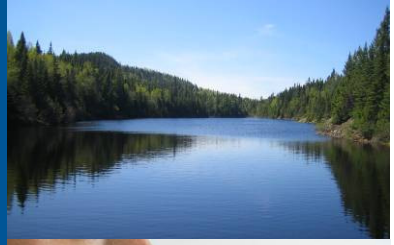
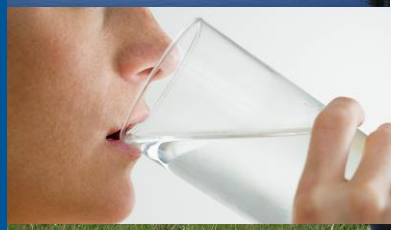






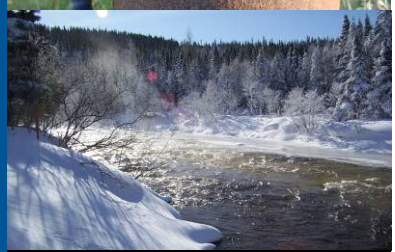

Real Time Water Quality Report
Minipi River

Deployment Period 2010-08-22 to 2010-09-21

2010-10-10

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 August 22, 2010, and remained deployed continuously until September 21, 2010, a 29 day period. On August 22, 2010, the instrument was checked *in situ* against a freshly calibrated **MiniSonde®** to verify that it was functioning properly, and had no significant drift.

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 Specific Conductivity, Dissolved Oxygen and Turbidity maintained *Excellent.* However Temperature and pH dropped slightly in their ranking. The temperature sensor on the QA/QC sonde may not have been left in the water body for an adequate amount of time before a reading was taken, when the readings are compared this can have affect on the outcome. The pH sensor only dropped to *Good,* however still provides a valid reading.

- 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**
2010-08-22 Deployment SN:43820	Temp (°C)	Excellent
	pH (units)	Excellent
	Sp. Conductivity (uS/cm)	Excellent
	Dissolved Oxygen (mg/L)	Excellent
	Turbidity (NTU)	Excellent
2010-09-21 Removal SN:43820	Temp (°C)	Marginal
	pH (units)	Good
	Sp. Conductivity (uS/cm)	Excellent
	Dissolved Oxygen (%)	Excellent
	Turbidity (NTU)	Excellent

Table 2: QA/QC Data Comparison Rankings for deployment between August 22 and September 21, 2010

DATA INTERPRETATION

WATER TEMPERATURE

- The hourly water temperature values (**Figure 1**) ranged from a minimum of 11.57˚C to a maximum of 19.55˚C.
- The temperature ranges are depicting a decline in water temperature from August into September as the climate gets cooler.
- 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. There are no water temperature events evident on the graph during this time.

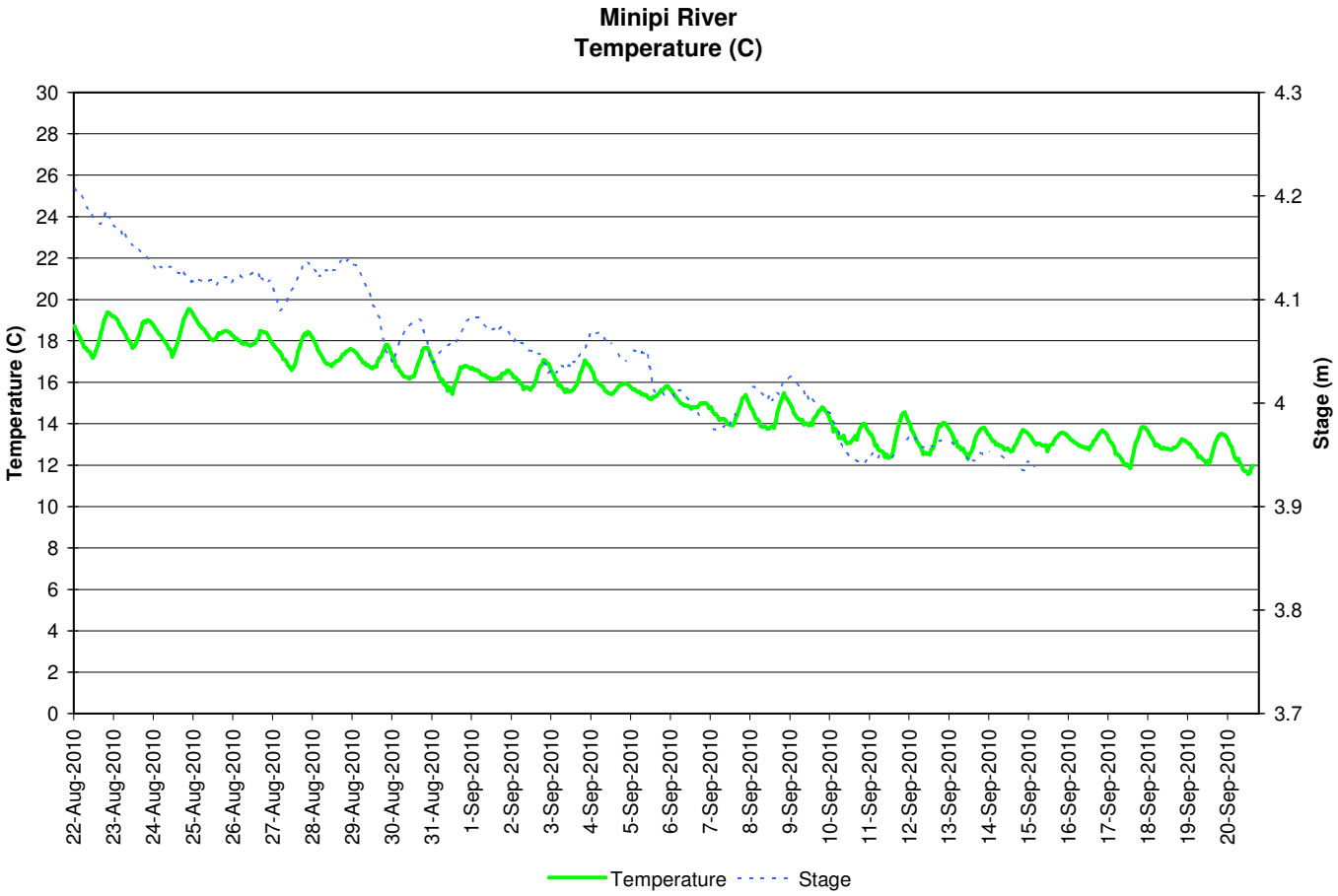

Figure 1: Water Temperature at Minipi River

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.

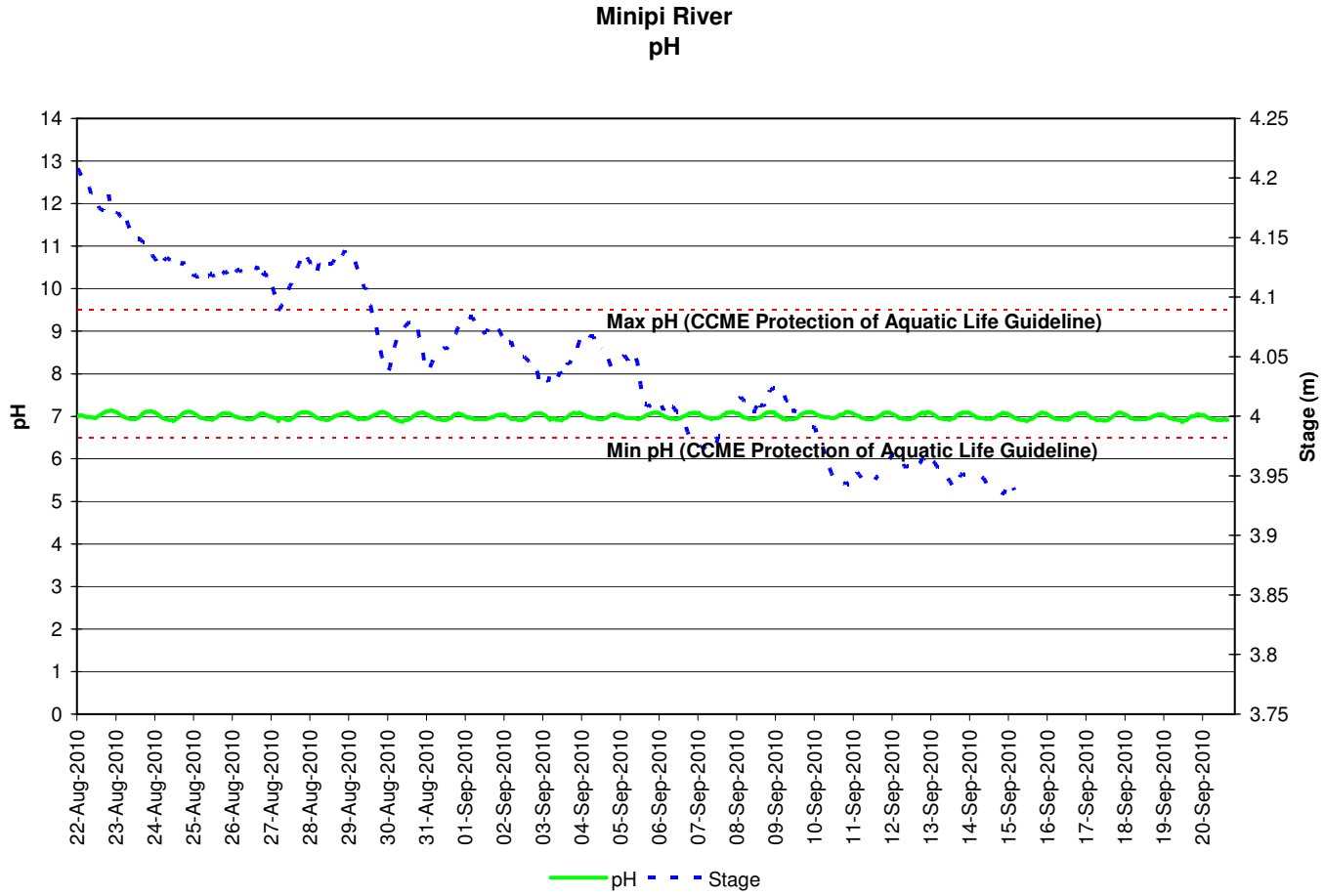

Figure 2: pH values at Minipi River

SPECIFIC CONDUCTIVITY

- The hourly specific conductivity **(Figure 3)** ranged from a minimum of 15.0µS/cm to a maximum of 17µS/cm over the deployment period.
- Specific Conductivity remained reasonably constant during the deployment month. There are several small increases in the values although still within the historical range for Minipi River. The median for conductivity at this station is ~16 µS/cm.
- The conductivity range displayed in Figure 3 is minimal; it just appears significant due to the scale of the graph.

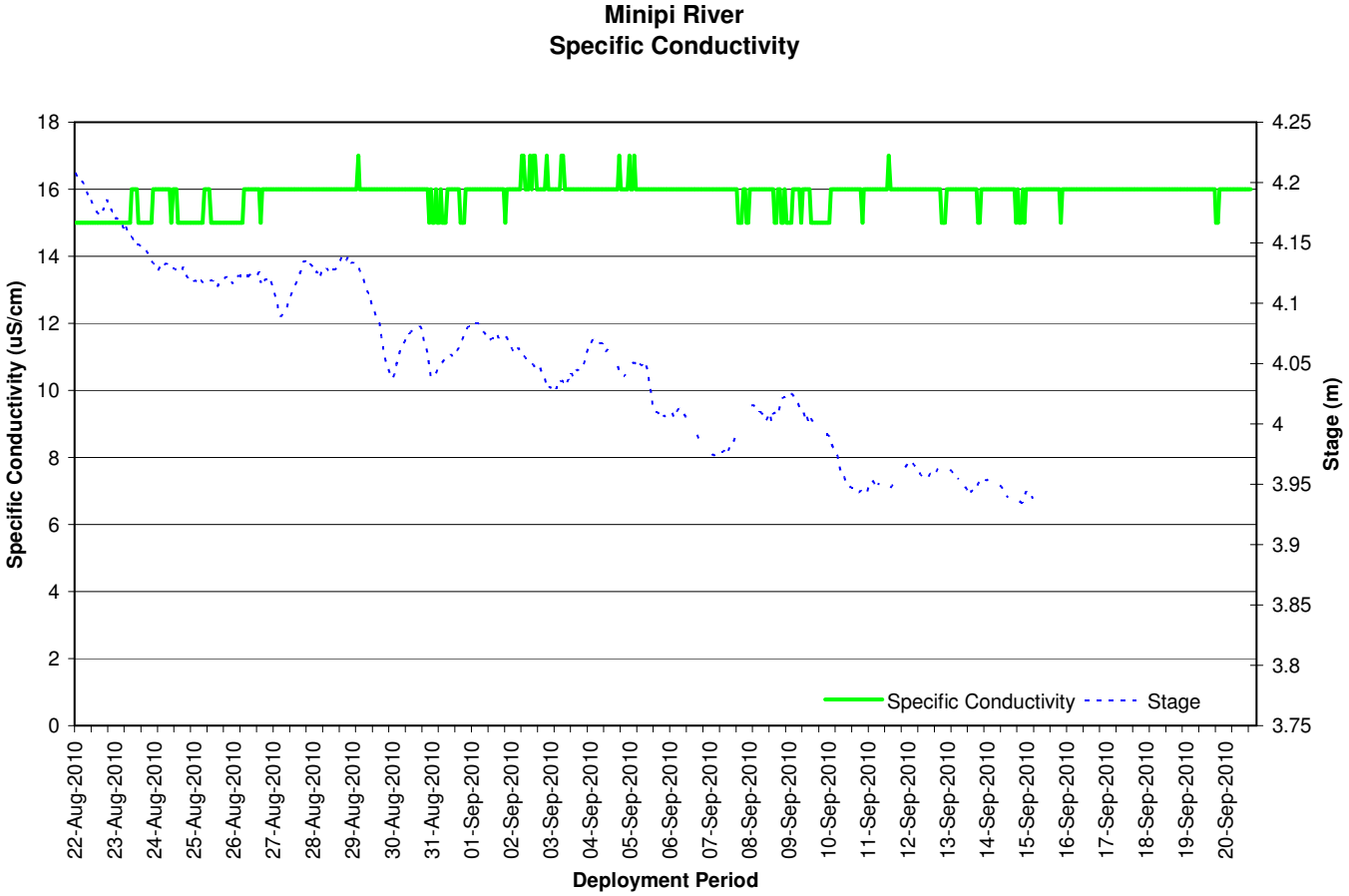

Figure 3: Minipi River Specific Conductivity Values

DISSOLVED OXYGEN

- The hourly dissolved oxygen (DO) (**Figure 4**) values ranged from a minimum of 8.63mg/L to a maximum of 10.16mg/L over the deployment period.
- During the deployment period the DO(mg/L) values gradually increased toward the end of September 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 August fell just below the limits recommended by CCME *Water Quality Guidelines for the Protection of Aquatic Life* (Other Life Stages – above 9.5 mg/L). However in early September the DO(mg/L) levels increased to above this CCME Guideline.
- The DO(mg/L) remained above the CCME *Water Quality Guidelines for the Protection of Aquatic Life* (Cold Water/Other Life Stages – above 6.5 mg/L) for the duration of deployment.
- For the majority of the deployment period the DO values remained constant. The median value for DO (mg/L) is 9.32mg/L

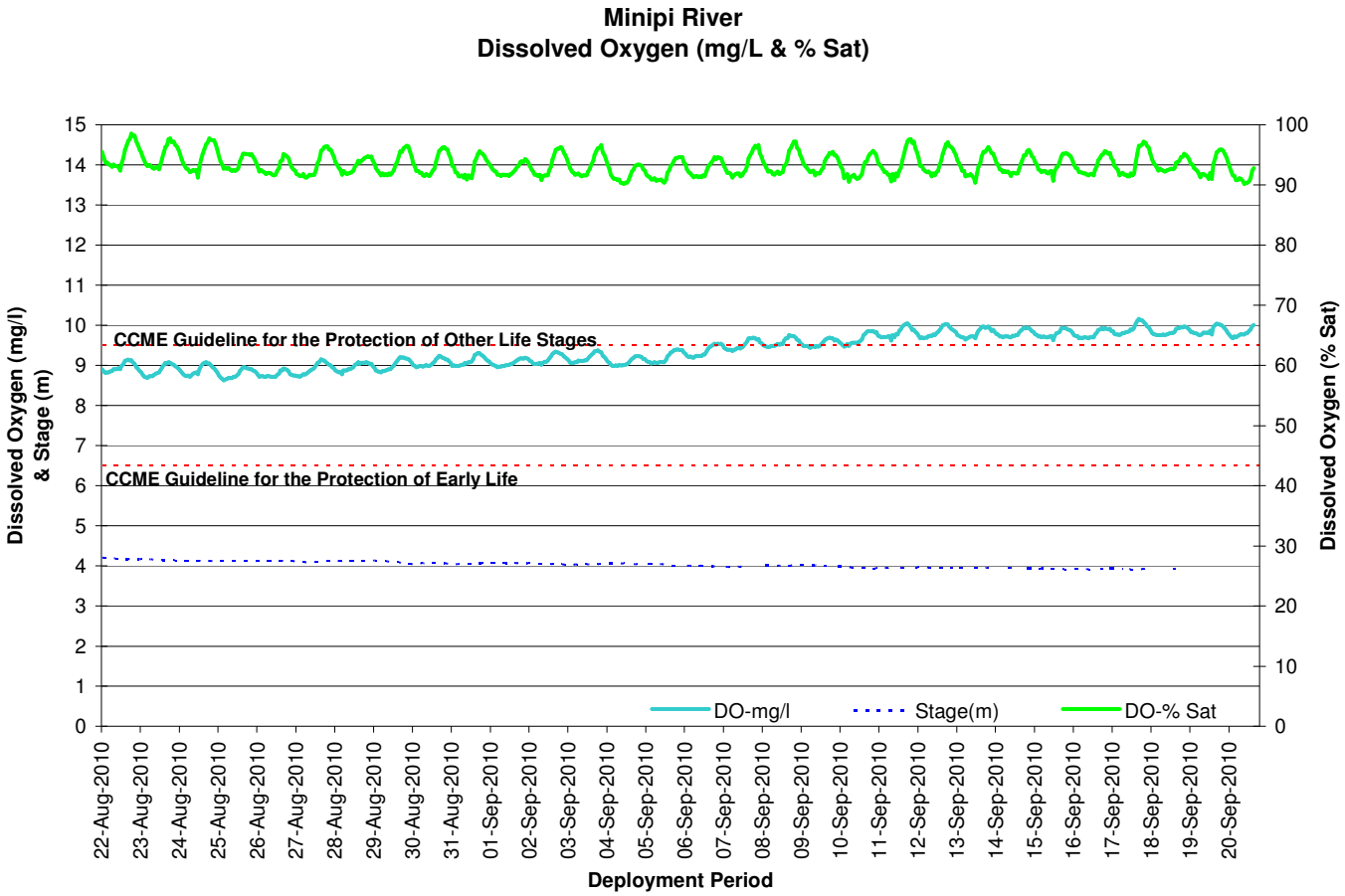

Figure 4: Dissolved Oxygen (mg/L & % Sat) at Minipi River

TURBIDITY

- The hourly turbidity values **(Figure 5)** range from a minimum of 0.0 NTU to a maximum of 15.4 NTU over the deployment period.
- The maximum turbidity reading was a unique reading in early September that peaked and immediately returned to ~0.0NTU. This event was likely a result of debris momentarily blocking the sensor window.
- Turbidity readings at Minipi River are historically low. While this is displayed clearly on figure 5, it is also identifiable by the median for the turbidity levels during this deployment period, which was 0.0NTU.

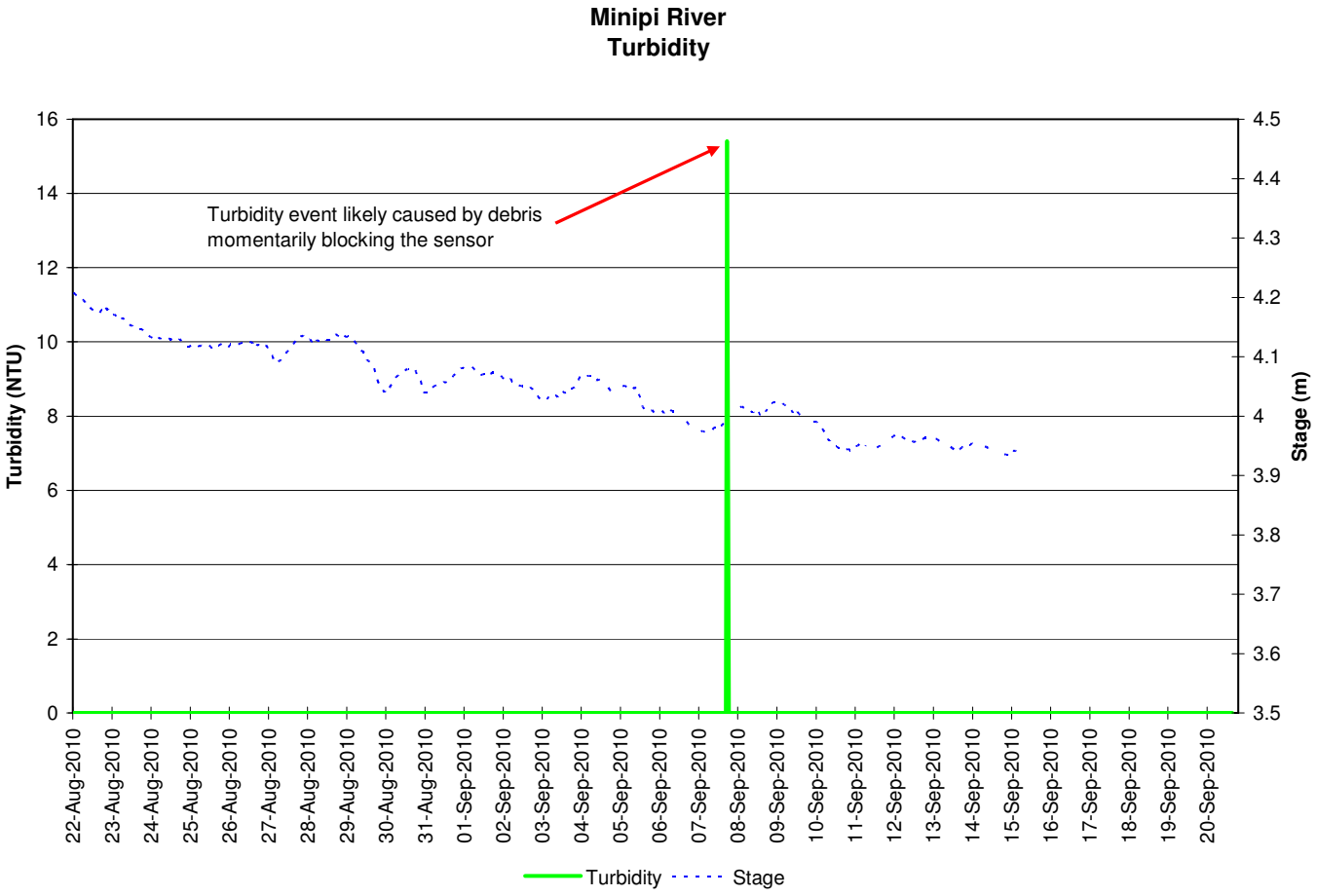

Figure 5: Turbidity Values for Minipi River

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 3.94m to a maximum of 4.21m with the highest peaks corresponding with precipitation events.
- The stream flow ranged from minimum of 29.4m³/s to a maximum of 43.1m³/s. Stream flow can be influence by precipitation events and corresponding runoff.
- Stream flow will naturally decrease during the deployment period as the air and water temperatures increases in the summer months.

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 August 22 to September 21, 2010.
- According to the rainfall recorded in Happy Valley- Goose Bay, the highest rainfall was ~29.2mm on September 5, 2010, with the lowest rainfall recorded was ~0.1 mm which occurred over several deployment days.

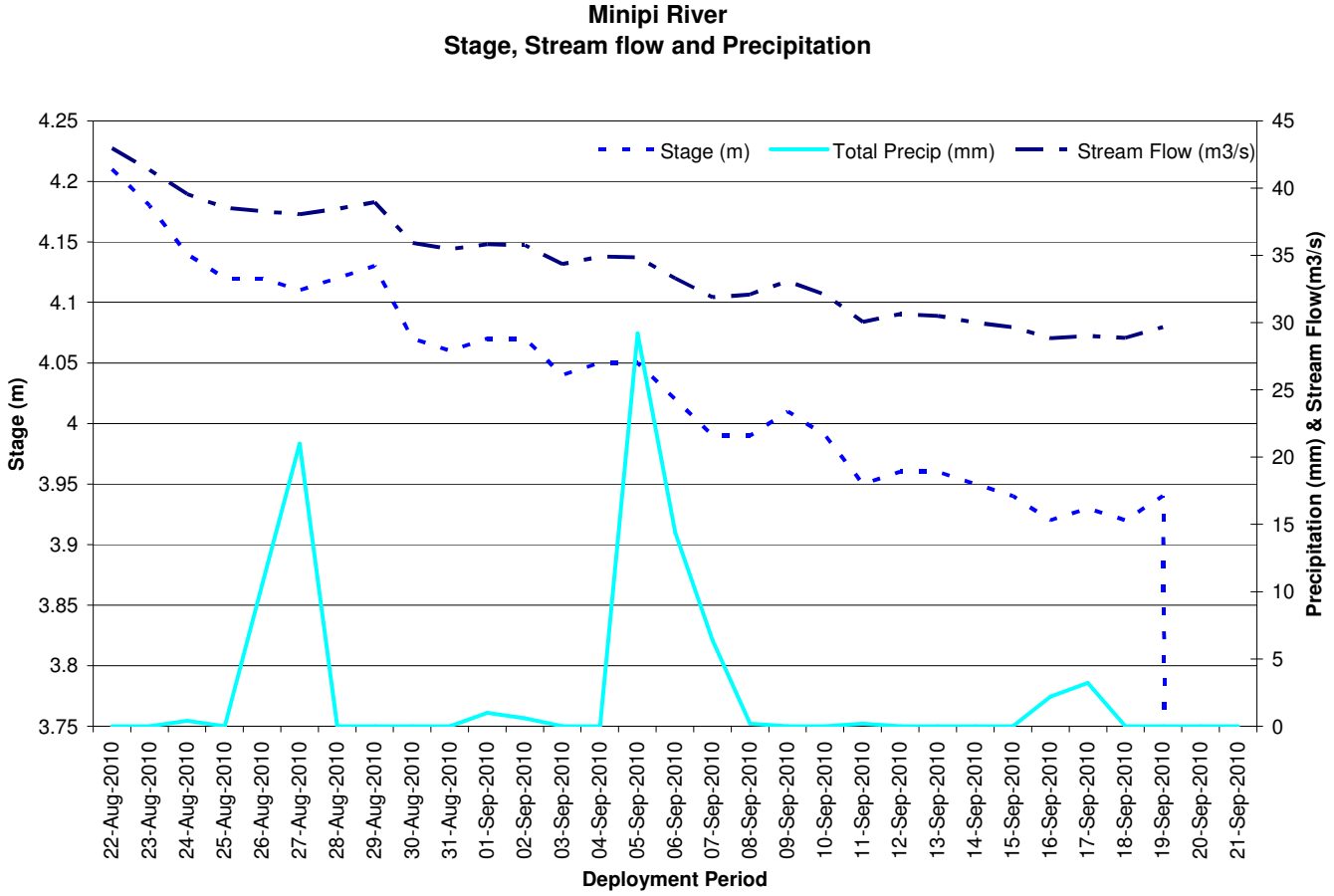

Figure 6: Minipi River stream flow and stage, compared with Happy Valley-Goose Bay precipitation.

CONCLUSION

During the deployment period between August 22, and September 21, 2010 a water quality monitoring instrument was deployed at the station on Minipi River below Minipi Lake. There was no water quality events recorded at the Minipi River. This 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 ~29 days. As air temperatures drop, there will be 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 toward the end of September. pH levels maintain a steady and consistent reading throughout deployment as noted on Figure 3, and remains within the ranges for the *CCME Guidelines for the Protections of Aquatic Life.* Stage is directly influenced by, rainfall events (peaks in data), drier phases throughout deployment and by natural evaporation rates (dips in the data). Therefore as noted in Figure 6, stage is indicating a natural pattern over the deployment period.

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

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