# Real-Time Water Quality Deployment Report

## Minipi River below Minipi Lake

**August 14 to**
**September 30, 2014**

Newfoundland Labrador

**Government of Newfoundland & Labrador**
**Department of Environment and Conservation**
**Water Resources Management Division**

# Contents

## General

- Department of Environment and Conservation staff monitors the real-time web pages regularly.
- This deployment report discusses water quality related events occurring at the station on Minipi River below Minipi Lake.
- On August 14, 2014, a real-time water quality monitoring instrument was deployed at the station on the Minipi River below Minipi Lake. The instrument was deployed for a period of 47 days. The instrument was removed on September 30.
- This station has been discontinued thus an instrument will no longer be deployed at this station.

## Quality Assurance and Quality Control

- As part of the Quality Assurance and Quality Control protocol (QA/QC), 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.
  - ► At deployment and removal, a QA/QC Sonde is temporarily deployed along side the Field Sonde. Values for temperature, pH, conductivity, dissolved oxygen and turbidity are compared between the two instruments**.** Based on the degree of difference between parameters recorded by the Field Sonde and QA/QC Sonde at deployment and at removal, a qualitative statement is made on the data quality (Table 1).

**Table 1: Ranking classifications for deployment and removal**

| | Rank | | | | |
|---|---|---|---|---|---|
| **Parameter** | **Excellent** | **Good** | **Fair** | **Marginal** | **Poor** |
| Temperature (°C) | <=+/-0.2 | >+/-0.2 to 0.5 | >+/-0.5 to 0.8 | >+/-0.8 to 1 | <+/-1 |
| pH (unit) | <=+/-0.2 | >+/-0.2 to 0.5 | >+/-0.5 to 0.8 | >+/-0.8 to 1 | >+/-1 |
| Sp. Conductance (µS/cm) | <=+/-3 | >+/-3 to 10 | >+/-10 to 15 | >+/-15 to 20 | >+/-20 |
| Sp. Conductance > 35 µS/cm (%) | <=+/-3 | >+/-3 to 10 | >+/-10 to 15 | >+/-15 to 20 | >+/-20 |
| Dissolved Oxygen (mg/L) (% Sat) | <=+/-0.3 | >+/-0.3 to 0.5 | >+/-0.5 to 0.8 | >+/-0.8 to 1 | >+/-1 |
| Turbidity <40 NTU (NTU) | <=+/-2 | >+/-2 to 5 | >+/-5 to 8 | >+/-8 to 10 | >+/-10 |
| Turbidity > 40 NTU (%) | <=+/-5 | >+/-5 to 10 | >+/-10 to 15 | >+/-15 to 20 | >+/-20 |

- It should be noted that the temperature sensor on any sonde is the most important. All other parameters can be broken down into three groups: temperature dependant, temperature compensated and temperature independent. Because the temperature sensor is not isolated from the rest of the sonde the entire sonde must be at the same temperature before the sensor will stabilize. The values may take some time to climb to the appropriate reading; if a reading is taken too soon it may not accurately portray the water body.

- Deployment and removal comparison rankings for the station on Minipi River deployed between August 14 and September 30, 2014 is summarized in Table 2.

**Table 2: Comparison rankings for Minipi River station August 14 – September 30, 2014.**

| Station | Date | Action | Comparison Ranking | | | | |
|---|---|---|---|---|---|---|---|
| | | | Temperature | pH | Conductivity | Dissolved Oxygen | Turbidity |
| Minipi River | Aug 14, 2014 | Deployment | Good | Excellent | Excellent | N/A | Excellent |
| | Sept 30, 2014 | Removal | Good | Excellent | Excellent | N/A | Excellent |

- At the Minipi River station, all parameters ranked either 'good' or 'excellent' at both deployment and removal. The DO could not be ranked due to the failure of the sensor on the QA/QC sonde at deployment and the failure of the sensor on the field sonde at removal.

## Data Interpretation

- The following graphs and discussion illustrate water quality-related events from August 14 to September 30 at the station on Minipi River below Minipi Lake.
- With the exception of water quantity data (stage), all data used in the preparation of the graphs and subsequent discussion below adhere to this stringent QA/QC protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

### Minipi River below Minipi Lake

- Water temperature ranged from 7.28 to 21.42°C during this deployment period (Figure 1).
- Water temperature decreased throughout the deployment period (Figure 2).

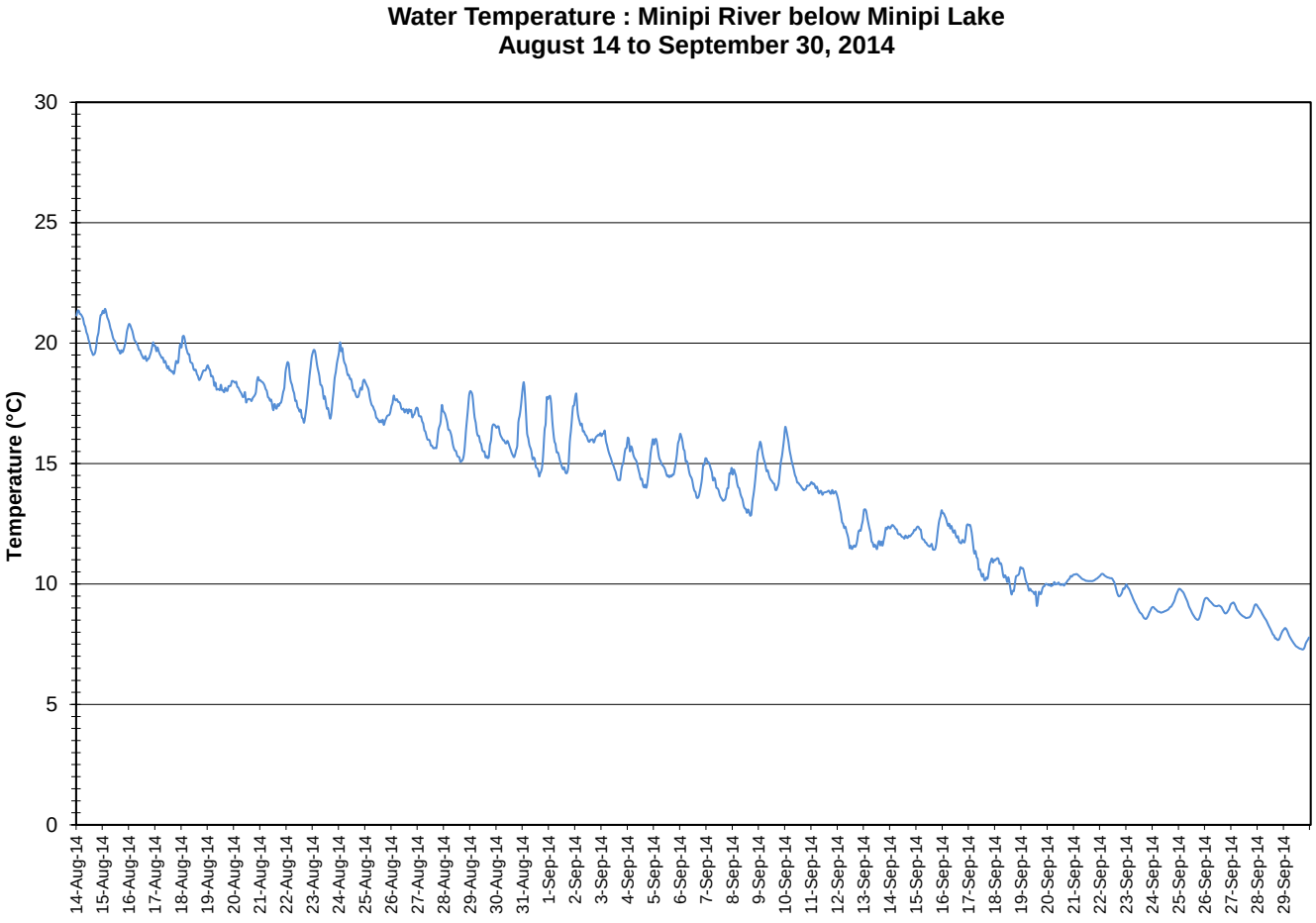


**Figure 1: Water temperature at Minipi River below Minipi Lake**

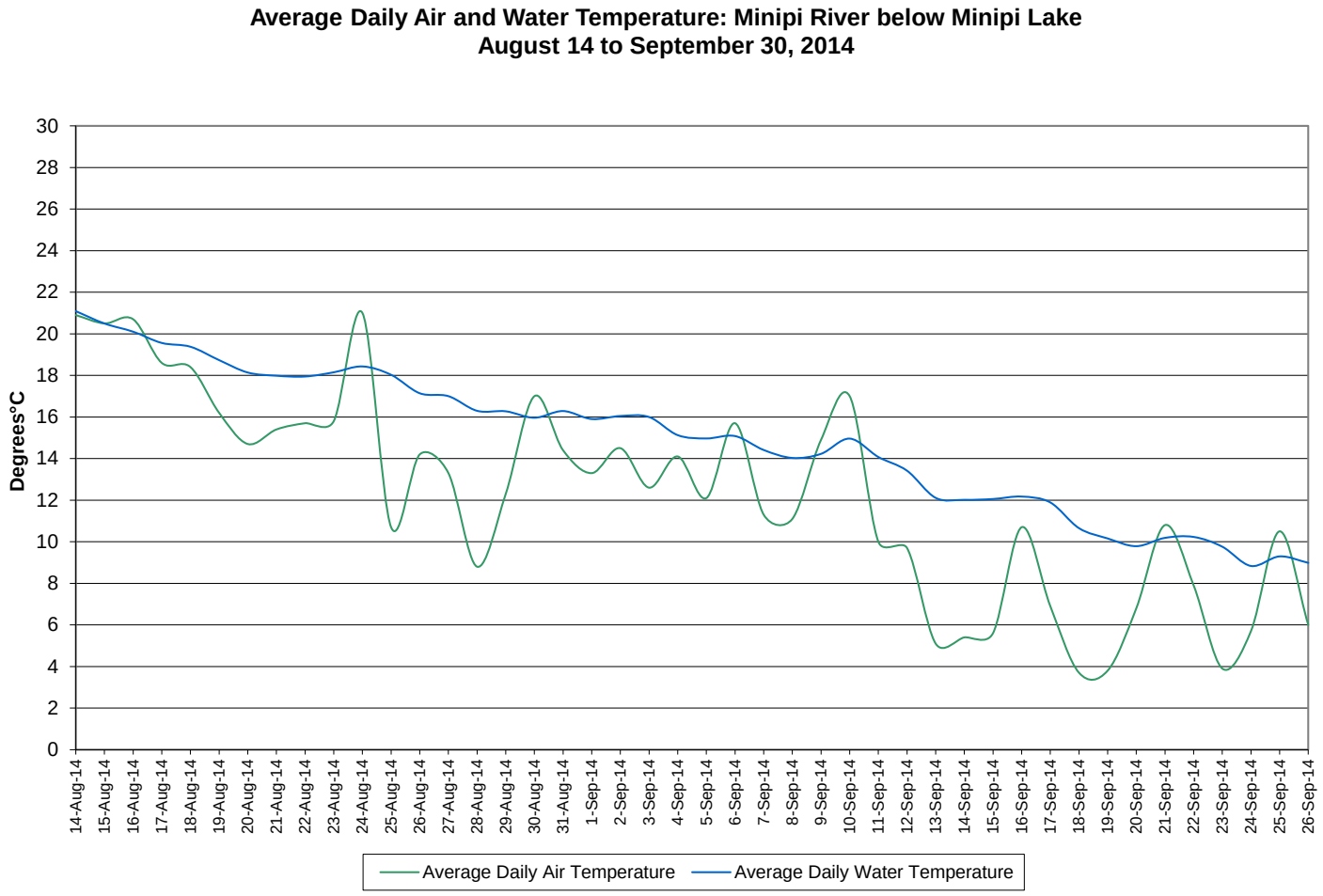


**Figure 2: Average daily air and water temperatures at Minipi River below Minipi Lake**

**(weather data collected at Goose Bay)**

- pH ranges between 6.78 and 7.16 pH units throughout the deployment period, with a median value of 6.95 units (Figure 3).
- All values during the deployment are within the CCME Guidelines for the Protection of Aquatic Life (between 6.5 and 9 pH units). pH fluctuates slightly during the day and night.

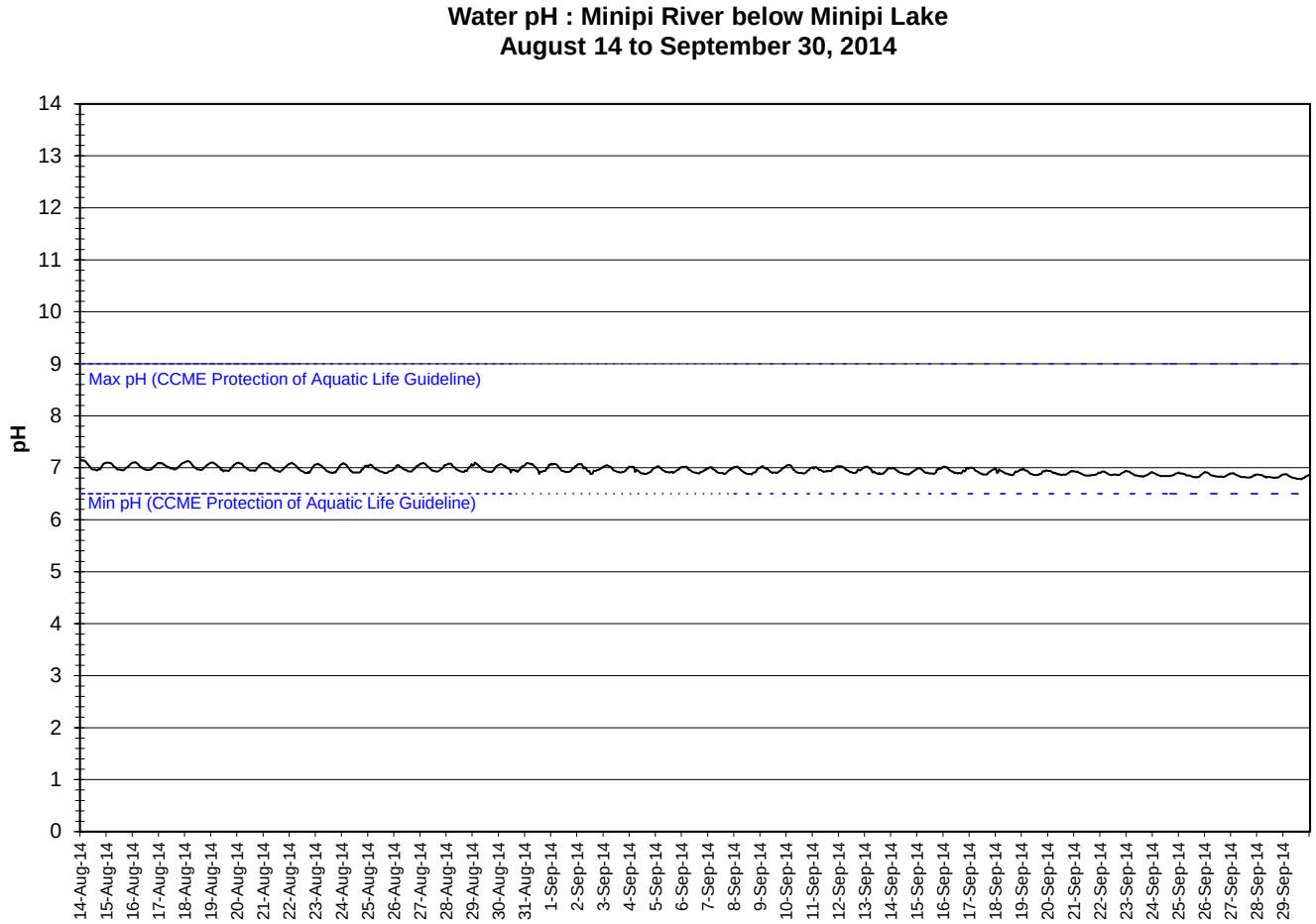


**Figure 3: pH at Minipi River below Minipi Lake**

- Specific conductivity ranges from 14.0 to 17.0 µs/cm (Figure 4).
- Specific conductivity was relatively stable during the deployment period, stage increased slightly at the end of the deployment period.

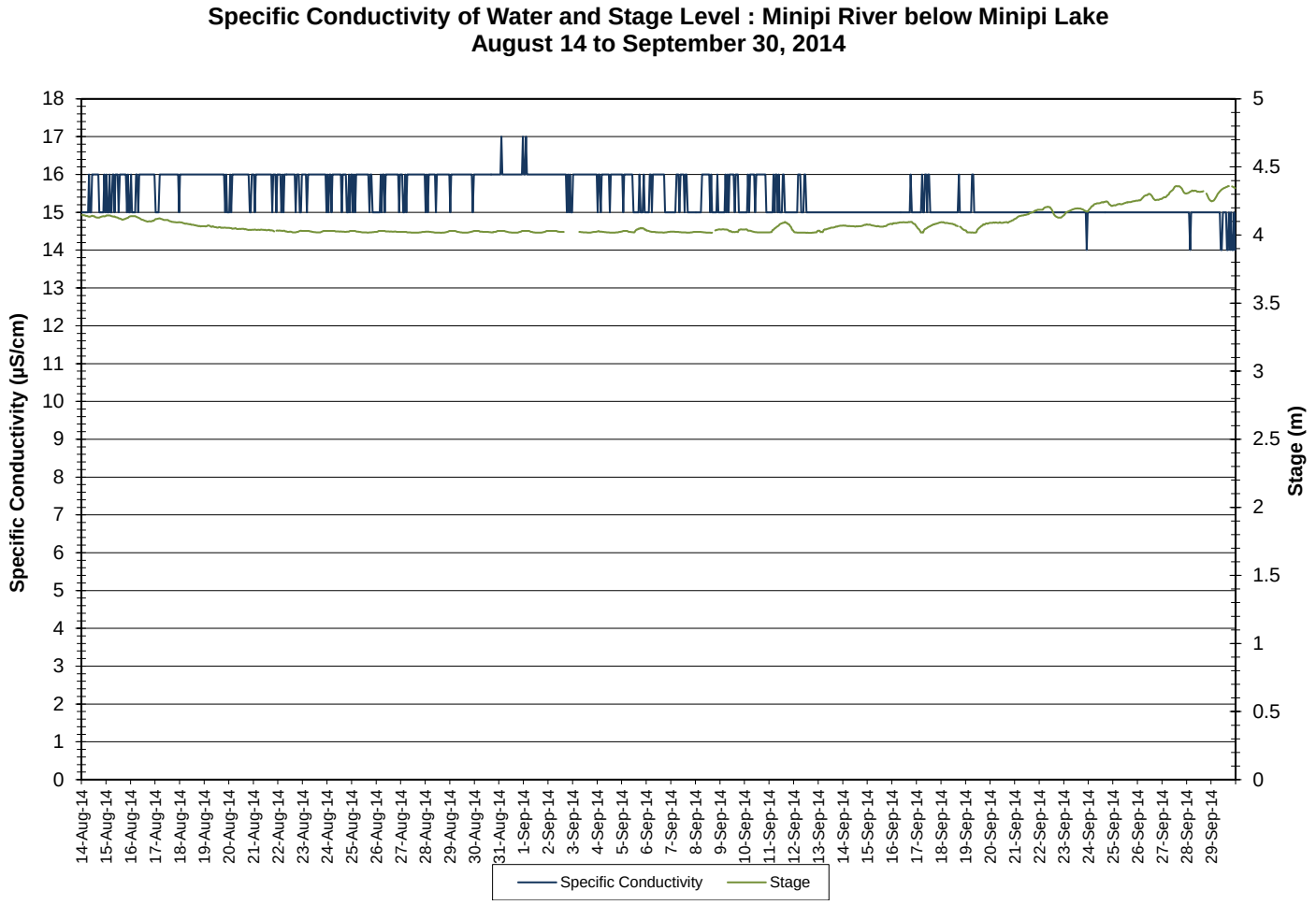


**Figure 4: Specific conductivity and stage level at Minipi River below Minipi Lake**

- The saturation of dissolved oxygen ranged from 90.4 to 101.60% and a range of 8.53 to 10.71 mg/l was found in the concentration of dissolved oxygen with a median value of 9.39 mg/l (Figure 5).
- All values were above the minimum CCME Guideline for the Protection of Other Life Stage Cold Water Biota of 6.5 mg/l. Most values were below the minimum CCME Guideline for the Protection of Early Life Stage Cold Water Biota value of 9.5 mg/l. The guidelines are indicated in blue on Figure 5.
- The sensor began to fail towards the end of the deployment period, this data was removed from the dataset.
- Dissolved Oxygen content increases slightly during the deployment period; this is due to the decreasing water temperature. Dissolved oxygen content fluctuates diurnally, displaying the inverse relationship to water temperature.

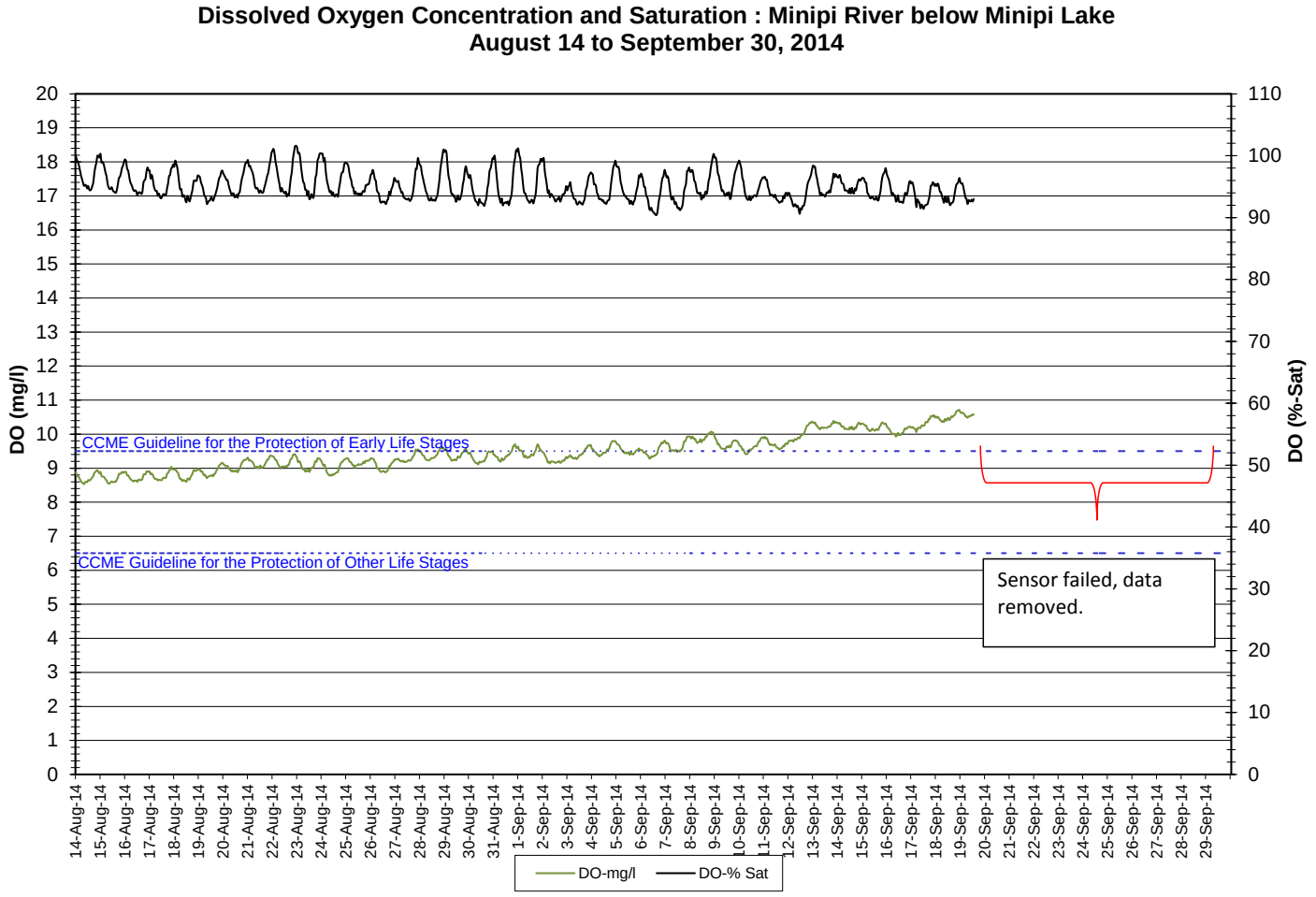


**Figure 5: Dissolved oxygen and percent saturation at Minipi River below Minipi Lake**

- Turbidity values typically remain at 0NTU for the majority of the deployment period (Figure 6).
- Turbidity readings >0NTU occur infrequently, at low magnitudes and for a maximum of 1 hour. This site is pristine with no background turbidity values.
- The turbidity sensor encountered technical issues towards the end of the deployment period, this data was removed from the dataset.

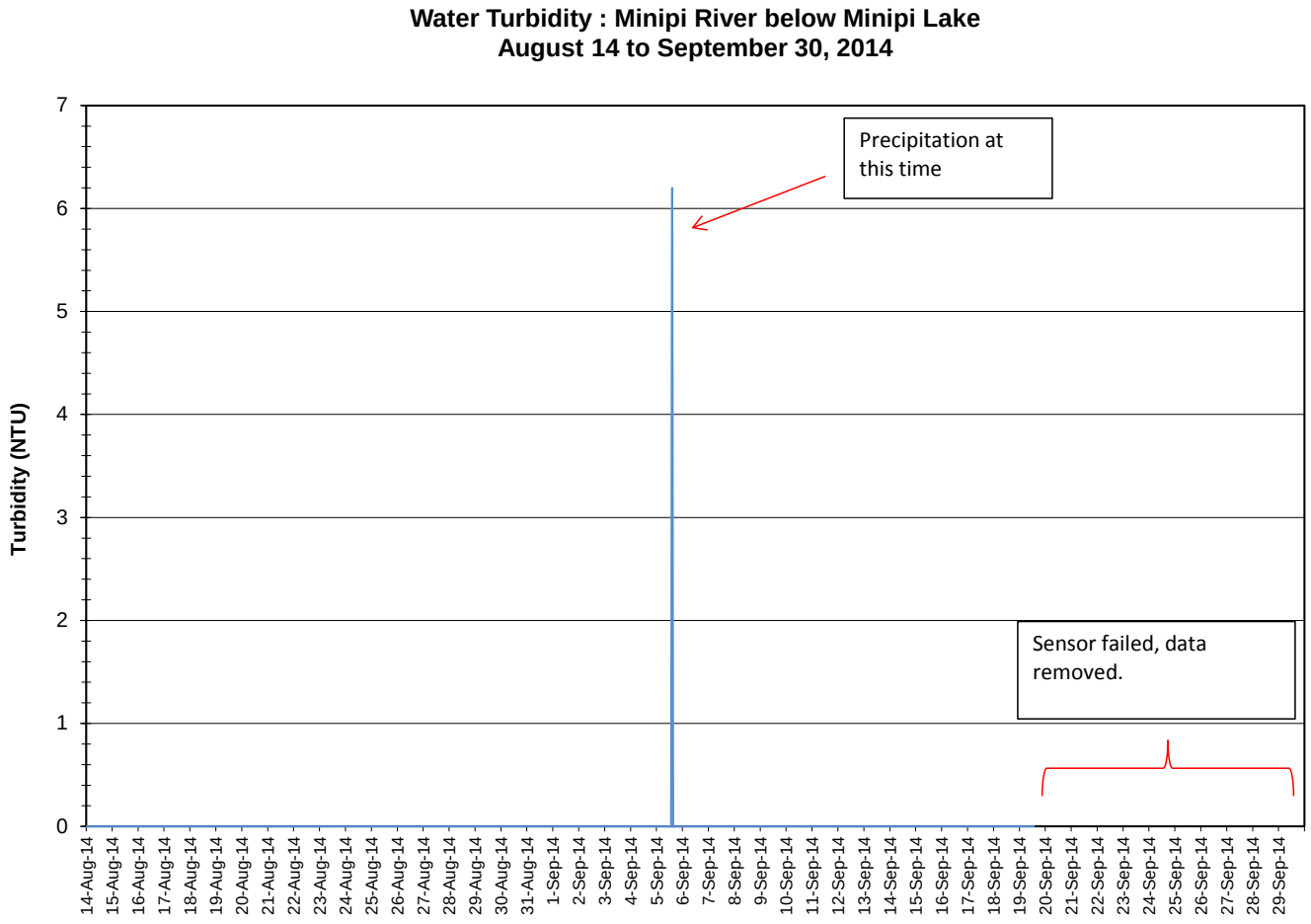


**Figure 6: Turbidity at Minipi River below Minipi Lake**

- Stage and precipitation are graphed below to show the relationship between rainfall and water level (Figure 7). Stage decreases in the beginning of the deployment period and then increases towards the end of the deployment period, with varying precipitation records.
- It is important to note the distance between where the precipitation data was collected (~100km to Goose Bay) and the area that drains the Minipi River at this point (~2300km$^2$). There is no significant correlation between precipitation and stage during this time at this station.

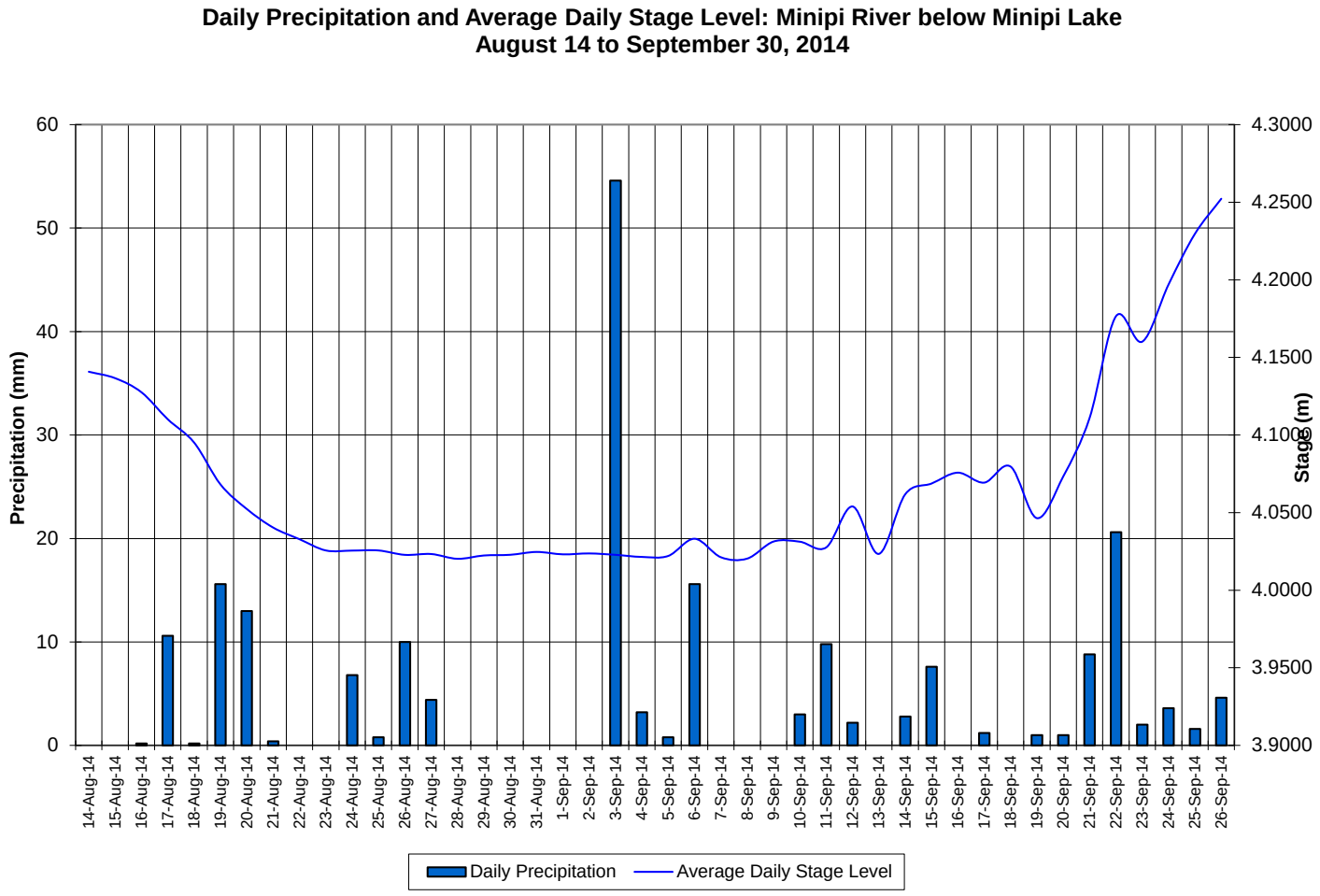


**Figure 7: Stage and precipitation at Minipi River below Minipi Lake**

## Conclusions

- An instrument at the water quality monitoring station on the Minipi River below Minipi Lake was deployed on August 14 and removed on September 30.
- In most cases, weather related events or increase/decreases in water level could be used to explain the fluctuations. Most values recorded were within ranges as suggested by the CCME Guidelines for the Protection of Aquatic Life for pH and dissolved oxygen.
- Temperature decreased, while dissolved oxygen increased slightly. Specific conductivity was relatively stable, and pH was stable. Turbidity was 0 NTU for the majority of the deployment period, with just one spike for a short period of time.
- This was the last deployment at this station; this station has been discontinued.

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## Appendix 1

**Average Daily Air Temperature and Precipitation: Happy Valley-Goose Bay**
**August 14 to September 30, 2014**