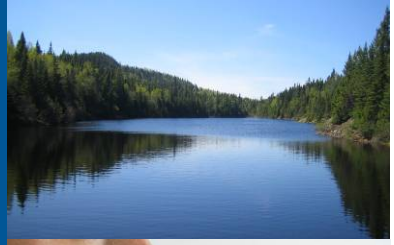
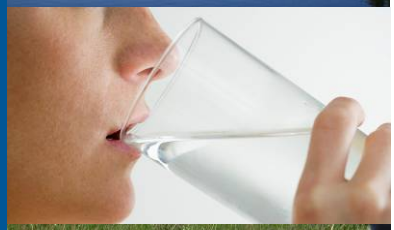



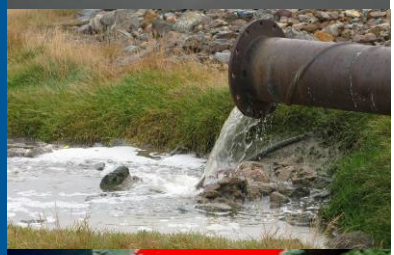


Real Time Water Quality Report Southwest Brook below Southwest Pond

Deployment Period 2010-10-19 to 2010-11-14

2010-12-20

Newfoundland Labrador

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

General

- This station is operated cooperatively with the Miawapukek First Nation (Conne River) as a Pilot Project for Drinking Water Source Monitoring. This is the only known application of Real Time Water Quality Monitoring for a drinking water source for any First Nations community in Canada.
- The Water Resources Management Division (WRMD) staff monitors the real-time web page on a daily basis. Any unusual observations are investigated, with site visits being carried out as warranted.
- Operators at Conne River are informed of any significant water quality events or instrumentation problems by WRMD.
- Site visits for QA/QC purposes are conducted by WRMD approximately four times per year.
- Monthly calibration and maintenance is undertaken by Cyrus Lambert at the Conne River Water Treatment Plant.
- The graphs below may sometimes show vertical lines from the data string to zero or the bottom of the graph. These lines should be ignored, as they are an artefact of individual missing data points. We are working to resolve this issue.

Maintenance and Calibration of Instrumentation

- After being cleaned and freshly calibrated the regular **DataSonde®** (s/n 44422) was installed on October 19, 2010, and remained deployed continuously until November 14, 2010, a 26 day period.

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. The procedure is based on the approach used by the United States Geological Survey. 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

- Upon deployment, a QA/QC **MiniSonde®** is temporarily deployed along side the Field **DataSonde®**. Values for temperature and dissolved oxygen are compared between the two instruments. A grab sample is taken to compare with the Field **DataSonde®** for specific conductivity, pH and turbidity parameters. Based on the difference between parameters recorded by the Field **DataSonde®**, QAQC **MiniSonde®** and grab sample a qualitative statement is usually made on the data quality upon deployment.
- At the end of a deployment period, readings are taken in the water body from the Field **MiniSonde®** (usually **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 ranking at the beginning and end of the deployment period are shown in **Table 2**.
- The 'Marginal' ranking for pH at the beginning of the deployment period represents the difference between the measurement on the field Sonde and lab results from the grab sample.
- The 'Marginal' ranking for Specific Conductivity at the end of the deployment period represents the difference between the measurement on the field Sonde and laboratory calibration.
- 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. Corrected data can be obtained upon request. Where appropriate, corrected data for water quality parameters are indicated.

Southwest Brook below Southwest Pond (NF02ZE0033)		
Date (yyyy-mm-dd)	**Parameter**	**Ranking**
2010-10-19 Deployment	Temp (^oC)	Excellent
	pH (units)	Marginal
	Sp. Conductivity (uS/cm)	Good
	Dissolved Oxygen (mg/L)	Fair
	Turbidity (NTU)	Excellent
2010-11-14 Removal	Temp (^oC)	Excellent
	pH (units)	Good
	Sp. Conductivity (uS/cm)	Marginal
	Dissolved Oxygen (%)	Excellent
	Turbidity (NTU)	Excellent

Table 2

Data Interpretation

- The water temperature (**Figure 1**) ranged from a minimum of 4.43 ˚C to a maximum of 10.83 ˚C, with temperature decreasing throughout the deployment period.
- While there appears to be little correlation with stage, there is far less diurnal variation during periods of increased stage, presumably due to precipitation, cloud cover and lower daytime ambient air temperatures.
- As fouling and instrument drift were negligible, no data corrections are made for temperature.

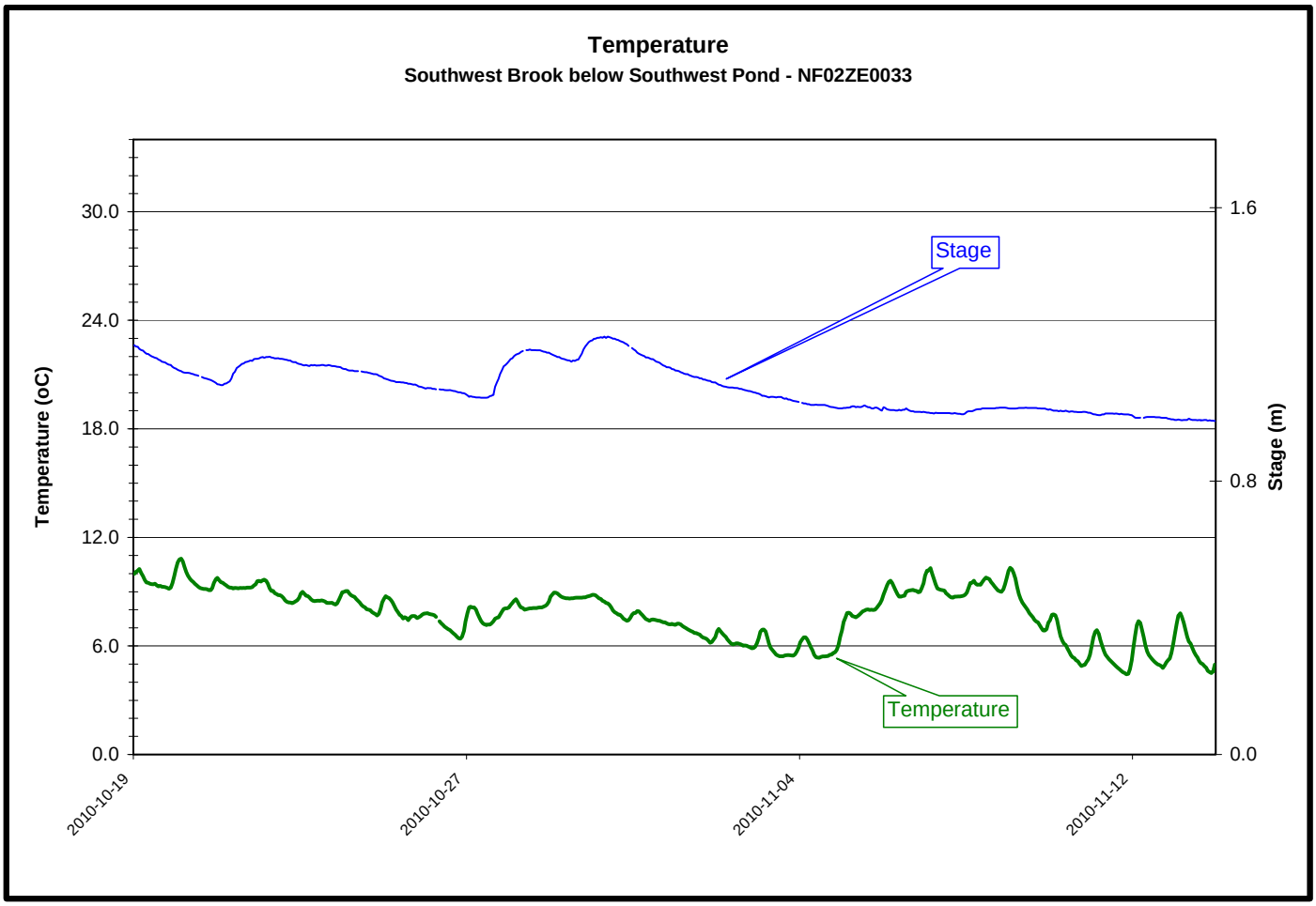

Figure 1

- Throughout the deployment period pH values (**Figure 2**) ranged from a minimum of 4.88 to a maximum of 5.33 with all the values falling below the recommended range (6.5 – 9.0) for the CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life*.
- The background pH of this stream is normally lower than the lower limit of the recommended range.
- The QA/QC protocol revealed a slight increase of 0.23 % in pH over the 26 day deployment period. The majority of this change was due to fouling. Accordingly, the correction factor has been applied to the raw data.

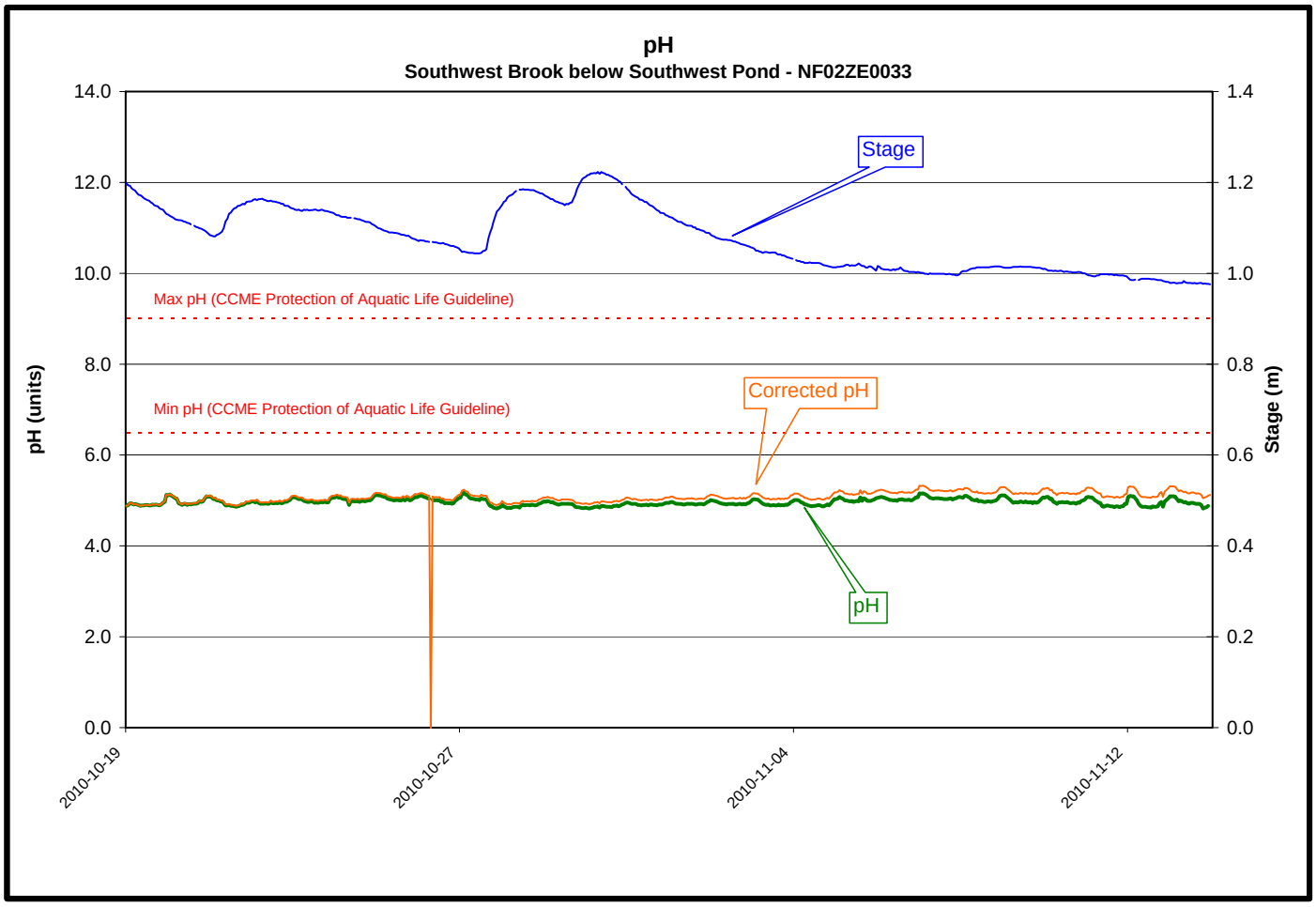

Figure 2

- The specific conductivity **(Figure 3)** ranged from a minimum of 13.7 µS/cm to a maximum of 15.7 µS/cm over the deployment period.
- There appears to be some correlation between specific conductivity and the beginning of the rising leg of each stage increase, suggesting that these changes were triggered by precipitation events and the onset of runoff.
- As fouling and instrument drift were negligible, no data corrections are made to the raw data.

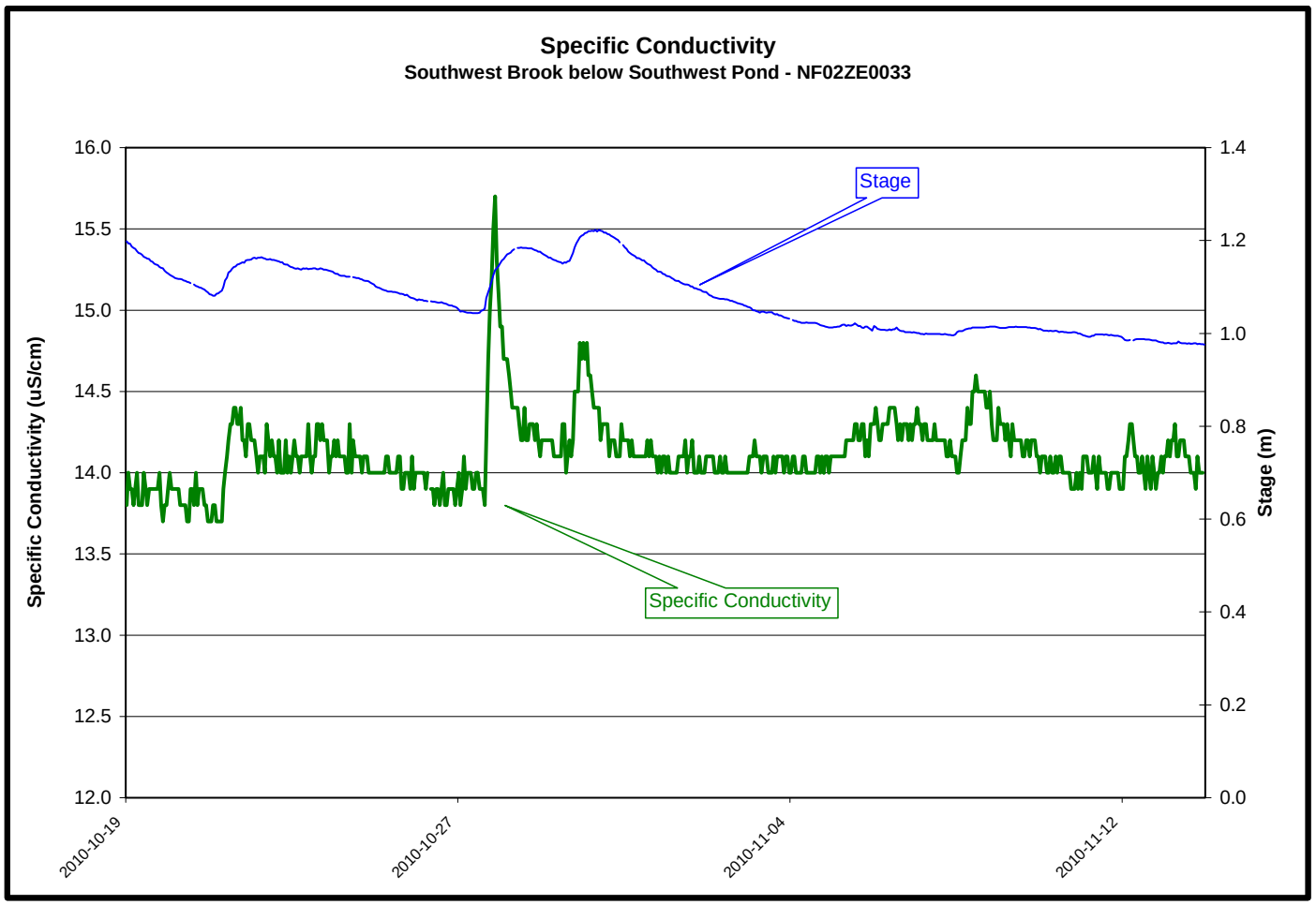

Figure 3

- The dissolved oxygen (**Figure 4**) values ranged from a minimum of 10.67 mg/L to a maximum of 12.41 mg/L over the deployment period. With the percent saturation ranging between 93.3 and 103.0.
- Dissolved oxygen (mg/L) is generally inversely proportional to water temperature.
- For the entire deployment period dissolved oxygen values fell above the upper limit recommended by CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life* (cold water/other life stages – above 6.5 mg/L; cold water/early life stages – above 9.5 mg/L).
- Lower dissolved oxygen values are considered to be solely a function of the naturally warmer water temperatures.
- The QA/QC protocol revealed a slight decrease of 0.5 % in dissolved oxygen (% Sat) over the 26 day deployment period. The majority of this change was due to instrument drift. Accordingly, the correction factor has been applied to the raw data.
- Based upon the fact that Dissolved Oxygen % Saturation had minimal drift, we can be confident that the Dissolved Oxygen mg/L values are accurate.

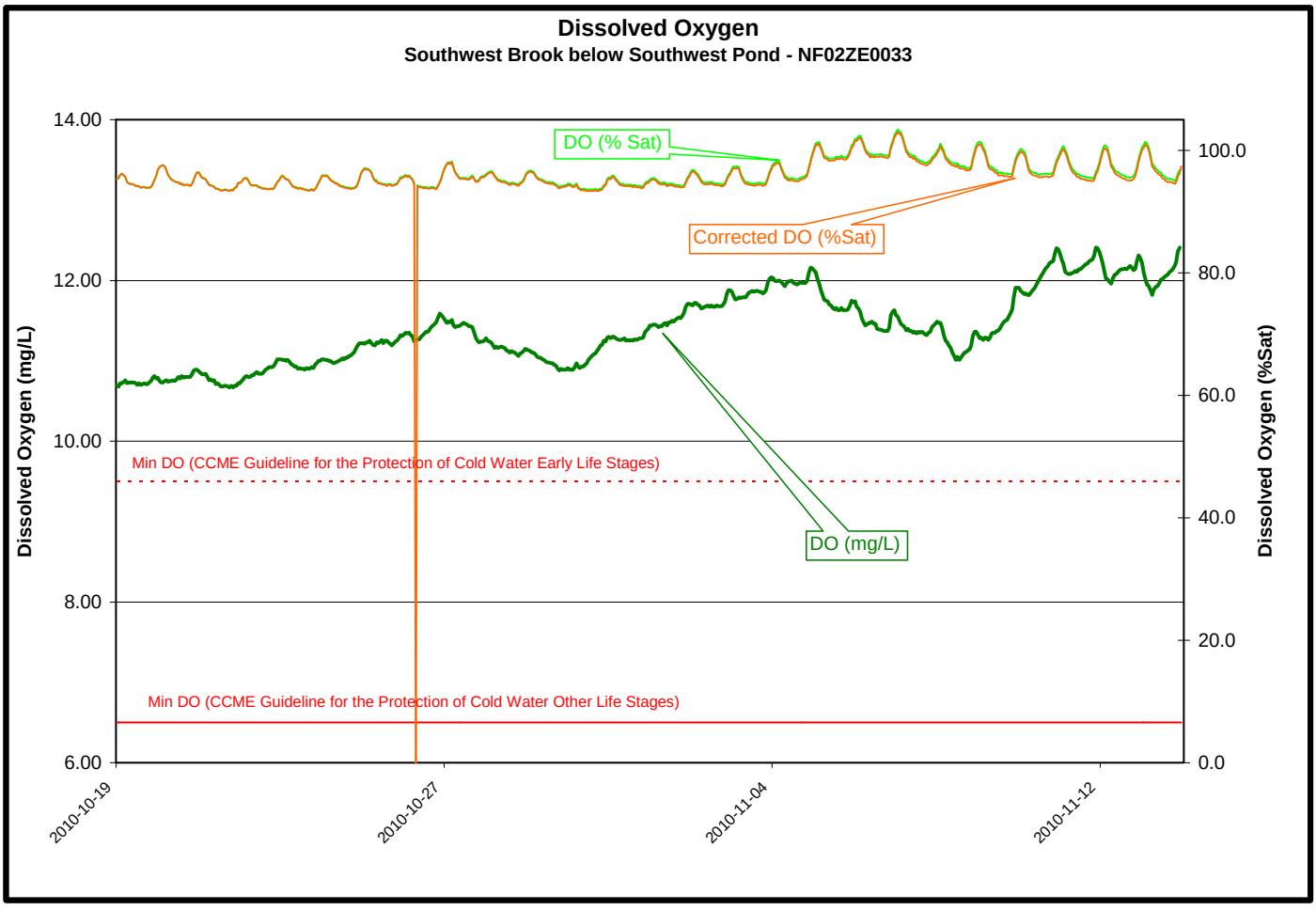

Figure 4

- The turbidity values **(Figure 5)** ranged from a minimum of 0.0 NTU to a maximum of 32.7 NTU.
- During this deployment period, an effort was made to place the instrument away from the plunge pool and the influences of turbulent water.
- The individual spikes in turbidity are insignificant short term events when natural stream debris passed near the sensor.
- Turbidity values have been unusual in this stream and will be the subject of further investigation.
- As there was minimal fouling or instrument drift, total error was negligible, thus no correction factor is applied to the raw turbidity data.

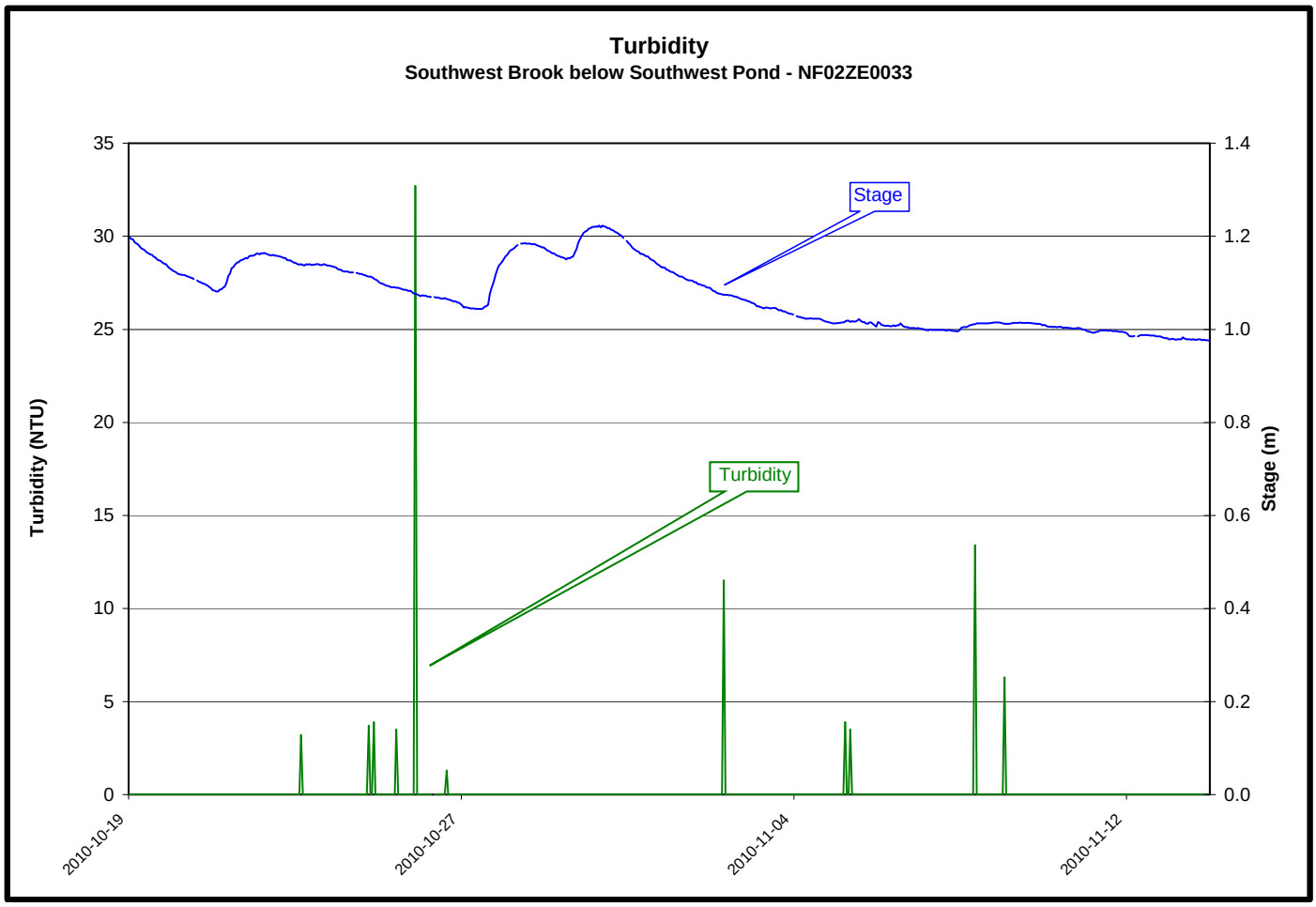

Figure 5

- The stage (**Figure 6)** or water level ranged from a minimum of 0.98 m to a maximum of 1.22 m, with the increases presumably resulting from precipitation events.
- Stream flow is within normal range.

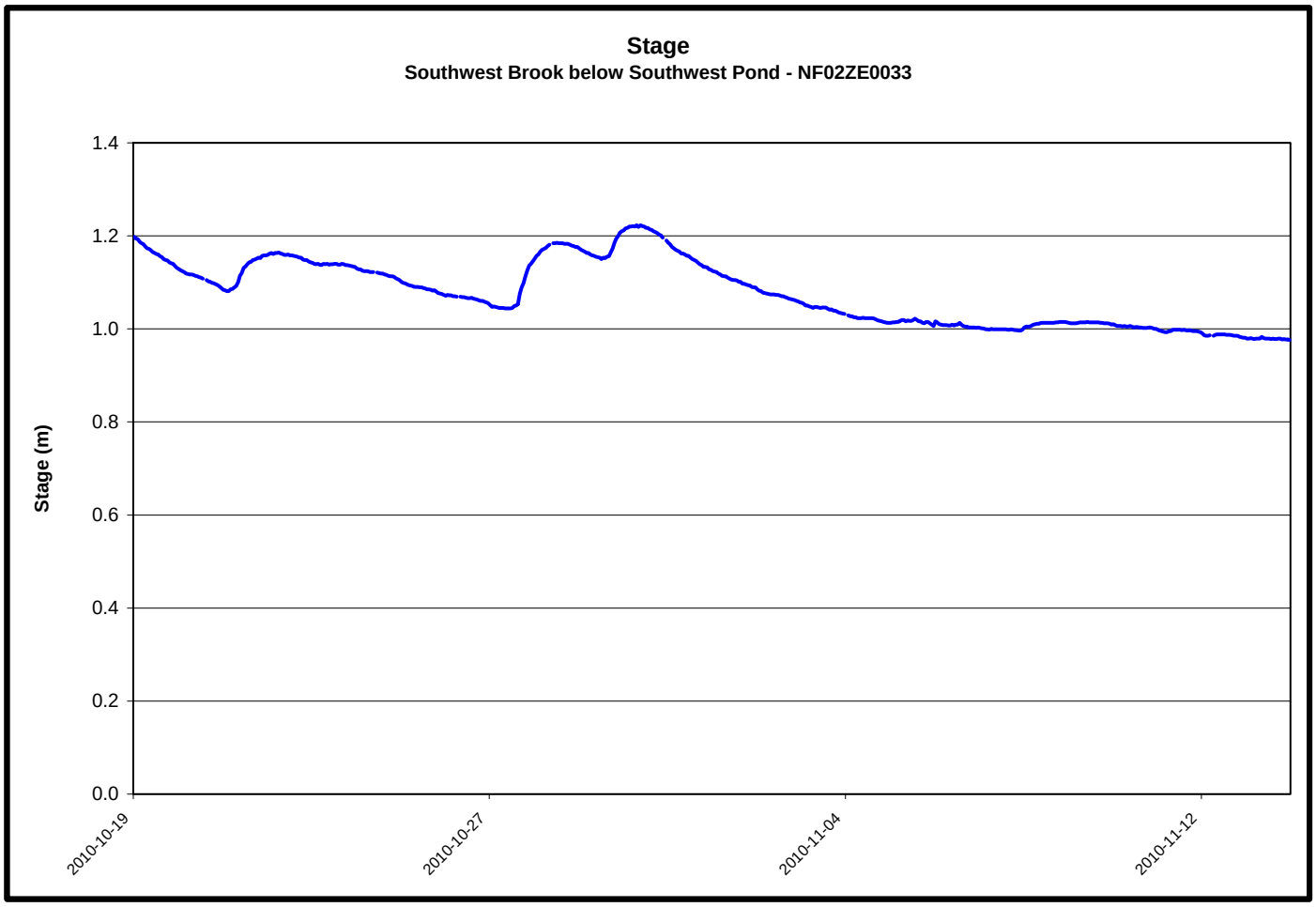

Figure 6

Prepared by:

Robert Wight
Environmental Scientist
Water Resources Management Division
Department of Environment and Conservation
Tel: 709-292-4280
Fax: 709-292-4365
e-mail: robertwight@gov.nl.ca