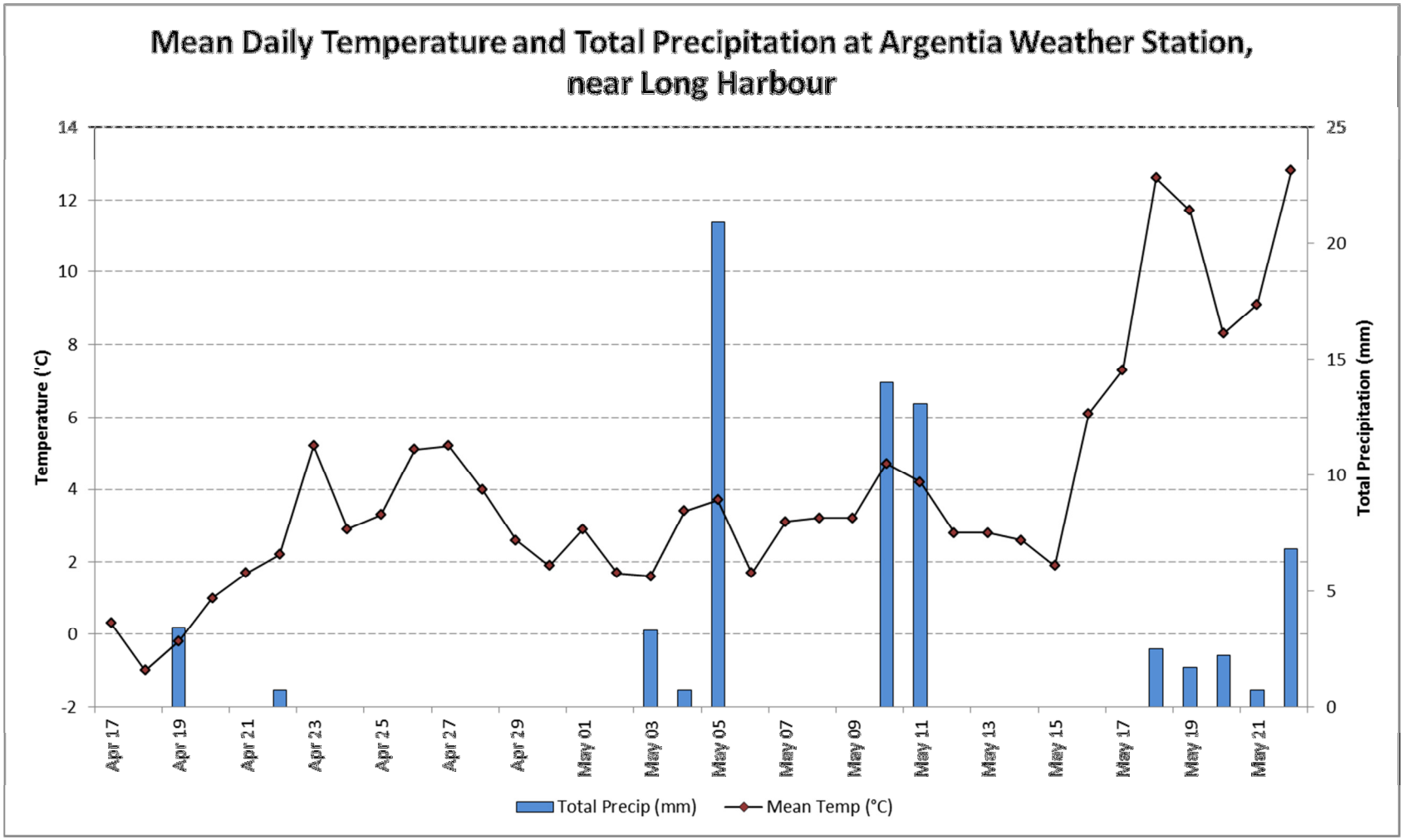
Turbidity is typically caused by fine suspended solids such as silt, clay, or organic material. Consistently high levels of turbidity tend to block sunlight penetration into a waterbody, discouraging plant growth. High turbidity can also damage the delicate respiratory organs of aquatic animals and cover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



Station	Parameter	Mean	Median	Min	Max
Big Pond	Turb (NTU)	0.0	0.0	0.0	0.0
Below Bridge	Turb (NTU)	3.7	2.0	1.4	646.0
Below Plant Discharge	Turb (NTU)	0.9	0.0	0.0	115.0

- Turbidity levels were generally low throughout this deployment period at Big Pond and Plant Discharge stations with some low-level turbidity persisting at Bridge station.
- Despite the near-zero turbidity levels at the end of the deployment, upon reaching Bridge station, the water was found to be very muddy and opaque. It can be concluded that turbidity levels can increase from near-zero to very high in less than an hour – the recording interval of the Rattling Brook network.

Appendix



Prepared by:
Ryan Pugh
Department of Environment and Conservation
Water Resources Management Division
Phone: 709.729.1681
Fax: 709.729.3020