Real-Time Water Quality Monitoring
2007 Annual Report
NF02ZK0023 - Rattling Brook below Bridge

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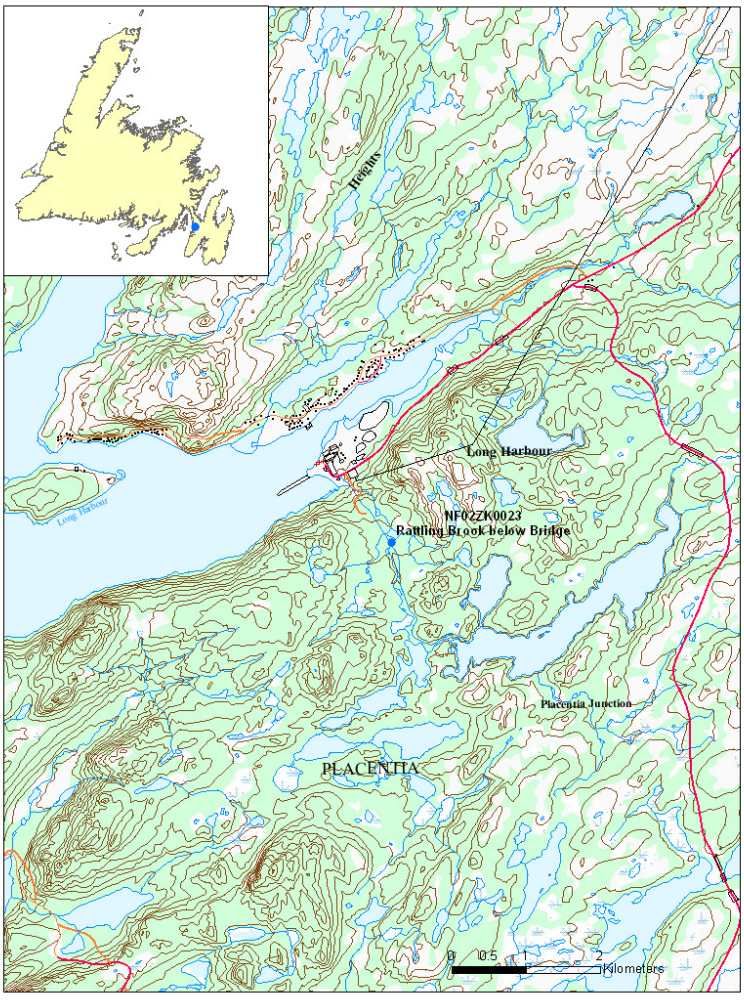
Section 1.0 Introduction

Real-Time Water Quality Monitoring began in Long Harbour at the site, Rattling Brook below Bridge, during the winter of 2006 with the establishment of a surface water station which is operational year round. The real-time station has provided invaluable baseline water quality information since installation. This real-time water quality station can be seen in **Figure 1**. This report will cover data collected since the initial installation on December 14, 2006 to December 31, 2007.

From the installation date of December 14, 2006 to January 23, 2007 the data from the real-time monitoring station was visible online. However, after this point there was need to make adjustments to the steel protective casing, too much debris was getting caught in the casing and hindering the sensors, thus the instrument was removed. Poor winter weather subsequently delayed a timely reinstallation and the instrument was not reinstalled until March 9, 2007. Throughout the remainder of the year, regular maintenance/calibration activities occurred approximately every 30 days resulting in short data gaps. Communication problems arose resulting in data gaps for the periods of April 13-20, April 22-May 15, 2007 and October 3–October 29, 2007. Due to issues with the instrument in October, it was removed and sent to the distributor for servicing, a replacement was used for remainder of the year.

Figure 1: Site Location



Section 2.0 Maintenance/Calibration

It is recommended by the Department of Environment and Conservation (DOEC) that regular maintenance/calibration take place on a monthly basis in order to ensure accuracy of the data from the real-time water quality monitoring station. **Table 1** identifies the dates that the instrument was removed/reinstalled for regular maintenance and calibration in 2007. It is important to note that some deployment periods were longer than thirty days due to such issues as staff availability and weather, of note, item number 2 has a long removal period which was due to poor weather hindering reinstallation.

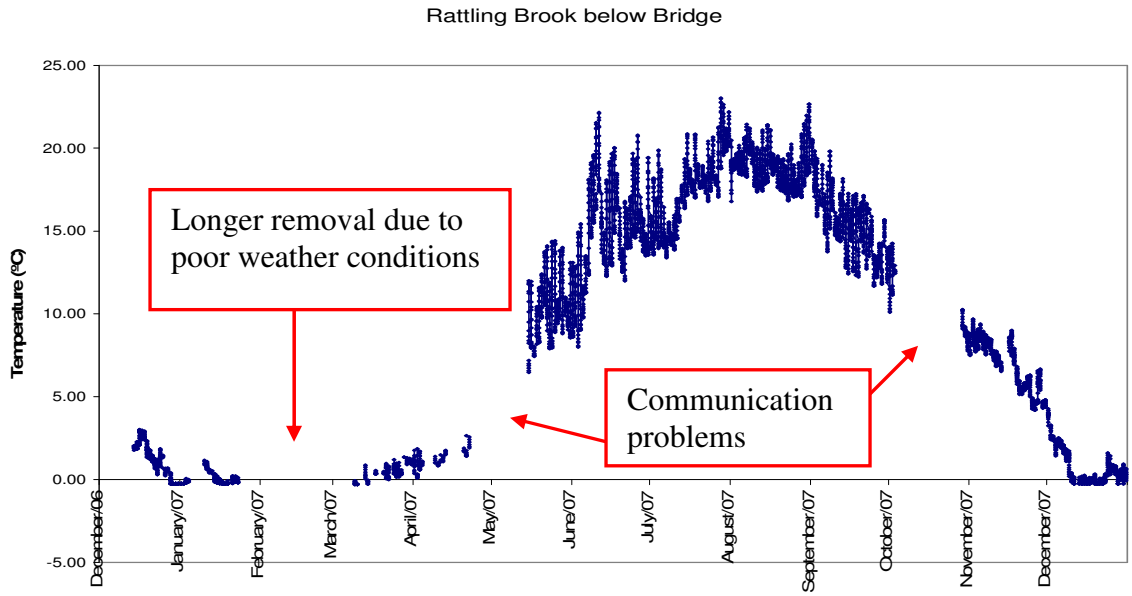
Table 1:Dates of Maintenance/Calibration of Instruments

Item Number	Date and time of removal		Date and time of reinstallation		Reason	Remarks
1			2006-12-14	14:30	Initial installation	
2	2007-01-23	11:30	2007-03-09	12:00	Maintenance/Calibration	Poor weather
3	2007-04-16	10:45	2007-04-17	11:30	Maintenance/Calibration	
4	2007-05-17	10:15	2007-05-18	11:00	Maintenance/Calibration	
5	2007-07-12	12:30	2007-07-13	13:00	Maintenance/Calibration	
6	2007-09-04	12:40	2007-09-05	13:00	Maintenance/Calibration	Limited staff availability
7	2007-10-03	11:15	2007-10-04	11:15	Warranty and Service	Replacement in-use
8	2007-11-13	13:30	2007-11-16	10:30	Maintenance/Calibration	Replacement in-use
9	2007-12-11	13:00	2007-12-13	15:35	Maintenance/Calibration	Replacement in-use

Section 3.0 Data Interpretation

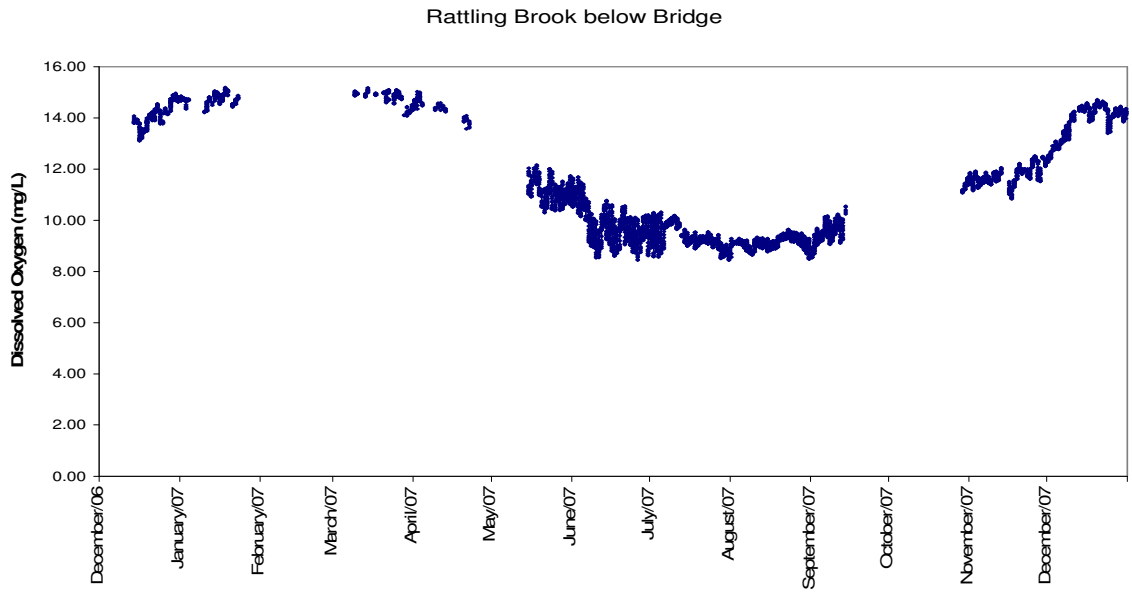
Seasonal variation in the water temperature (**Figure 2**) is clear, with a temperature range of -0.31 to 23.03ºC. As expected minimum temperature values were recorded in during the winter months and maximum temperature values in the summer months.

Figure 2: Temperature



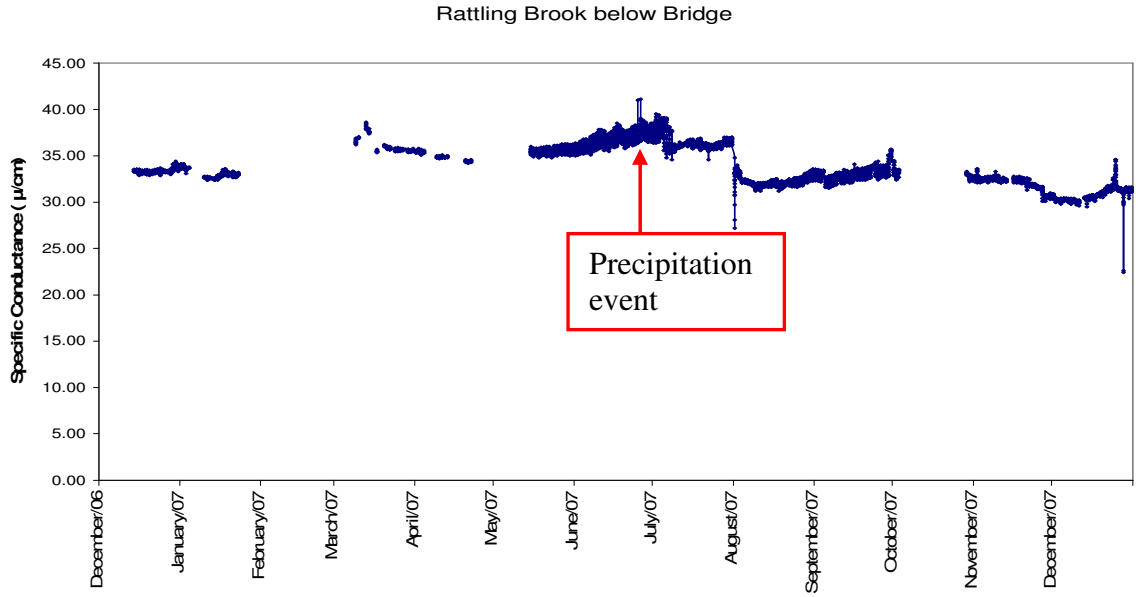
Dissolved oxygen (DO) (**Figure 3**) generally correspond inversely with temperature values. DO had a range of 8.44 to 15.19 mg/L. The majority of DO values were above the most conservative concentration of 9.5 mg/L recommended by the Canadian Council of Ministers of the Environment (CCME) Protection of Freshwater Aquatic Life Guidelines.

Figure 3: Dissolved Oxygen



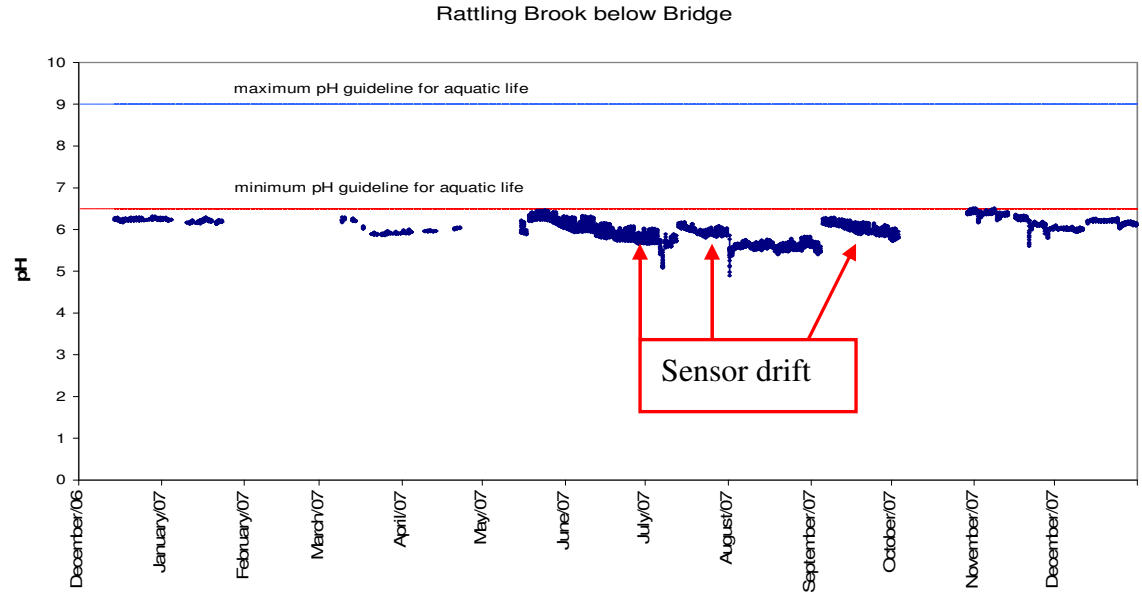
Specific conductivity values (**Figure 4**) remained within a range of 22.4 µS/cm to 41.1 µS/cm over the reporting period. This low range indicates that not many ions (contaminants) are entering the system, a spike in the beginning of July corresponds to a heavy rainfall event (Appendix A for climate data).

Figure 4: Specific Conductance



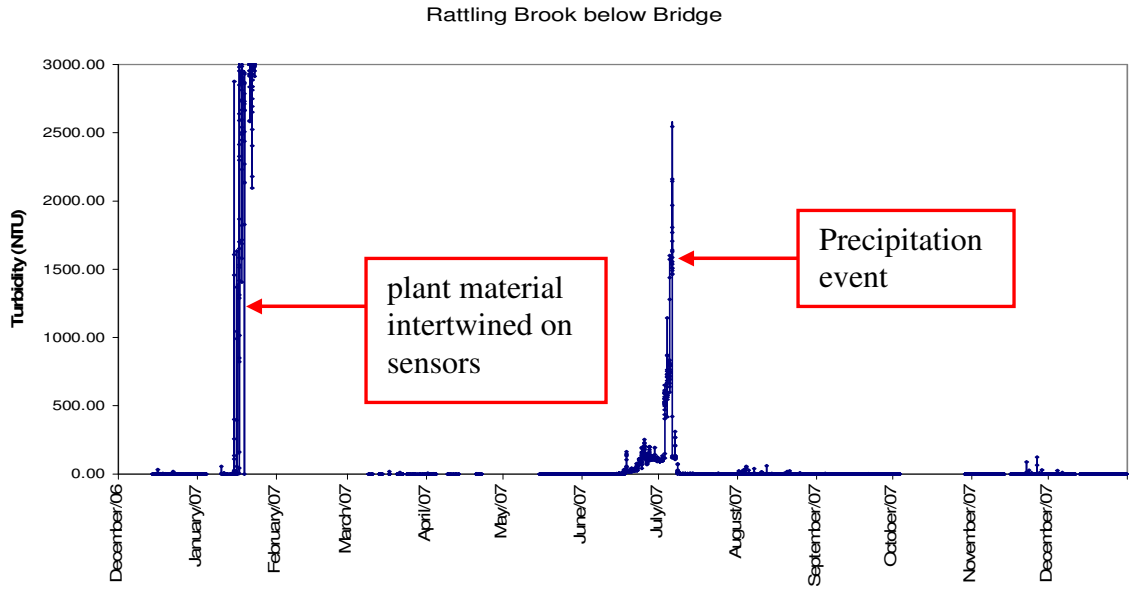
pH (**Figure 5**) values were relatively consistent throughout the reporting period, however it appears as though the pH sensor drifted slightly in the summer month. Subsequently, the instrument was sent for servicing and a replacement instrument was used for the remainder of the fall and winter months , more stable values were achieved for this period. pH ranged from 4.89 to 6.51, almost all falling below the lower CCME Protection of Aquatic Life guideline (6.5-9.0) due to the naturally acidic nature of NL waters.

Figure 5: pH



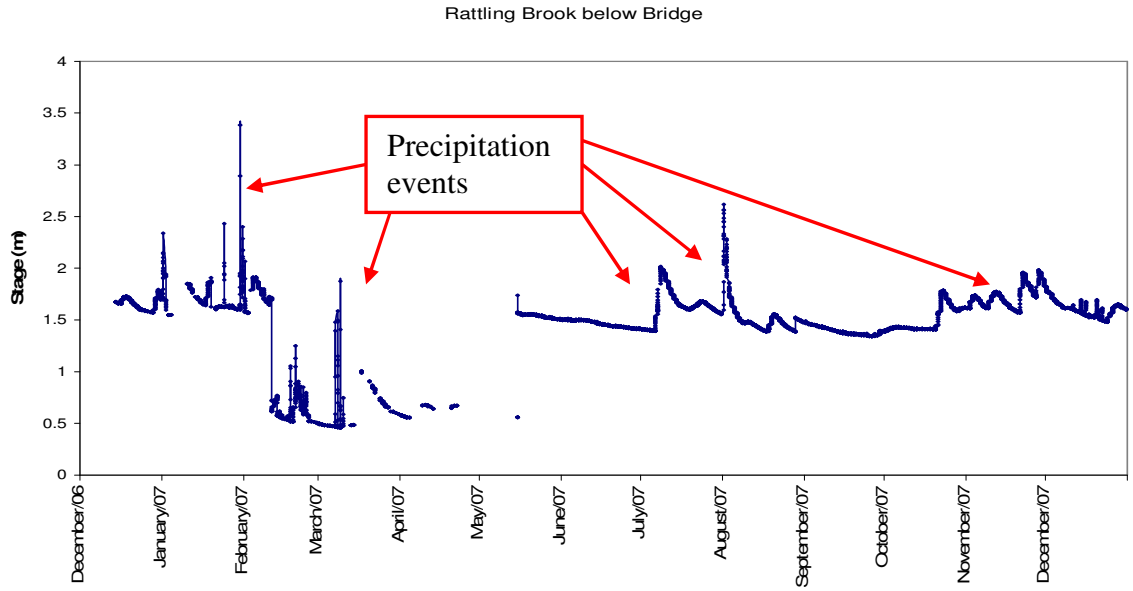
Turbidity values (**Figure 6**) remained relatively stable throughout the reporting period. Two significant events occurred during the year. The first event occurred in early January, after inspection of the instrument, it was found that plant material had become intertwined on the sensors resulting in a saturated turbidity sensor (3000 NTU). The second event occurred in July, concurrent with a period of heavy precipitation event (Appendix A for climate data), in which turbidity values increased to 2545 NTU.

Figure 6: Turbidity



Stage values (**Figure 7**) ranged from 1.48 to 3.38 m and correspond to precipitation events (Appendix A for climate data). The most significant precipitation events occurred in early January, early February, early July, mid August, mid October and throughout November.

Figure 7: Stage



Overall, the Rattling Brook below Bridge station displayed very consistent values for all measured parameters over the 2007 period. Most variation in parameter values over the year have been attributed to natural conditions, precipitation events and sensor drift.

Section 4.0 Quality Assurance/Quality Control (QA/QC) Measures

Quality Assurance/Quality Control (QA/QC) measures are a very important aspect of the Real-Time Water Quality Monitoring Site at Rattling Brook below Bridge. These measures are put in place to ensure that the instruments are reading data accurately. The QA/QC procedures established by DOEC are two-fold:

1) Data from the water quality monitoring instrument in-situ are compared to data from a portable instrument in-situ at the time of redeployment after maintenance/calibration procedures have been performed; data must fall within a specified range. **Table 2** summarizes the QA/QC results comparing the field readings against the QA instrument.

2) Grab water samples are taken from each station at the time of redeployment and sent to a laboratory for analysis; the results are then compared to those of the water quality monitoring instrument in-situ (Datasonde); data must fall within a specified range. **Table 3** summarizes the QA/QC results comparing the Datasonde readings against the laboratory readings (only three readings available from the lab for comparison – pH; conductivity; turbidity).

As can be seen in **Table 2**, the QA/QC comparison between the field instrument and the QA instrument at the time of redeployment was generally excellent or good. There were some instances throughout the year when pH QA/QC comparison rankings fell as low as fair and poor which provided good indication that the sensor was not calibrating properly as a result, the instrument was sent away for servicing.

As can be seen in **Table 3**, the QA/QC comparison between the field instrument and laboratory data at the time of redeployment was generally excellent. There were two instances throughout the year when conductivity QA/QC comparison ranking was good and marginal. This has recently been encountered with a variety of the QA/QC samples for a number of other real-time water quality samples and will be looked at in more detail in 2008.

Table 2: QA/QC Results (Datasonde vs. Minisonde)

Reinstallation Date	Parameters	Datasonde Data	Minisonde Data	Rating
2006-12-14	Temp (°C)	1.76	NA	NA
	pH (units)	6.28	NA	NA
	Conductivity (µS/cm)	33.4	NA	NA
	Dissolved Oxygen (mg/L)	14.07	NA	NA
2007-03-09	Temp (°C)	-0.22	-0.26	Excellent
	pH (units)	6.3	5.18	Poor
	Conductivity (µS/cm)	36.4	36.6	Excellent
	Dissolved Oxygen (mg/L)	15.05	14.82	Excellent
2007-04-17	Temp (°C)	2.78	NA	NA
	pH (units)	NA	5.84	NA
	Conductivity (µS/cm)	NA	34.3	NA
	Dissolved Oxygen (mg/L)	NA	13.77	NA
2007-05-18	Temp (°C)	8.08	8.16	Excellent
	pH (units)	6.21	5.49	Fair
	Conductivity (µS/cm)	34.9	35.1	Excellent
	Dissolved Oxygen (mg/L)	12.16	11.89	Excellent
2007-07-13	Temp (°C)	17.53	17.56	Excellent
	pH (units)	6.16	6.08	Excellent
	Conductivity (µS/cm)	36.3	35.6	Excellent
	Dissolved Oxygen (mg/L)	9.43	9.39	Excellent
2007-09-05	Temp (°C)	18.4	18.12	Good
	pH (units)	6.26	6.24	Excellent
	Conductivity (µS/cm)	31.6	31.4	Excellent
	Dissolved Oxygen (mg/L)	9.6	9.55	Excellent
2007-10-04	Temp (°C)	NA	NA	NA
	pH (units)	NA	NA	NA
	Conductivity (µS/cm)	NA	NA	NA
	Dissolved Oxygen (mg/L)	NA	NA	NA
2007-11-16	Temp (°C)	7.75	7.56	Good
	pH (units)	6.32	5.91	Good
	Conductivity (µS/cm)	32.3	31.9	Excellent
	Dissolved Oxygen (mg/L)	11.51	11.67	Excellent
2007-12-13	Temp (°C)	0.13	0.2	Excellent
	pH (units)	6.14	5.92	Good
	Conductivity (µS/cm)	30.4	29.9	Excellent
	Dissolved Oxygen (mg/L)	14.27	14.45	Excellent

Note: NA refers to a lack of data from at the time of reinstallation. NA for the Datasonde indicates communication problems between the Datasonde and the datalogger. NA for the Minisonde indicates that readings were not taken, reasons include the Minisonde was not communicating and batteries were low, a result of cold weather.

Table 3: QA/QC Results (Datasonde vs. Laboratory)

Reinstallation Date	Parameters	Datasonde Data	Laboratory Data	Rating
2006-12-14	pH (units)	6.28	NA	NA
	Conductivity (µS/cm)	33.4	NA	NA
	Turbidity (NTU)	0	NA	NA
2007-03-09	pH (units)	6.3	6.19	Excellent
	Conductivity (µS/cm)	36.4	44	Marginal
	Turbidity (NTU)	0	0.6	Excellent
2007-04-17	pH (units)	NA	NA	NA
	Conductivity (µS/cm)	NA	NA	NA
	Turbidity (NTU)	NA	NA	NA
2007-05-18	pH (units)	6.21	NA	NA
	Conductivity (µS/cm)	34.9	NA	NA
	Turbidity (NTU)	0	NA	NA
2007-07-13	pH (units)	6.16	6.25	Excellent
	Conductivity (µS/cm)	36.3	37	Excellent
	Turbidity (NTU)	0	0.6	Excellent
2007-09-05	pH (units)	6.26	6.18	Excellent
	Conductivity (µS/cm)	31.6	32	Excellent
	Turbidity (NTU)	0	0.3	Excellent
2007-10-04	pH (units)	NA	6.26	NA
	Conductivity (µS/cm)	NA	33	NA
	Turbidity (NTU)	NA	0.5	NA
2007-11-16	pH (units)	6.32	6.26	Excellent
	Conductivity (µS/cm)	32.3	33	Excellent
	Turbidity (NTU)	0	0.3	Excellent
2007-12-13	pH (units)	6.14	6.12	Excellent
	Conductivity (µS/cm)	30.4	33	Good
	Turbidity (NTU)	0	0.5	Excellent

Note: NA for the Datasonde indicates communication problems between the Datasonde and the datalogger at the time of reinstallation. NA for Laboratory Data indicates that no QA water sampling was performed due to a change in laboratories used to analyze the samples in April and May.

Section 5.0 Conclusions

The Rattling Brook below Bridge real-time water quality monitoring site has been very successful in gathering water quality data for the past year. The site instrument was received from servicing and will be put back onsite January, 2008. The near-real time water quality data allows VNBC staff to become aware of natural background water quality at this site. To date, the data has clearly shown that the ambient water quality is of good quality and stable.

Section 6.0 Path Forward

In order for a program to be successful, it is essential to continually evaluate and move forward. The following is a list of planned activities to be carried out in the upcoming year.

- shipment of instrument for servicing work as required
- continued year-round monitoring of water quality with continued data analysis in the form of deployment reports
- communication between DOEC and VBNC staff to respond to emerging issues on a proactive basis
- continued site visitation with monthly maintenance/calibration by DOEC staff
- continued work on Automatic Data Retrieval System to incorporate new capabilities
- continued transfer of data from DOEC to VBNC staff through the departmental web page
- provide on-line statistical analysis of data
- evaluation and upgrading of QA/QC procedures
- work on extrapolation of other water quality parameters using regression analysis
- creation of value added products using the real-time water quality data, remote sensing and water quality indices
- further communication between DOEC and VBNC staff to discuss upgrading/expanding the real-time water quality monitoring network at Long Harbour as the project moves into the construction phase

Appendix A: Climate Data for Argentia, NL

Daily Data Report for December 2006

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	8.0	2.0	5.0	13.0	0.0			4.9	0		
02	9.0	-0.3	4.4	13.6	0.0			8.6	0		
03	2.1	0.2	1.2	16.8	0.0			0.0	0		
04	2.1	-1.6	0.3	17.7	0.0			17.5	0		
05	2.2	0.3	1.3	16.7	0.0			1.6	M		
06	1.9	-3.9	-1.0	19.0	0.0			0.0	M		
07	11.8	-3.2	4.3	13.7	0.0			4.2	M		
08	12.9	3.5	8.2	9.8	0.0			18.4	M		
09	1.3	-4.0							M		
10	5.5	-3.5							M		
11	4.2	2.7							M		
12	-0.9	-6.5							M		
13	-4.2	-3.4	0.4	17.6	0.0			0.0	M		
14	8.6	1.6	5.1	12.9	0.0			5.1	M		
15	5.3	3.9	4.6	13.4	0.0			11.0	M		
16	10.4	3.2	6.8	11.2	0.0			9.8	M		
17	5.0	4.0	4.5	13.5	0.0			0.0	M		
18	5.3	2.1	3.7	14.3	0.0			0.0	M		
19	-0.4	-4.7	-2.6	20.6	0.0			0.0	M		
20	0.6	-4.7	-2.1	20.1	0.0			0.6	M		
21	2.9	-2.8	0.1	17.9	0.0			1.6	M		
22	-0.6	-3.3	-2.0	20.0	0.0			0.0	M		
23	4.3	-3.9	0.2	17.8	0.0			3.3	M		
24	7.8	-0.8	3.5	14.5	0.0			3.7	M		
25	3.0	2.0	2.5	15.5	0.0			0.0	M		
26	1.9	0.0	1.0	17.0	0.0			6.8	M		
27	0.7	-0.2	0.3	17.7	0.0			0.0	M		
28	-2.2	-4.9	-3.6	21.6	0.0			0.0	M		
29	-5.0	-6.8	-5.9	23.9	0.0			0.0	M		
30	-0.5	-8.9	-4.7	22.7	0.0			0.0	M		
31	-0.2	-4.7	-2.5	20.5	0.0			2.0	M		
Sum				525.6	0.0			99.8			
Avg	3.6	-1.5	1.0								
Xtrm	12.9	-8.9									

Station installed December 14, 2006

Daily Data Report for January 2007

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	0.3	-6.4	-3.1	21.1	0.0			0.0			
02	7.6	-3.4	2.1	15.9	0.0			12.9			
03	2.1	-2.1	0.0	18.0	0.0			0.0			
04	2.8	-2.0	0.4	17.6	0.0			0.0			
05	4.2	1.0	2.6	15.4	0.0			9.2			
06	6.6	1.8	4.2	13.8	0.0			22.7			
07	4.1	2.6	3.4	14.6	0.0			0.0			
08	9.9	1.7	5.8	12.2	0.0			11.9			
09	5.6	0.9	3.3	14.7	0.0			3.5			
10	2.5	1.9	2.2	15.8	0.0			1.3			
11	0.6	-1.0	-0.2	18.2	0.0			1.1			
12	2.5	-2.1	0.2	17.8	0.0			2.4			
13	2.1	0.7	1.4	16.6	0.0			3.7			
14	0.0	-6.4	-3.2	21.2	0.0			0.7			
15	-3.1	-6.1	-4.6	22.6	0.0			1.9			
16	-2.1	-8.4	-5.3	23.3	0.0			0.7			
17	-11.0	-12.5	-11.8	29.8	0.0			0.0			
18	-0.8	-14.2	-7.5	25.5	0.0			0.0			
19	4.9	-8.5	-1.8	19.8	0.0			2.9			
20	5.9	-0.2	2.9	15.1	0.0			10.6			
21	0.2	-0.5	-0.2	18.2	0.0			4.2			
22	-3.0	-5.3	-4.2	22.2	0.0			0.0			
23	-1.1	-6.0	-3.6	21.6	0.0			3.8			
24	1.2	-4.2	-1.5	19.5	0.0			7.6			
25	-0.3	-1.0	-0.7	18.7	0.0			0.7			
26	2.4	-4.4	-1.0	19.0	0.0			6.9			
27	0.8	-0.6	0.1	17.9	0.0			2.6			
28	-1.5	-2.6	-2.1	20.1	0.0			0.6			
29	-2.8	-4.4	-3.6	21.6	0.0			6.9			
30	-3.6	-7.3	-5.5	23.5	0.0			0.6			
31	-4.7	-6.6	-5.7	23.7	0.0			0.0			
Sum				595.0	0.0			119.7			
Avg	1.0	-3.4	-1.2								
Xtrm	9.9	-14.2									

Daily Data Report for February 2007

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	-3.5	-10.0	-6.8	24.8	0.0			0.6	M		
02	5.8	-6.5	-0.4	18.4	0.0			23.2	M		
03	4.1	-0.5	1.8	16.2	0.0			4.1	M		
04	-2.5	-5.5	-4.0	22.0	0.0			0.0	M		
05	-3.1	-6.2	-4.7	22.7	0.0			1.3	M		
06	-6.9	-10.0	-8.5	26.5	0.0			0.0	M		
07	-4.8	-9.5	-7.2	25.2	0.0			0.0	M		
08	-6.0	-9.3	-7.7	25.7	0.0			0.7	M		
09	-5.8	-8.7	-7.3	25.3	0.0			0.0	M		
10	-4.6	-9.4	-7.0	25.0	0.0			1.3	M		
11	-4.9	-7.5	-6.2	24.2	0.0			0.0	M		
12	-3.9	-6.2	-5.1	23.1	0.0			0.6	M		
13	-0.8	-6.0	-3.4	21.4	0.0			0.0	M		
14	-0.8	-4.5	-2.7	20.7	0.0			0.0	M		
15	2.5	-5.5	-1.5	19.5	0.0			7.5	M		
16	0.3	-2.7	-1.2	19.2	0.0			0.0	M		
17	-2.5	-5.7	-4.1	22.1	0.0			0.6	M		
18	-1.2	-6.8	-4.0	22.0	0.0			6.9	M		
19	-1.4	-2.9	-2.2	20.2	0.0			8.0	M		
20	-0.2	-4.0	-2.1	20.1	0.0			0.0	M		
21	-2.8	-4.6	-3.7	21.7	0.0			0.0	M		
22	-3.0	-5.6	-4.3	22.3	0.0			0.0	M		
23	-2.1	-6.0	-4.1	22.1	0.0			2.6	14		
24	-1.5	-5.0	-3.3	21.3	0.0			0.0	13		
25	0.0	-3.6	-1.8	19.8	0.0			0.0	12		
26	1.5	-1.3	0.1	17.9	0.0			0.6	13		
27	-0.3	-2.1	-1.2	19.2	0.0			0.0	13		
28	0.0	-3.1	-1.6	19.6	0.0			0.0	13		
Sum				608.2	0.0			58.0			
Avg	-1.7	-5.7	-3.7								
Xtrm	5.8	-10.05									

Daily Data Report for March 2007

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	-1.6	-6.6	-4.1	22.1	0.0			0.0	13		
02	-0.6	-4.8	-2.7	20.7	0.0			0.0	13		
03	1.7	-6.5	-2.4	20.4	0.0			2.0	13		
04	2.2	-3.7	-0.8	18.8	0.0			2.8	12		
05	-0.4	-1.4	-0.9	18.9	0.0			0.0	12		
06	-0.3	-2.2	-1.3	19.3	0.0			1.5	16		
07	-4.1	-6.5	-5.3	23.3	0.0			0.0	13		
08	-7.5	-9.1	-8.3	26.3	0.0			0.0	12		
09	-5.0	-12.0	-8.5	26.5	0.0			0.0	13		
10	0.3	-8.6	-4.2	22.2	0.0			0.0	12		
11	5.3	-3.9	0.7	17.3	0.0			3.2	12		
12	4.7	1.4	3.1	14.9	0.0			3.0	9		
13	-0.6	-4.5	-2.6	20.6	0.0			0.0	9		
14	5.6	-5.1	0.3	17.7	0.0			0.0	9		
15	9.7	3.3	6.5	11.5	0.0			1.0	9		
16	4.9	1.2	3.1	14.9	0.0			0.6	9		
17	8.5	-4.4	2.1	15.9	0.0			0.0	9		
18	12.3	1.4	6.9	11.1	0.0			2.3	9		
19	2.1	-0.3	0.9	17.1	0.0			0.0	7		
20	4.6	-3.5	0.6	17.4	0.0			11.3	7		
21	-0.5	-5.1	-2.8	20.8	0.0			0.0	8		
22	2.2	-9.0	-3.4	21.4	0.0			1.7	10		
23	1.7	-0.7	0.5	17.5	0.0			0.0	8		
24	-0.6	-3.1	-1.9	19.9	0.0			0.0	7		
25	0.0	-8.4	-4.2	22.2	0.0			0.0	8		
26	0.5	-4.5	-2.0	20.0	0.0			0.0	8		
27	3.7	-1.6	1.1	16.9	0.0			0.0	10		
28	3.3	0.2	1.8	16.2	0.0			1.3	15		
29	1.3	-1.5	-0.1	18.1	0.0			1.2	9		
30	3.3	-0.6	1.4	16.6	0.0			0.0	9		
31	2.0	-0.8	0.6	17.4	0.0			0.0	9		
Sum				583.9	0.0			31.9			
Avg	1.9	-3.6	-0.8								
Xtrm	12.3	-12.0									

Daily Data Report for April 2007

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	0.0	-3.4	-1.7	19.7	0.0			0.0	10		
02	1.2	-5.2	-2.0	20.0	0.0			0.0	10		
03	1.9	-4.9	-1.5	19.5	0.0			1.3	9		
04	2.5	-0.8	0.9	17.1	0.0			0.6	10		
05	4.7	1.0	2.9	15.1	0.0			0.0	10		
06	8.4	-0.7	3.9	14.1	0.0			3.0	8		
07	5.9	-0.7	2.6	15.4	0.0			2.7	9		
08	9.3	1.3	5.3	12.7	0.0			1.6	8		
09	3.0	0.2	1.6	16.4	0.0			0.6	10		
10	1.2	-1.0	0.1	17.9	0.0			0.0	9		
11	2.0	-1.3	0.4	17.6	0.0			0.0	10		
12	2.4	-3.6	-0.6	18.6	0.0			0.0	9		
13	4.9	-3.4	0.8	17.2	0.0			0.0	10		
14	2.0	-1.0	0.5	17.5	0.0			0.0	9		
15	6.1	-0.6	2.8	15.2	0.0			0.0	9		
16	7.5	-0.6	3.5	14.5	0.0			0.0	10		
17	3.8	1.3	2.6	15.4	0.0			0.0	9		
18	3.3	0.9	2.1	15.9	0.0			0.6	9		
19	3.4	0.6	2.0	16.0	0.0			0.0	9		
20	4.3	-0.5	1.9	16.1	0.0			0.0	9		
21	6.3	-2.3	2.0	16.0	0.0			0.0	9		
22	5.3	-2.4	1.5	16.5	0.0			0.0	11		
23	4.4	-0.8	1.8	16.2	0.0			1.6	10		
24	6.5	1.1	3.8	14.2	0.0			0.0	10		
25	5.3	0.5	2.9	15.1	0.0			0.0	9		
26	4.0	-0.8	1.6	16.4	0.0			0.0	9		
27	5.3	0.1	2.7	15.3	0.0			0.0	8		
28	7.0	0.3	3.7	14.3	0.0			14.7	8		
29	5.7	0.8	3.3	14.7	0.0			0.0	8		
30	5.8	2.1	4.0	14.0	0.0			0.6	8		
Sum				484.6	0.0			27.3			
Avg	4.4	-0.8	1.8								
Xtrm	9.3	-5.2									

Daily Data Report for May 2007

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	7.0	2.8	4.9	13.1	0.0			15.8	0		
02	4.1	1.3	2.7	15.3	0.0			0.7	0		
03	3.2	-0.3	1.5	16.5	0.0			0.0	0		
04	2.8	0.8	1.8	16.2	0.0			1.9	0		
05	5.8	1.1	3.5	14.5	0.0			0.0	0		
06	6.4	1.8	4.1	13.9	0.0			0.0	0		
07	5.8	1.4	3.6	14.4	0.0			0.0	0		
08	10.2	1.8	6.0	12.0	0.0			0.0	0		
09	8.5	2.7	5.6	12.4	0.0			0.0	0		
10	14.6	2.8	8.7	9.3	0.0			0.0	0		
11	11.4	3.6	7.5	10.5	0.0			0.6	0		
12	9.1	3.5	6.3	11.7	0.0			9.2	0		
13	8.5	0.1	4.3	13.7	0.0			0.0	0		
14	7.3	0.4	3.9	14.1	0.0			0.0	0		
15	6.1	-1.5	2.3	15.7	0.0			0.7	0		
16	8.8	2.8	5.8	12.2	0.0			0.0	0		
17	6.5	0.5	3.5	14.5	0.0			11.1	0		
18	9.6	1.6	5.6	12.4	0.0			0.0	0		
19	13.5	1.5	7.5	10.5	0.0			2.5	0		
20	16.8	5.5	11.2	6.8	0.0			3.6	0		
21	12.0	4.8	8.4	9.6	0.0			0.0	0		
22	6.7	3.0	4.9	13.1	0.0			0.6	0		
23	8.1	1.6	4.9	13.1	0.0			0.0	0		
24	10.1	-0.6	4.8	13.2	0.0			0.0	0		
25	18.0	1.8	9.9	8.1	0.0			1.4	0		
26	6.9	3.4	5.2	12.8	0.0			6.8	0		
27	12.3	3.8	8.1	9.9	0.0			0.0	0		
28	8.2	3.2	5.7	12.3	0.0			4.7	0		
29	9.3	4.2	6.8	11.2	0.0			0.7	0		
30	8.6	3.5	6.1	11.9	0.0			0.0	0		
31	11.1	2.6	6.9	11.1	0.0			0.0	0		
Sum				386.0	0.0			60.3			
Avg	8.9	2.1	5.5								
Xtrm	18.0	-1.5									

Daily Data Report for June 2007

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	8.7	3.1	5.9	12.1	0.0			9.2	0		
02	9.1	4.7	6.9	11.1	0.0			0.0	0		
03	7.6	1.2	4.4	13.6	0.0			0.0	0		
04	9.6	1.8	5.7	12.3	0.0			0.0	0		
05	12.6	4.2	8.4	9.6	0.0			0.6	0		
06	16.8	7.9	12.4	5.6	0.0			4.4	0		
07	20.8	8.4	14.6	3.4	0.0			0.0	0		
08	20.6	7.1	13.9	4.1	0.0			0.0	0		
09	16.2	9.9	13.1	4.9	0.0			0.0	0		
10	14.3	9.2	11.8	6.2	0.0			0.0	0		
11	21.7	8.9	15.3	2.7	0.0			0.0	0		
12	11.9	7.0	9.5	8.5	0.0			0.0	0		
13	12.6	6.3	9.5	8.5	0.0			0.0	0		
14	9.7	5.5	7.6	10.4	0.0			0.0	0		
15	7.6	4.6	6.1	11.9	0.0			0.0	0		
16	12.6	5.0	8.8	9.2	0.0			0.6	0		
17	15.6	8.1	11.9	6.1	0.0			0.0	0		
18	17.4	8.5	13.0	5.0	0.0			7.6	0		
19	11.2	9.7	10.5	7.5	0.0			5.2	0		
20	11.2	7.5	9.4	8.6	0.0			0.6	0		
21	17.2	7.9	12.6	5.4	0.0			0.0	0		
22	16.2	8.6	12.4	5.6	0.0			0.0	0		
23	18.0	8.3	13.2	4.8	0.0			1.3	0		
24	14.6	7.9	11.3	6.7	0.0			0.0	0		
25	14.1	10.5	12.3	5.7	0.0			0.0	0		
26	13.7	8.1	10.9	7.1	0.0			0.0	0		
27	12.2	8.5	10.4	7.6	0.0			2.3	0		
28	13.2	8.3	10.8	7.2	0.0			3.2	0		
29	12.6	9.2	10.9	7.1	0.0			4.0	0		
30	11.7	7.6	9.7	8.3	0.0			0.7	0		
Sum				226.8	0.0			39.7			
Avg	13.7	7.1	10.4								
Xtrm	21.7	1.2									

Daily Data Report for July 2007

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	11.8	7.6	9.7	8.3	0.0			0.0	0		
02	14.3	7.6	11.0	7.0	0.0			0.0	0		
03	11.0	7.6	9.3	8.7	0.0			0.0	0		
04	12.9	7.3	10.1	7.9	0.0			0.0	0		
05	14.3	8.3	11.3	6.7	0.0			1.8	0		
06	15.8	10.6	13.2	4.8	0.0			62.1	0		
07	16.2	10.4	13.3	4.7	0.0			11.7	0		
08	12.8	9.5	11.2	6.8	0.0			15.1	0		
09	12.8	8.5	10.7	7.3	0.0			0.0	0		
10	13.0	7.9	10.5	7.5	0.0			0.0	0		
11	14.7	9.6	12.2	5.8	0.0			0.0	0		
12	19.0	9.5	14.3	3.7	0.0			1.4	0		
13	17.6	12.7	15.2	2.8	0.0			1.3	0		
14	14.5	11.2	12.9	5.1	0.0			0.0	0		
15	18.6	11.6	15.1	2.9	0.0			0.0	0		
16	19.8	11.6	15.7	2.3	0.0			9.1	0		
17	14.3	12.3	13.3	4.7	0.0			2.1	0		
18	17.4	11.3	14.4	3.6	0.0			2.3	0		
19	18.9	12.9	15.9	2.1	0.0			15.1	0		
20	15.6	13.6	14.6	3.4	0.0			0.6	0		
21	16.3	14.4	15.4	2.6	0.0			0.0	0		
22	15.3	13.6	14.5	3.5	0.0			16.1	0		
23	18.1	11.9	15.0	3.0	0.0			0.0	0		
24	16.4	12.9	14.7	3.3	0.0			0.6	0		
25	16.1	13.9	15.0	3.0	0.0			0.0	0		
26	16.6	13.2	14.9	3.1	0.0			1.6	0		
27	19.7	11.5	15.6	2.4	0.0			0.0	0		
28	18.2	13.6	15.9	2.1	0.0			0.0	0		
29	18.6	15.4	17.0	1.0	0.0			0.6	0		
30	20.0	15.2	17.6	0.4	0.0			3.3	0		
31	19.3	16.0	17.7	0.3	0.0			189.3E	0		
Sum				130.8	0.0			334.1E			
Avg	16.1	11.4	13.8								
Xtrm	20.0	7.3									

Daily Data Report for August 2007

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†	21.1	13.6	17.4	0.6	0.0	M	M	8.2		32	41
02†	17.5	11.8	14.7	3.3	0.0	M	M	0.0			<31
03†	16.7	11.7	14.2	3.8	0.0	M	M	0.0			<31
04†	19.8	11.8	15.8	2.2	0.0	M	M	0.0		18	37
05†	19.4	13.4E	16.4E	1.6E	0.0E	M	M	0.0		M	M
06†	19.2	12.6	15.9	2.1	0.0	M	M	0.0		21	37
07†	19.1	12.6E	15.9E	2.1E	0.0E	M	M	0.7E		M	M
08†	20.4	16.1	18.3	0.0	0.3	M	M	0.0		17	46
09†	20.3	13.2	16.8	1.2	0.0	M	M	18.8		18	67
10†	17.9	12.2	15.1	2.9	0.0	M	M	0.0		32	69
11†	18.4	14.1	16.3	1.7	0.0	M	M	0.0		21	39
12†	17.9	12.2	15.1	2.9	0.0	M	M	0.0		21	32
13†	19.1	11.1	15.1	2.9	0.0	M	M	0.0		18	33
14†	23.1	13.7	18.4	0.0	0.4	M	M	0.0		15	41
15†	21.4	14.0	17.7	0.3	0.0	M	M	0.0		19	32
16†	18.5	15.5	17.0	1.0	0.0	M	M	0.0		21	39
17†	19.3	15.8	17.6	0.4	0.0	M	M	35.0		21	61
18†	21.1	16.3	18.7	0.0	0.7	M	M	16.5		20	72
19†	17.2	13.8	15.5	2.5	0.0	M	M	0.0		23	80
20†	16.6	13.2	14.9	3.1	0.0	M	M	0.0		26	54
21†	17.0	13.1	15.1	2.9	0.0	M	M	0.0		24	33
22†	16.6	10.4	13.5	4.5	0.0	M	M	0.0		25	32
23†	16.5	9.5	13.0	5.0	0.0	M	M	0.0			<31
24†	17.5	11.0	14.3	3.7	0.0	M	M	0.0		22	32
25†	18.8	10.4	14.6	3.4	0.0	M	M	0.0			<31
26†	18.8	12.7	15.8	2.2	0.0	M	M	0.0		15	32
27†	18.6	14.5	16.6	1.4	0.0	M	M	0.0			<31
28†	19.1	14.3	16.7	1.3	0.0	M	M	0.0			<31
29†	19.3	14.1	16.7	1.3	0.0	M	M	0.0		22	33
30†	19.0	14.6	16.8	1.2	0.0	M	M	0.0		21	35
31†	20.3	16.4	18.4	0.0	0.4	M	M	0.0			<31
Sum				61.5E	1.8E	M	M	79.2E			
Avg	18.9	13.2E	16.0E								
Xtrm	23.1	9.5E								23•	80

Daily Data Report for September 2007

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†	20.8	13.5	17.2	0.8	0.0	M	M	9.9		19	78
02†	17.8	10.7	14.3	3.7	0.0	M	M	0.0		36	56
03†	16.6	9.8	13.2	4.8	0.0	M	M	0.0		21	46
04†	16.1	13.4	14.8	3.2	0.0	M	M	3.5		21	48
05†	16.6	10.0	13.3	4.7	0.0	M	M	0.0		25	46
06†	14.4	6.9	10.7	7.3	0.0	M	M	0.0		2	41
07†	16.4	7.2	11.8	6.2	0.0	M	M	0.0			<31
08†	17.5	11.3	14.4	3.6	0.0	M	M	0.0			<31
09†	16.5	10.8	13.7	4.3	0.0	M	M	0.0		4	46
10†	12.3	10.6	11.5	6.5	0.0	M	M	0.6		4	41
11†	15.2	10.9	13.1	4.9	0.0	M	M	0.0		12	46
12†	19.4	11.6	15.5	2.5	0.0	M	M	0.6		15	80
13†	15.9	10.4	13.2	4.8	0.0	M	M	0.0		26	57
14†	14.4	9.2	11.8	6.2	0.0	M	M	0.0		27	46
15†	15.6	8.3	12.0	6.0	0.0	M	M	0.0		17	56
16†	18.1	10.7	14.4	3.6	0.0	M	M	4.2		18	85
17†	14.7	8.1	11.4	6.6	0.0	M	M	0.0			<31
18†	15.7	6.9	11.3	6.7	0.0	M	M	0.0			<31
19†	15.4	8.2	11.8	6.2	0.0	M	M	0.0		24	33
20†	15.6	13.2	14.4	3.6	0.0	M	M	0.0		21	48
21†	18.0	8.7	13.4	4.6	0.0	M	M	0.0		27	37
22†	16.3	9.3	12.8	5.2	0.0	M	M	0.0		17	39
23†	18.4	12.2	15.3	2.7	0.0	M	M	8.1		19	57
24†	12.9	9.1	11.0	7.0	0.0	M	M	0.0		27	59
25†	12.2	9.1	10.7	7.3	0.0	M	M	0.0		32	41
26†	13.3	9.6	11.5	6.5	0.0	M	M	8.1		17	41
27†	15.8	8.1	12.0	6.0	0.0	M	M	0.0		20	46
28†	18.5	7.9	13.2	4.8	0.0	M	M	6.8		21	74
29†	15.6	9.7	12.7	5.3	0.0	M	M	15.4		23	52
30†	12.2	6.5	9.4	8.6	0.0	M	M	0.0		32	41
Sum				154.2	0.0	M	M	57.2			
Avg	15.9	9.7	12.83								
Xtrm	20.8	6.5								18	85

Daily Data Report for October 2007

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†	12.9	6.6	9.8	8.2	0.0	M	M	0.0		24	48
02†	14.2	10.6	12.4	5.6	0.0	M	M	0.0		25	48
03†	15.1	10.3	12.7	5.3	0.0	M	M	0.0			<31
04†	15.2	10.5	12.9	5.1	0.0	M	M	2.9		20	48
05†	14.3	11.1	12.7	5.3	0.0	M	M	0.0		26	59
06†	13.5	8.7	11.1	6.9	0.0	M	M	0.0		33	57
07†	10.2	6.8	8.5	9.5	0.0	M	M	0.7		28	52
08†	11.0	6.7	8.9	9.1	0.0	M	M	4.4		33	61
09†	9.0	5.2	7.1	10.9	0.0	M	M	0.0		35	56
10†	11.1	4.2	7.7	10.3	0.0	M	M	0.0		33	33
11†	11.2	4.2	7.7	10.3	0.0	M	M	0.0		11	37
12†	12.1	3.6	7.9	10.1	0.0	M	M	0.0		7	39
13†	11.9	6.1	9.0	9.0	0.0	M	M	9.0		10	63
14†	9.7	7.3	8.5	9.5	0.0	M	M	0.0			<31
15†	12.0	6.6	9.3	8.7	0.0	M	M	7.8			<31
16†	7.7	3.7	5.7	12.3	0.0	M	M	3.0		34	43
17†	8.0	4.4	6.2	11.8	0.0	M	M	0.0		34	57
18†	8.0	4.1	6.1	11.9	0.0	M	M	0.7		27	54
19†	8.7	2.6	5.7	12.3	0.0	M	M	0.0		31	35
20†	15.3	4.3	9.8	8.2	0.0	M	M	25.6		20	74
21†	14.0	8.7	11.4	6.6	0.0	M	M	23.0		21	65
22†	10.3	4.3	7.3	10.7	0.0	M	M	0.0		26	54
23†	14.6	5.3	10.0	8.0	0.0	M	M	0.0		20	69
24†	11.9	5.9	8.9	9.1	0.0	M	M	0.0		21	59
25†	7.2	4.5	5.9	12.1	0.0	M	M	0.0		29	32
26†	8.8	4.4	6.6	11.4	0.0	M	M	0.0		26	54
27†	10.7	7.7	9.2	8.8	0.0	M	M	0.0		26	44
28†	15.6	9.3	12.5	5.5	0.0	M	M	17.9		19	72
29†	10.6	2.5	6.6	11.4	0.0	M	M	9.7		26	54
30†	6.2	1.9	4.1	13.9	0.0	M	M	0.6			<31
31†	4.9	2.1	3.5	14.5	0.0	M	M	0.6		34	43
Sum				**292.3**	**0.0**	**M**	**M**	**105.9**			
Avg	**11.2**	**5.9**	**8.55**								
Xtrm	**15.6**	**1.9**								**20**	**74**

Daily Data Report for November 2007

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†	13.7	3.6	8.7	9.3	0.0	M	M	0.0		21	76
02†	16.5	4.9	10.7	7.3	0.0	M	M	22.2		20	93
03†	7.6	1.5	4.6	13.4	0.0	M	M	0.0		12	50
04†	15.4	6.6	11.0	7.0	0.0	M	M	2.6		21	98
05†	11.3	5.0	8.2	9.8	0.0	M	M	0.0		23	32
06†	9.6	2.4	6.0	12.0	0.0	M	M	0.0		2	37
07†	9.0	1.6	5.3	12.7	0.0	M	M	0.0		15	39
08†	11.0	6.1	8.6	9.4	0.0	M	M	10.2		14	70
09†	8.8	2.8	5.8	12.2	0.0	M	M	24.9		2	54
10†	4.1	1.8	3.0	15.0	0.0	M	M	0.0		8	57
11†	12.9	2.4	7.7	10.3	0.0	M	M	20.5		12	76
12†	7.6	3.4	5.5	12.5	0.0	M	M	0.6		23	65
13†	4.6	2.0	3.3	14.7	0.0	M	M	1.4		26	48
14†	6.9	1.9	4.4	13.6	0.0	M	M	0.0		30	43
15†	12.2	4.0	8.1	9.9	0.0	M	M	0.0		21	56
16†	17.0	10.7	13.9	4.1	0.0	M	M	1.3		15	72
17†	14.3	5.4	9.9	8.1	0.0	M	M	5.7		24	96
18†	7.4	0.4	3.9	14.1	0.0	M	M	0.0		2	37
19†	1.6	-1.8	-0.1	18.1	0.0	M	M	0.0		4	41
20†	2.7	-1.5	0.6	17.4	0.0	M	M	3.4		7	48
21†	6.1	1.5	3.8	14.2	0.0	M	M	56.1		9	61
22†	4.0	0.8	2.4	15.6	0.0	M	M	0.0			<31
23†	11.5	1.0	6.3	11.7	0.0	M	M	2.4		18	37
24†	10.6	0.2	5.4	12.6	0.0	M	M	16.0		28	74
25†	4.0	-0.3	1.9	16.1	0.0	M	M	0.0		25	54
26†	6.5	2.6	4.6	13.4	0.0	M	M	1.3		21	59
27†	12.3	4.5	8.4	9.6	0.0	M	M	21.4		21	87
28†	8.7	-0.7	4.0	14.0	0.0	M	M	0.0		26	87
29†	4.4	-2.3	1.1	16.9	0.0	M	M	0.0		13	57
30†	8.9	0.0	4.5	13.5	0.0	M	M	6.3		28	76
Sum				**368.5**	**0.0**	**M**	**M**	**196.3**			
Avg	**9**	**2.4**	**5.69**								
Xtrm	**17.0**	**-2.3**								**21**	**98**

Daily Data Report for December 2007

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†	2.0E	-0.2E	0.9E	17.1E	0.0E	M	M	M		27E	69E
02†	2.0	0.3	1.2	16.8	0.0	M	M	15.1		35	102
03†	3.2	-0.4	1.4	16.6	0.0	M	M	0.7		35	83
04†	3.9	-1.1	1.4	16.6	0.0	M	M	4.5		10	56
05†	4.8	1.5	3.2	14.8	0.0	M	M	0.6		26	54
06†	3.1	0.4	1.8	16.2	0.0	M	M	6.3		24	52
07†	1.0	-3.0	-1.0	19.0	0.0	M	M	0.0		29	46
08†	6.7	-0.9	2.9	15.1	0.0	M	M	2.6		26	74
09†	2.3	-7.3	-2.5	20.5	0.0	M	M	1.2		27	69
10†	-3.0	-6.8	-4.9	22.9	0.0	M	M	0.0		29	67
11†	-2.8	-4.8	-3.8	21.8	0.0	M	M	0.0		28	54
12†	1.6	-5.2	-1.8	19.8	0.0	0.0	M	3.2		34	80
13†	-0.3	-8.6	-4.5	22.5	0.0	M	M	0.0	5	30	67
14†	-6.8	-10.7	-8.8	26.8	0.0	M	M	0.0	3	32	41
15†	-6.1	-9.3	-7.7	25.7	0.0	M	M	0.0	4	36	39
16†	-5.7	-10.4	-8.1	26.1	0.0	M	M	0.0	4	11	54
17†	5.0	-6.5	-0.8	18.8	0.0	M	M	10.5		14	122
18†	0.1	-1.8	-0.9	18.9	0.0	M	M	0.0		26	83
19†	-0.9	-8.7	-4.8	22.8	0.0	M	M	0.0		31	52
20†	-6.2	-9.2	-7.7	25.7	0.0	M	M	0.0		5	43
21†	-2.2	-8.8	-5.5	23.5	0.0	M	M	0.0		3	57
22†	-1.8	-9.1	-5.5	23.5	0.0	M	M	0.0		26	44
23†	1.4	-2.3	-0.5	18.5	0.0	M	M	0.0		24	54
24†	10.5	1.3	5.9	12.1	0.0	0.0	M	5.9		21	106
25†	1.8	-0.7	0.6	17.4	0.0	M	M	0.0		26	89
26†	1.1	-0.3	0.4	17.6	0.0	M	M	0.0		26	57
27†	0.2	-4.2	-2.0	20.0	0.0	M	M	1.4		8	52
28†	-1.3	-4.3	-2.8	20.8	0.0	0.0	M	9.6	5	36	85
29†	-3.2	-6.0	-4.6	22.6	0.0	M	M	0.0	1	12	63
30†	3.3	-3.2	0.1	17.9	0.0	0.0	M	4.9	10	12	76
31†	3.2	-5.7	-1.3	19.3	0.0	M	M	4.3	6	13	95
Sum				617.7E	0.0E	0.0*	M	70.8*			
Avg	0.5E	-4.4E	-1.92E								
Xtrm	10.5E	-10.7E								14	122