# Real-Time Water Quality Deployment Report

## Minipi River below Minipi Lake

**May 26 to**
**June 29, 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 May 26, 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 34 days. The instrument was removed on June 29.

## Quality Assurance and Quality Control

- 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.
  - ► 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 QAQC 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 May 26 and June 29, 2011 is summarized in Table 2.

**Table 2: Comparison rankings for Minipi River station, May 26 – June 29, 2011**

| Station | Date | Action | Comparison Ranking | | | | |
|---|---|---|---|---|---|---|---|
| | | | Temperature | pH | Conductivity | Dissolved Oxygen | Turbidity |
| Minipi River | May 26, 2011 | Deployment | Excellent | Excellent | Excellent | Excellent | Excellent |
| | Jun 29, 2011 | Removal | Excellent | Excellent | Excellent | Excellent | Excellent |

- At the Minipi River station, all parameters ranked 'excellent' at both deployment and removal.

## Data Interpretation

- The following graphs and discussion illustrate water quality-related events from May 26 to June 29 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 QAQC protocol. Water Survey of Canada is responsible for QAQC of water quantity data. Corrected data can be obtained upon request.

## Minipi River below Minipi Lake

- The water quality monitoring instrument was deployed using the boat located at the station and assistance by Environment Canada employees on site. Water level was quite high at the time of deployment which made accessing the river safely without the use of a boat nearly impossible.
- Water temperature ranged from 2.91 to 13.79$^{o}$C during this deployment period (Figure 1).
- Water temperature is increasing throughout the deployment period. This trend is expected due to the increasing ambient air temperatures in the spring and summer seasons (Figure 2). Water temperature fluctuates diurnally.

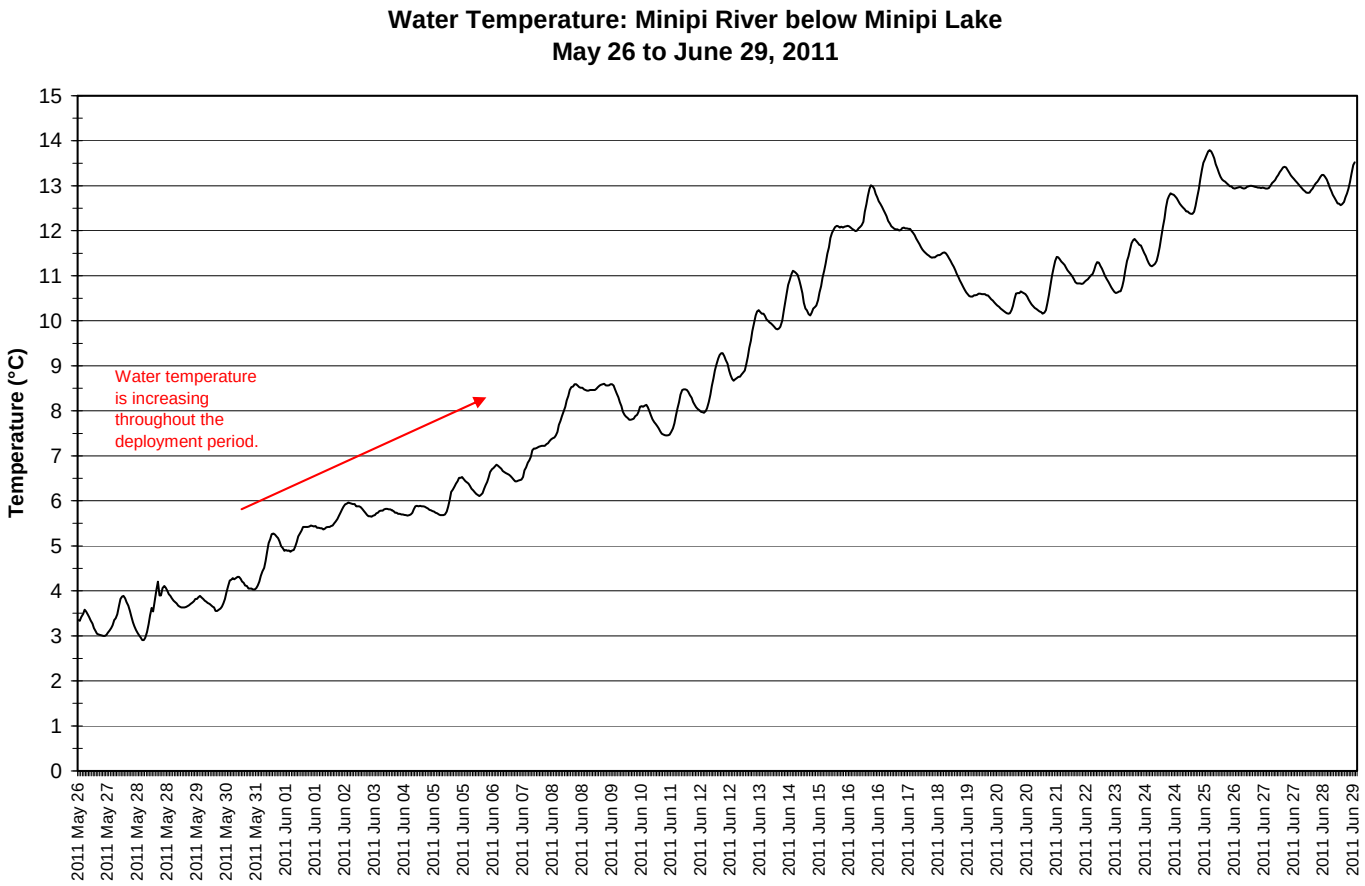


**Figure 1: Water temperature at Minipi River below Minipi Lake**

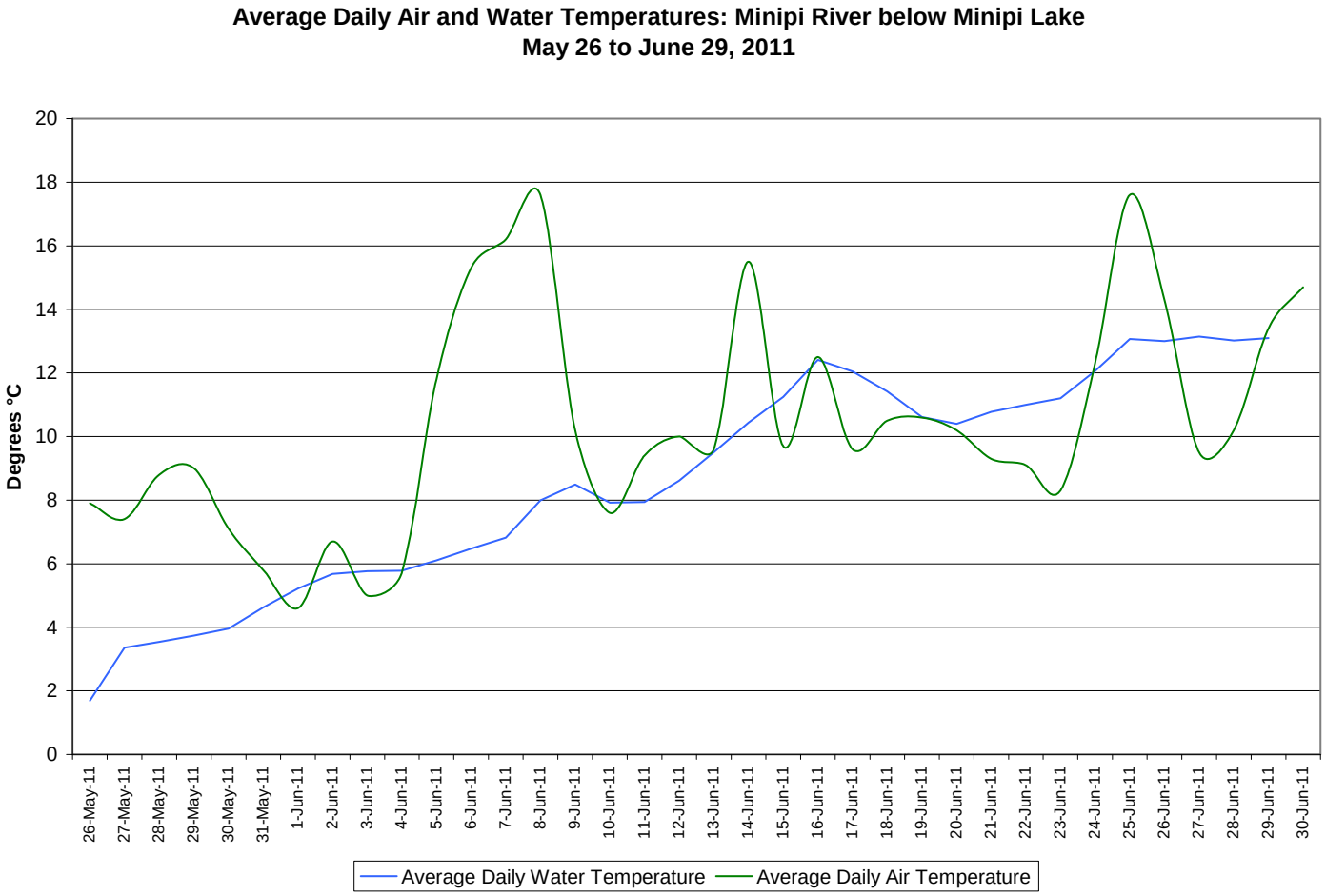


**Figure 2: Average daily air and water temperatures at Minipi River below Minipi Lake (weather data collected at Goose Bay)**

- pH ranges between 6.52 and 6.81 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 very slightly during the day and night.

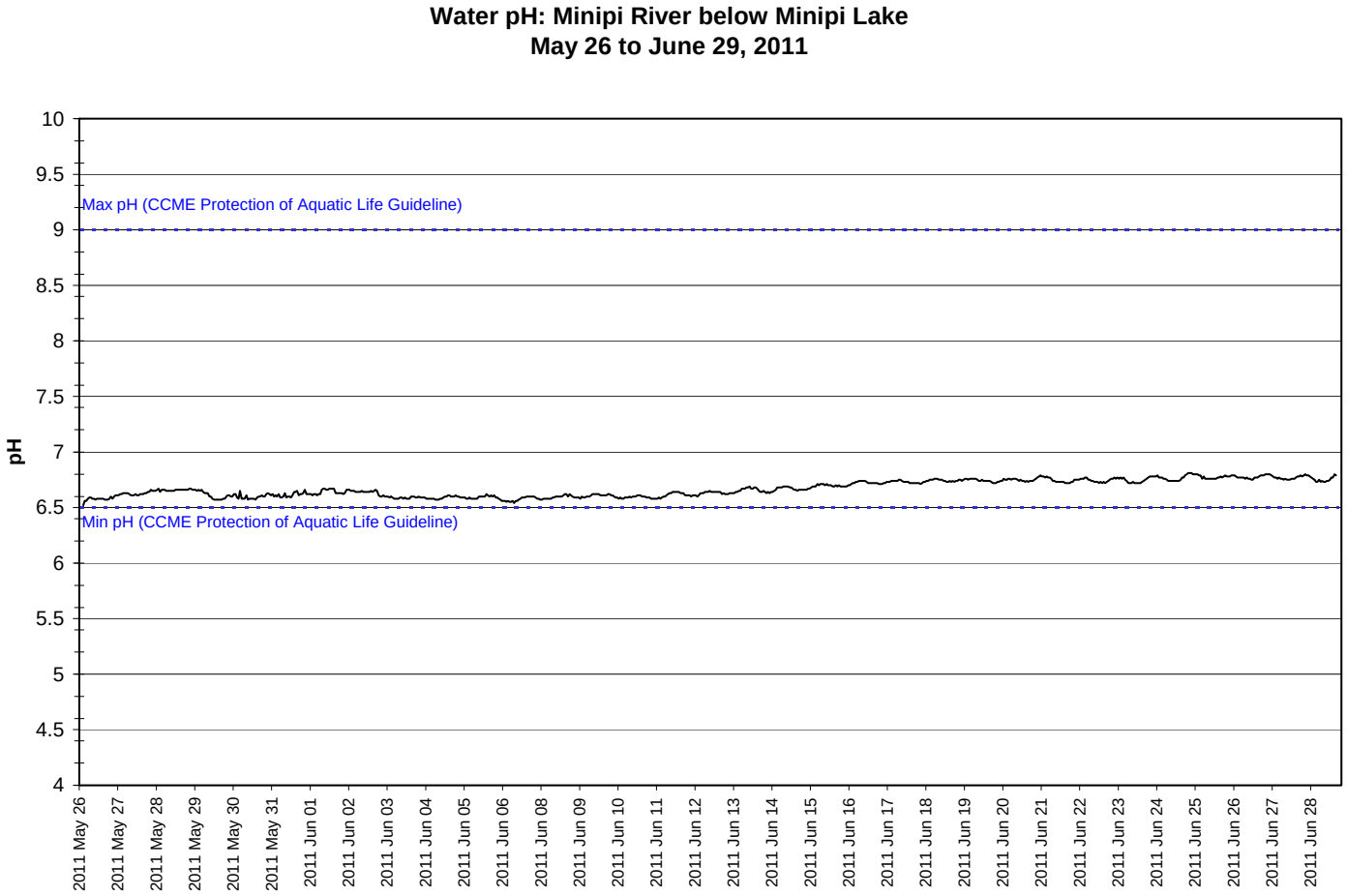


**Figure 3: pH at Minipi River below Minipi Lake**

- Specific conductivity ranges from 12.0 to 16.0µS/cm during the deployment period, averaging 13.0µS/cm (Figure 4). Due to a programming error at this station, specific conductivity is recorded to zero decimal places. Environment Canada, while on site in July, will rectify this error for future data collection.
- Stage is included in Figure 4 to illustrate the inverse relationship between conductivity and water level. Stage is decreasing throughout the deployment period. As stage decreases, specific conductivity increases (indicated by red arrows on Figure 4). As the water level decreases, the concentration of dissolved solids is increased. Increases in stage levels typically dilute the dissolved solids, decreasing the specific conductivity.

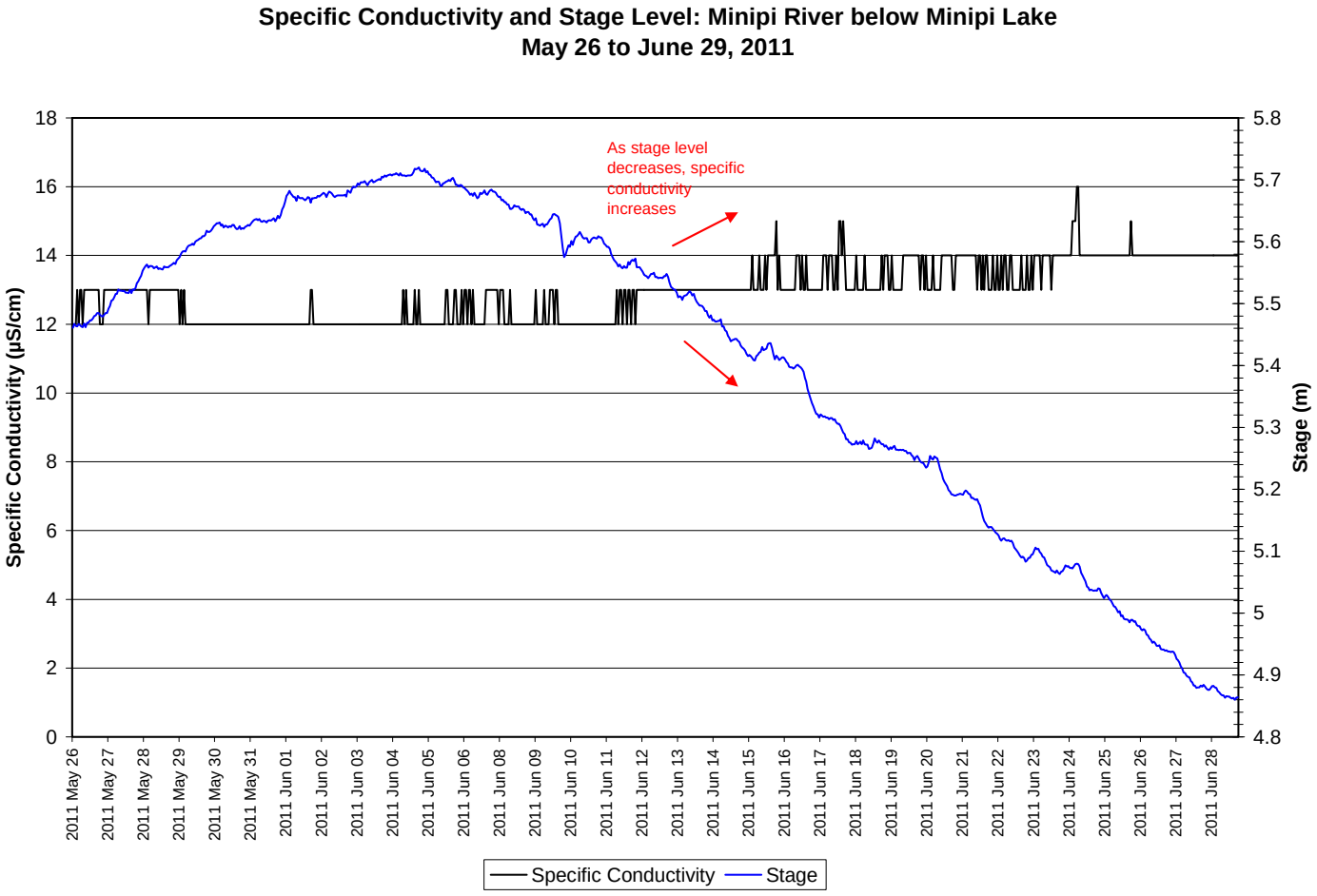


**Figure 4: Specific conductivity and stage level at Minipi River below Minipi Lake**

- The saturation of dissolved oxygen ranged from 95.7 to 100.1% and a range of 10.20 to 13.19mg/l was found in the concentration of dissolved oxygen with a median value of 11.40mg/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 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 decreases slightly over the deployment period. This trend is expected given the increasing air and water temperatures (Figure 2). Dissolved oxygen content fluctuates diurnally, displaying the inverse relationship to water temperature.

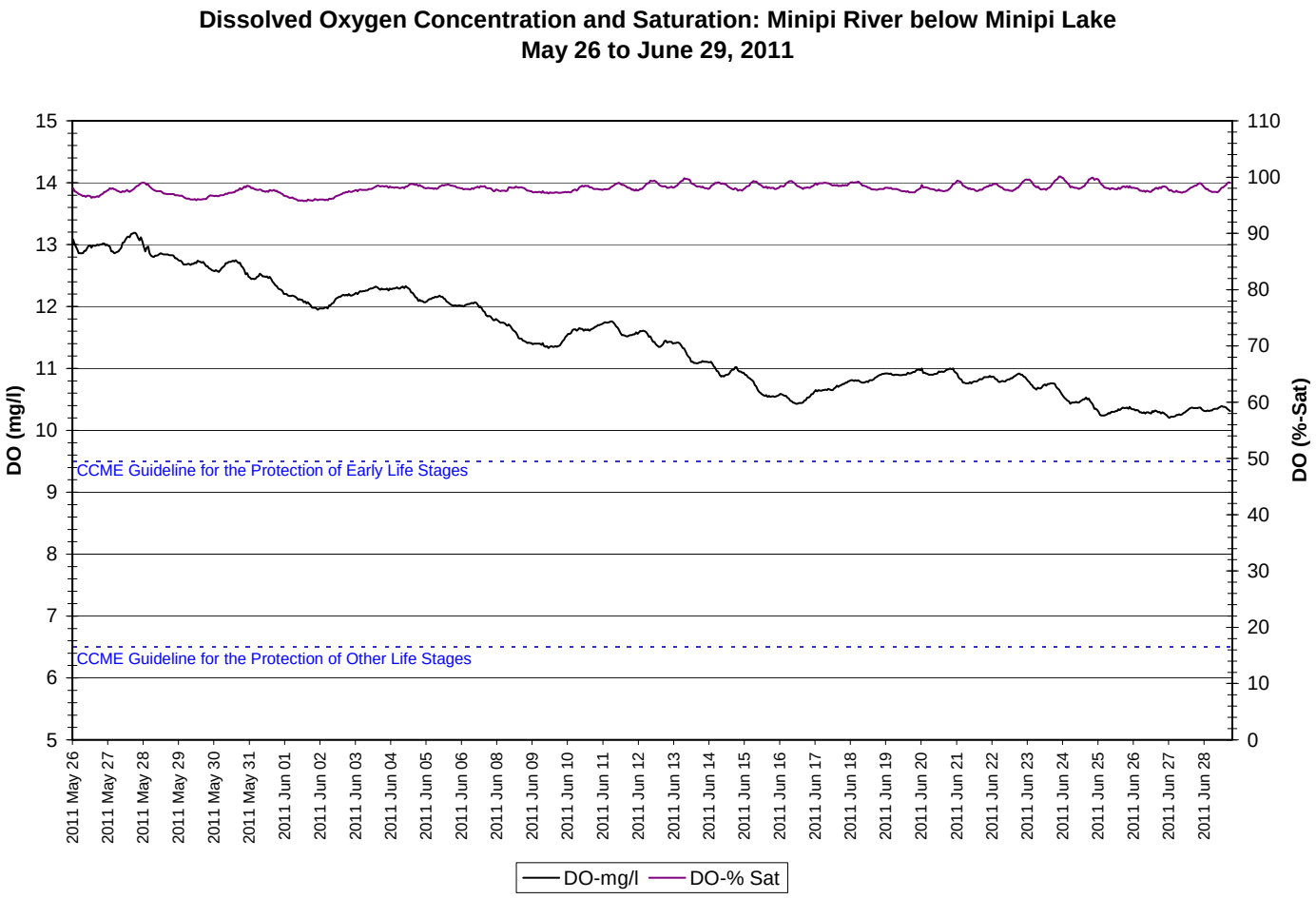


**Figure 5: Dissolved oxygen and percent saturation at Minipi River below Minipi Lake**

- 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.

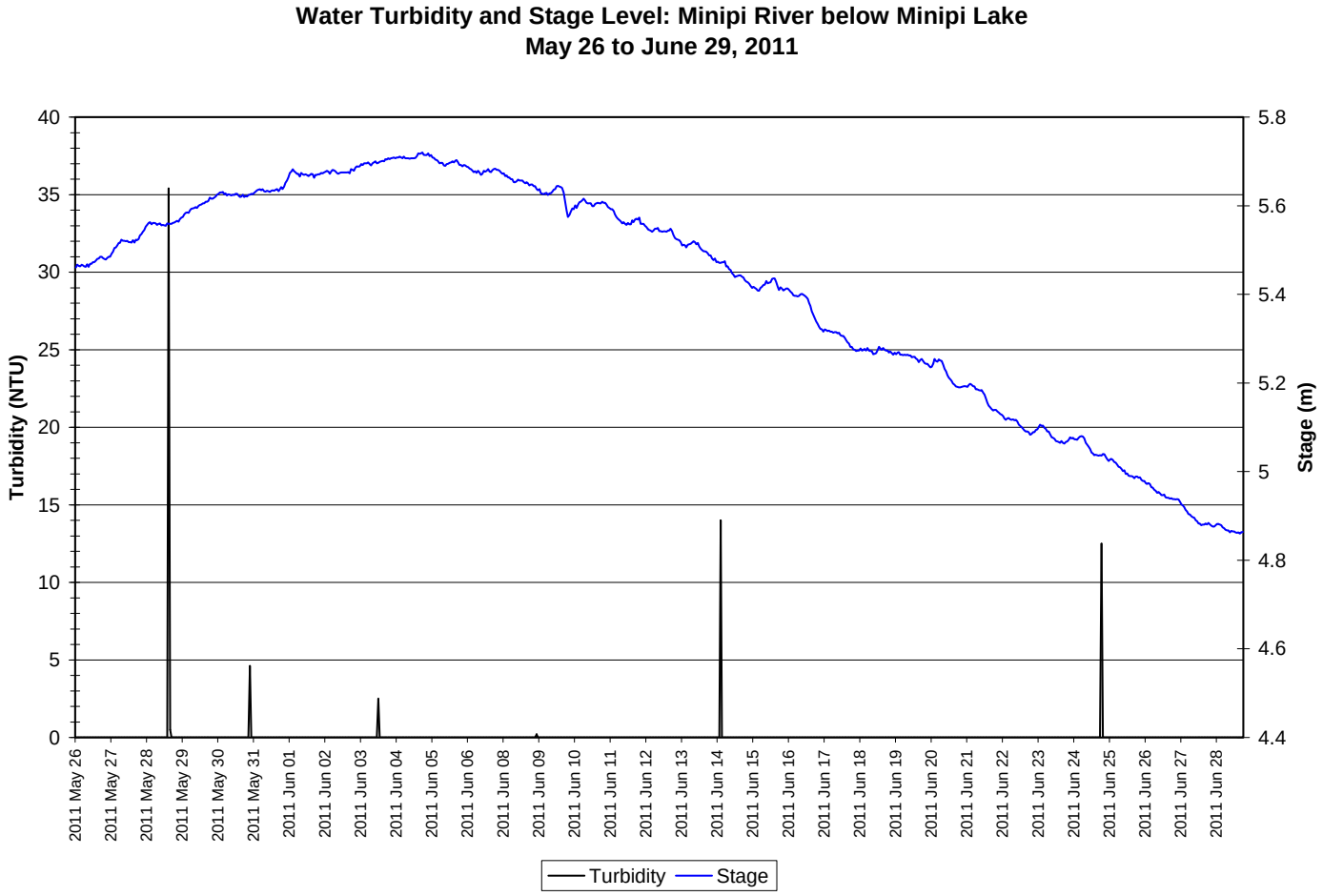


**Figure 6: Turbidity and stage level at Minipi River below Minipi Lake**

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

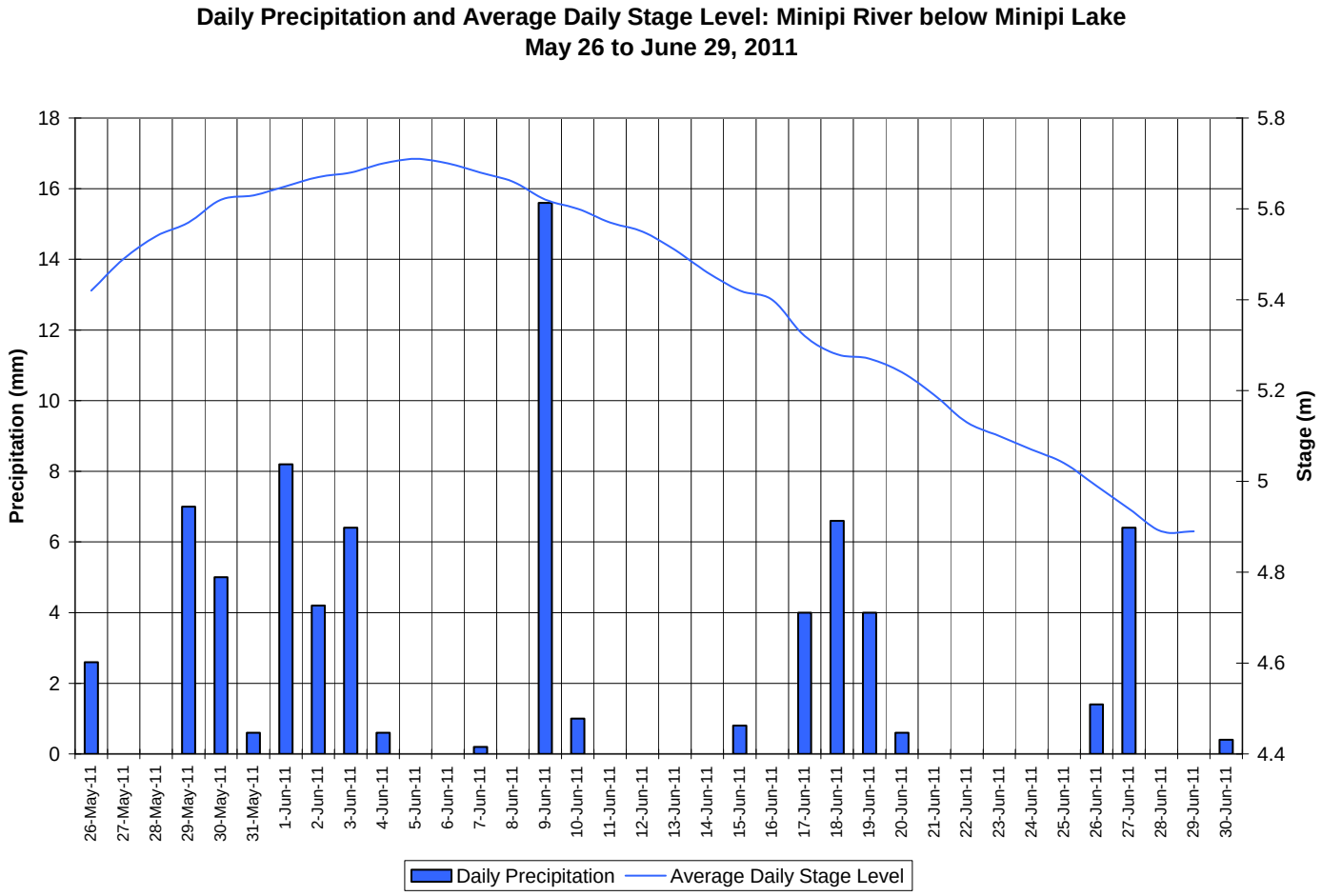


**Figure 7: Stage and precipitation at Minipi River below Minipi Lake**

## Conclusions

- An instrument at the water quality monitoring station on the Minipi River below Minipi Lake was deployed on May 26 and removed on June 29.
- 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 and dissolved oxygen.

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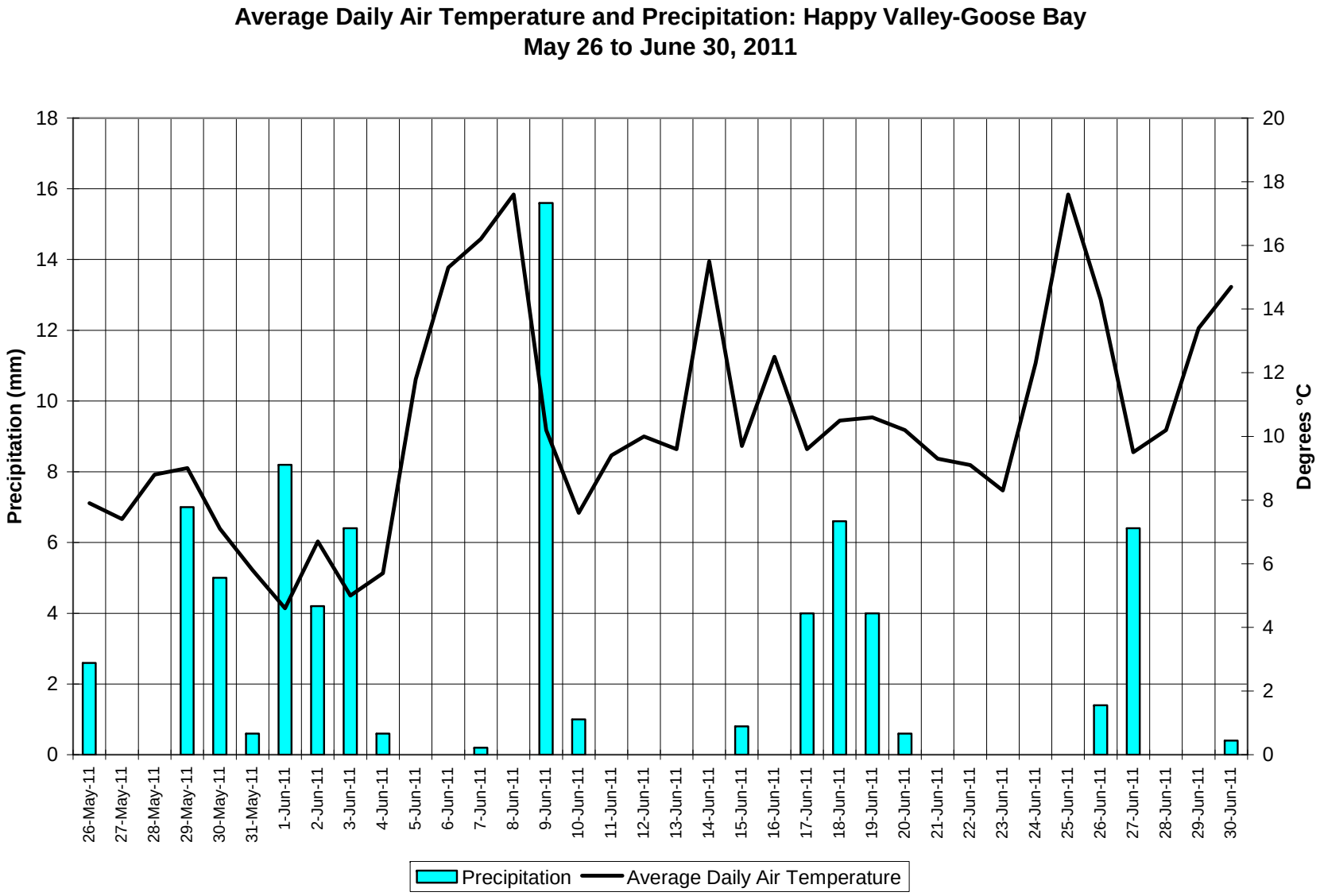
## Appendix 1


Average Daily Air Temperature and Precipitation: Happy Valley-Goose Bay
May 26 to June 30, 2011
Precipitation (mm)
Degrees °C
0
2
4
6
8
10
12
14
16
18
20
26-May-11
27-May-11
28-May-11
29-May-11
30-May-11
31-May-11
1-Jun-11
2-Jun-11
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Precipitation
Average Daily Air Temperature