Real-Time Water Quality Deployment Report

Minipi River below Minipi Lake

October 4 to
November 3, 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 October 4, 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 29 days. The instrument was removed on November 3.

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.

Minipi River below Minipi Lake, Newfoundland and Labrador

- Deployment and removal comparison rankings for the station on Minipi River deployed between October 4 and November 3, 2011 is summarized in Table 2.

Table 2: Comparison rankings for Minipi River station October 4 – November 3, 2011

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Minipi River	Oct 4, 2011	Deployment	Excellent	Fair	Excellent	Excellent	Excellent
	Nov 3, 2011	Removal	Marginal	Marginal	Good	Excellent	Excellent

- At the Minipi River station, temperature, conductivity, dissolved oxygen and turbidity ranked 'excellent' at deployment while pH ranked 'fair', the field instrument read a value of 6.32 while the QA/QC instrument read a value of 6.86. Within the first seven hours of deployment, the pH sensor on the field instrument had stabilized and was reading a value of 6.81 which when compared to the QA/QC instrument yields an 'excellent' ranking. The initial discrepancy was due to insufficient time for stabilization.

- At removal, conductivity, dissolved oxygen and turbidity ranked either 'excellent' or 'good', while temperature and pH ranked 'marginal'. For temperature, the field instrument read a value of 3.48^{o}C while the QA/QC instrument read a value of 4.30 ^{o}C. This could be due to the placement of the QA/QC instrument in the water body or the amount of time the instrument was given to stabilize before the reading was recorded. For pH, the field instrument read a value of 6.91 while the QA/QC instrument read a value of 5.91. As the pH sensor is temperature related, this discrepancy is also likely due to positioning and stabilization time and related to the difference in temperature readings.

Data Interpretation

- The following graphs and discussion illustrate water quality-related events from October 4 to November 3 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 3.39 to 9.58^{o}C during this deployment period (Figure 1).
- Water temperature is decreasing throughout the deployment period. This trend is expected due to the decreasing ambient air temperatures in the season (Figure 2). Water temperature fluctuates diurnally.
- Water temperature decreases by 1 ^{o}C for approximately one hour on October 25, 2011.

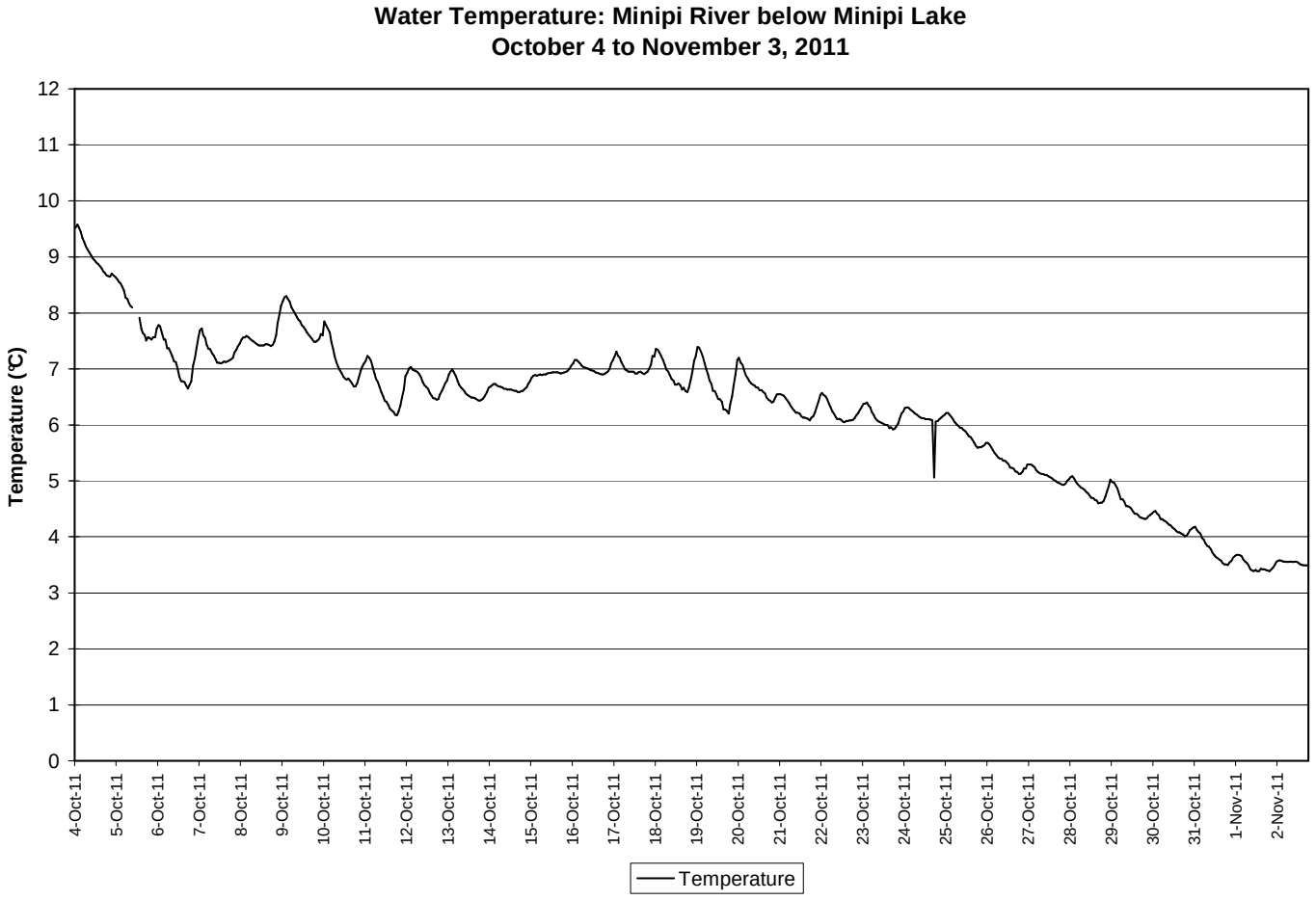

Figure 1: Water temperature at Minipi River below Minipi Lake

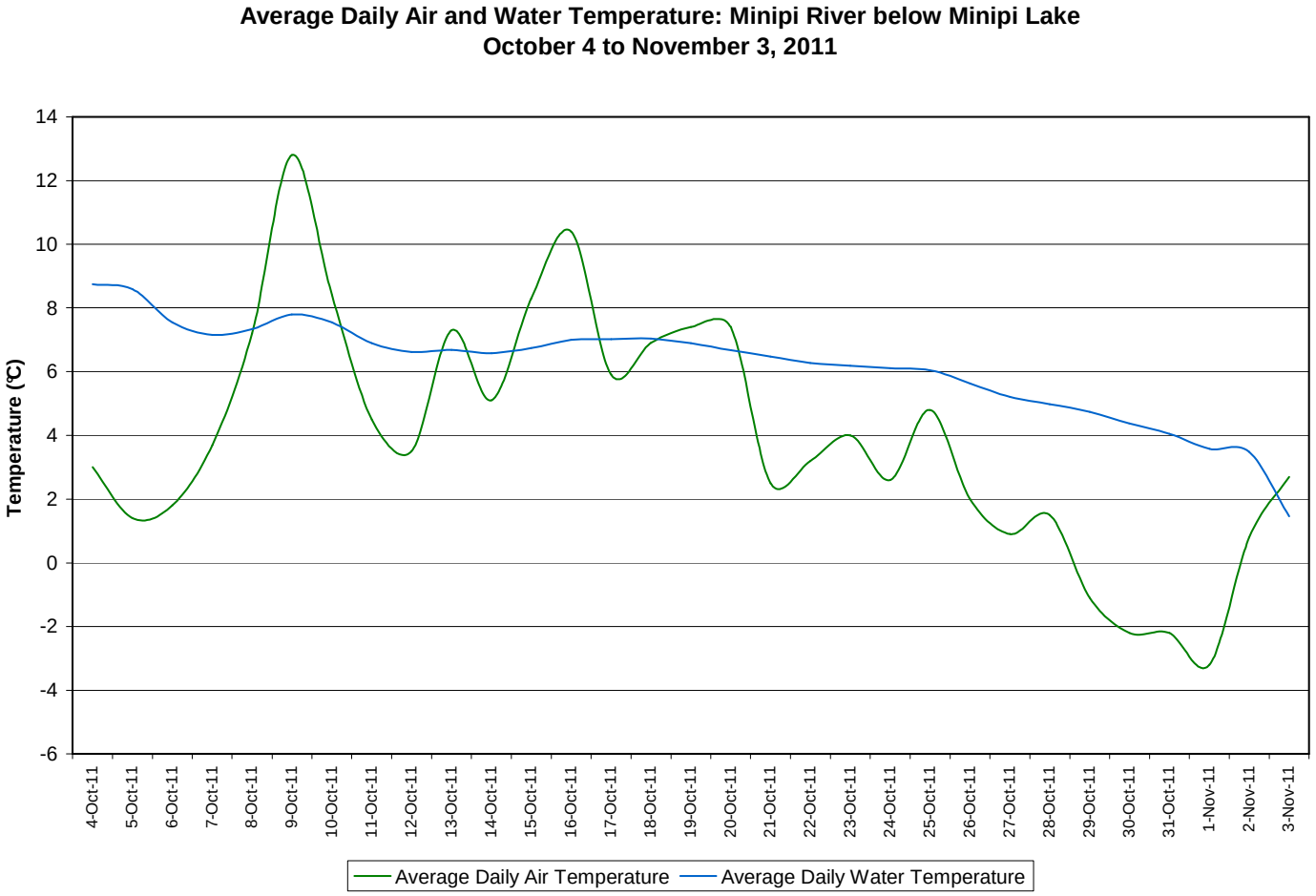

Figure 2: Average daily air and water temperatures at Minipi River below Minipi Lake

(weather data collected at Goose Bay)

- pH ranges between 6.61 and 7.01 pH units throughout the deployment period (Figure 3). The average pH is 6.94 units.
- 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.

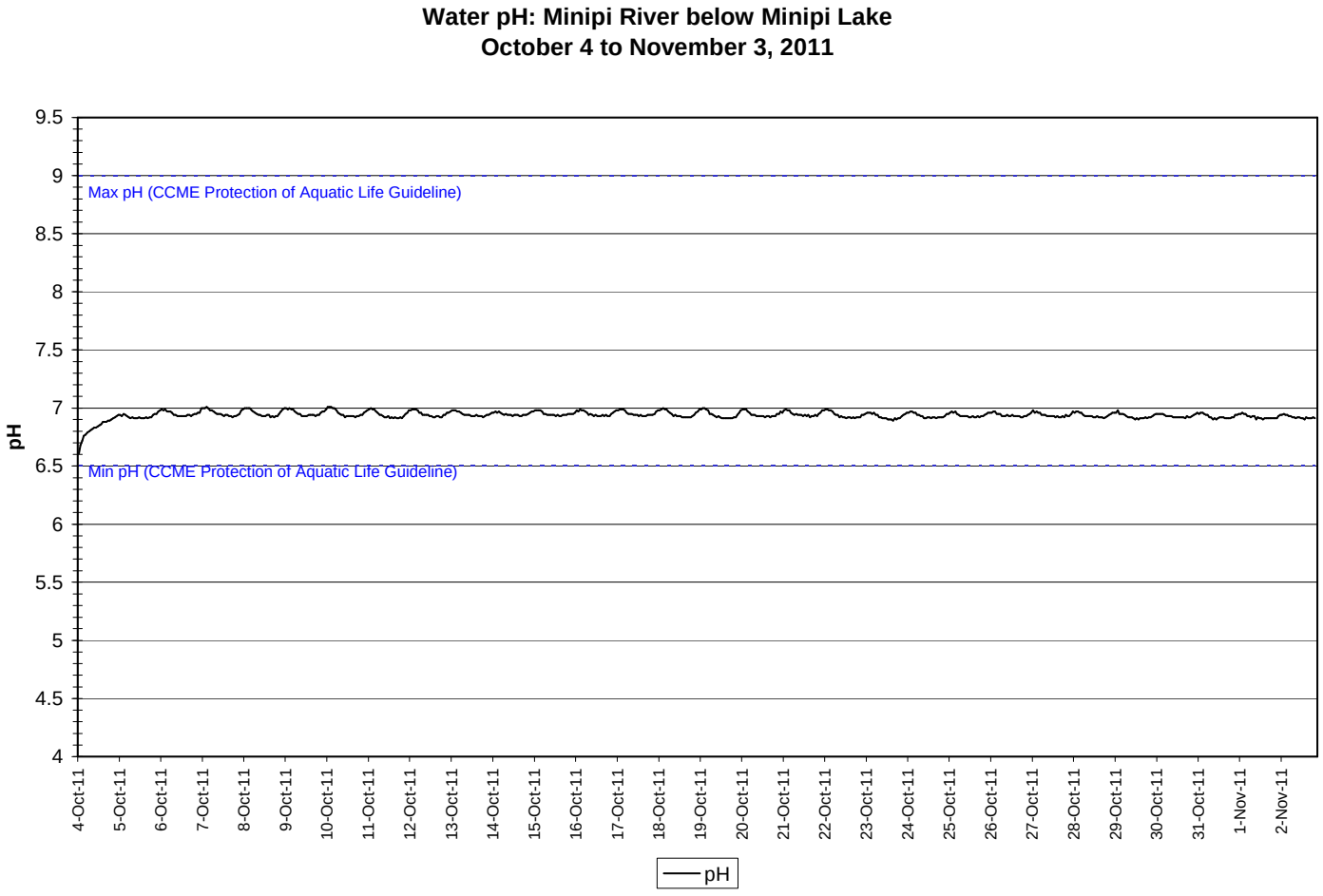

Figure 3: pH at Minipi River below Minipi Lake

- 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 the instrument that was deployed in the river. Specific conductivity ranges from 15.0 to 16.0 µs/cm.
- Specific conductivity is very stable at this station throughout stage fluctuations.

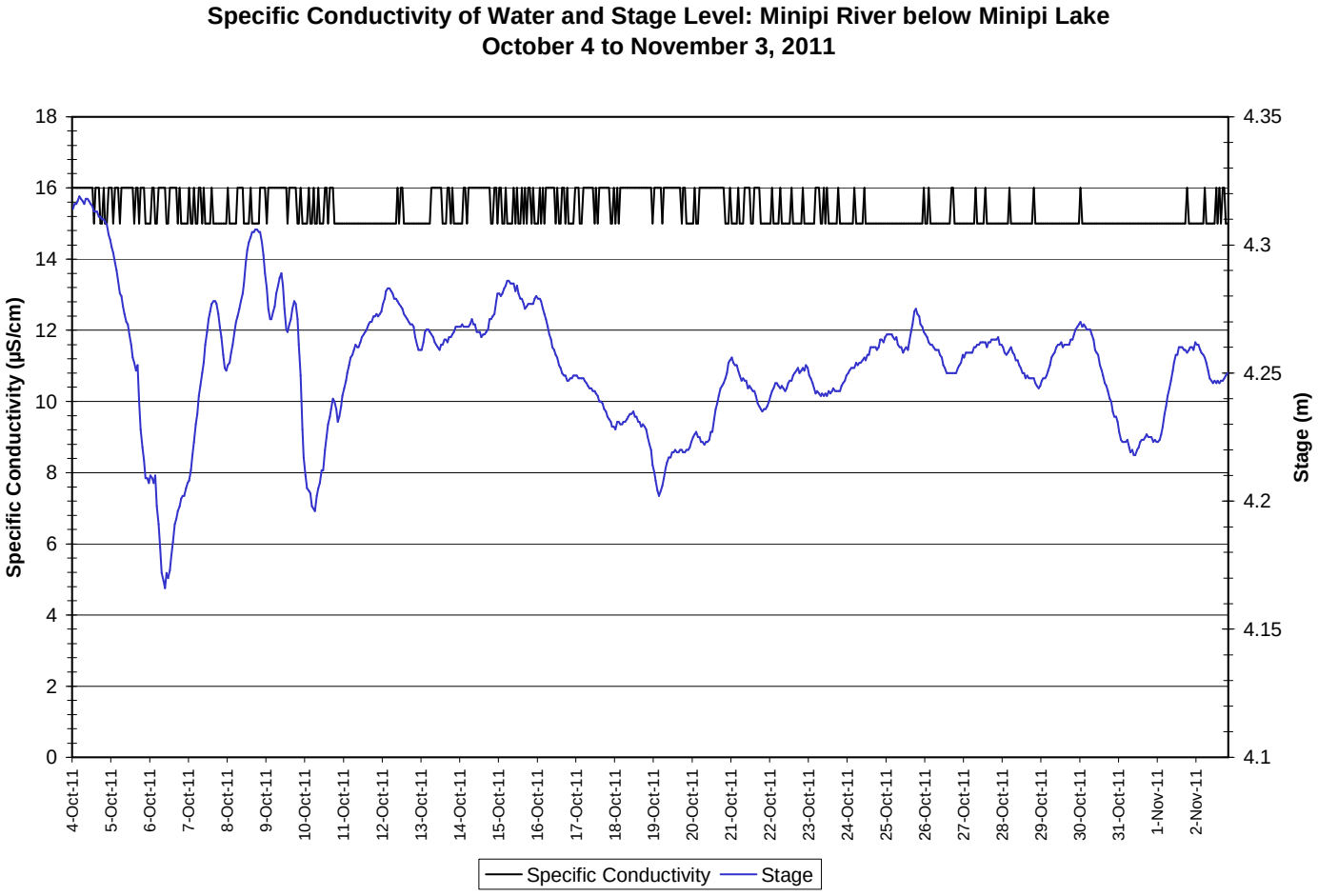

Figure 4: Specific conductivity and stage level at Minipi River below Minipi Lake

- The saturation of dissolved oxygen ranged from 92.5 to 97.6% and a range of 10.97 to 12.79mg/l was found in the concentration of dissolved oxygen with a median value of 11.66mg/l (Figure 5).
- All values were above both the minimum CCME Guideline for the Protection of Other Life Stage Cold Water Biota of 6.5 mg/l and 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 generally increasing. Dissolved oxygen content fluctuates diurnally, displaying the inverse relationship to water temperature.

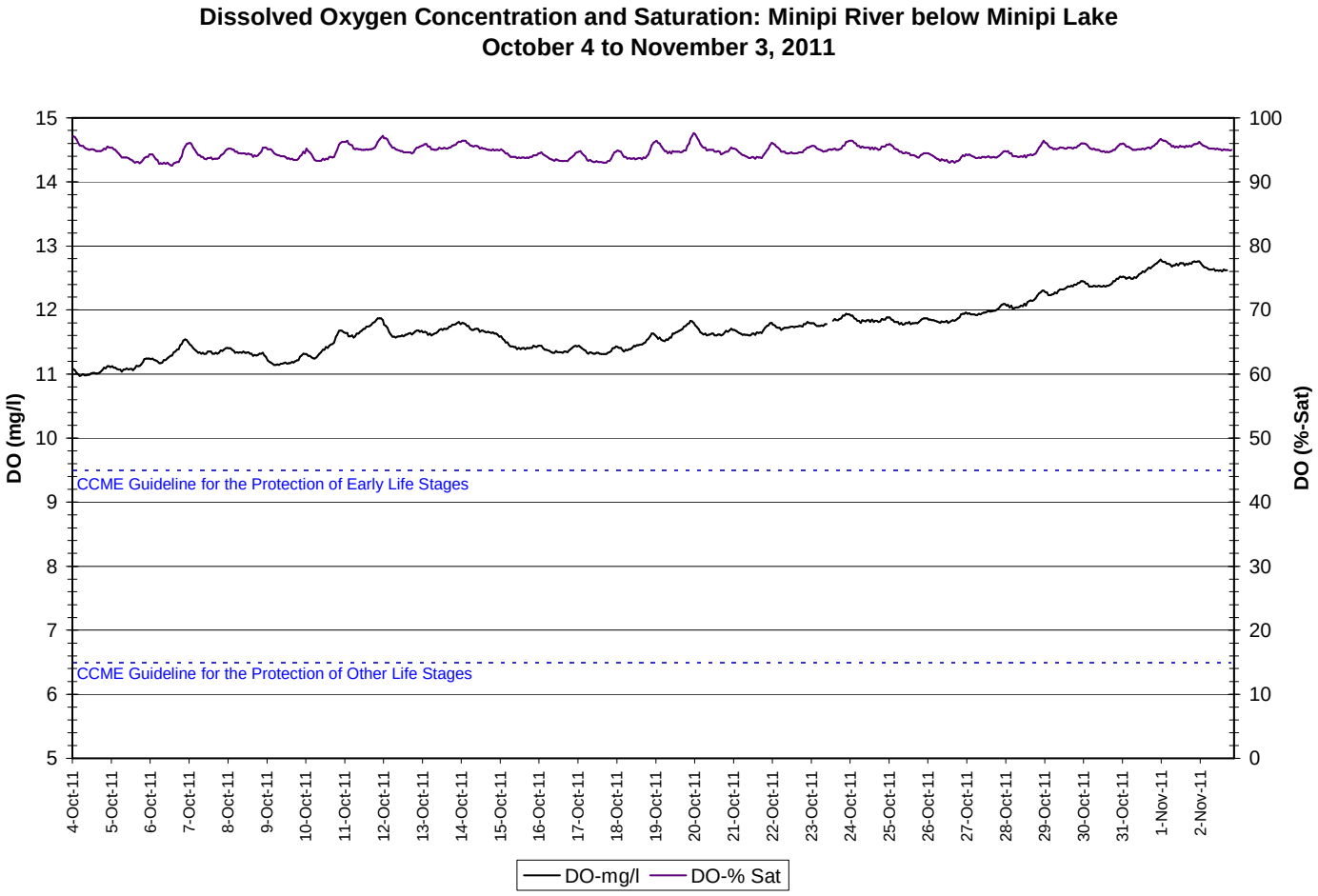

Figure 5: Dissolved oxygen and percent saturation at Minipi River below Minipi Lake

- 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.

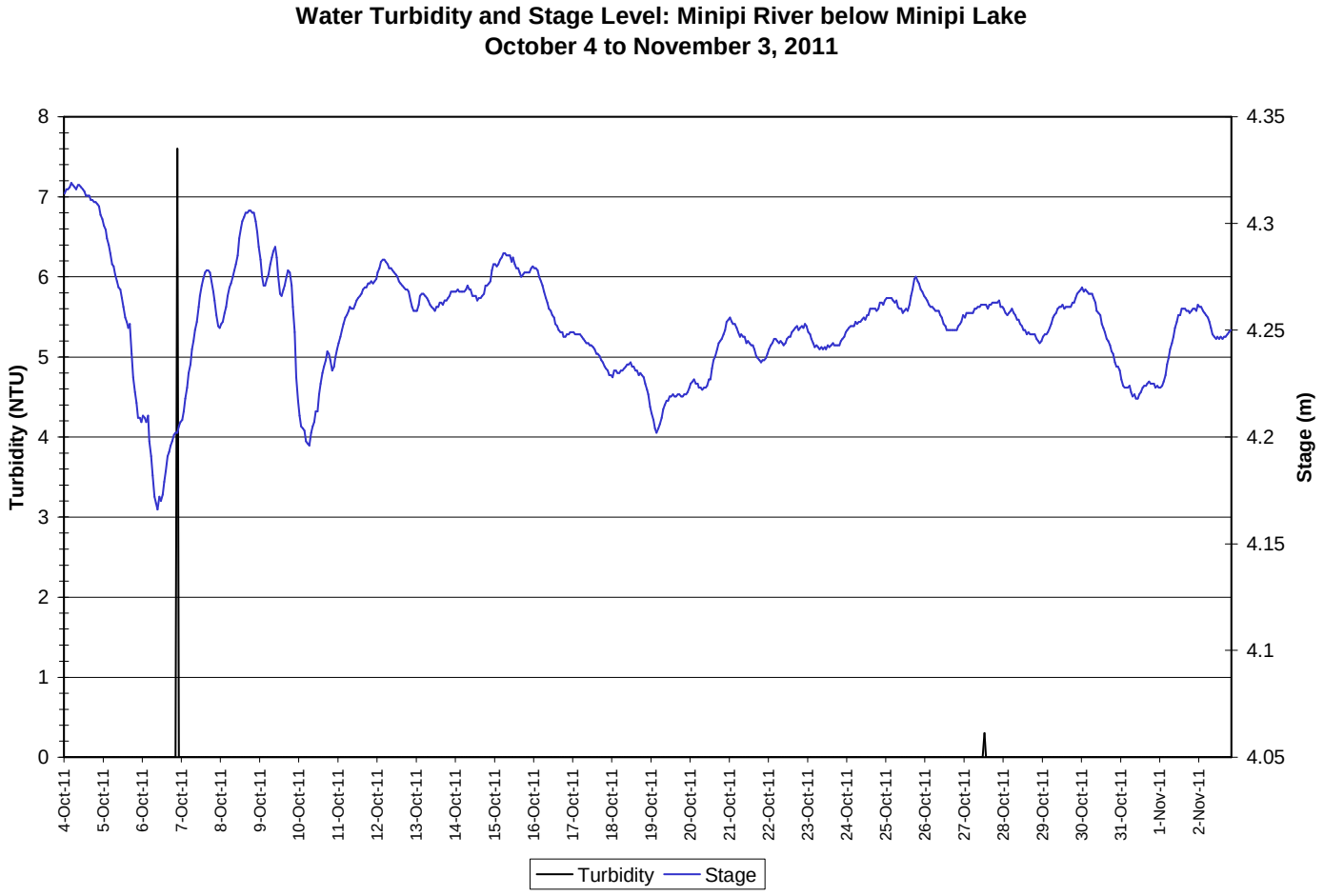

Figure 6: Turbidity and stage level at Minipi River below Minipi Lake

- Stage and precipitation are graphed below to show the relationship between rainfall and water level (Figure 7). Stage varies throughout 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.

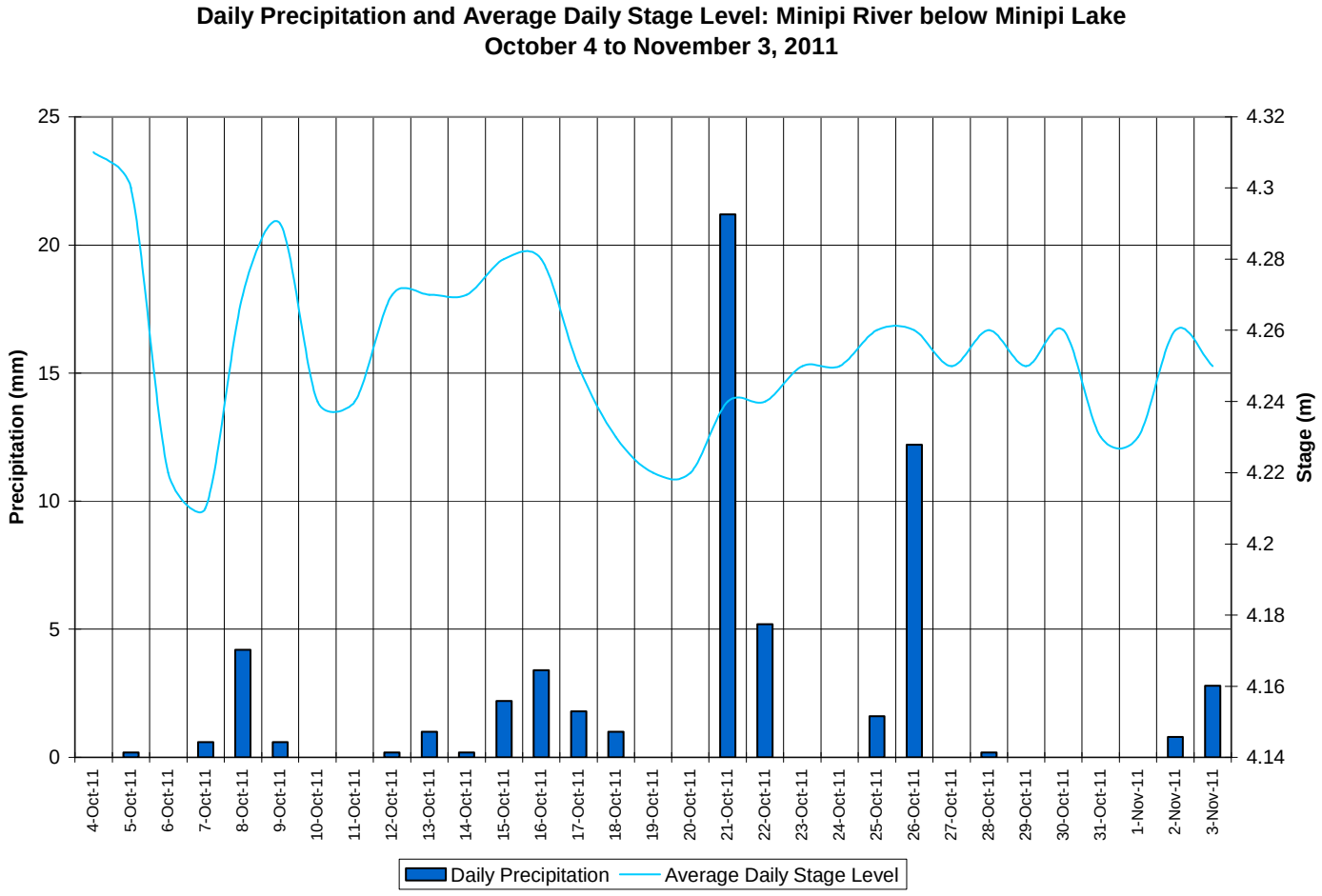

Figure 7: Stage and precipitation at Minipi River below Minipi Lake

Conclusions

- An instrument at the water quality monitoring station on the Minipi River below Minipi Lake was deployed on October 4 and removed on November 3.
- 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 was decreasing while dissolved oxygen was increasing. Specific conductivity and pH were very stable. There were no turbidity events during the deployment period.
- The Instrument was removed on November 3, 2011 for the winter season. The instrument will be deployed in spring 2012 when ice conditions permit

Prepared by:
Maria Murphy
Department of Environment and Conservation
Water Resources Management Division
Phone: 709.896.7981
Fax: 709.896.9566

Appendix 1

Daily Precipitation and Average Daily Stage Level: Minipi River below Minipi Lake
October 4 to November 3, 2011