# Real-Time Water Quality Deployment Report

## Rattling Brook Network

**August 8, 2014 to September 9, 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
## 2014-08-08 to 2014-09-09

## General

- Department of Environment and Conservation staff monitors the real-time web pages consistently.
- The deployment period for this report is 31 days. No transmissions were lost during this time frame and all data was found to be reasonable and representative of actual 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**

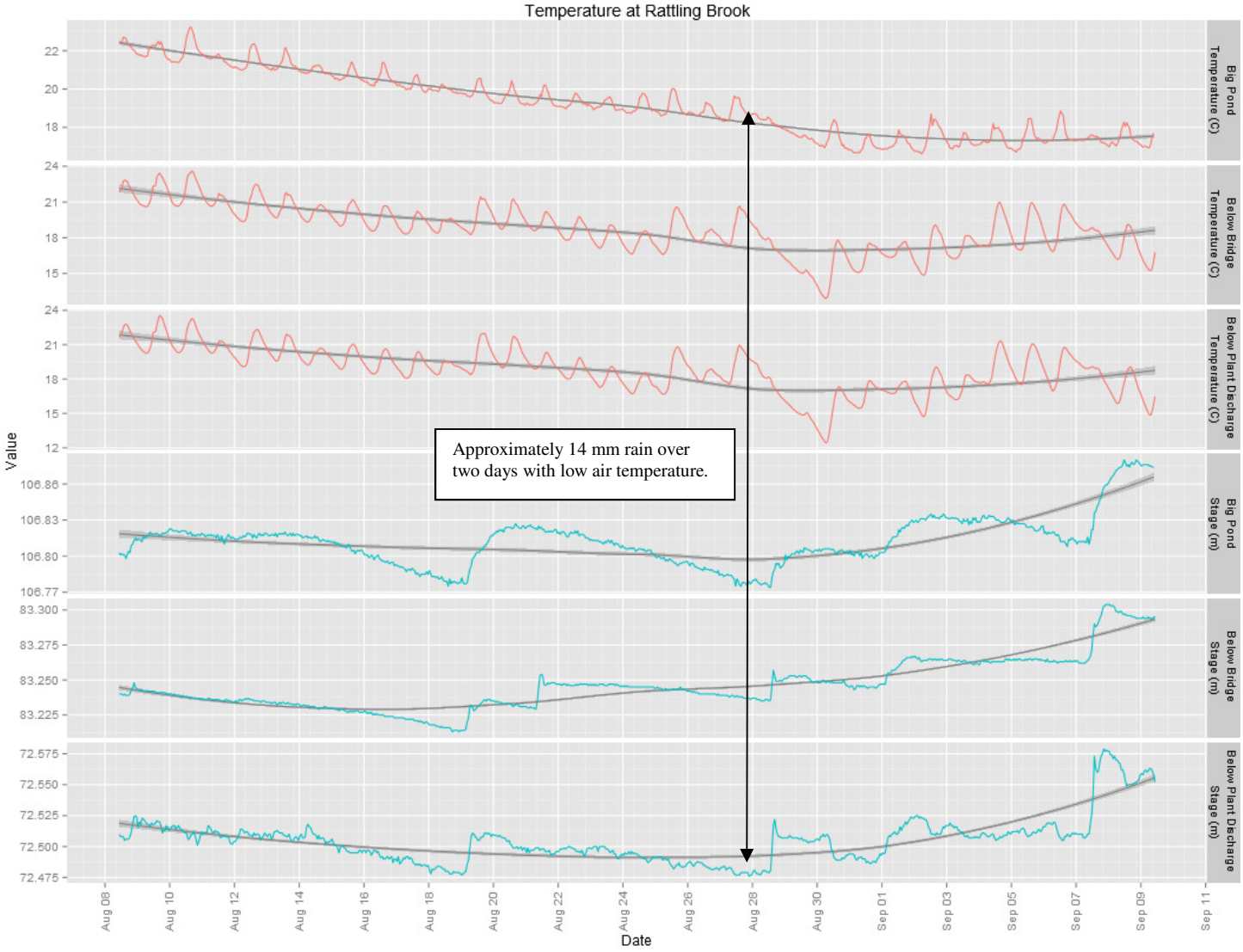
| Station | Date | Action | Comparison Ranking | | | | |
|---|---|---|---|---|---|---|---|
| | | | Temperature | pH | Conductivity | Dissolved Oxygen | Turbidity |
| Rattling Brook Big Pond | 2014-08-08 | Deployment | Excellent | Good | Excellent | Excellent | Excellent |
| | 2014-09-09 | Removal | Excellent | Excellent | Excellent | NA | Good |
| Rattling Brook below Bridge | 2014-08-08 | Deployment | Good | Excellent | Excellent | Excellent | Good |
| | 2014-09-09 | Removal | Good | Excellent | Excellent | NA | Good |
| Rattling Brook below Plant Discharge | 2014-08-08 | Deployment | Excellent | Excellent | Excellent | Excellent | Excellent |
| | 2014-09-09 | Removal | Excellent | Good | Excellent | NA | Excellent |

- All rankings fell within the “Excellent” and “Good” categories during this deployment interval. Due to a battery problem with the QAQC instrument, however, dissolved oxygen values could not be ranked.

## 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.*

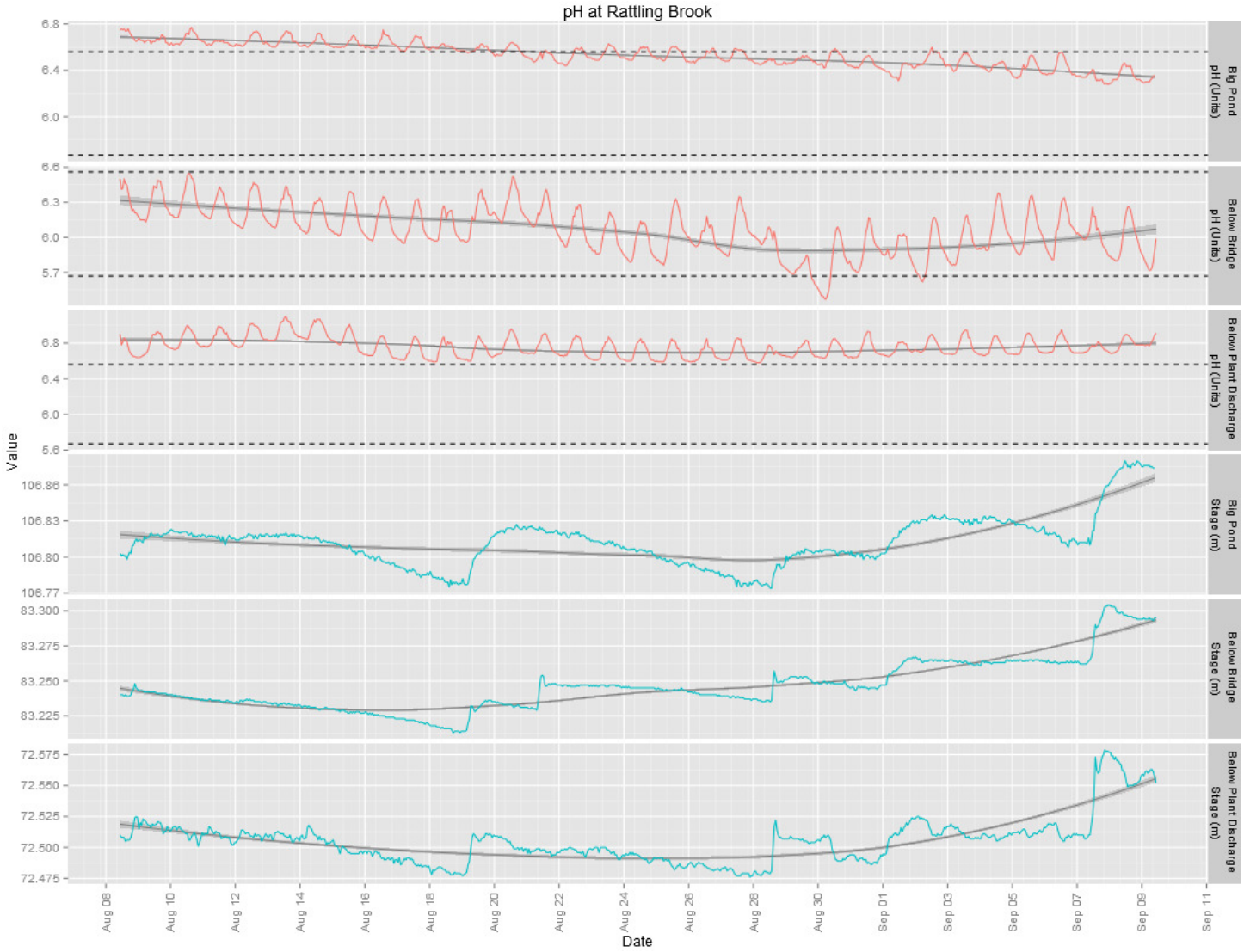



| Station | Parameter | Mean | Median | Min | Max |
|---|---|---|---|---|---|
| **Big Pond** | Temperature (C) | 19.18 | 19.09 | 16.61 | 23.26 |
| **Below Bridge** | Temperature (C) | 18.75 | 18.75 | 12.90 | 23.60 |
| **Below Plant Discharge** | Temperature (C) | 18.80 | 18.93 | 12.42 | 23.55 |

- Water temperatures declined throughout this deployment period from the high summer temperatures towards lower fall temperatures. A large decline in water temperature was observed on August 28th onward due to a period of rain and low air temperatures.

## 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.*

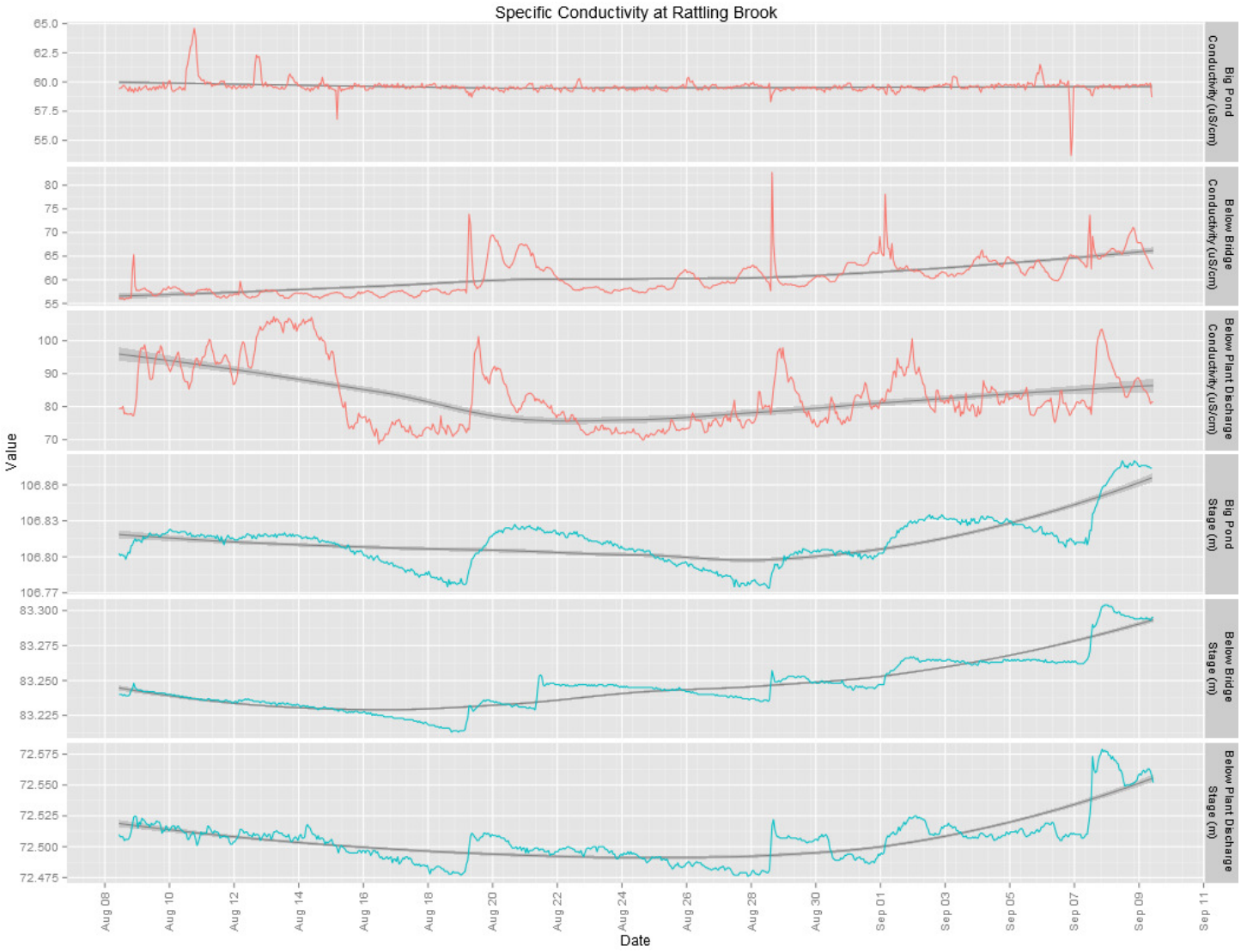



| Station | Parameter | Mean | Median | Min | Max |
|---|---|---|---|---|---|
| **Big Pond** | pH (Units) | 6.53 | 6.54 | 6.28 | 6.77 |
| **Below Bridge** | pH (Units) | 6.06 | 6.06 | 5.47 | 6.55 |
| **Below Plant Discharge** | pH (Units) | 6.76 | 6.75 | 6.58 | 7.10 |

- pH at Big Pond and Bridge stations indicated a slight decline in pH over the deployment period likely because of decreasing biological productivity due to falling water temperatures as summer progresses into fall. Meanwhile, at Plant Discharge station, pH levels were somewhat more stable, possibly due to the moderating effect of increased alkalinity due to the influence of settling pond effluent.

## 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.*

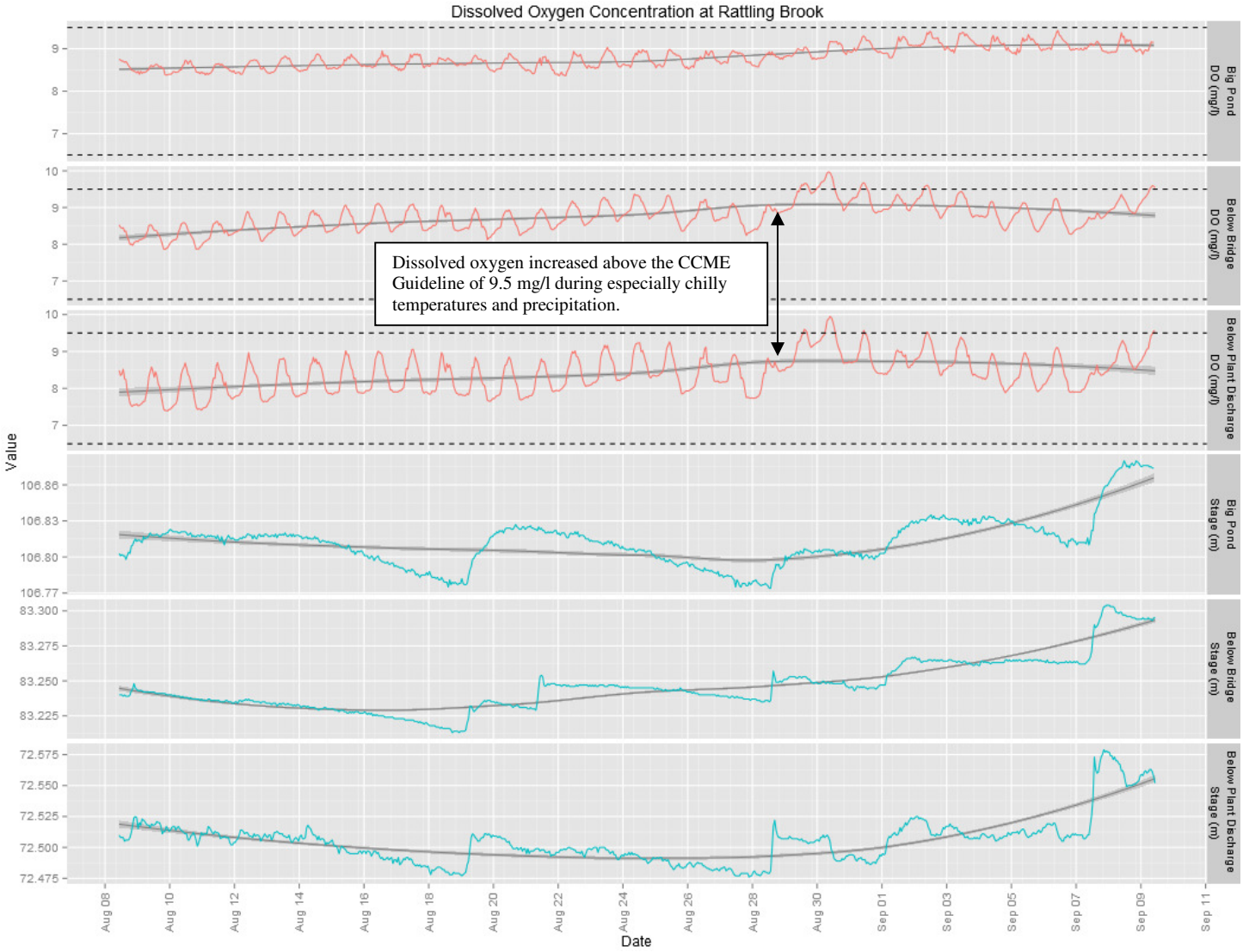



| Station | Parameter | Mean | Median | Min | Max |
|---|---|---|---|---|---|
| **Big Pond** | Conductivity (uS/cm) | 59.6 | 59.6 | 53.7 | 64.6 |
| **Below Bridge** | Conductivity (uS/cm) | 60.4 | 59.3 | 55.8 | 82.7 |
| **Below Plant Discharge** | Conductivity (uS/cm) | 83.2 | 81.1 | 68.7 | 107.3 |

- Specific conductivity was stable at Big Pond while it increased somewhat at Bridge and Plant Discharge stations towards the middle and latter half of the deployment period. Conductivity tended to increase as water flowed downstream from Big Pond to Bridge and Plant Discharge.

## 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.*

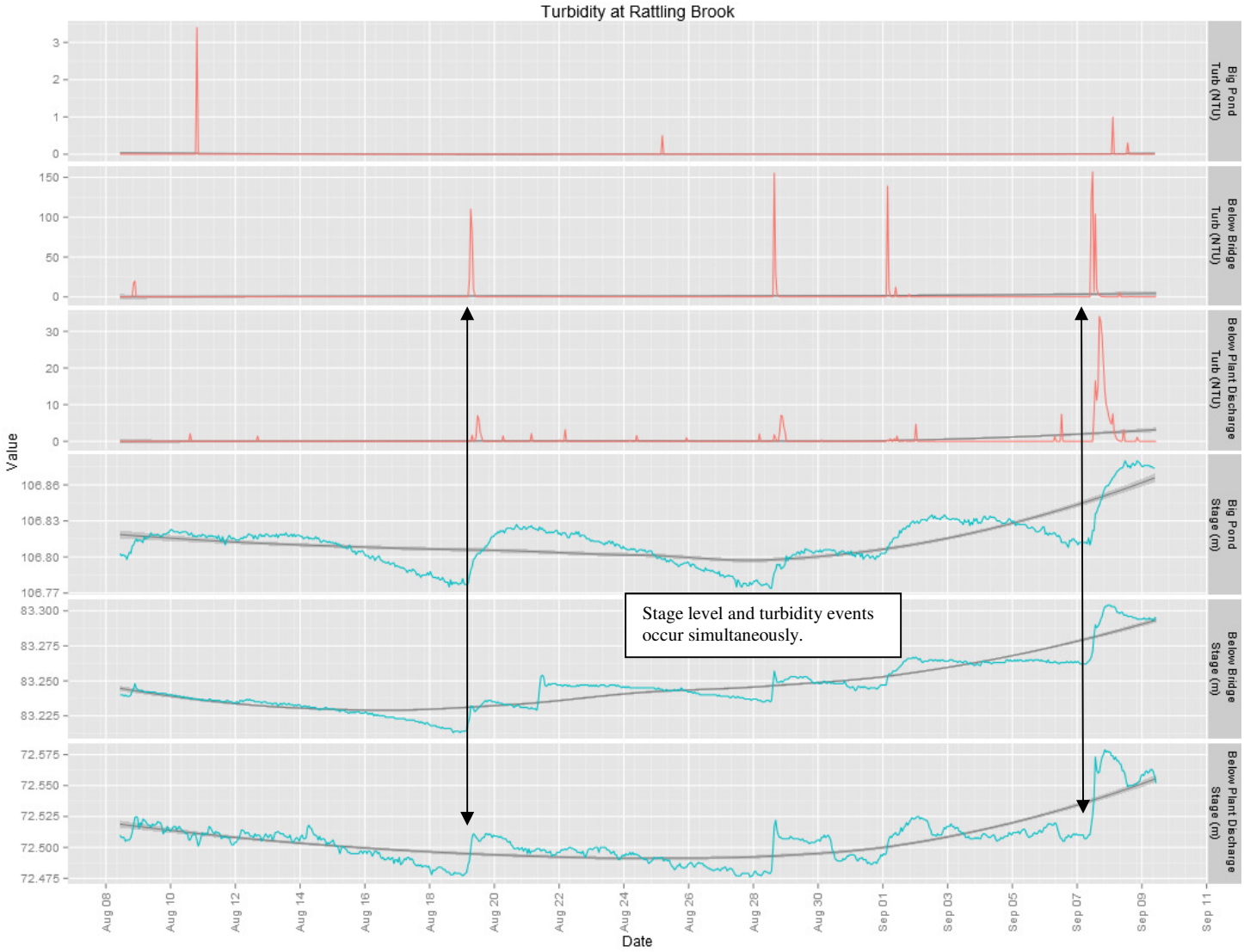



| Station | Parameter | Mean | Median | Min | Max |
|---|---|---|---|---|---|
| **Big Pond** | DO (mg/l) | 8.80 | 8.78 | 8.36 | 9.43 |
| **Below Bridge** | DO (mg/l) | 8.76 | 8.76 | 7.86 | 9.97 |
| **Below Plant Discharge** | DO (mg/l) | 8.41 | 8.40 | 7.39 | 9.95 |

- Dissolved oxygen concentrations increased at each station over the course of the deployment period as water temperatures and biological productivity declined.

## Turbidity

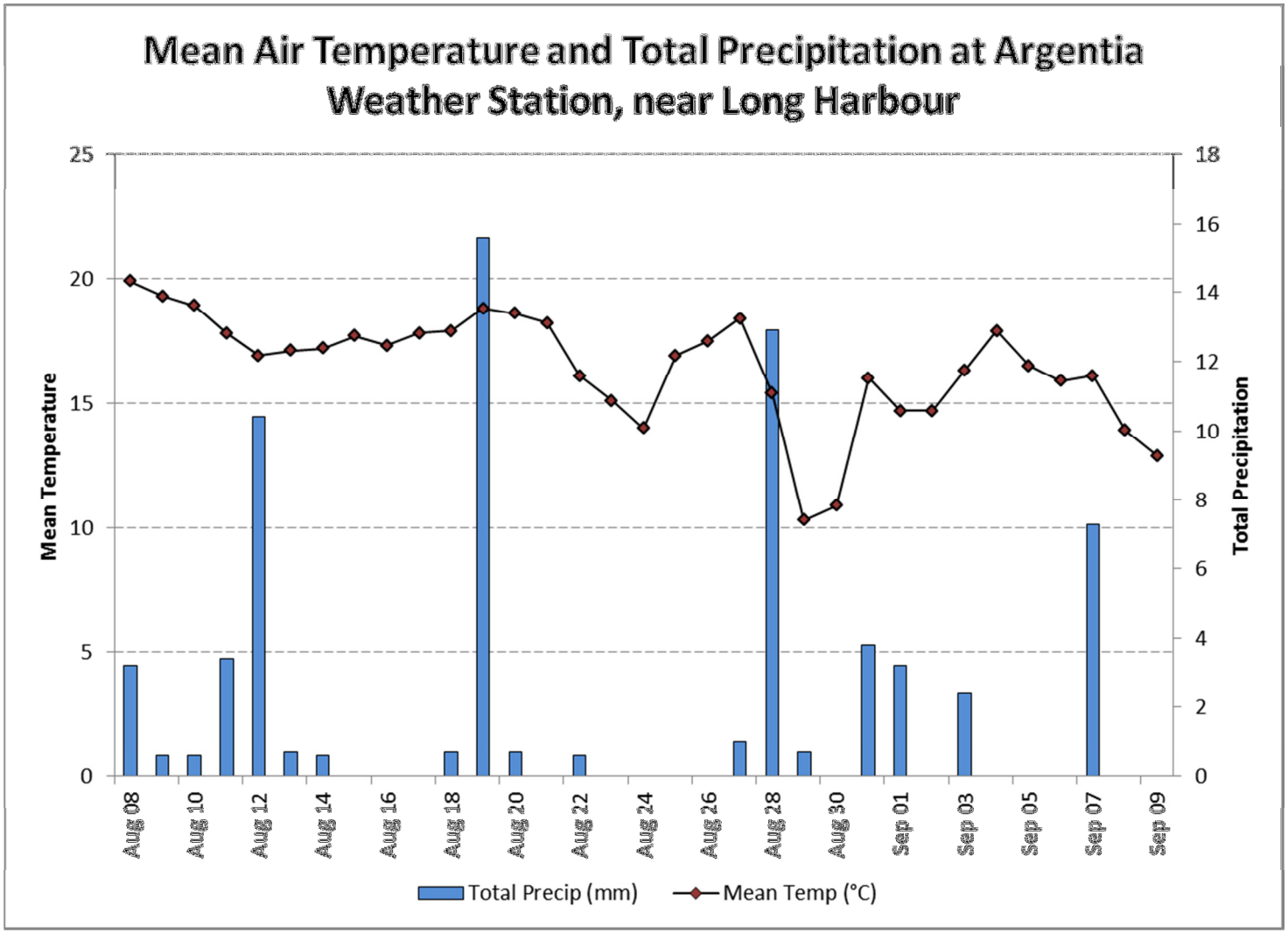
*Turbidity is typically caused by fine suspended solids such as silt, clay, or organic material. Consistently high levels of turbidity tend to block sunlight penetration into a waterbody, discouraging plant growth. High turbidity can also damage the delicate respiratory organs of aquatic animals and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




| Station | Parameter | Mean | Median | Min | Max |
|---|---|---|---|---|---|
| **Big Pond** | Turb (NTU) | 0.0 | 0.0 | 0.0 | 3.4 |
| **Below Bridge** | Turb (NTU) | 1.3 | 0.0 | 0.0 | 156.8 |
| **Below Plant Discharge** | Turb (NTU) | 0.4 | 0.0 | 0.0 | 34.1 |

- A handful of turbidity events punctuated generally clear waters in the Rattling Brook system during this deployment period. Most turbidity events occurred in conjunction with precipitation and stage-level increases, as illustrated in the graph above.

## Appendix




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