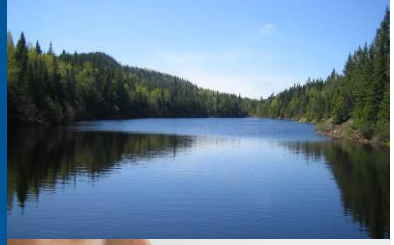
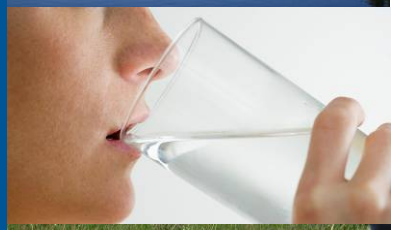






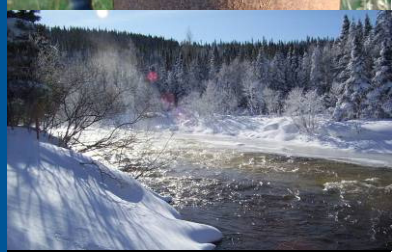

Real Time Water Quality Report
Humber River at Humber Village

Deployment Period 2010-07-21 to 2010-09-24

2010-10-26

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 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 July 21, 2010, and remained deployed continuously until September 24, 2010. This deployment period was slightly longer than normal however the instrument maintained good operation for the duration of it.

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 **DataSonde®** 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 **DataSonde®** and grab sample, 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 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. Corrected data can be obtained upon request.

Humber River at Humber Village (NF02Y10012)		
Date (yyyy-mm-dd)	**Parameter**	**Ranking**
2010-07-21 Deployment	Temp (^{o}C)	Excellent
	pH (units)	Good
	Sp. Conductivity (uS/cm)	Good
	Dissolved Oxygen (mg/L)	Excellent
	Turbidity (NTU)	Excellent
2010-09-24 Removal	Temp (^{o}C)	Excellent
	pH (units)	Excellent
	Sp. Conductivity (uS/cm)	Excellent
	Dissolved Oxygen (%)	Fair
	Turbidity (NTU)	Excellent

Table 2

Data Interpretation

- The water temperature (**Figure 1**) ranged from a minimum of 12.01 ˚C to a maximum of 20.32 ˚C, throughout the deployment period.

- There are two periods when temperature takes a noticeable dip around July 27th to 30th and September 4th to 5th. The first dip may be influenced by an increasing flow trend as well as cooler temperatures at night for several nights preceding it. The second dip seems to correspond with a short quick spike in flow as well as a cooling trend in air temperature during the days preceding the dip. Because this is a large river with a significant lake (Deer Lake) a few kilometres upstream, water temperature is relatively slow to respond to changing trends in air temperature.

- There is a noticeable diurnal temperature trend with a gentle drop during cooling each night.

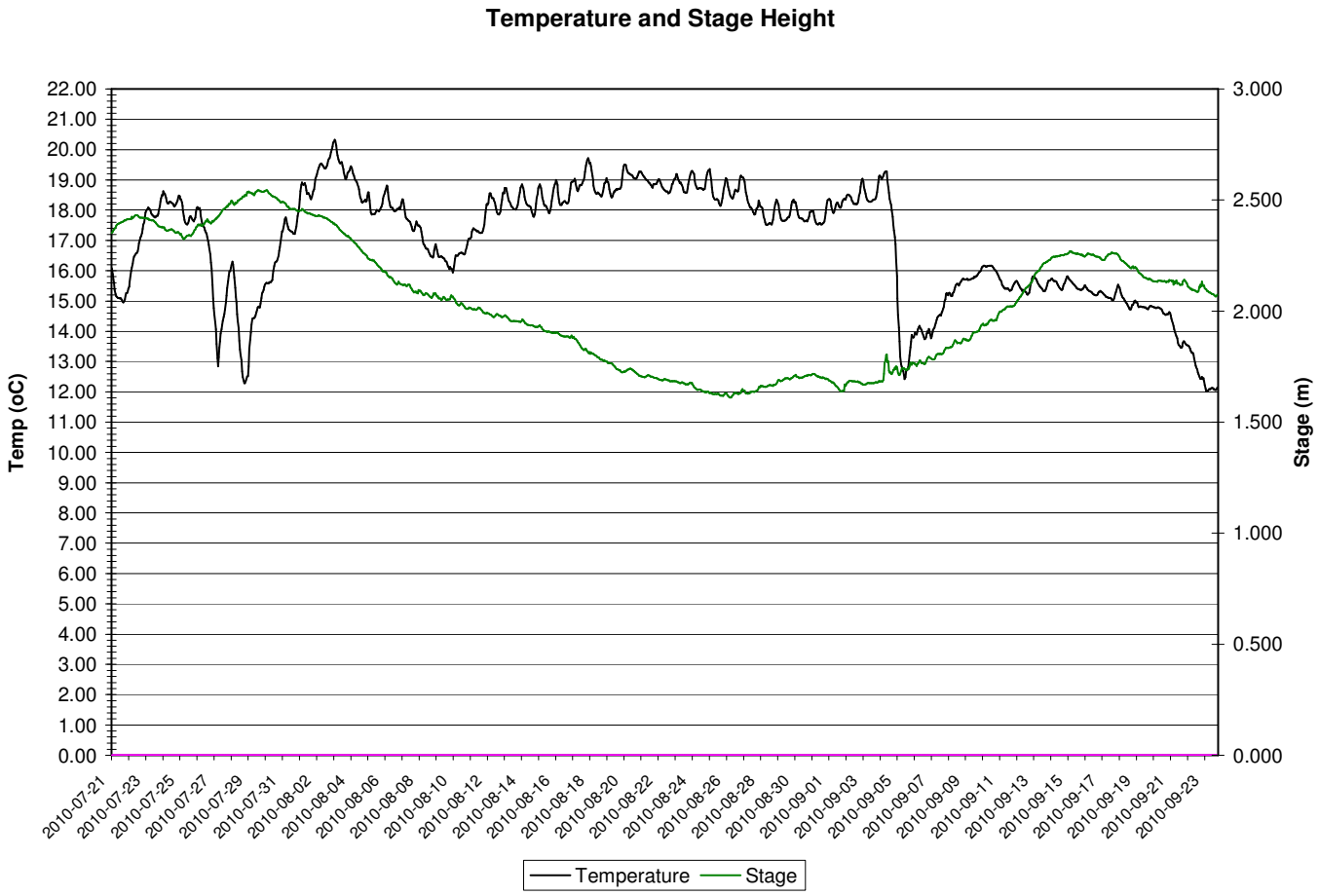

Figure 1

- The pH ranged from a low of 6.86 to a high of 7.31 and remained quite stable throughout the deployment period. (**Figure 2**).

- All pH readings were within the range of 6.5 to 9.0 recommended by CCME for the protection of aquatic life.

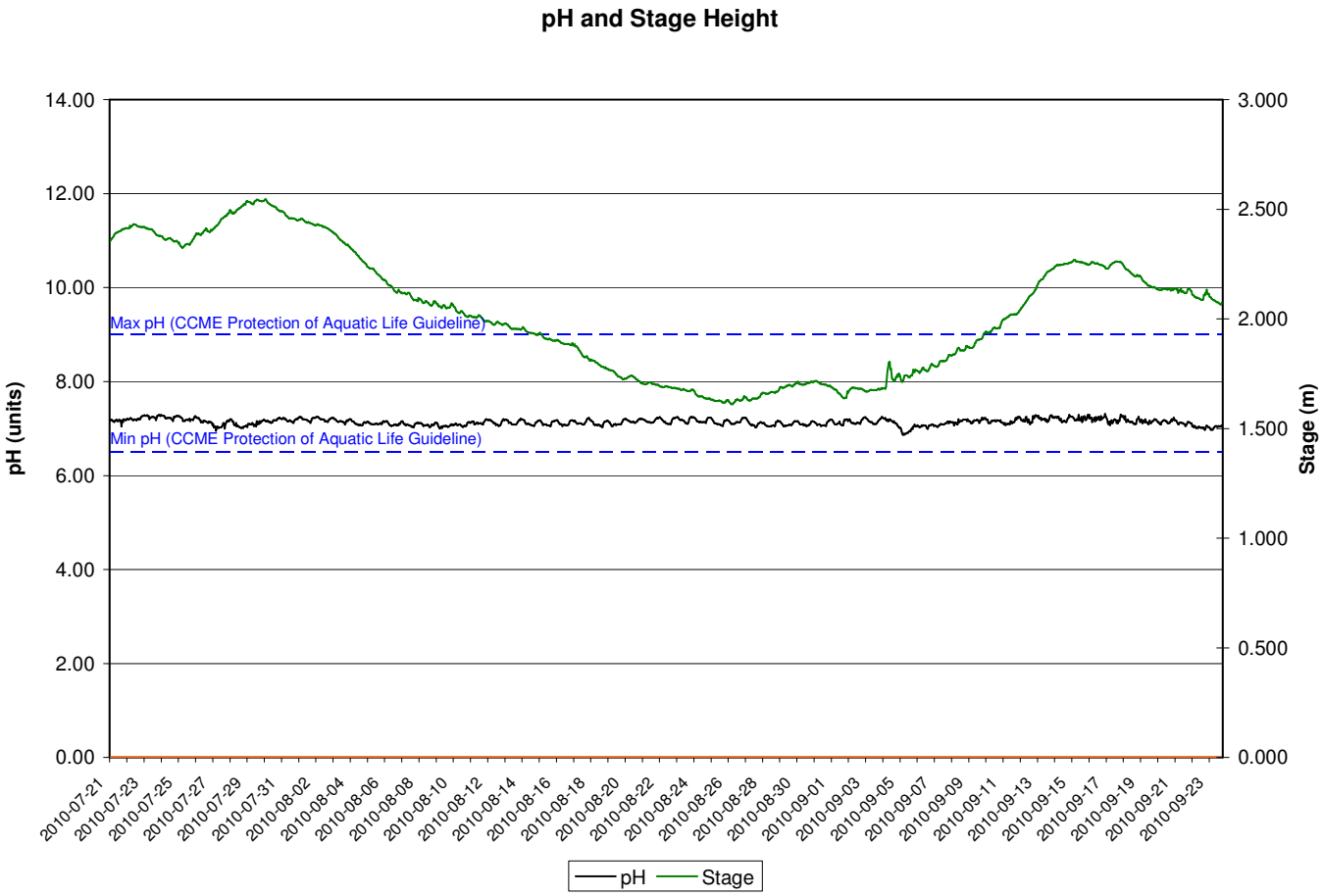

Figure 2

- The corrected specific conductivity **(Figure 3)** ranged from a minimum of 36.2 µS/cm to a maximum of 39.1 µS/cm over the deployment period.
- Stage height and flow were relatively stable throughout the deployment period and did not seem to have a significant impact on conductivity.
- By comparing the corrected and uncorrected specific conductivity it can bee seen that the instrument slowly drifted off calibration over the deployment period.

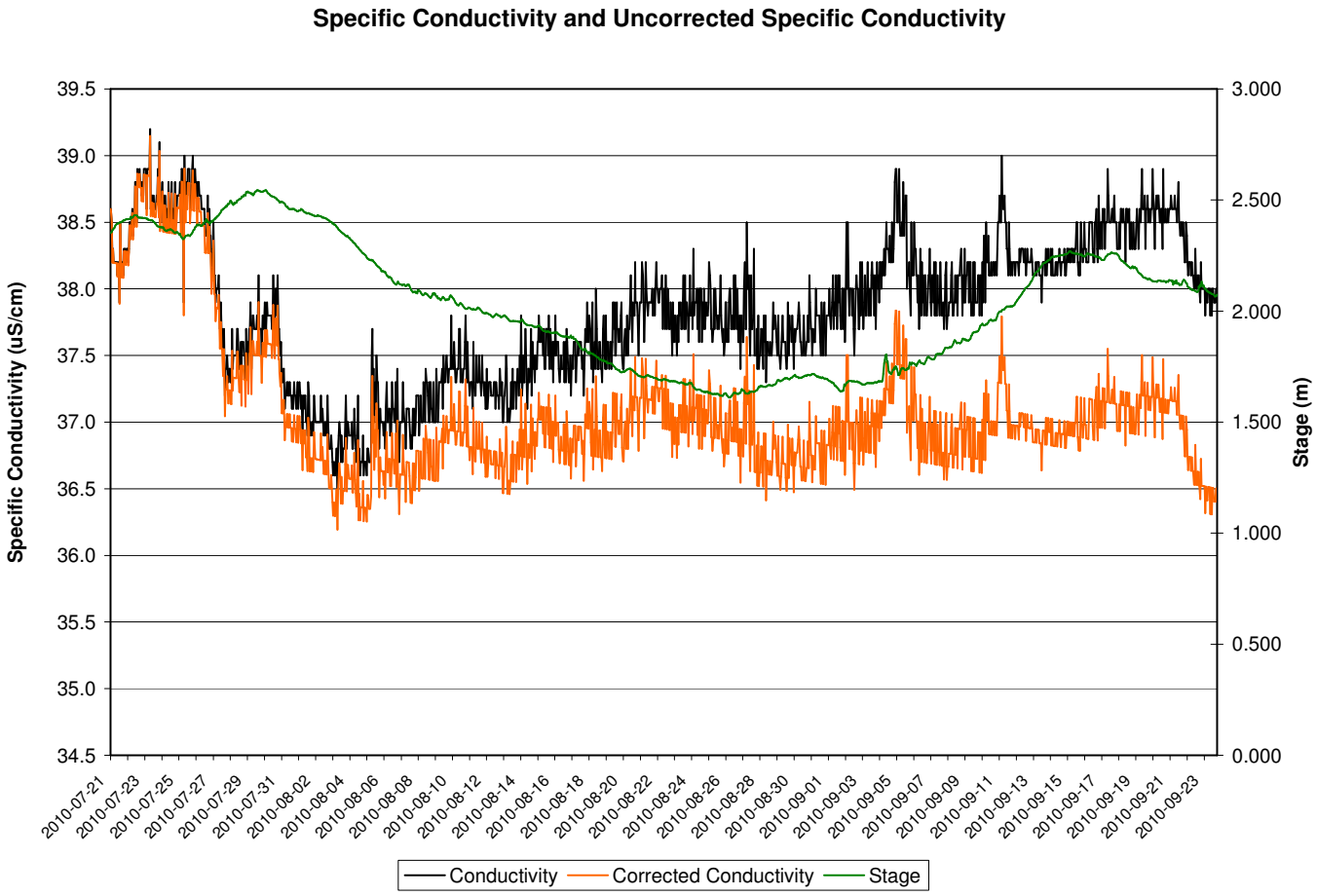

Figure 3

- The dissolved oxygen (**Figure 4**) values ranged from a minimum of 7.75 mg/L to a maximum of 9.86 mg/L over the deployment period. The corrected percent saturation for dissolved oxygen ranged from a low of 85.1% to a high of 97.9%.

- By comparing the corrected and uncorrected percent saturation data it can be seen that the instrument slowly drifts off calibration over the deployment period.

- Dissolved oxygen (mg/L) is generally inversely proportional to water temperature and there are several points in the deployment period where a significant change in DO can be attributed to a change in temperature. Most notably around September 4th there is a noticeable jump in DO which is related to a quick drop in temperature at that time. A regular diurnal fluctuation in DO can also be seen which is related to the normal diurnal fluctuation in temperature.

- 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 cold water/other life stages (above 6.5 mg/L) while most values were below the guideline for cold water/early life stages (above 9.5 mg/L).

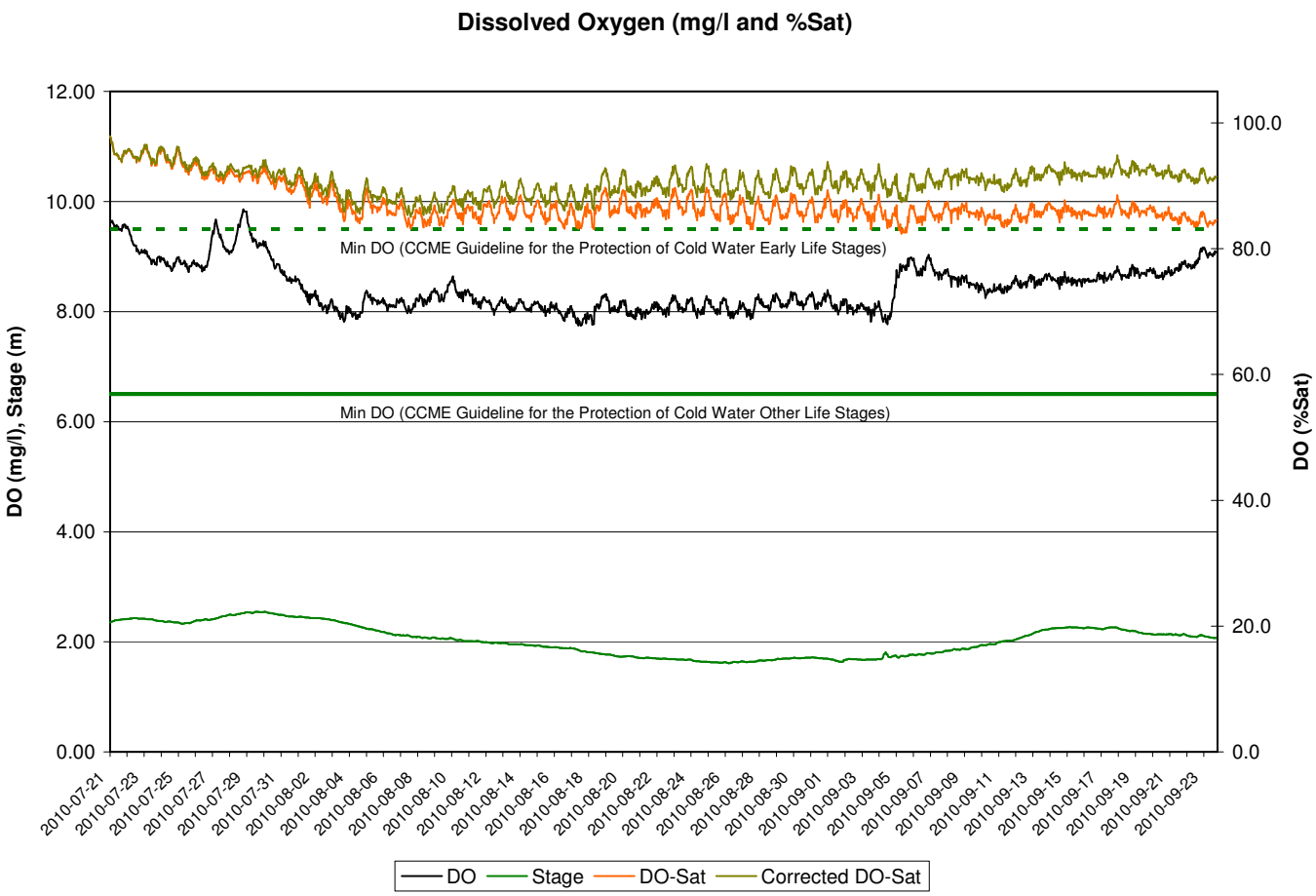

Figure 4

- With the exception of two small spikes the turbidity values **(Figure 5)** were consistently at 0 NTU for the entirety of the deployment period.

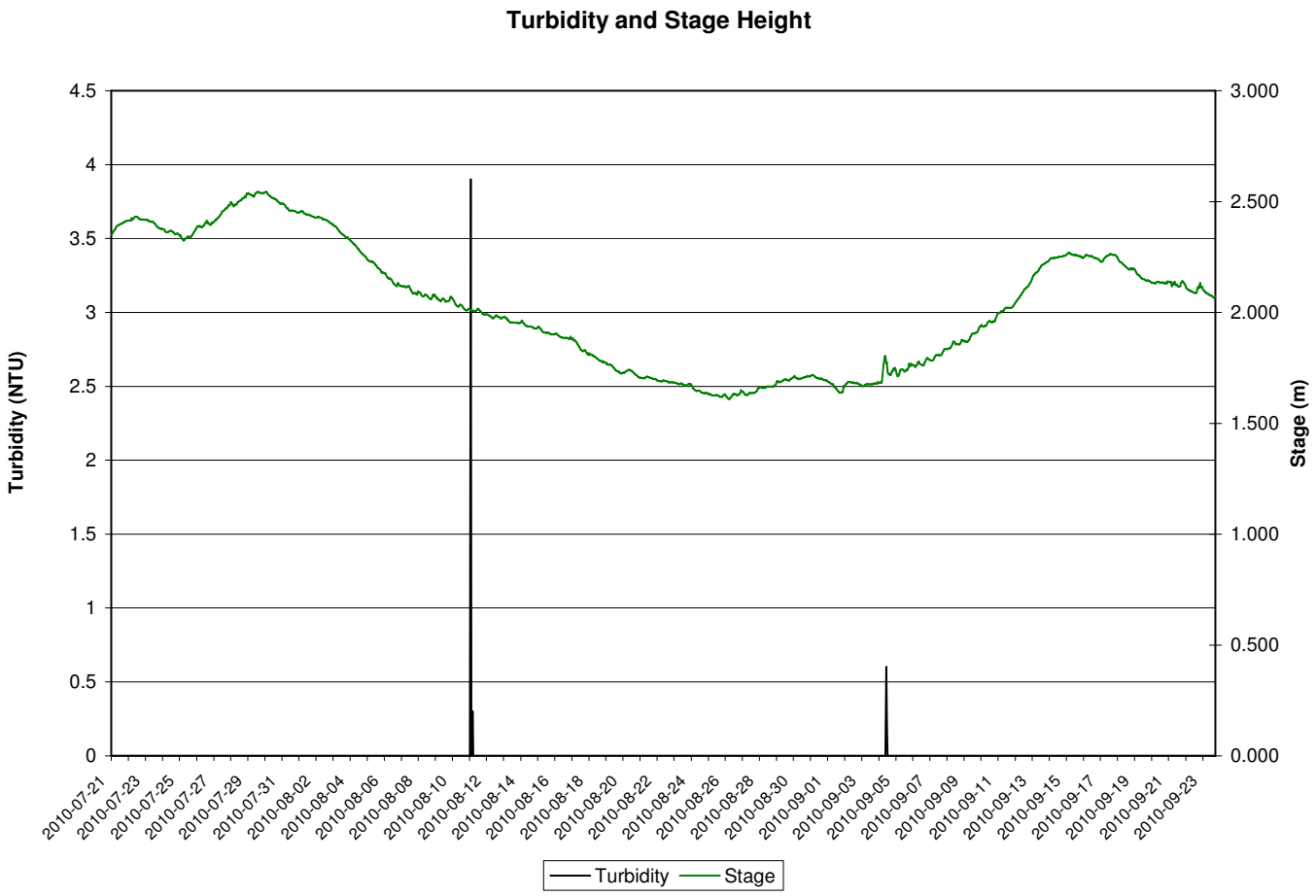

Figure 5

- The stage height (**Figure 6)** or water level ranged from a minimum of 1.611 m to a maximum of 2.545 m with the corresponding flow ranging from161 m^3/s to 322 m^3/s.

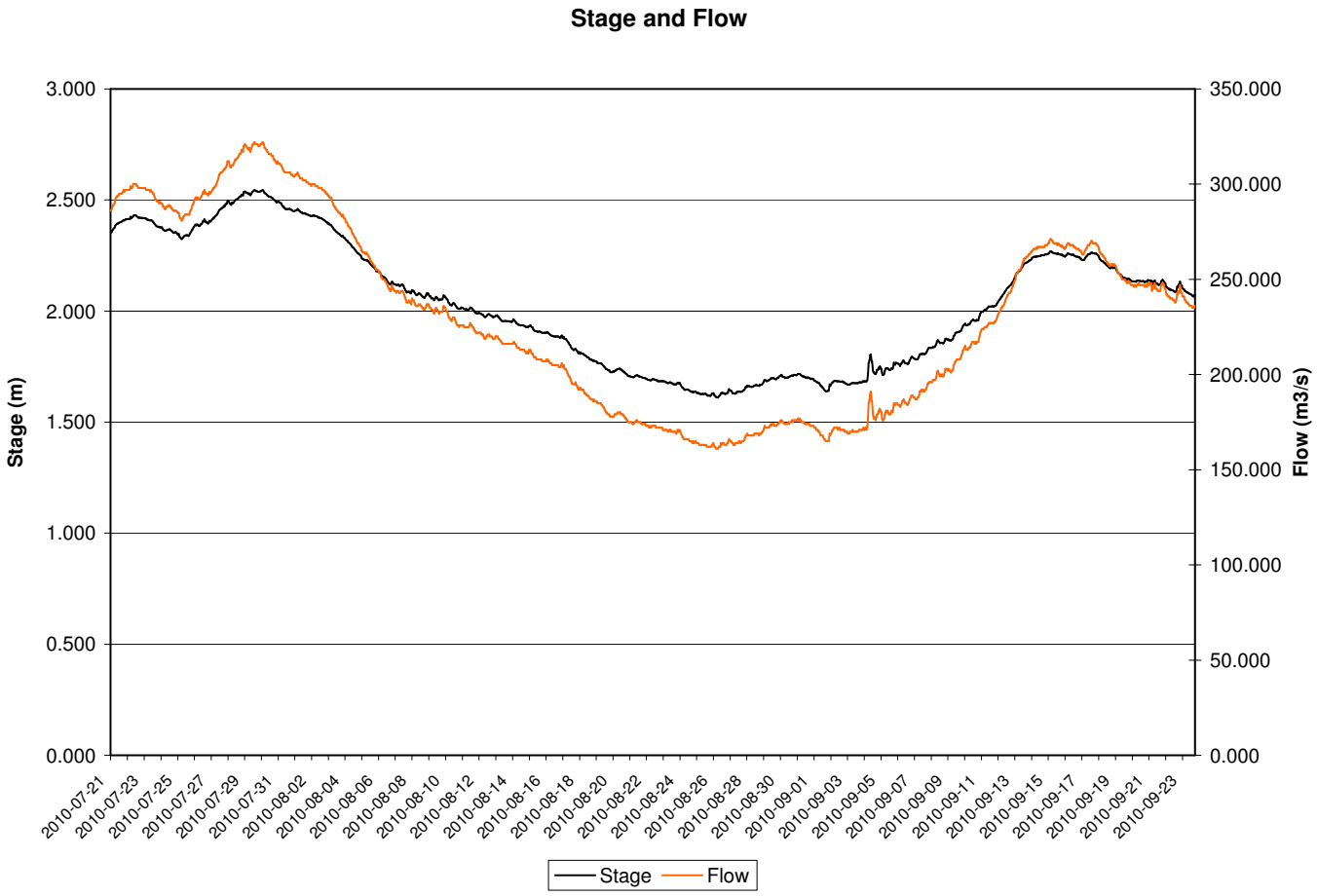

Figure 6

Climate Data

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

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Appendix A

Daily Data Report for July 2010

Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	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
21†	**26.0**	**14.0**	**20.0**	**0.0**	**2.0**	**0.0**	**0.0**	**0.0**	**0**		
22†	**25.0**	**13.0**	**19.0**	**0.0**	**1.0**	**6.8**	**0.0**	**6.8**	**0**		
23†	**23.0**	**15.0**	**19.0**	**0.0**	**1.0**	**0.0**	**0.0**	**0.0**	**0**		
24†	**25.5**	**12.0**	**18.8**	**0.0**	**0.8**	**20.7**	**0.0**	**20.7**	**0**		
25†	**25.0**	**12.0**	**18.5**	**0.0**	**0.5**	**6.4**	**0.0**	**6.4**	**0**		
26†	**21.0**	**15.5**	**18.3**	**0.0**	**0.3**	**0.4**	**0.0**	**0.4**	**0**		
27†	**16.0**	**11.5**	**13.8**	**4.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0**		
28†	**25.0**	**10.0**	**17.5**	**0.5**	**0.0**	**0.4**	**0.0**	**0.4**	**0**		
29†	**23.5**	**16.5**	**20.0**	**0.0**	**2.0**	**7.7**	**0.0**	**7.7**	**0**		
30†	**22.5**	**16.0**	**19.3**	**0.0**	**1.3**	**11.5**	**0.0**	**11.5**	**0**		
31†	**18.5**	**13.0**	**15.8**	**2.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0**		

Daily Data Report for August 2010

Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	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†	24.5	13.5	19.0	0.0	1.0	0.0	0.0	0.0	0		
02†	24.0	12.5	18.3	0.0	0.3	0.0	0.0	0.0	0		
03†	24.5	15.5	20.0	0.0	2.0	0.0	0.0	0.0	0		
04†	25.5	14.5	20.0	0.0	2.0	2.0	0.0	2.0	0		
05†	27.0	17.5	22.3	0.0	4.3	1.0	0.0	1.0	0		
06†	27.5	19.0	23.3	0.0	5.3	0.3	0.0	0.3	0		
07†	21.0	16.0	18.5	0.0	0.5	11.5	0.0	11.5	0		
08†	25.0	11.5	18.3	0.0	0.3	0.8	0.0	0.8	0		
09†	25.0	16.5	20.8	0.0	2.8	4.0	0.0	4.0	0		
10†	26.0	16.0	21.0	0.0	3.0	0.2	0.0	0.2	0		
11†	19.5	13.0	16.3	1.7	0.0	1.0	0.0	1.0	0		
12†	20.5	11.5	16.0	2.0	0.0	0.1	0.0	0.1	0		
13†	22.0	8.5	15.3	2.7	0.0	0.0	0.0	0.0	0		
14†	24.0	13.0	18.5	0.0	0.5	0.0	0.0	0.0	0		
15†	25.0	12.5	18.8	0.0	0.8	0.0	0.0	0.0	0		
16†	26.0	12.5	19.3	0.0	1.3	0.0	0.0	0.0	0		
17†	28.5	13.5	21.0	0.0	3.0	0.8	0.0	0.8	0		
18†	28.0	18.5	23.3	0.0	5.3	0.0	0.0	0.0	0		
19†	25.0	15.5	20.3	0.0	2.3	0.0	0.0	0.0	0		
20†	23.0	13.0	18.0	0.0	0.0	0.0	0.0	0.0	0		
21†	17.0	13.5	15.3	2.7	0.0	0.2	0.0	0.2	0		
22†	18.0	13.5	15.8	2.2	0.0	0.0	0.0	0.0	0		
23†	18.5	13.5	16.0	2.0	0.0	0.0	0.0	0.0	0		
24†	23.0	10.0	16.5	1.5	0.0	0.0	0.0	0.0	0		
25†	25.0	12.5	18.8	0.0	0.8	0.0	0.0	0.0	0		
26†	28.5	12.5	20.5	0.0	2.5	10.0	0.0	10.0	0		
27†	24.0	12.5	18.3	0.0	0.3	0.2	0.0	0.2	0		
28†	21.5	14.5	18.0	0.0	0.0	0.0	0.0	0.0	0		

29†	25.0	11.5	18.3	0.0	0.3	0.0	0.0	0.0	0
30†	25.0	17.0	21.0	0.0	3.0	0.3	0.0	0.3	0
31†	22.5	11.0	16.8	1.2	0.0	0.0	0.0	0.0	0
Sum				**16.0**	**41.6**	**32.4**	**0.0**	**32.4**	
Avg	**23.9**	**13.7**	**18.8**						
Xtrm	**28.5**	**8.5**							

Daily Data Report for September 2010

Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	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†	23.0	17.0	20.0	0.0	2.0	0.0	0.0	0.0	0		
02†	23.0	19.0	21.0	0.0	3.0	12.5	0.0	12.5	0		
03†	22.0	15.5	18.8	0.0	0.8	0.0	0.0	0.0	0		
04†	28.0	17.5	22.8	0.0	4.8	9.0	0.0	9.0	0		
05†	24.0	18.5	21.3	0.0	3.3	0.0	0.0	0.0	0		
06†	21.0	14.0	17.5	0.5	0.0	0.0	0.0	0.0	0		
07†	21.0	14.0	17.5	0.5	0.0	0.0	0.0	0.0	0		
08†	15.0	11.0	13.0	5.0	0.0	0.0	0.0	0.0	0		
09†	14.5	10.0	12.3	5.7	0.0	16.1	0.0	16.1	0		
10†	15.5	10.0	12.8	5.2	0.0	6.7	0.0	6.7	0		
11†	12.0	10.5	11.3	6.7	0.0	4.8	0.0	4.8	0		
12†	11.0	6.5	8.8	9.2	0.0	0.0	0.0	0.0	0		
13†	15.5	3.0	9.3	8.7	0.0	1.1	0.0	1.1	0		
14†	16.5	9.5	13.0	5.0	0.0	2.4	0.0	2.4	0		
15†	15.5	11.5	13.5	4.5	0.0	6.7	0.0	6.7	0		
16†	15.0	12.0	13.5	4.5	0.0	12.8	0.0	12.8	0		
17†	15.5	11.0	13.3	4.7	0.0	0.0	0.0	0.0	0		
18†	18.5	11.5	15.0	3.0	0.0	0.0	0.0	0.0	0		
19†	17.5	12.0	14.8	3.2	0.0	1.7	0.0	1.7	0		
20†	15.0	12.0	13.5	4.5	0.0	0.0	0.0	0.0	0		
21†	12.0	10.0	11.0	7.0	0.0	0.0	0.0	0.0	0		
22†	15.5	8.5	12.0	6.0	0.0	0.0	0.0	0.0	0		
23†	13.5	9.0	11.3	6.7	0.0	0.7	0.0	0.7	0		
24†	13.5	8.5	11.0	7.0	0.0	0.0	0.0	0.0	0		