







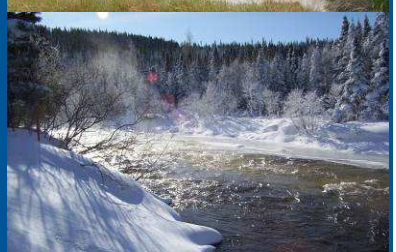

Real-Time Water Quality Deployment Report

Minipi River below Minipi Lake

August 2 to
September 2, 2011

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 2, 2011, 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 30 days. The instrument was removed on September 2, 2011.

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 2 and September 2, 2011 is summarized in Table 2.

Table 2: Comparison rankings for Minipi River station August 2 – September 2, 2011

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Minipi River	August 2, 2011	Deployment	Excellent	Excellent	Excellent	Excellent	Excellent
	Sep 2, 2011	Removal	Good	Excellent	Excellent	Good	Fair

- At the Minipi River station, all parameters ranked 'excellent' at deployment. At removal, temperature, pH, specific conductivity and dissolved oxygen ranked either 'good' or 'excellent', while turbidity ranked 'fair'. The field instrument read a value of 0.0NTU and the QA/QC instrument read a value of 6.1NTU. Turbidity values are typically 0NTU at this station and the QA/QC instrument was reading high throughout the day at other sampling stations. A calibration error with the QA/QC instrument is likely the cause of the discrepancy between the two instruments.

Data Interpretation

- The following graphs and discussion illustrate water quality-related events from August 2 to September 2 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 15.14 to 20.59^{o}C during this deployment period (Figure 1).
- Water temperature decreases after the first week of being deployed; it then remains stable for the remainder of the deployment period. This trend is expected due to the ambient air temperatures in the season (Figure 2). Water temperature fluctuates diurnally.

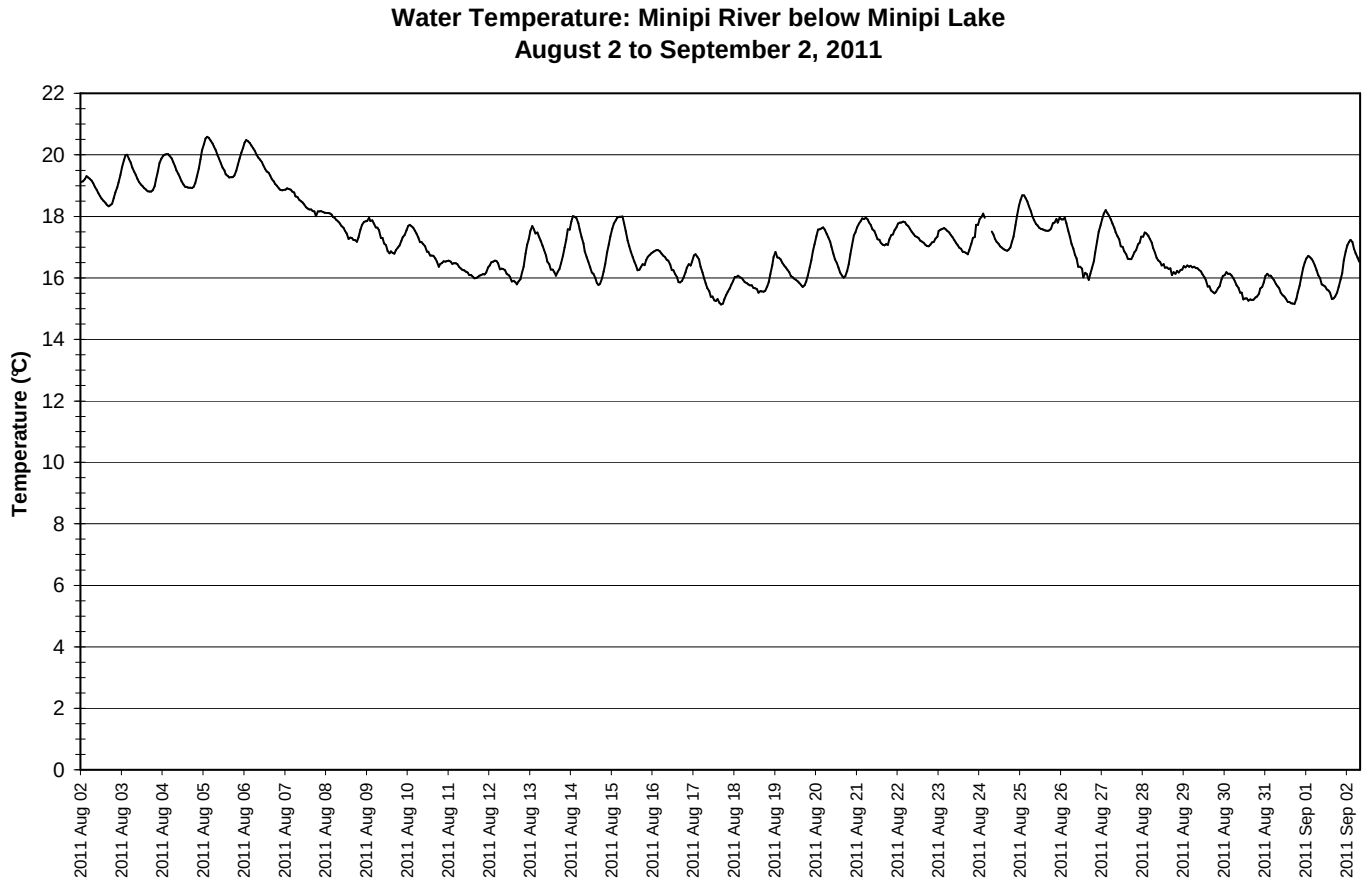

Figure 1: Water temperature at Minipi River below Minipi Lake

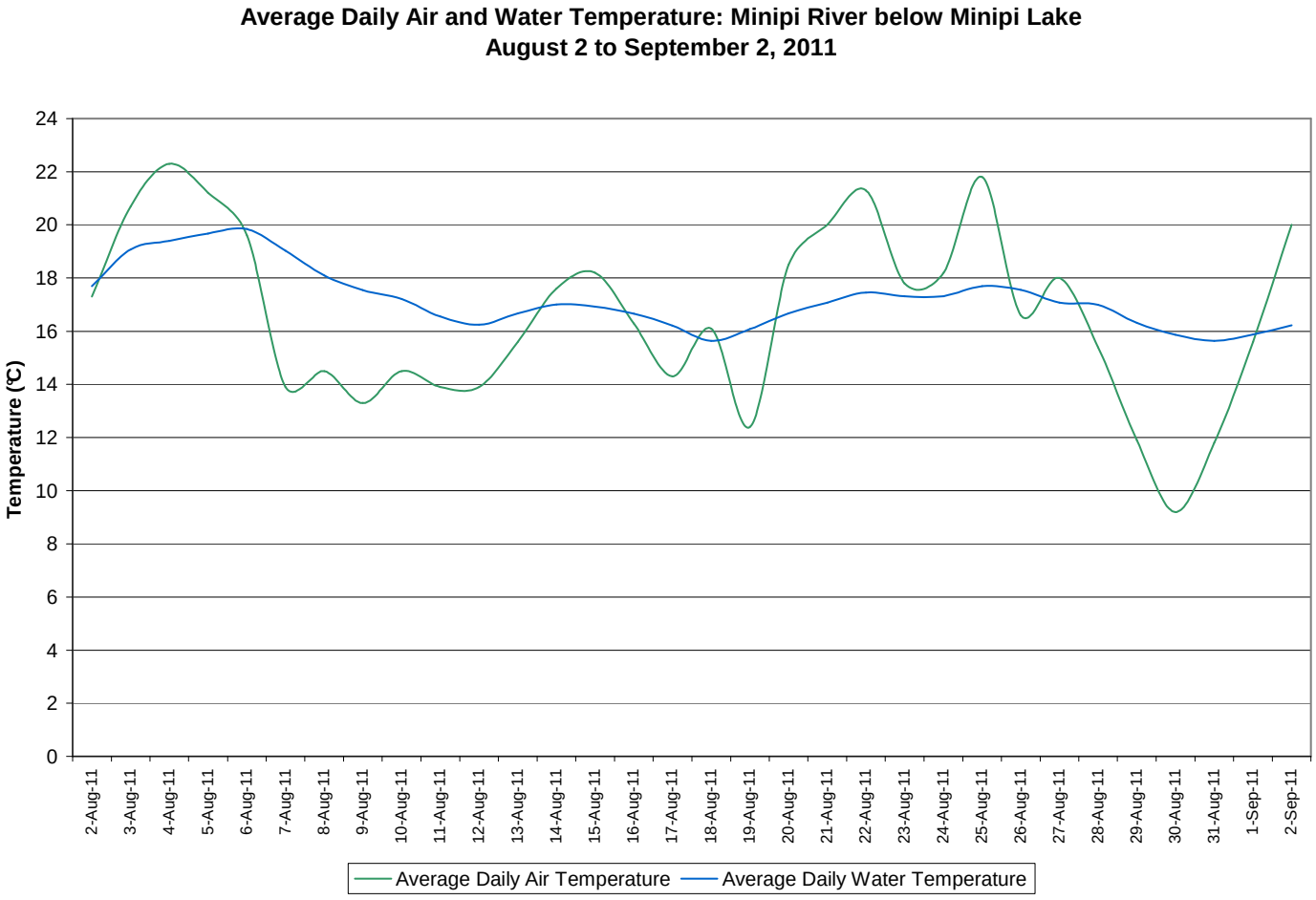

Figure 2: Average daily air and water temperatures at Minipi River below Minipi Lake

(weather data collected at Goose Bay)

- pH ranges between 6.79 and 7.11 pH units throughout the deployment period (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.

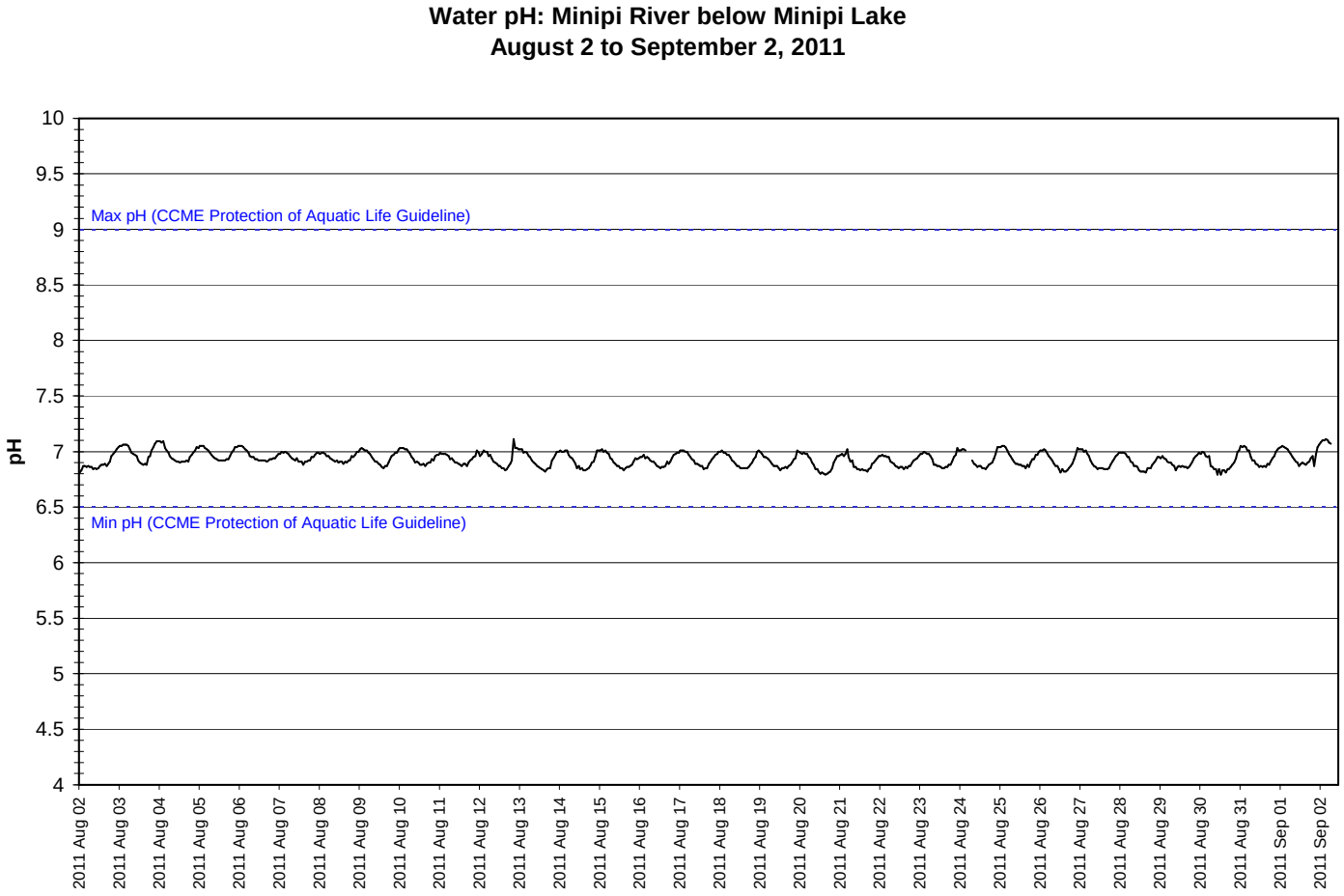

Figure 3: pH at Minipi River below Minipi Lake

- Specific conductivity did not transmit correctly due to a programming issue with the data logger. Environment Canada will be on site in March 2012 to remediate the error.
- The following graph depicts data that was obtained from the log file of instrument that was deployed in the river.
- Specific conductivity is generally stable at this station, ranging between 15.0 and 17.0 µs/cm.

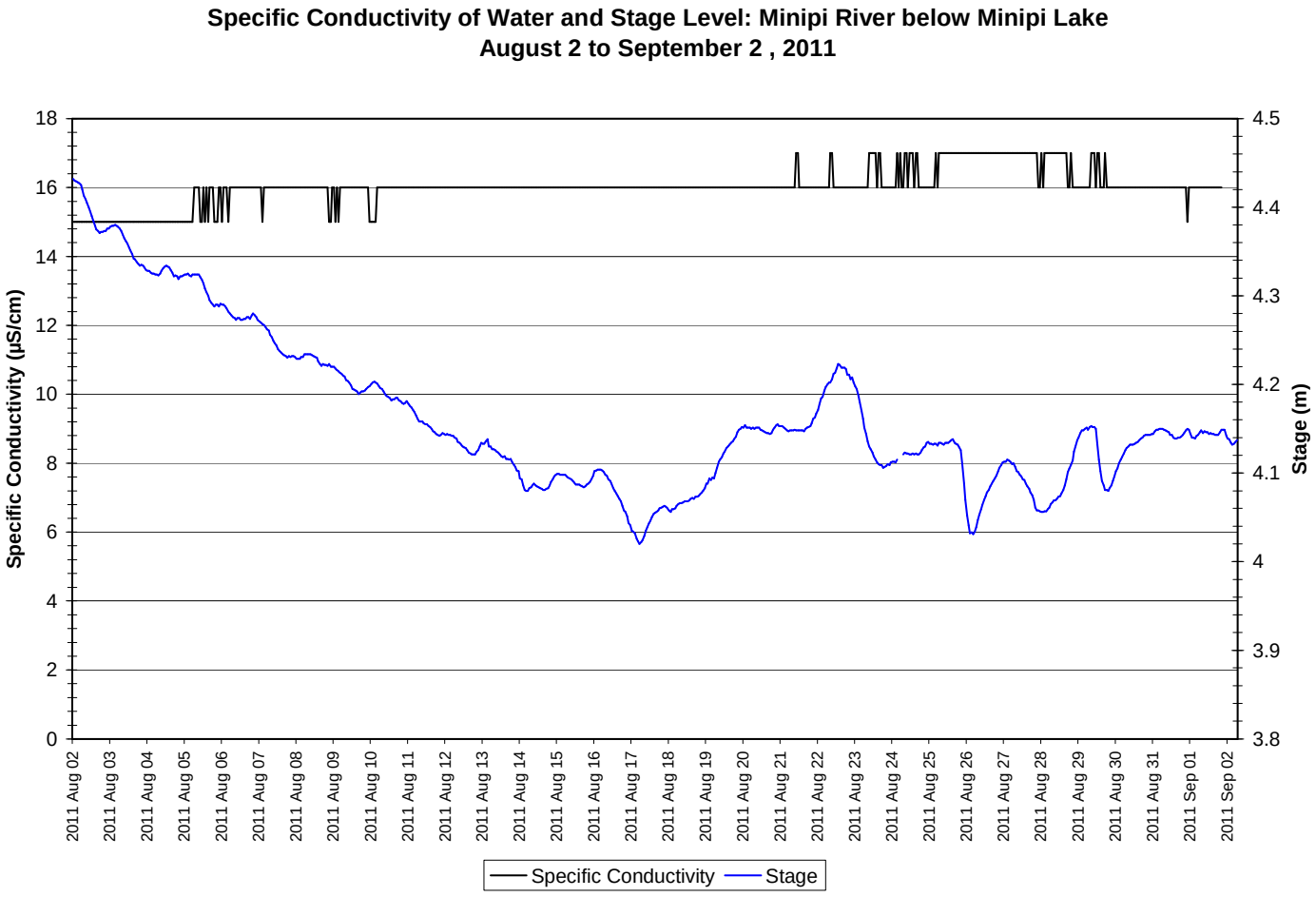

Figure 4: Specific conductivity and stage level at Minipi River below Minipi Lake

- The saturation of dissolved oxygen ranged from 91.7% to 99.6% and a range of 8.66 to 9.75mg/l was found in the concentration of dissolved oxygen with a median value of 9.21mg/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 just 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.
- Dissolved Oxygen content is consistent over the deployment period. This trend is expected given the warm ambient air temperatures in the summer season (Figure 2). Dissolved oxygen content fluctuates diurnally, displaying the inverse relationship to water temperature.

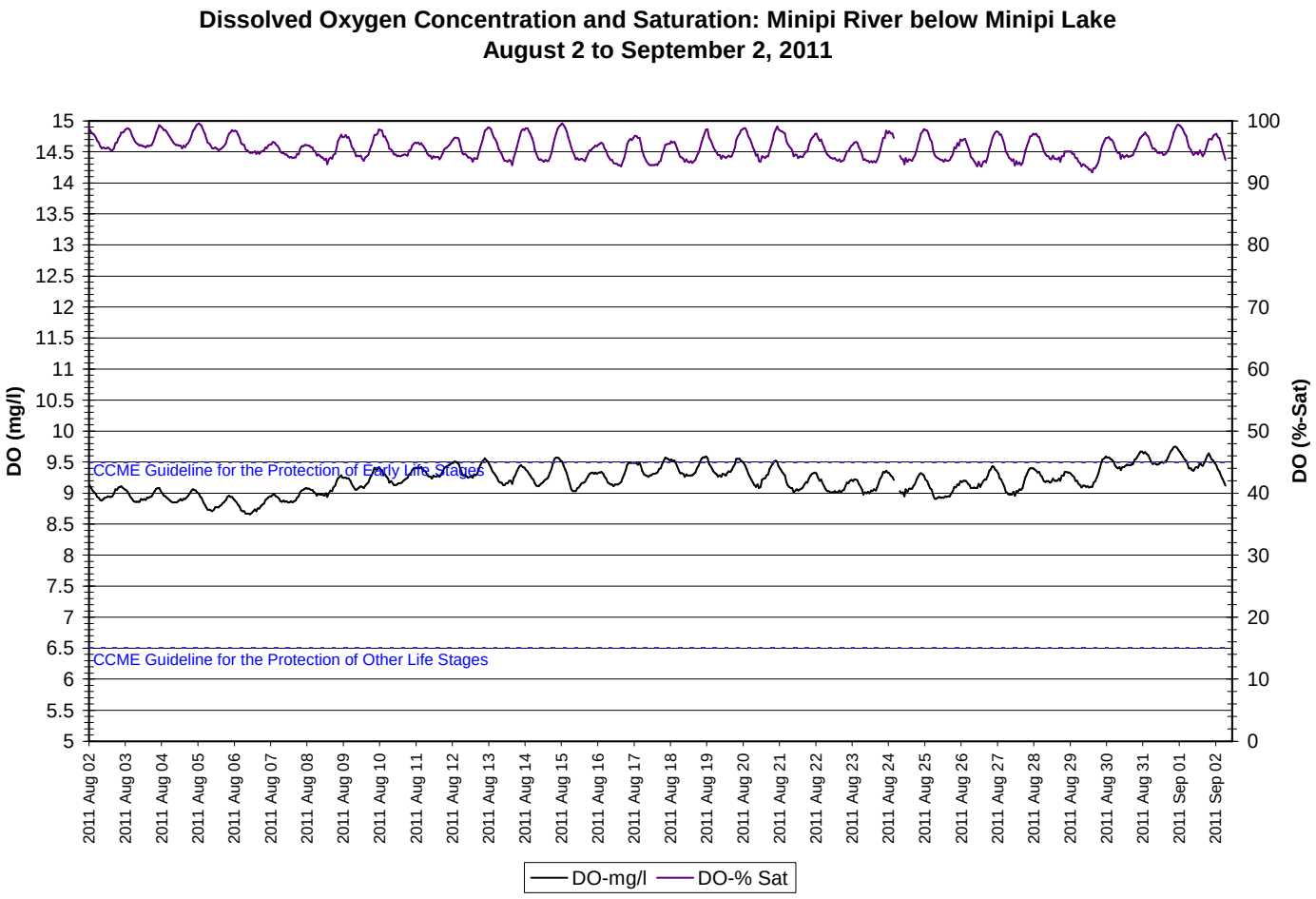

Figure 5: Dissolved oxygen and percent saturation at Minipi River below Minipi Lake

- 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.
- Turbidity >0NTU did occur for approximately 3.5 days at a low magnitude, between August 27-30. There is no explanation for this as it does not correspond with any weather data for that area.

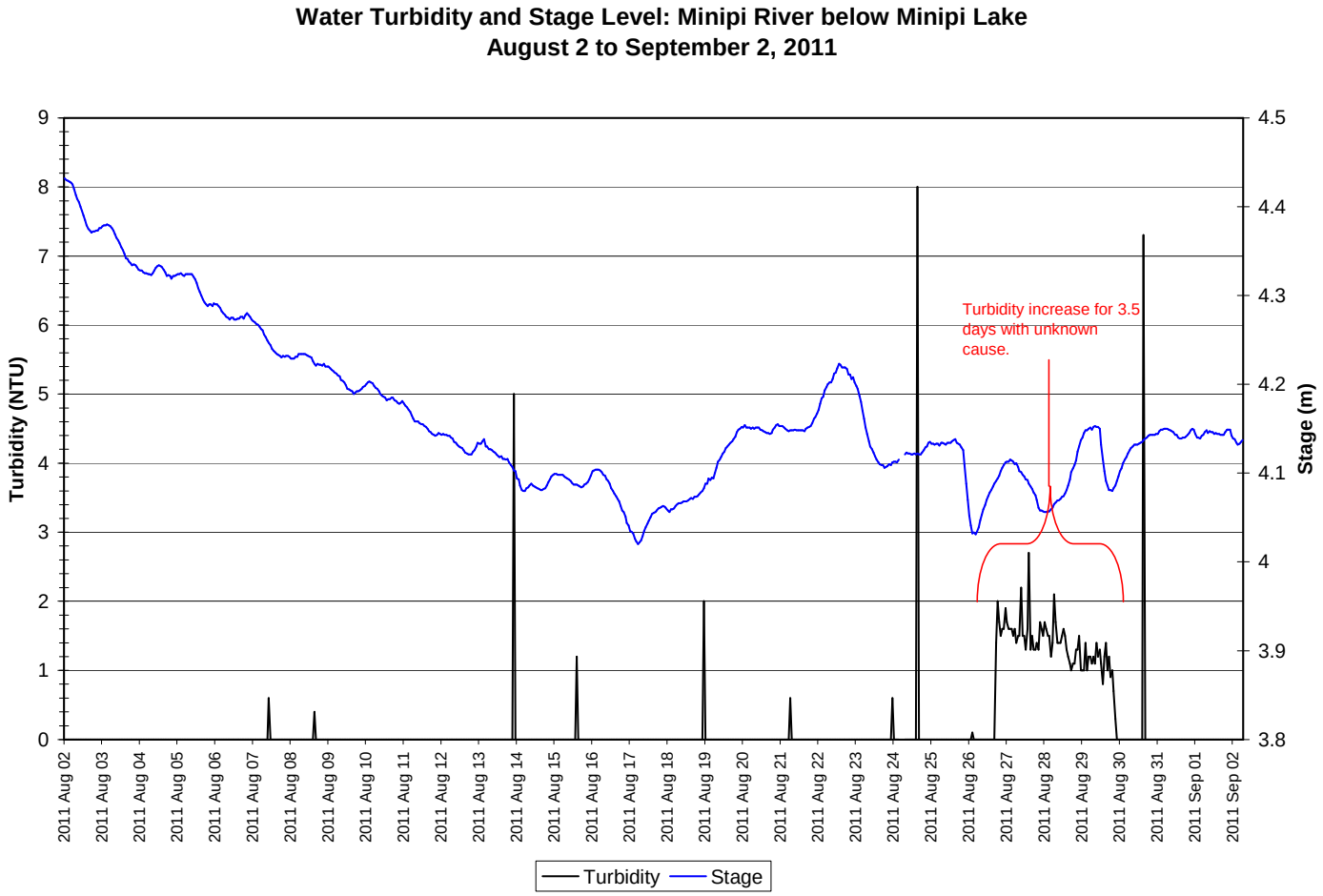

Figure 6: Turbidity and stage level at Minipi River below Minipi Lake

- Stage and precipitation are graphed below to show the relationship between rainfall and water level (Figure 7). Stage is generally decreasing throughout the first half of the deployment period, before increasing slightly and fluctuating for the remainder of the deployment period. Precipitation records vary throughout the month.
- 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.

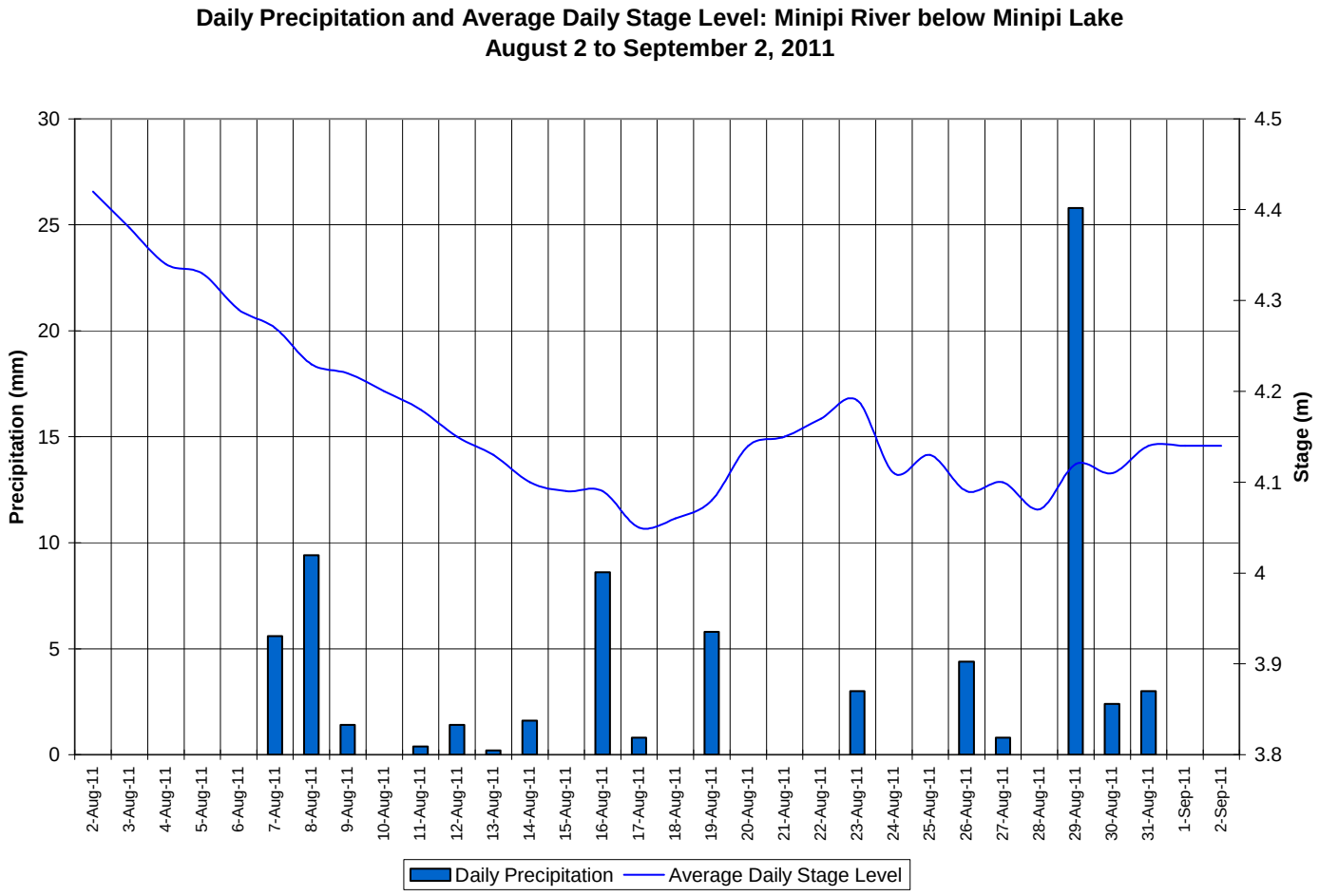

Figure 7: Stage and precipitation at Minipi River below Minipi Lake

Conclusions

- An instrument at the water quality monitoring station on the Minipi River below Minipi Lake was deployed on August 2 and removed on September 2.
- In most cases, weather related events or increase/decreases in water level could be used to explain the fluctuations. All values recorded were within ranges as suggested by the CCME Guidelines for the Protection of Aquatic Life for pH. During the deployment, most dissolved oxygen values were just below the minimum CCME Guideline for the Protection of Early Life Stage Cold Water Biota value of 9.5 mg/l, this is expected due to the warm ambient air temperatures during the summer season.
- Turbidity did increase above baseline 0NTU for approximately 3.5 days during the deployment period. There is no explanation for this as it does not correspond with any weather data for that area.

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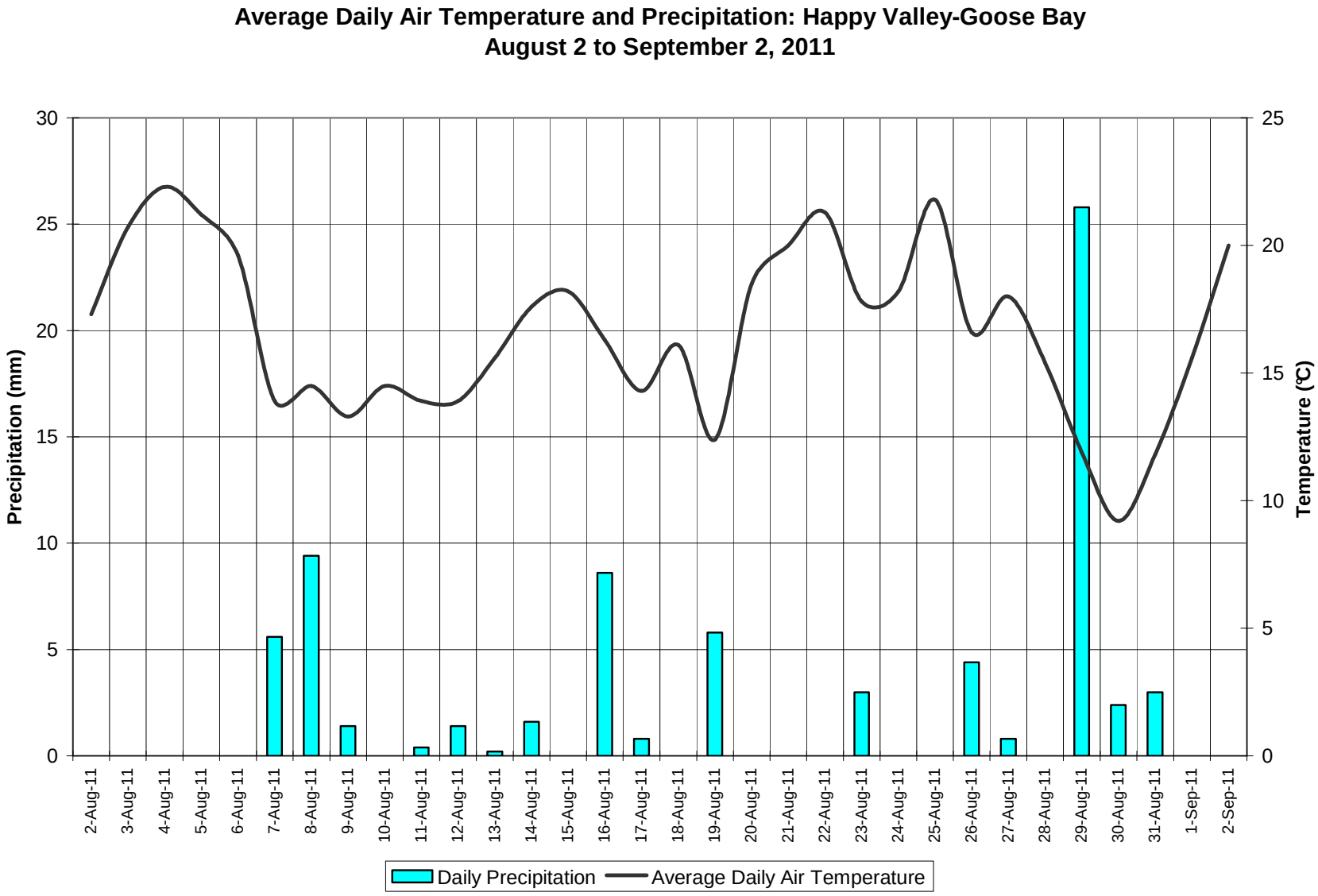
Appendix 1


Average Daily Air Temperature and Precipitation: Happy Valley-Goose Bay
August 2 to September 2, 2011
Precipitation (mm)
Temperature (°C)
30
25
20
15
10
5
0
25
20
15
10
5
0
2-Aug-11
3-Aug-11
4-Aug-11
5-Aug-11
6-Aug-11
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25-Aug-11
26-Aug-11
27-Aug-11
28-Aug-11
29-Aug-11
30-Aug-11
31-Aug-11
1-Sep-11
2-Sep-11
Daily Precipitation
Average Daily Air Temperature