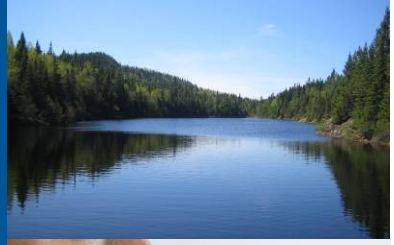
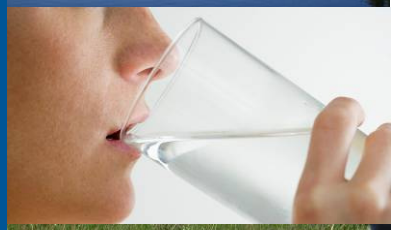






Real Time Water Quality Report
Humber River at Humber Village

Deployment Period 2011-08-12 to 2011-11-01

2012-01-06

Newfoundland Labrador

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

General

- This station is operated as part of the Provincial Real Time Water Quality (RTWQ) network.
- This station is operated year round.
- Staff of the Water Resources Management Division (WRMD) monitors the real-time web page on a daily basis. Any unusual observations are investigated.
- This site is easily accessed and the instrument is normally removed on a monthly to bi-monthly basis for maintenance and calibration and is reinstalled within one to two days.

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Maintenance and Calibration of Instrumentation

- After being freshly calibrated the **DataSonde®** for Humber River at Humber Village was installed on August 12, 2011, and remained deployed continuously until November 1, 2011. This deployment period was a total of 81 days and the instrument maintained good operation for the duration of the deployment.

Quality Assurance / Quality Control (QA/QC) Measures

- As part of the Quality Assurance and Quality Control (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.

	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 **DataSonde®** is temporarily deployed *in situ,* adjacent to the Field **DataSonde®**. Depending on the degree of difference between each parameter from the Field and QA/QC sondes a qualitative rank is assigned (See Table 1). The possible ranks, from most to least desirable, are: Excellent, Good, Fair, Marginal and Poor. A grab sample is also taken for additional confirmation of conditions at deployment and to allow for future modelling studies.
- At the end of a deployment period, a freshly cleaned and calibrated QA/QC sonde is placed *in situ,* adjacent to the Field sonde. Values are compared between all parameters and differences are ranked for placement in Table 2.
- The ranking at the beginning and end of the deployment period are shown in **Table 2**.
- 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 and corrected data can be obtained upon request.

Humber River at Humber Village (NF02Y10012)		
Date (yyyy-mm-dd)	**Parameter**	**Ranking**
2011-08-12 Deployment	Temp (°C)	Fair
	pH (units)	Excellent
	Sp. Conductivity (uS/cm)	Excellent
	Dissolved Oxygen (mg/L)	Excellent
	Turbidity (NTU)	Excellent
2011-11-01 Removal	Temp (°C)	Excellent
	pH (units)	Good
	Sp. Conductivity (uS/cm)	Excellent
	Dissolved Oxygen (%)	Fair
	Turbidity (NTU)	Excellent

Table 2

Data Interpretation

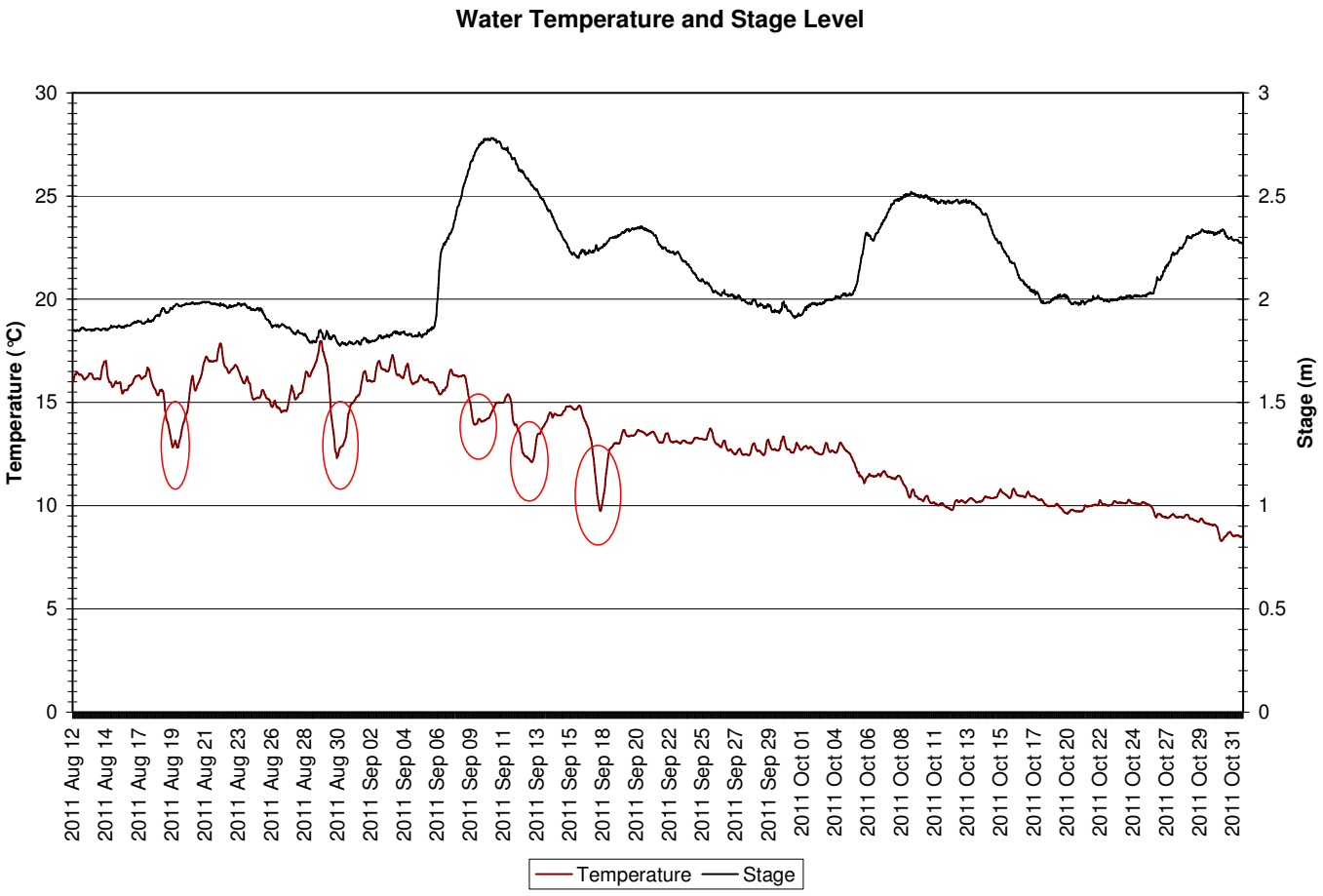

Figure 1

- The water temperature (**Figure 1**) ranged from a minimum of 8.29 ˚C to a maximum of 17.98 ˚C, with a general decreasing trend throughout the deployment period.

- For most of the deployment period there is a clear diurnal temperature cycling trend visible. This trend is caused by cooling each night and warming during the day.

- During the first half of the deployment period there are a number of occasions where temperature takes a significant dip (see inside red ovals). A review of the climate data shows these dips correspond to periods when air temperature was noticeably lower.

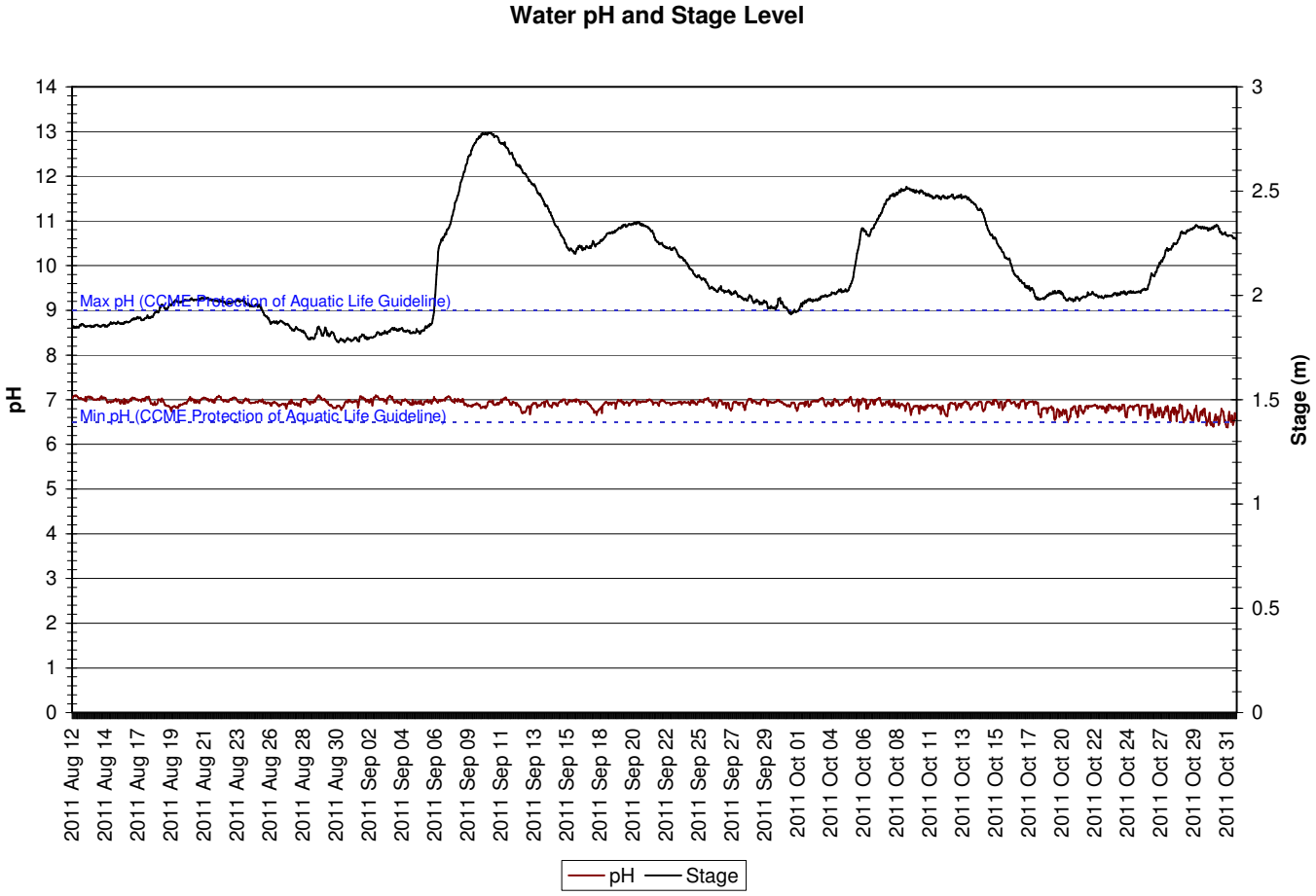

Figure 2

- The pH (**Figure 2**) ranged from a low of 6.38 to a high of 7.10 and remained very stable throughout the deployment period.

- Almost all of the pH readings were within the range of 6.5 to 9.0 recommended by CCME for the protection of aquatic life. Towards the end of the deployment period pH reading appear to drift off calibration slightly and dip just below 6.5 as a result.

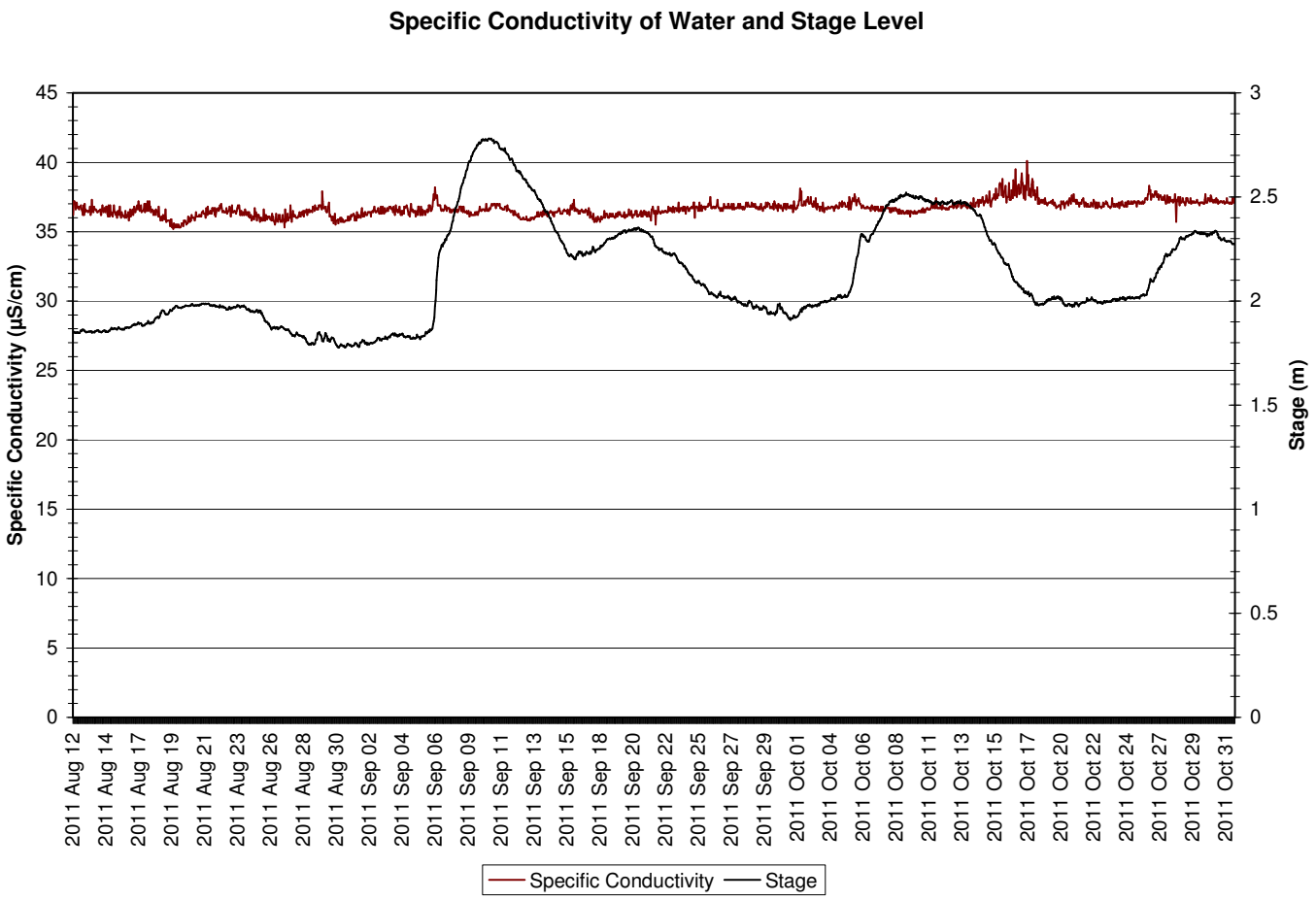

Figure 3

- The specific conductivity **(Figure 3)** ranged from a minimum of 35.2 µS/cm to a maximum of 40.1 µS/cm and remained relatively stable over the deployment period.

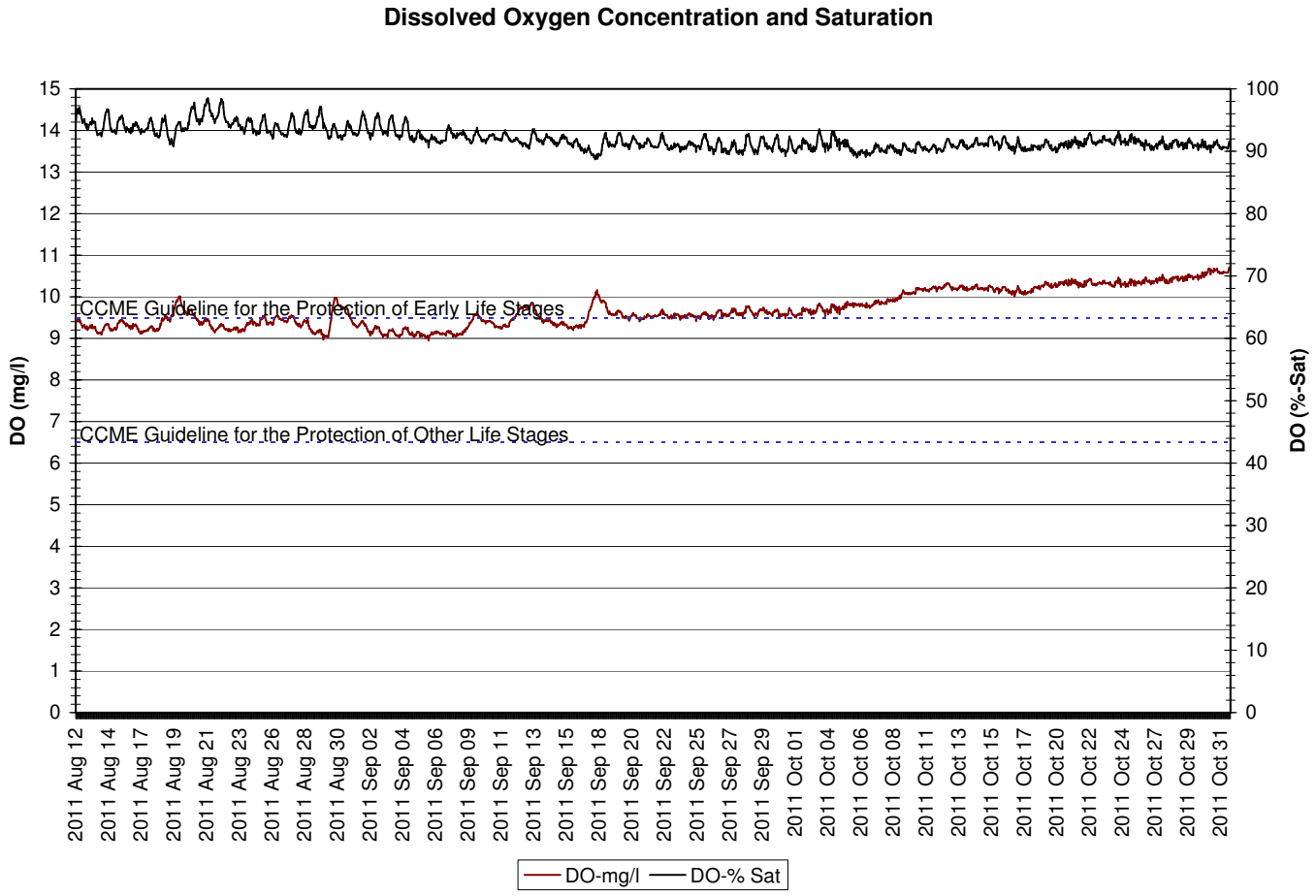

Figure 4

- The dissolved oxygen (**Figure 4**) values ranged from a minimum of 8.95 mg/L to a maximum of 10.71 mg/L over the deployment period. The percent saturation for dissolved oxygen ranged from a low of 88.7% to a high of 98.5%.

- Dissolved oxygen (mg/L) is generally inversely proportional to water temperature and a gentle increasing trend over the deployment period is related to a decreasing temperature trend. There is also a clear diurnal trend in both dissolved oxygen and percent saturation which is related to the diurnal temperature trend.

- Throughout the deployment period, all dissolved oxygen values fell above the limits recommended by CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life* for other life stages (above 6.5 mg/L) which is appropriate for late summer and early fall.

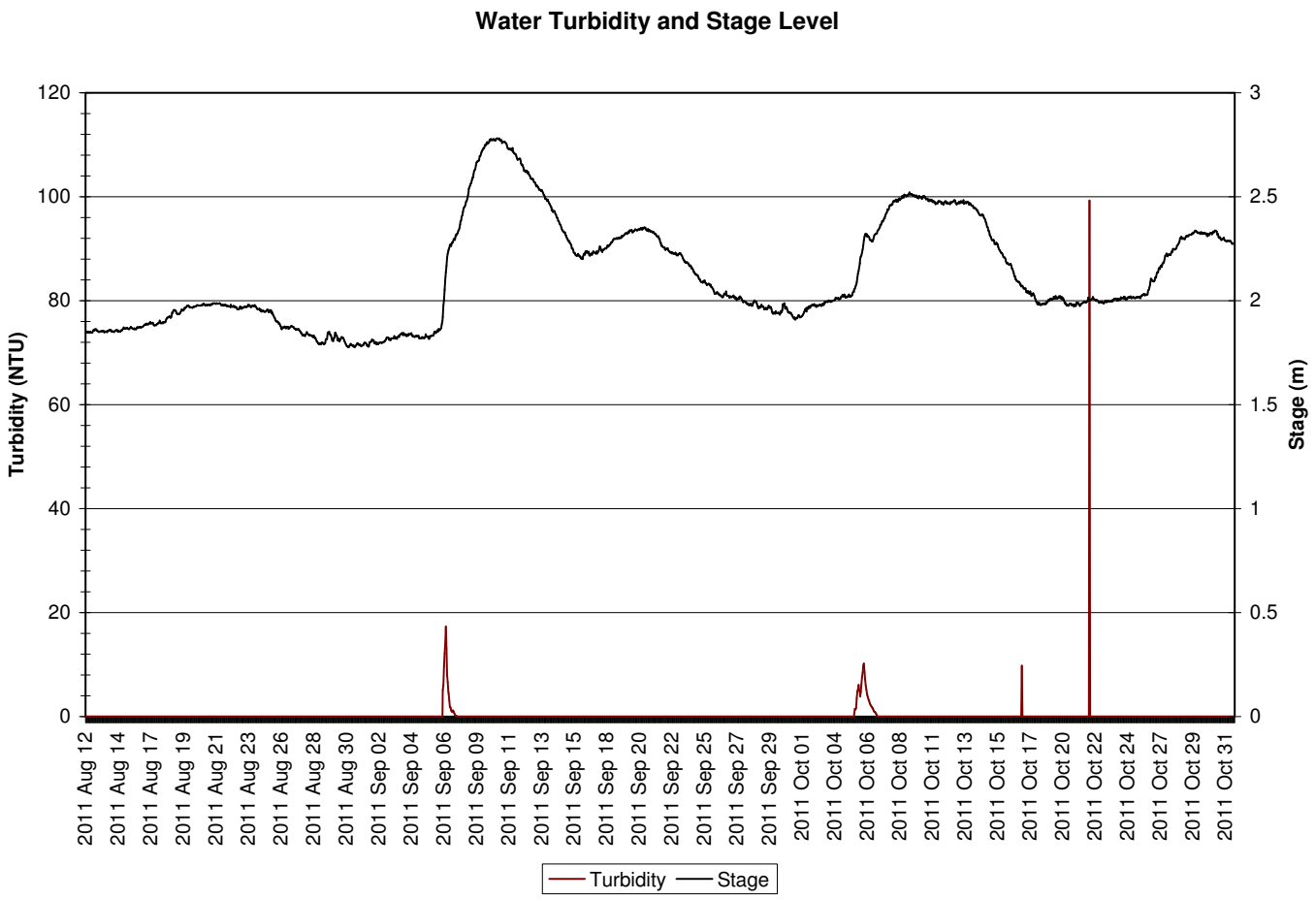

Figure 5

- Turbidity values ranged from 0.0 NTU to 99.3 NTU. Most of the spikes in turbidity can be attributed to a combination of biofouling * and/or debris accumulation** around the sensor. The turbidity at this site is usually close to zero but during the summer months biofouling can occur. Fluctuations in turbidity related to other factors, such as siltation related to flood events or an upstream disturbance, could be masked by interference from biofouling and debris accumulation.

* Biofouling is the growth of a thin film of algae, mould and/or other aquatic life forms and can even include interference from benthic macroinvertebrates. Biofouling interferes with the normal operation of a number of water quality sensors on the **DataSonde®** used at this site, including turbidity.
** Typical debris at this site includes small bits of plant matter such as grass or leaves which get trapped near the head of the turbidity sensor and interfere with normal readings.

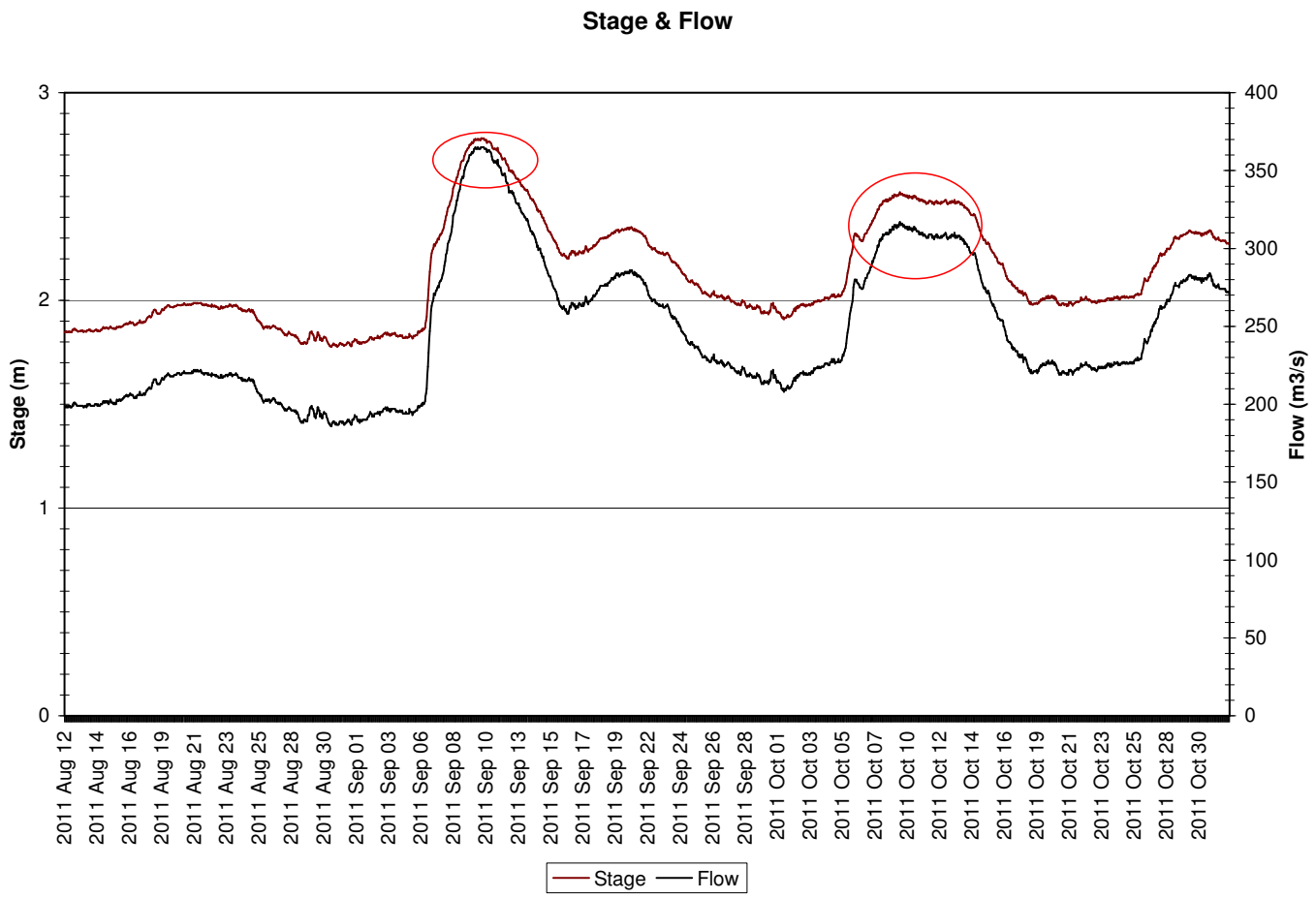

Figure 6

- The stage height (**Figure 6**) or water level ranged from a minimum of 1.78 m to a maximum of 2.78 m with the corresponding flow ranging from 186 m^3/s to 365 m^3/s.

- Peak flows starting around September 7th and October 7th (see inside the red ovals) can be attributed to periods of significant rainfall in the days preceding the peaks.

Climate Data

- Climate data for the deployment period from the nearest station (Corner Brook) is included in Appendix A.

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Appendix A

Climate Data for August 2011

Daily Data Report for August 2011

Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
12†	21.5	10.0	15.8	2.2	0.0	0.0	0.0	0.0	0		
13†	20.5	15.0	17.8	0.2	0.0	0.0	0.0	0.0	0		
14†	22.5	14.5	18.5	0.0	0.5	4.1	0.0	4.1	0		
15†	25.0	16.0	20.5	0.0	2.5	4.1	0.0	4.1	0		
16†	20.0	15.5	17.8	0.2	0.0	7.5	0.0	7.5	0		
17†	18.5	15.0	16.8	1.2	0.0	0.0	0.0	0.0	0		
18†	23.5	11.5	17.5	0.5	0.0	0.0	0.0	0.0	0		
19†	27.5	16.0	21.8	0.0	3.8	0.0	0.0	0.0	0		
20†	26.5	13.5	20.0	0.0	2.0	0.0	0.0	0.0	0		
21†	26.5	18.0	22.3	0.0	4.3	0.0	0.0	0.0	0		
22†	30.0	15.5	22.8	0.0	4.8	1.4	0.0	1.4	0		
23†	20.5	16.0	18.3	0.0	0.3	0.9	0.0	0.9	0		
24†	19.5	14.5	17.0	1.0	0.0	0.0	0.0	0.0	0		
25†	25.0	14.5	19.8	0.0	1.8	0.0	0.0	0.0	0		
26†	24.0	19.5	21.8	0.0	3.8	8.1	0.0	8.1	0		
27†	24.0	13.0	18.5	0.0	0.5	0.0	0.0	0.0	0		
28†	25.5	16.5	21.0	0.0	3.0	4.8	0.0	4.8	0		
29†	30.0	16.5	23.3	0.0	5.3	0.0	0.0	0.0	0		
30†	20.0	16.5	18.3	0.0	0.3	0.0	0.0	0.0	0		
31†	19.0	9.0	14.0	4.0	0.0	6.8	0.0	6.8	0		

Climate Data for September 2011

Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
01†	20.0	10.5	15.3	2.7	0.0	0.0	0.0	0.0	0		
02†	24.5	8.5	16.5	1.5	0.0	0.0	0.0	0.0	0		
03†	23.0	16.5	19.8	0.0	1.8	0.2	0.0	0.2	0		
04†	22.5	16.5	19.5	0.0	1.5	0.0	0.0	0.0	0		
05†	21.5	12.0	16.8	1.2	0.0	19.8	0.0	19.8	0		
06†	12.5	10.5	11.5	6.5	0.0	43.4	0.0	43.4	0		
07†	16.0	10.0	13.0	5.0	0.0	0.0	0.0	0.0	0		
08†	17.0	10.0	13.5	4.5	0.0	0.3	0.0	0.3	0		
09†	21.0	14.5	17.8	0.2	0.0	0.0	0.0	0.0	0		
10†	12.0	10.5	11.3	6.7	0.0	0.4	0.0	0.4	0		
11†	18.5	5.0	11.8	6.2	0.0	0.0	0.0	0.0	0		
12†	15.5	12.0	13.8	4.2	0.0	0.0	0.0	0.0	0		
13†	19.0	7.0	13.0	5.0	0.0	0.0	0.0	0.0	0		
14†	23.5	10.0	16.8	1.2	0.0	0.0	0.0	0.0	0		
15†	18.5	12.5	15.5	2.5	0.0	12.9	0.0	12.9	0		
16†	18.5	12.0	15.3	2.7	0.0	0.0	0.0	0.0	0		
17†	9.5	6.0	7.8	10.2	0.0	0.0	0.0	0.0	0		
18†	18.5	3.5	11.0	7.0	0.0	0.0	0.0	0.0	0		
19†	18.0	8.5	13.3	4.7	0.0	1.0	0.0	1.0	0		
20†	16.0	8.0	12.0	6.0	0.0	4.1	0.0	4.1	0		
21†	15.5	9.0	12.3	5.7	0.0	0.0	0.0	0.0	0		
22†	17.5	7.0	12.3	5.7	0.0	0.8	0.0	0.8	0		

Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
23†	17.0	11.0	14.0	4.0	0.0	0.0	0.0	0.0	0		
24†	13.5	9.0	11.3	6.7	0.0	0.0	0.0	0.0	0		
25†	18.0	11.5	14.8	3.2	0.0	0.0	0.0	0.0	0		
26†	13.0	7.0	10.0	8.0	0.0	0.0	0.0	0.0	0		
27†	11.5	4.5	8.0	10.0	0.0	0.8	0.0	0.8	0		
28†	13.0	3.5	8.3	9.7	0.0	0.0	0.0	0.0	0		
29†	17.5	7.5	12.5	5.5	0.0	0.0	0.0	0.0	0		
30†	24.0	10.0	17.0	1.0	0.0	0.4	0.0	0.4	0		

Climate Data for October 2011

Daily Data Report for October 2011

Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
01†	20.0	14.0	17.0	1.0	0.0	25.6	0.0	25.6	0		
02†	9.5	8.0	8.8	9.2	0.0	0.0	0.0	0.0	0		
03†	14.0	7.0	10.5	7.5	0.0	0.0	0.0	0.0	0		
04†	14.0	5.5	9.8	8.2	0.0	7.8	0.0	7.8	0		
05†	7.0	5.0	6.0	12.0	0.0	10.3	0.0	10.3	0		
06†	4.5	3.0	3.8	14.2	0.0	1.7	0.0	1.7	0		
07†	5.0	0.5	2.8	15.2	0.0	0.0	0.0	0.0	0		
08†	10.0	0.0	5.0	13.0	0.0	1.8	0.0	1.8	0		
09†	17.5	4.5	11.0	7.0	0.0	0.0	0.0	0.0	0		
10†	14.0	9.0	11.5	6.5	0.0	0.0	0.0	0.0	0		
11†	10.0	7.0	8.5	9.5	0.0	0.0	0.0	0.0	0		
12†	12.0	0.0	6.0	12.0	0.0	0.0	0.0	0.0	0		
13†	13.0	3.5	8.3	9.7	0.0	0.0	0.0	0.0	0		
14†	13.5	8.5	11.0	7.0	0.0	0.0	0.0	0.0	0		
15†	22.0	11.5	16.8	1.2	0.0	3.3	0.0	3.3	0		
16†	20.0	7.5	13.8	4.2	0.0	0.3	0.0	0.3	0		
17†	15.5	10.0	12.8	5.2	0.0	9.1	0.0	9.1	0		
18†	13.0	8.0	10.5	7.5	0.0	6.0	0.0	6.0	0		
19†	13.0	7.0	10.0	8.0	0.0	0.0	0.0	0.0	0		
20†	10.0	3.5	6.8	11.2	0.0	2.3	0.0	2.3	0		
21†	14.5	8.0	11.3	6.7	0.0	0.6	0.0	0.6	0		
22†	13.0	8.5	10.8	7.2	0.0	0.5	0.0	0.5	0		
23†	11.0	6.5	8.8	9.2	0.0	0.4	0.0	0.4	0		
24†	9.5	7.5	8.5	9.5	0.0	1.4	0.0	1.4	0		
25†	9.0	7.0	8.0	10.0	0.0	16.1	0.0	16.1	0		
26†	3.5	2.0	2.8	15.2	0.0	17.7	0.0	17.7	0		
27†	2.5	1.5	2.0	16.0	0.0	0.0	4.6	4.6	0		
28†	5.5	0.5	3.0	15.0	0.0	0.0	2.4	2.4	0		
29†	3.5	1.0	2.3	15.7	0.0	0.0	2.0	2.0	0		
30†	2.5	-1.0	0.8	17.2	0.0	0.0	22.4	22.4	0		
31†	3.0	0.0	1.5	16.5	0.0	0.0	1.0	1.0	10		