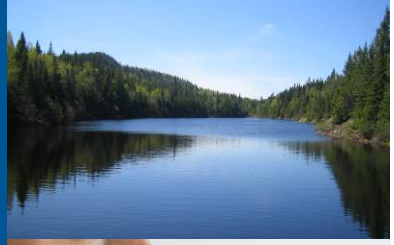
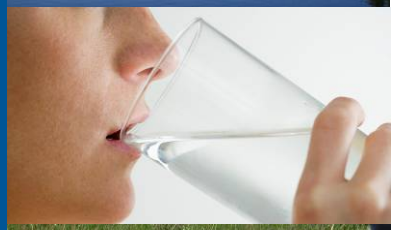



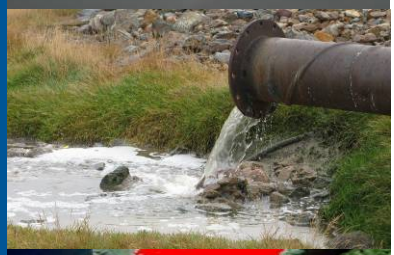


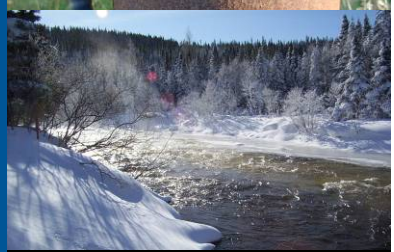

Real Time Water Quality Report Southwest Brook below Southwest Pond

Deployment Period 2012-08-15 to 2012-10-09

2012-10-12

Newfoundland Labrador

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

General

- This station is operated cooperatively with the Miawpukek 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.

Maintenance and Calibration of Instrumentation

- The regular **DataSonde®** (s/n 44422) was cleaned and freshly calibrated and installed on August 15, 2012 and remained deployed continuously until October 9, 2012, a 54 day period.
- The regular QA/QC **MiniSonde®** (s/n 44998) was cleaned and freshly calibrated and used during the deployment and removal for QA/QC measurements.

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)	<=+/-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 and removal, a QA/QC **MiniSonde®** is temporarily deployed along side the Field **DataSonde®**. Values for each recorded parameter are compared between the two instruments. Based on the difference between parameters recorded by the Field **DataSonde®** and QA/QC **MiniSonde®** a qualitative statement (Ranking) is usually made on the data.

- The ranking at the beginning and end of the deployment period are shown in **Table 2**.
- With the exception of water quantity data (Stage and Flow), 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.

Southwest Brook below Southwest Pond (NF02ZE0033)		
Date **(yyyy-mm-dd)**	**Parameter**	**Ranking**
2012-08-15 Deployment	Temp (^{o}C)	Excellent
	pH (units)	Excellent
	Sp. Conductivity (uS/cm)	Excellent
	Dissolved Oxygen (mg/L)	Excellent
	Turbidity (NTU)	Excellent
2012-10-09 Removal	Temp (^{o}C)	Excellent
	pH (units)	Excellent
	Sp. Conductivity (uS/cm)	Excellent
	Dissolved Oxygen (mg/L)	Excellent
	Turbidity (NTU)	Excellent

Table 2

Data Interpretation

- The water temperature (**Figure 1**) ranged from a minimum of 12.92 ˚C to a maximum of 24.55 ˚C, with temperature decreasing over the deployment period.
- There appears to be little correlation with stage, however, there is less diurnal variation when stage is increased.

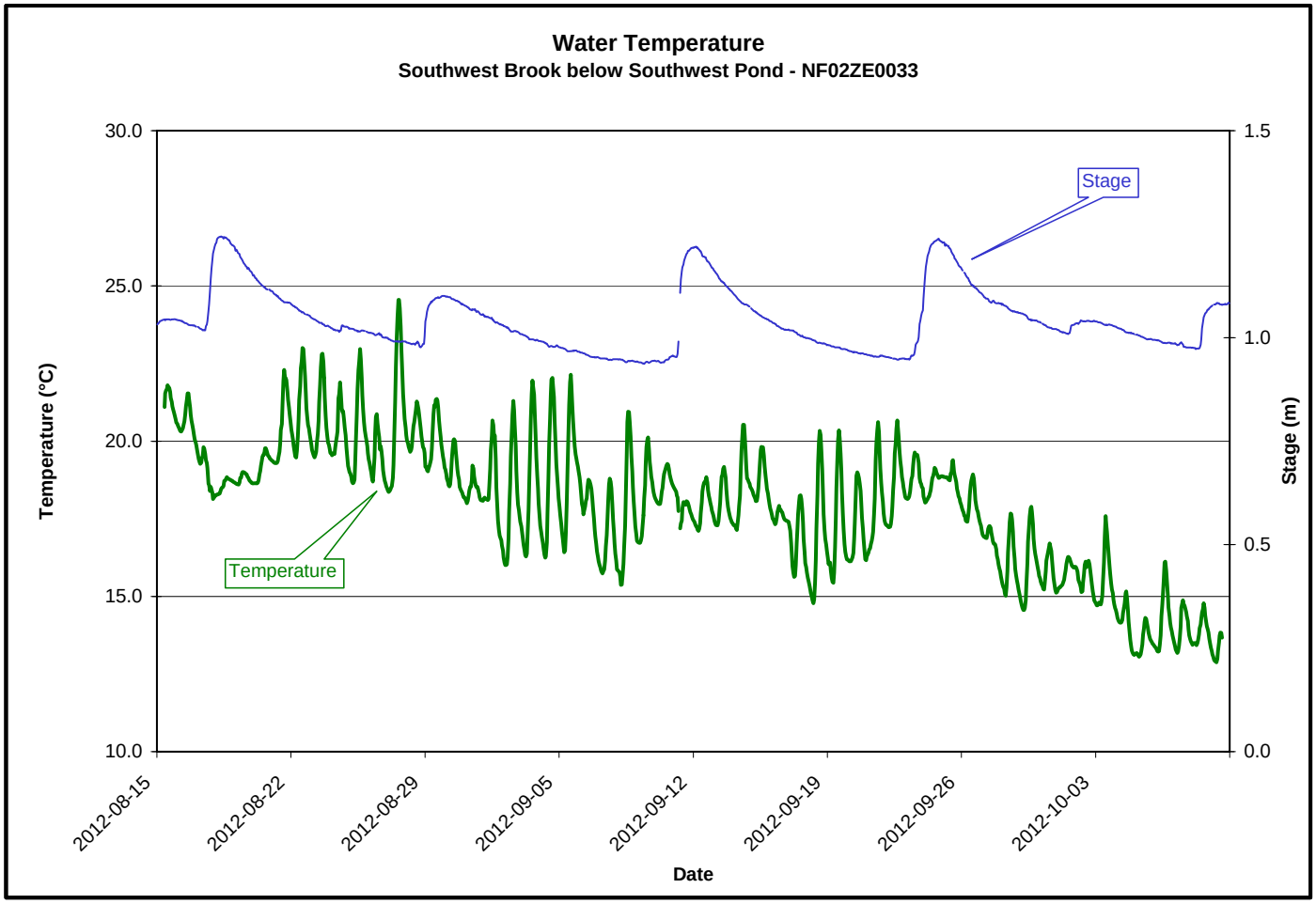

Figure 1

- Throughout the deployment period pH values (**Figure 2**) ranged from a minimum of 4.85 to a maximum of 5.81 with all the values falling well below the recommended range (6.5 – 9.0) for the CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life*.

- There was very little variation in pH over this deployment period, although an inverse relationship with stage is clearly evident.

- The background pH of this stream is normally lower than the lower limit of the recommended range.

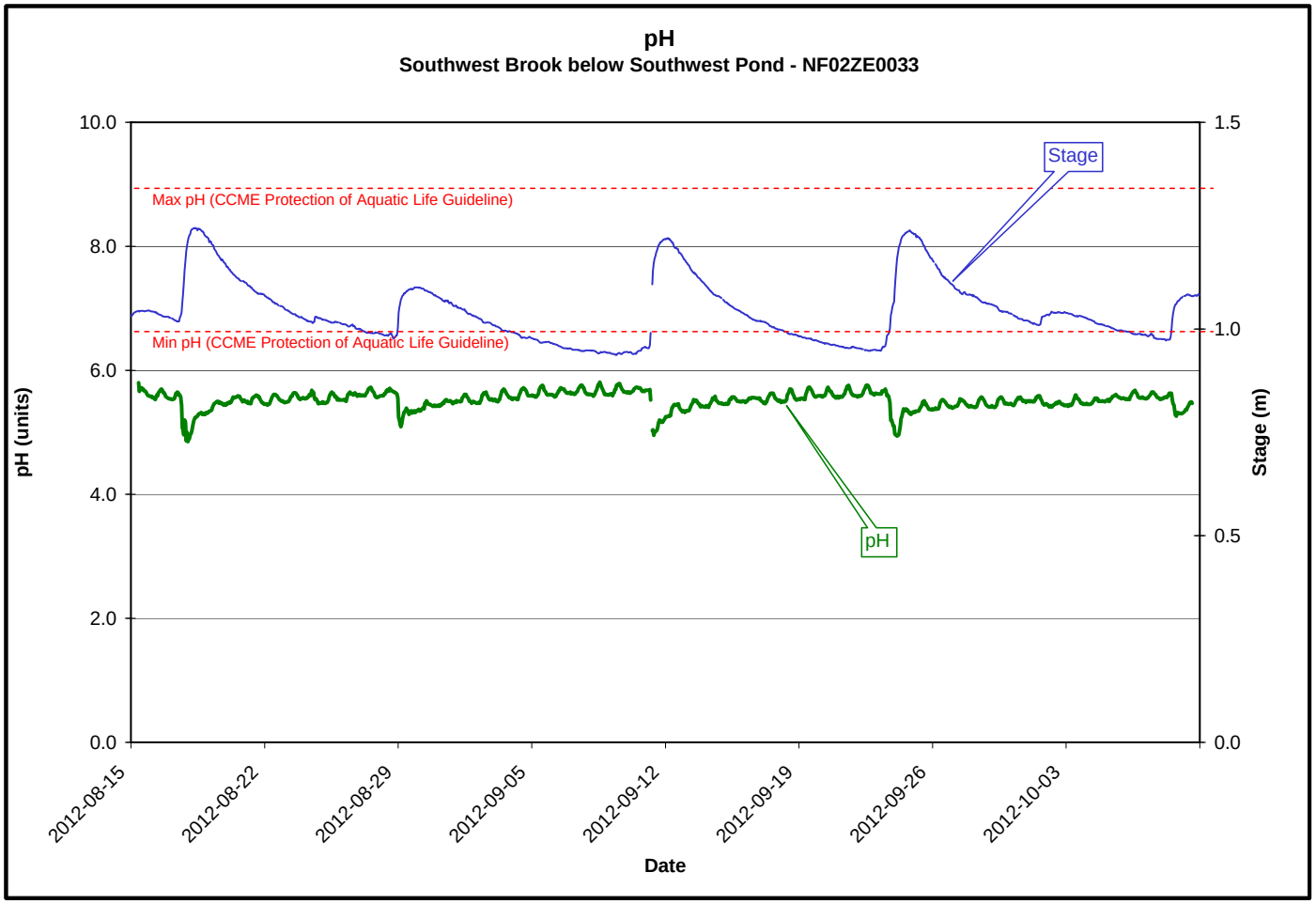

Figure 2

- The specific conductivity **(Figure 3)** ranged from a minimum of 18.3 µS/cm to a maximum of 24.5 µS/cm over the deployment period.
- During this deployment period, there was an overall slight increase in specific conductivity.
- A direct relationship with stage is clearly evident, with minor peaks in specific conductivity clearly evident following each increase in stage.
- It is interesting to note that on September 11, 2012, following the remnants of a tropical storm, the specific conductivity did not return to its pre-storm level, but remained about 2 µS/cm lower for the remainder of the deployment period.

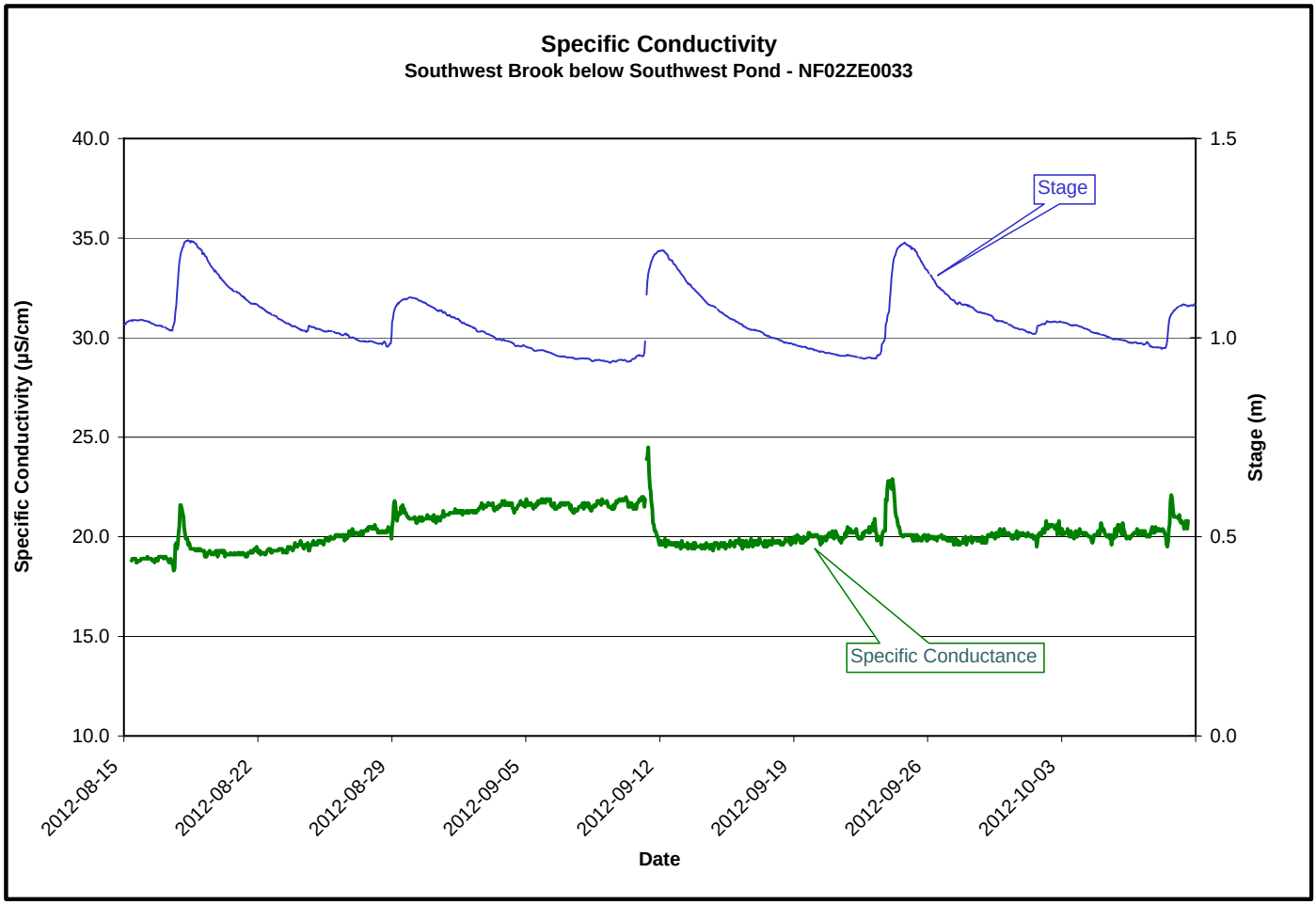

Figure 3

- The dissolved oxygen (**Figure 4**) values ranged from a minimum of 8.36 mg/L to a maximum of 10.19 mg/L over the deployment period; with the percent saturation ranging between 90.1 and 103.2.
- Dissolved oxygen (mg/L) is generally inversely proportional to water temperature.
- Throughout the deployment period dissolved oxygen values consistently fell above the lower 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).
- Based upon the fact that Dissolved Oxygen % Saturation had minimal change over the deployment period, we can be confident that the Dissolved Oxygen mg/L values are accurate.

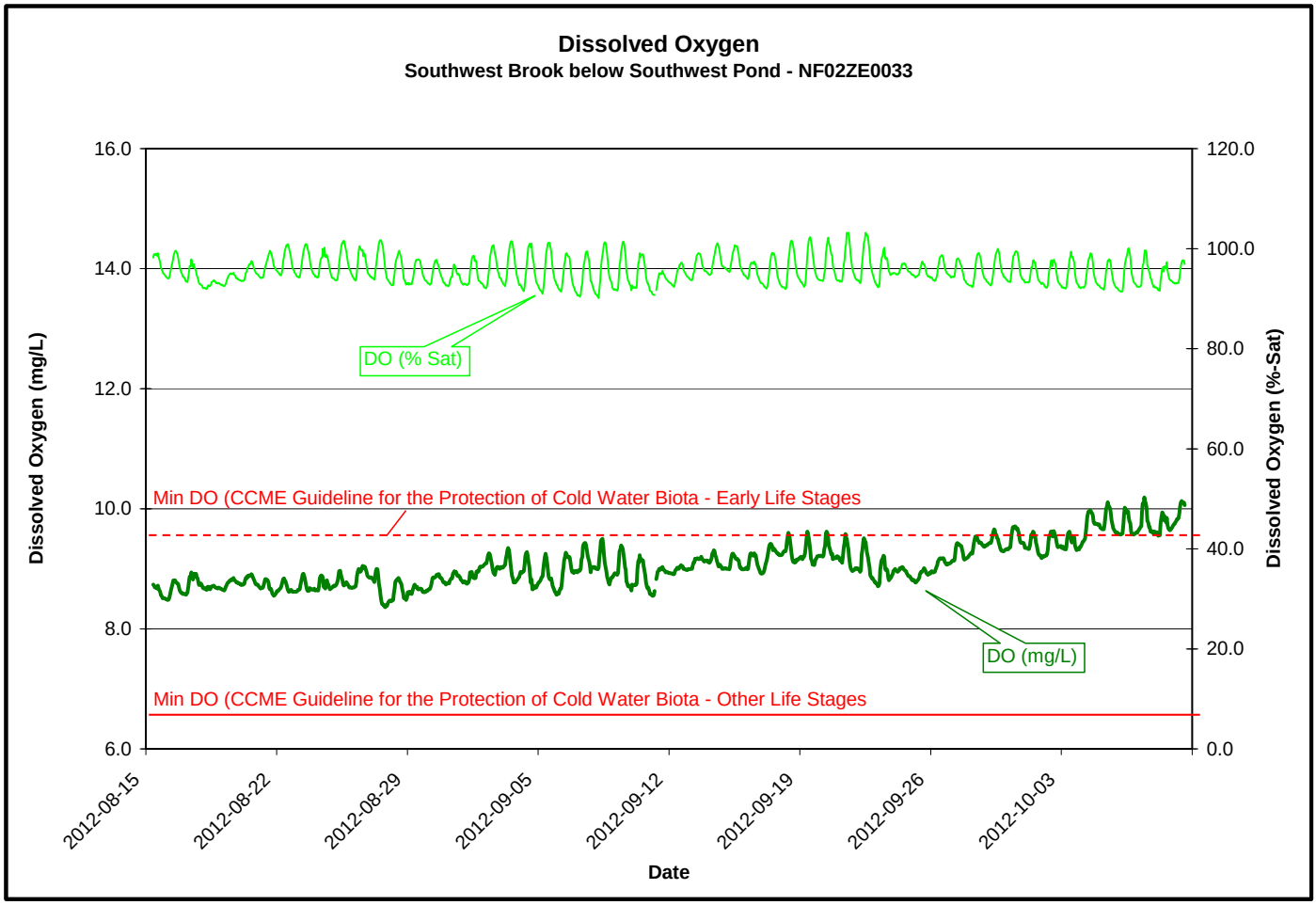

Figure 4

- The turbidity values **(Figure 5)** ranged from a minimum of 0.0 NTU to a maximum of 38.4 NTU.
- Turbidity was minimal during most of this deployment period, with only two minor events recorded prior to September 30, 2012. However, from September 30, 2012 to October 6, 2012, as indicated by the red ellipse, there was a fairly significant and long term episode of high turbidity recorded.
- This corresponds with higher than normal turbidity values recorded at the water treatment plant; however, it is interesting to note that the high levels at the plant were around 1 NTU.
- There is no obvious explanation for these high turbidity values.

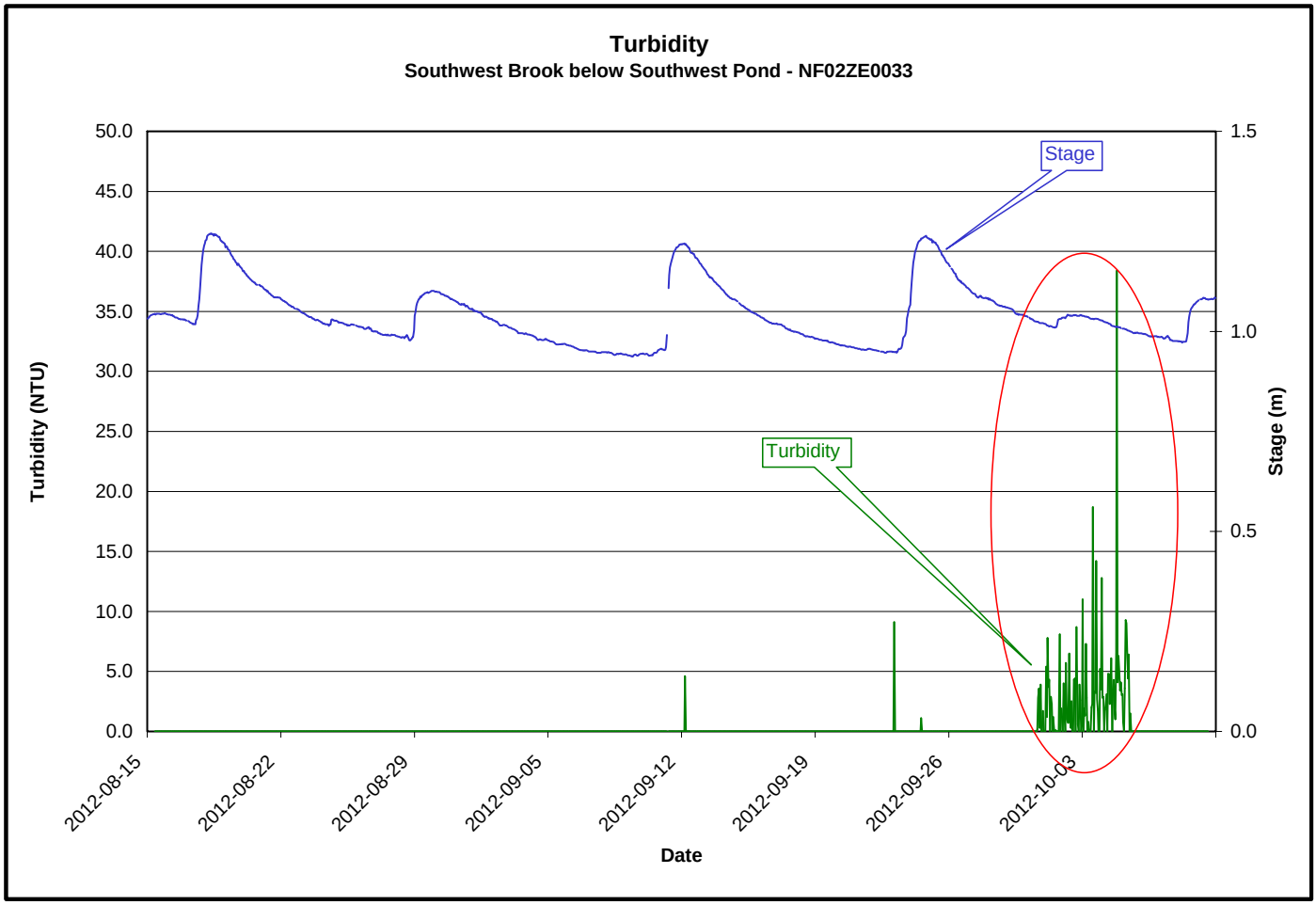

Figure 5

- The stage or water level ranged from a minimum of 0.94 m to a maximum of 1.25 m. The flow or discharge ranged from a minimum of 0.06 m^3/s to a maximum of 0.2.02 m^3/s (**Figure 6)**.
- The increase in stage and flow is resultant from precipitation events.
- Stream stage and flow are within normal ranges.

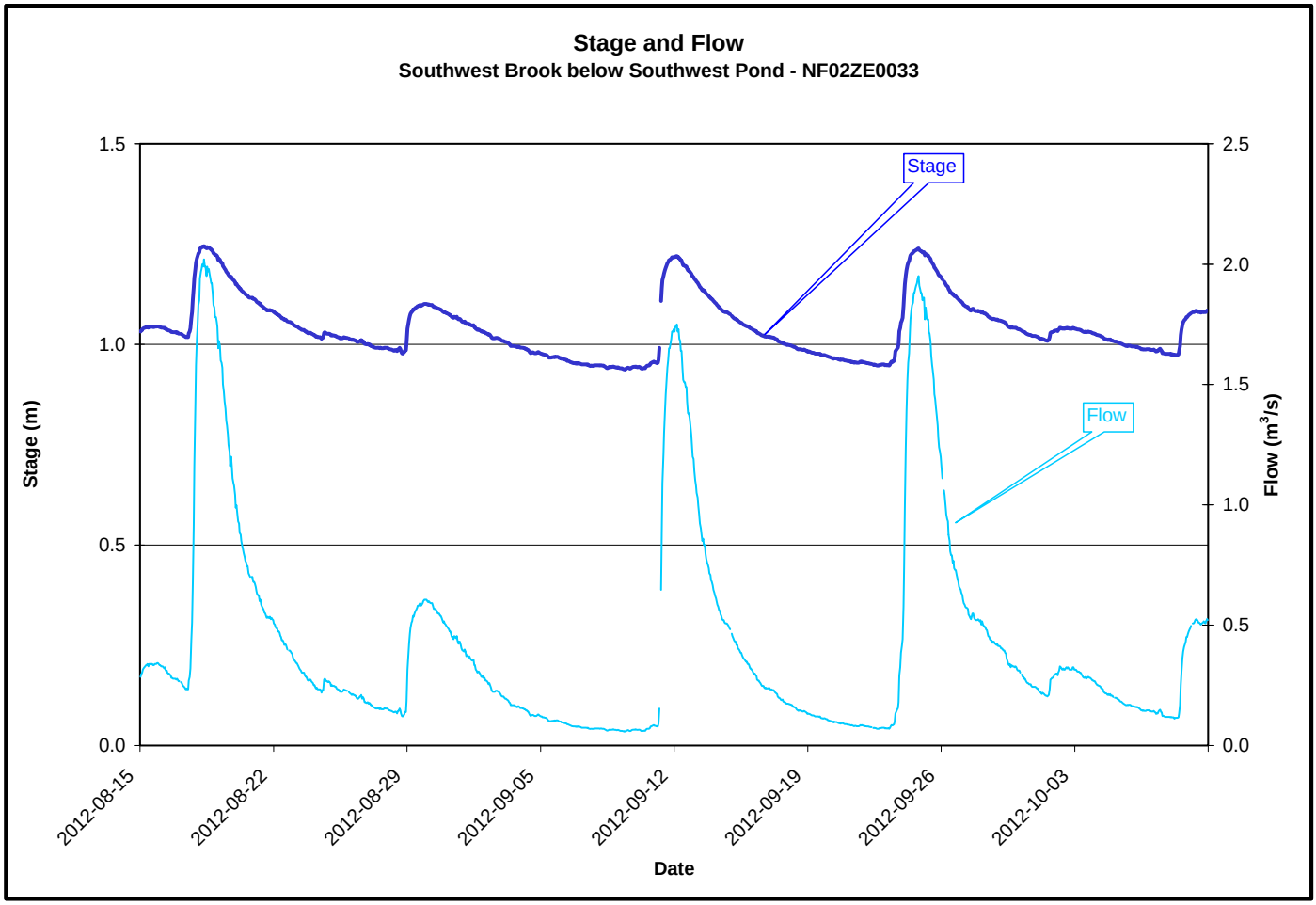

Figure 6

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