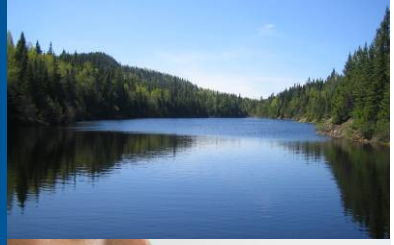
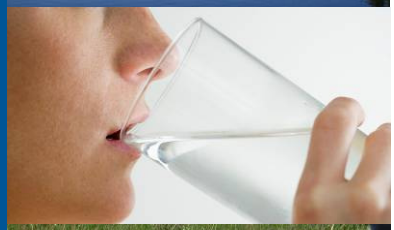






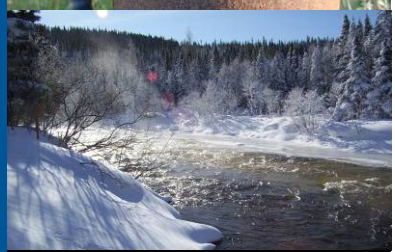

Real Time Water Quality Report
Minipi River

Deployment Period 2010-09-21 to 2010-11-03

2010-11-17

Newfoundland Labrador

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

General

- Water Resources Management Division (WRMD) staff monitors the real-time web page on a daily basis.

Maintenance and Calibration of Instrumentation

- After being cleaned and freshly calibrated the **DataSonde®** for Minipi River was installed on September 21, 2010, and remained deployed continuously until November 3, 2010, a 43 day period. On September 21, 2010, the instrument was checked *in situ* against a freshly calibrated **MiniSonde®** to verify that it was functioning properly.

Quality Assurance / Quality Control (QA/QC) Measures

- As part of the QA/QC protocol, an assessment of the reliability of data recorded by an instrument is made at the beginning and end of the deployment period. See **Table 1**.

	Rank				
Parameter	**Excellent**	**Good**	**Fair**	**Marginal**	**Poor**
Temperature (oC)	<=+/-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

Table 1: Ranking limits for Parameters

- Upon deployment, a QAQC **MiniSonde®** is temporarily deployed along side the Field **DataSonde®**. Values for temperature, pH, conductivity, dissolved oxygen and turbidity are compared between the two instruments. Based on the difference between parameters recorded by the Field **DataSonde®**, QAQC **MiniSonde®** a qualitative statement is made on the data quality upon deployment.
- At the end of a deployment period, readings are taken in the water body from the Field **DataSonde®** before and after a thorough cleaning in order to assess the degree of biofouling. During calibration in the laboratory, an assessment of calibration drift is made and the two error values are combined to give Total Error (T_e). If T_e exceeds a predetermined data correction criterion, a correction based on T_e is applied to the dataset using linear interpolation. Based on the value for T_e, a qualitative statement is also made on the data quality upon removal.
- The rankings at the beginning and end of the deployment period are shown in **Table 2** for Minipi River.

- At the time of deployment all parameters are ranked as *Excellent*. At the time of removal the parameters Temperature, Specific Conductivity, Dissolved Oxygen and Turbidity maintained *Excellent* rankings. pH ranking had dropped slightly to *Good.* pH sensors take a considerable amount of time to stabilize in a water body to obtain a 'true' reading , this instrument may have required some extra time before the reading was taken at that point in time, however this sensor will still provide a valid reading.

- There is a gap in the data during this deployment period from September 21 through to September 25, 2010. Investigation by Environment Canada into the cause of the missing data was conducted on site. It was identified that the connection cable (leads out of the hut down to the instrument) at Minipi River had been tampered with by either a bear or moose and was damaged and disconnected.

- 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 Quality Assurance and Quality Control (QA/QC) protocol. Water Survey of Canada is responsible for QA/QC of water quantity data (Stage). Corrected data can be obtained upon request. Where appropriate, corrected data for water quality parameters are indicated.

Minipi River Station		
Date (yyyy-mm-dd)	**Parameter**	**Ranking**
2010-09-21 Deployment SN:47384	Temp (°C)	Excellent
	pH (units)	Excellent
	Sp. Conductivity (uS/cm)	Excellent
	Dissolved Oxygen (mg/L)	Excellent
	Turbidity (NTU)	Excellent
2010-11-03 Removal SN:47384	Temp (°C)	Excellent
	pH (units)	Good
	Sp. Conductivity (uS/cm)	Excellent
	Dissolved Oxygen (%)	Excellent
	Turbidity (NTU)	Excellent

Table 2: QA/QC Data Comparison Rankings for deployment between September 21 and November 3, 2010

DATA INTERPRETATION

WATER TEMPERATURE

- The hourly water temperature values (**Figure 1**) ranged from a minimum of 3.58˚C to a maximum of 10.80˚C.
- There is a natural decline in the water temperature as the seasons start to adjust to a cooler air temperature. This is evident in Figure 1 as the temperature levels drop in November.
- Stage can be defined as the height of the surface of a river or other fluctuating body of water above a set point. The set point is the bottom axis of this graph.
- Water temperature follows a natural diurnal pattern over this deployment period.
- On November 3, 2010 the instrument was removed for the winter season, and is scheduled for redeployment in the spring of 2011.

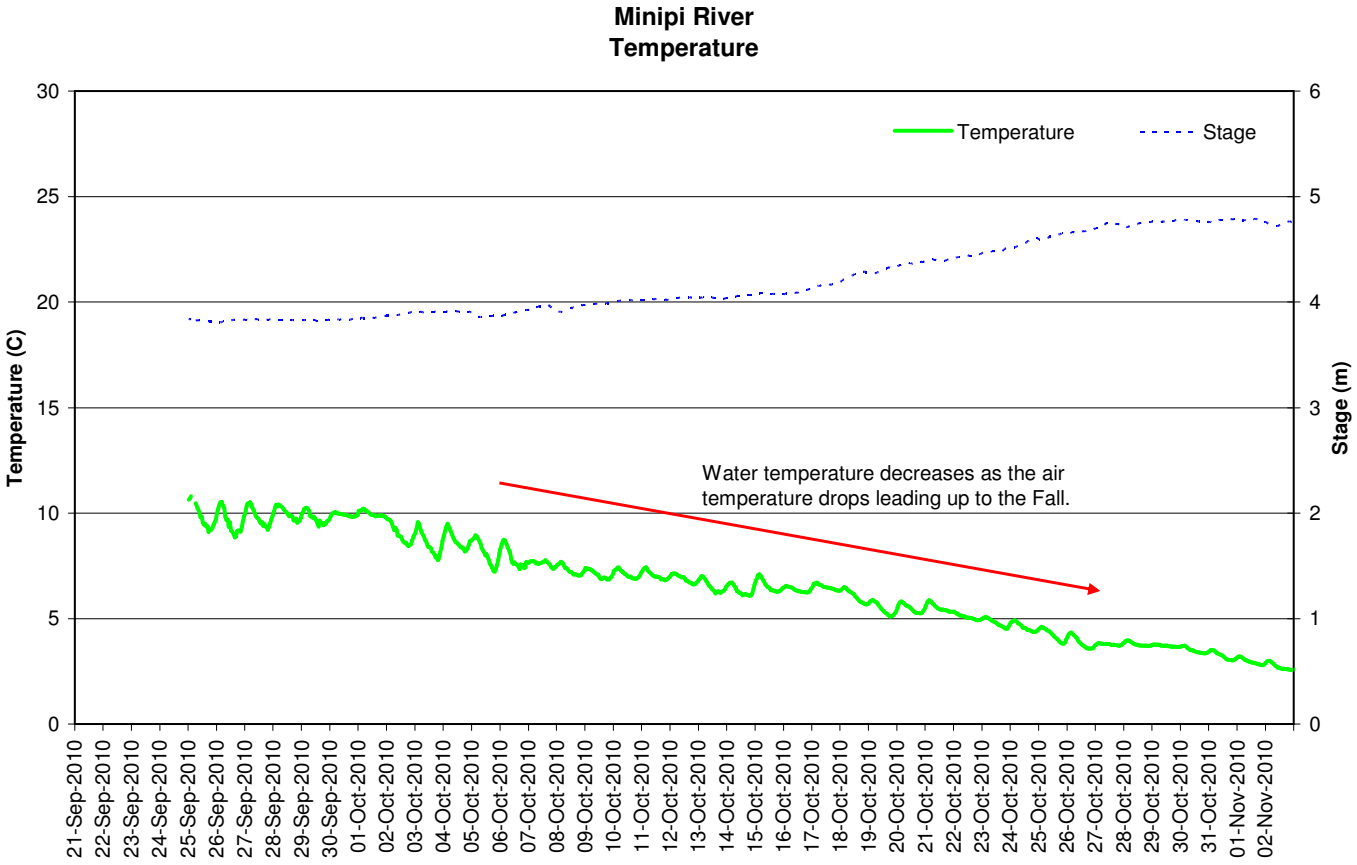

Figure 1: Water Temperature at Minipi River

pH

- Throughout the deployment period the hourly pH values (**Figure 2**) ranged from a minimum of 6.86 to a maximum of 7.14.
- pH during this deployment period is reasonably stable with no evidence of changes in the values.
- The background pH of Minipi River is historically constant around the minimum limit for the CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life* recommended range.

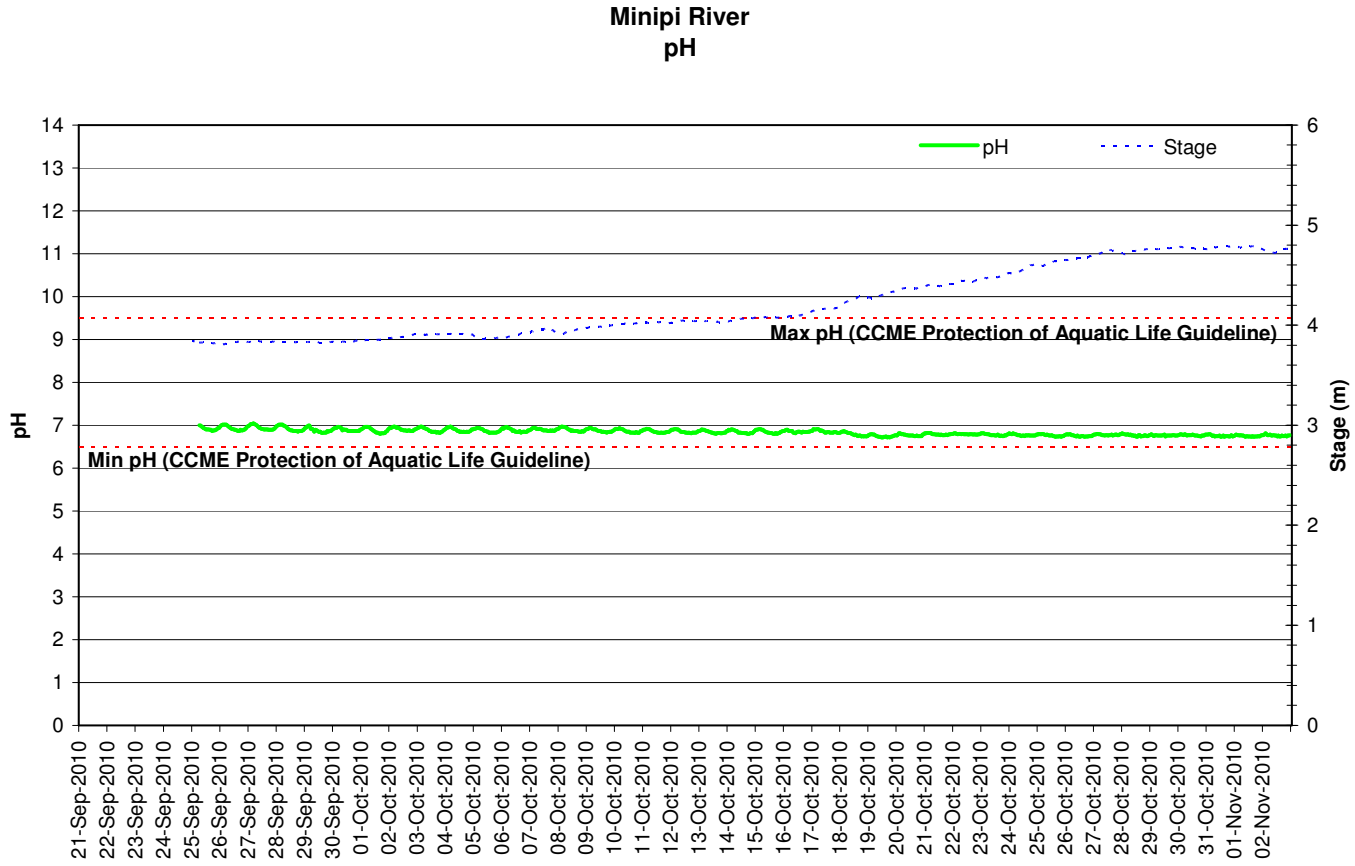

Figure 2: pH values at Minipi River

SPECIFIC CONDUCTIVITY

- The hourly specific conductivity **(Figure 3)** ranged from a minimum of 14.0µS/cm to a maximum of 16µS/cm over the deployment period.
- Specific Conductivity remained reasonably constant during the deployment month.
- The median for conductivity at this station is ~15µS/cm.
- The conductivity range displayed in Figure 3 is minimal; it just appears significant due to the scale of the graph.
- There is evidence of a significant relationship between conductivity and stage, as stage increases the conductivity levels decrease slightly. This is a frequent and standard relationship, as rainfall dilutes the water body it saturates the dissolved substances (salts) in the water body and creates a lower reading for conductivity.

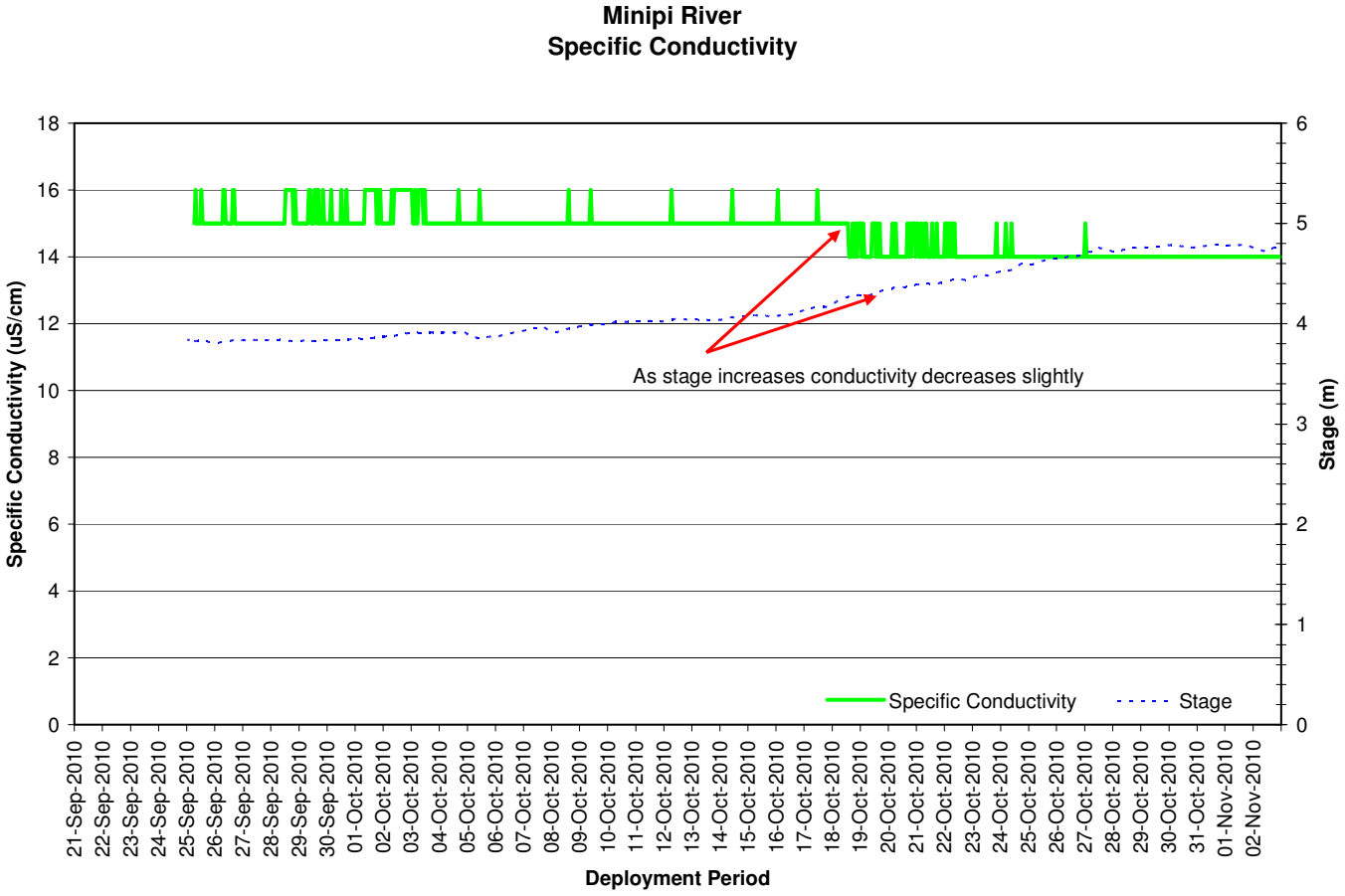

Figure 3: Minipi River Specific Conductivity Values

DISSOLVED OXYGEN

- The hourly dissolved oxygen (DO) (**Figure 4**) values ranged from a minimum of 10.42mg/L to a maximum of 12.77mg/L over the deployment period.
- During the deployment period the DO(mg/L) values gradually increased toward the end of November 2010. As air and water temperatures cool the DO(mg/L) content will increase in the water body, this is a natural and expected trend.
- The DO(mg/L) values for the deployment period remained above the ranges recommended by CCME *Water Quality Guidelines for the Protection of Aquatic Life*.
- For the majority of the deployment period the DO values remained constant. The median value for DO (mg/L) is 11.32mg/L

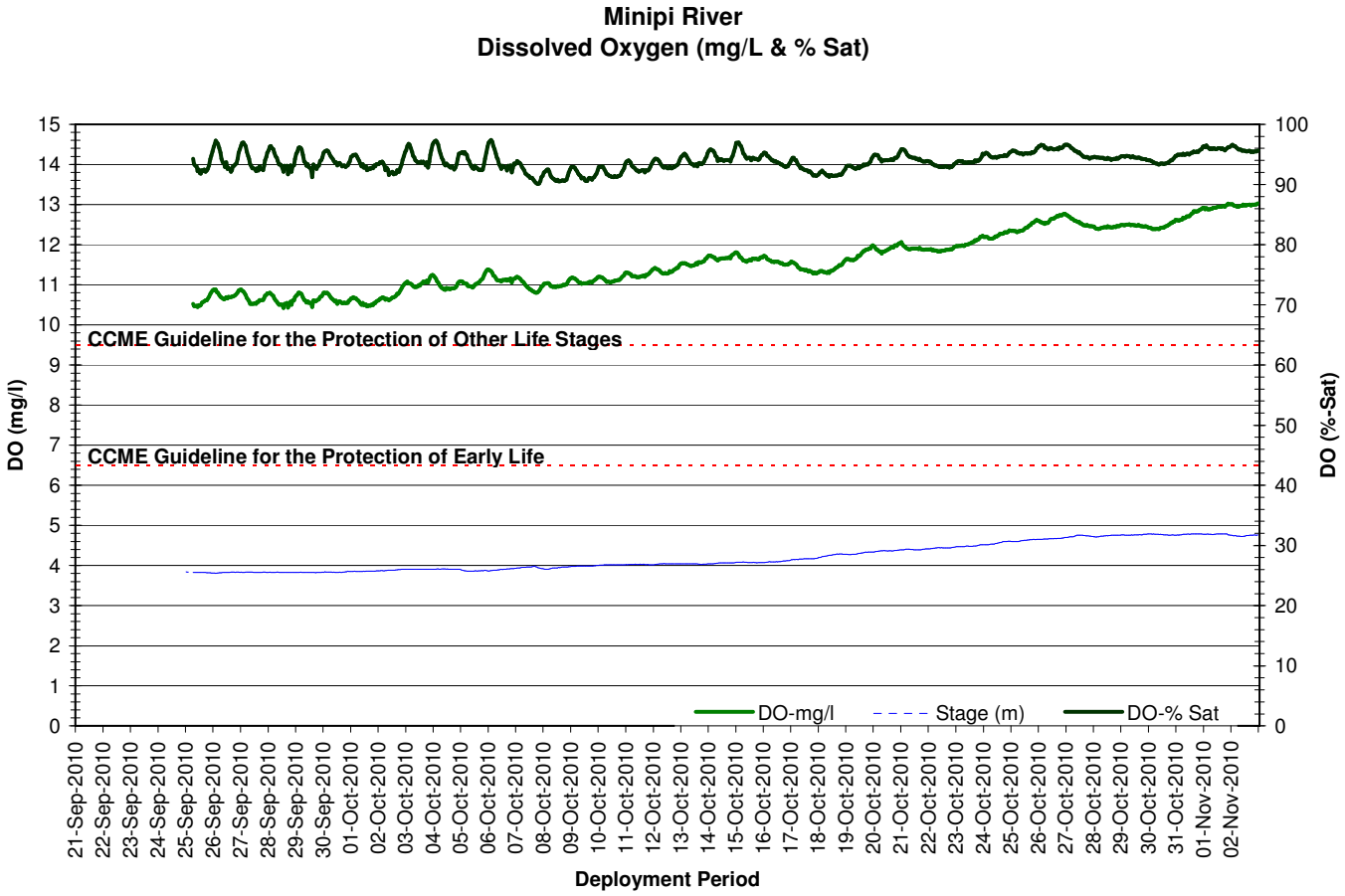

Figure 4: Dissolved Oxygen (mg/L & % Sat) at Minipi River

TURBIDITY

- The hourly turbidity values (**Figure 5**) range from a minimum of 0.0NTU to a maximum of 3.9NTU over the deployment period.
- The peaks noted on the graph are possibility due to debris passing over the sensor at the time the reading is taken.
- Turbidity readings at Minipi River are historically low. The turbidity levels are demonstrated on figure 5; it is also identifiable by the median for the turbidity levels during this deployment period, which was 0.0NTU.

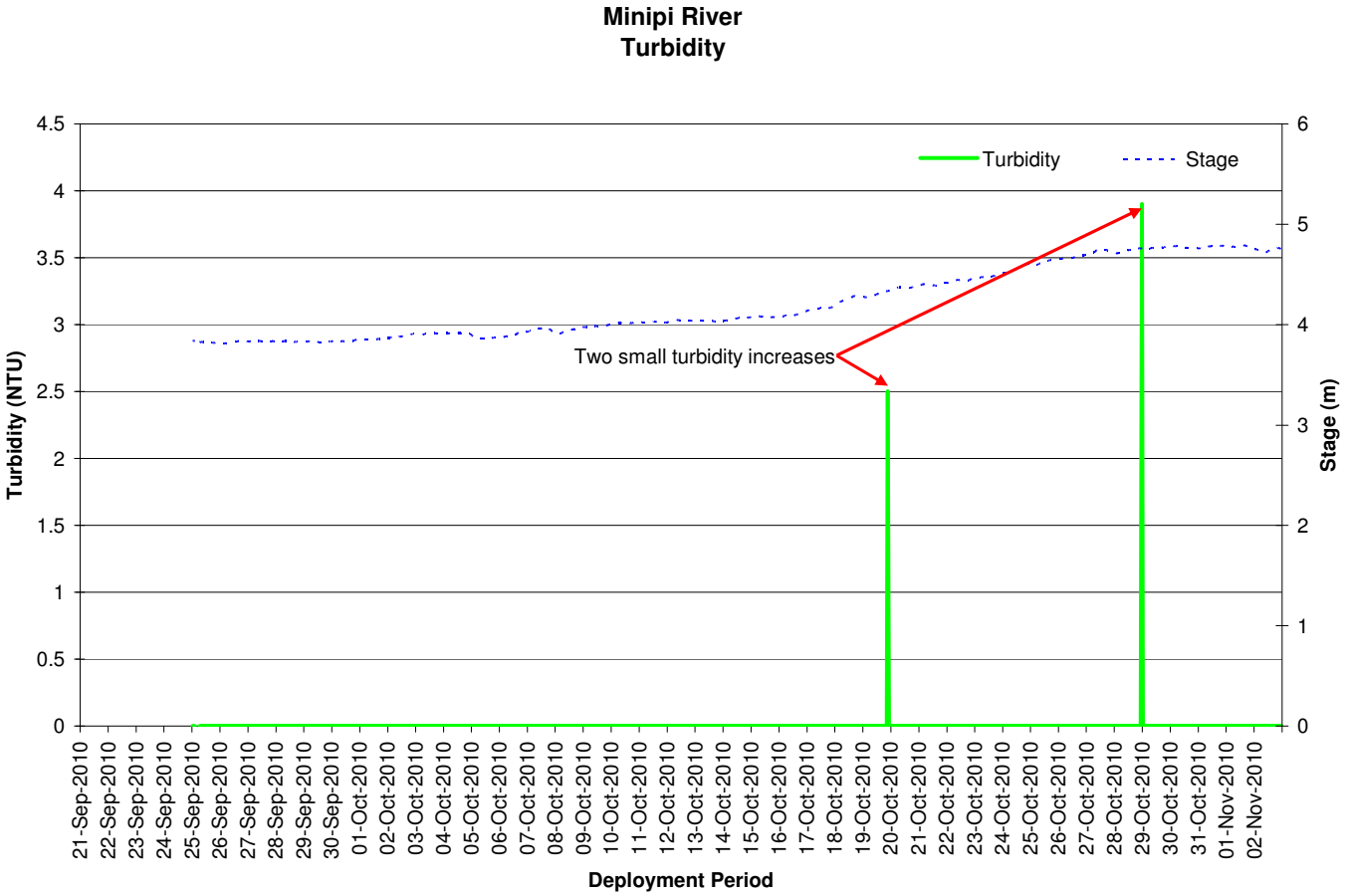

Figure 5: Turbidity Values for Minipi River

STAGE AND STREAM FLOW

- Stage can be defined as the height of the surface of a river or other fluctuating body of water above a set point. The set point is the bottom axis of this graph.
- The stage (**Figure 6)** ranged from a minimum of 3.81m to a maximum of 4.78m with the highest peaks corresponding with precipitation events.
- The stream flow ranged from minimum of ~24m³/s to a maximum of 76.2m³/s. Stream flow can be influence by precipitation events and corresponding runoff.
- Stream flow remained steady at initial deployment, over time there is an evident increase in stream flow and it continues to peak at the end of the deployment period. The increase in stream flow also corresponds with a slight increase in stage.

PRECIPITATION

- The closest recorded rainfall to Minipi River is at a weather station in Happy Valley – Goose Bay. This station is monitored by Environment Canada, where the data is available at http://www.climate.weatheroffice.gc.ca/climateData/dailydata_e.html?Prov=XX&timeframe=2&StationID=6777&Day=1&Month=5&Year=2010&cmdB1=Go
- **Figure 6** indicates the range of precipitation for this area between September 22 to November 3 2010.
- According to the rainfall recorded in Happy Valley- Goose Bay, the highest rainfall was ~34mm on October 2, 2010, with the lowest rainfall recorded was ~0.4 mm which occurred over several deployment days.

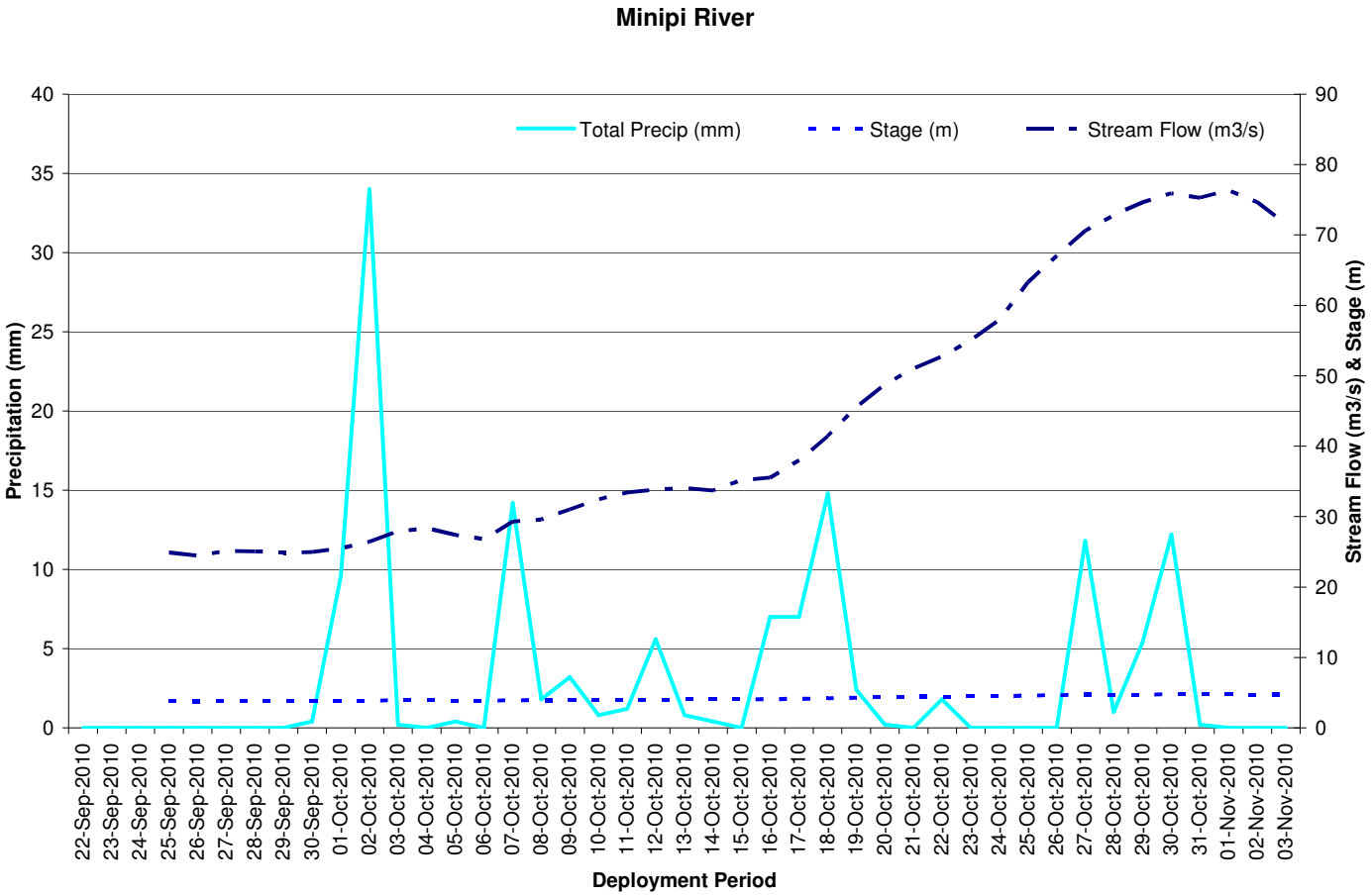

Figure 6: Minipi River stream flow and stage, compared with Happy Valley-Goose Bay precipitation.

CONCLUSION

During the deployment period between September 22, and November 3, 2010 a water quality monitoring instrument was deployed at the station on Minipi River below Minipi Lake. There was no significant water quality events recorded at the Minipi River. However there is a gap in the data from, September 21 to September 25, 2010. It was concluded by Environment Canada that the connection cable (leads out of the hut down to the instrument) at Minipi River had been tampered with by either a bear or moose and was eaten right through.

For the reminder of the deployment period the river has maintained a consistent and natural trend during monitoring, with any events that occurred able to be explained due to natural influences (i.e. rainfall, runoff, high flow). All parameters presented in this report display typical seasonal patterns over this deployment period of ~43 days. As air temperatures drop, there was corresponding decreases in water temperature as depicted in Figure 1. Water temperature will also influence dissolved oxygen (mg/L) content, as noted on Figure 4 as the DO levels rise slightly toward the end of September into October. pH levels maintain a steady and consistent reading throughout deployment as noted on Figure 3, these readings are also within the ranges for the *CCME Guidelines for the Protections of Aquatic Life.* Stage and stream flow are directly influenced by, rainfall events (peaks in data), drier phases throughout deployment and by natural evaporation rates (dips in the data).

This Minipi River below Minipi Lake station is operating well and displays all natural trends one would expect to identify in this water body.

Prepared by:

Tara Clinton
Water Resources Management Division
Department of Environment and Conservation
taraclinton@gov.nl.ca
(709) 729 5925