

Waterford River @ Kilbride

NF02ZM0009

March to June 2008



Government of Newfoundland & Labrador
Department of Environment and Conservation
Water Resources Management Division
St. John's, NL, A1B 4J6 Canada

**Real Time Water Quality Monthly Report
Waterford River - St. John's NL
March 2008**

General

- Data from the Waterford River real-time station is monitored by the Water Resources Management Division staff regularly.

Maintenance and Calibration of Instrumentation

- The following table displays the dates when the Waterford River water quality probe was installed and removed during this deployment period for routine cleaning, maintenance and calibration.

Table 1: Table of Water Quality Probe Installation and Removal

Date Installed	Date Removed
March 28 th , 2008	June 5 th , 2008

- Water quality readings were taken with a second freshly cleaned and calibrated water quality instrument at the time of installation and removal for QAQC comparison. The QAQC instrument was calibrated prior to each use.

Quality Assurance and Quality Control

- Deployment and removal comparison rankings for the Waterford River deployment from March 28th to June 5th, 2008 are summarized in **Table 2**.
- The absence of turbidity ranking can be attributed to the QA/QC probe lacking a turbidity sensor.

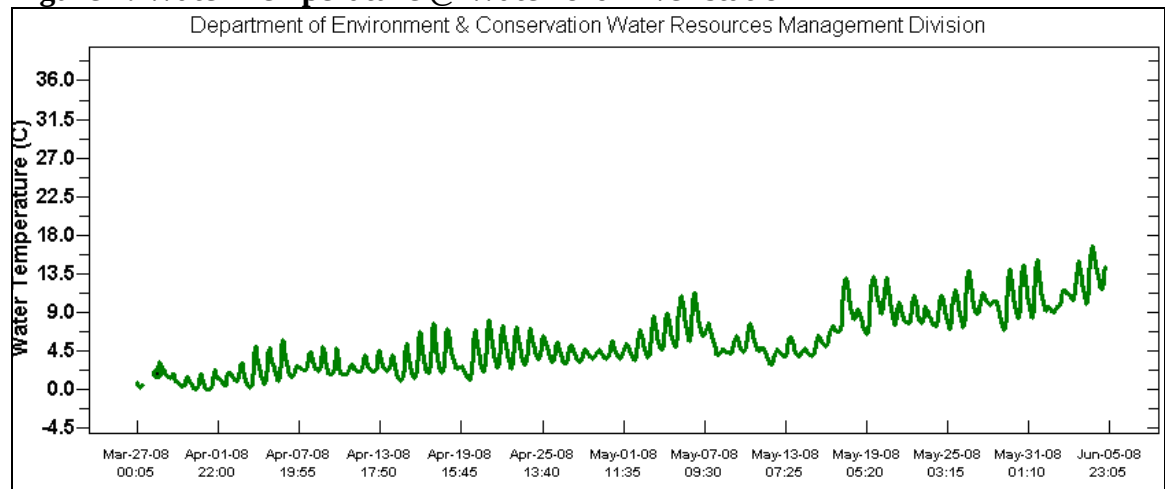
Table 2: Comparison rankings for Waterford @ Kilbride station March 28th – June 5th, 2008

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Waterford @ Kilbride	March 28 th , 2008	Deployment	Fair	Fair	Excellent	Excellent	N/A
	June 5 th , 2008	Removal	Good	Good	Good	Poor	N/A

Data Interpretation

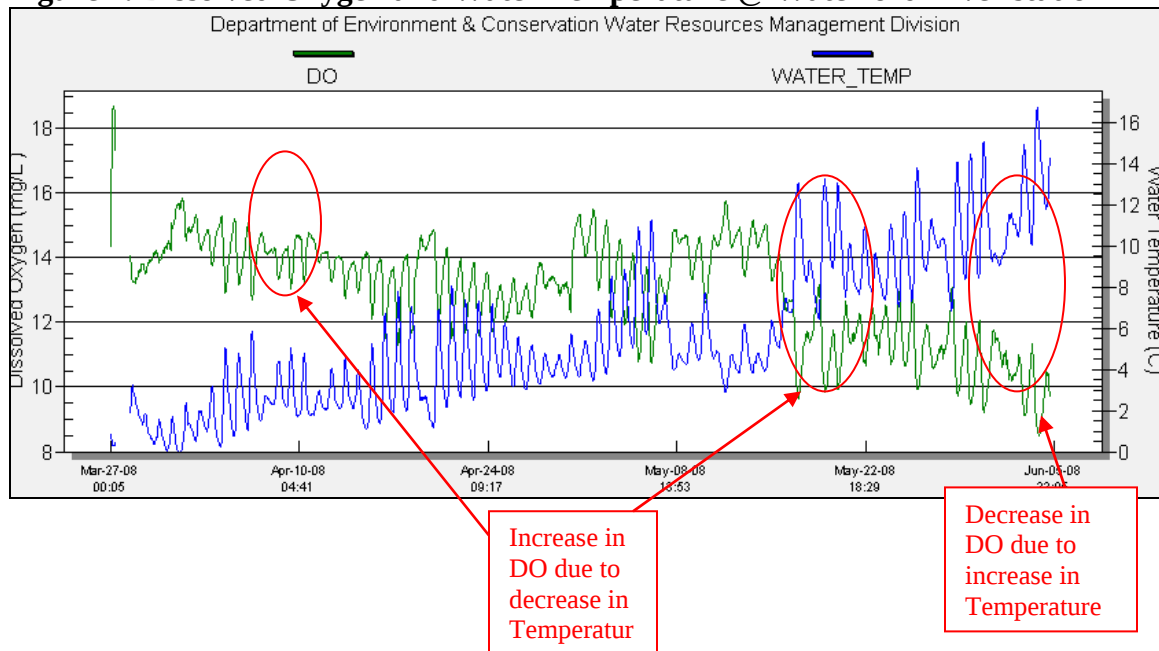
- **Water temperatures** were fairly constant and increasing during this deployment, ranging between 0.0 and 16.71°C, which is within the expected temperature range for this time of year. Water temperature data is shown in **Figure 1** below.

Figure 1: Water Temperature @ Waterford River station



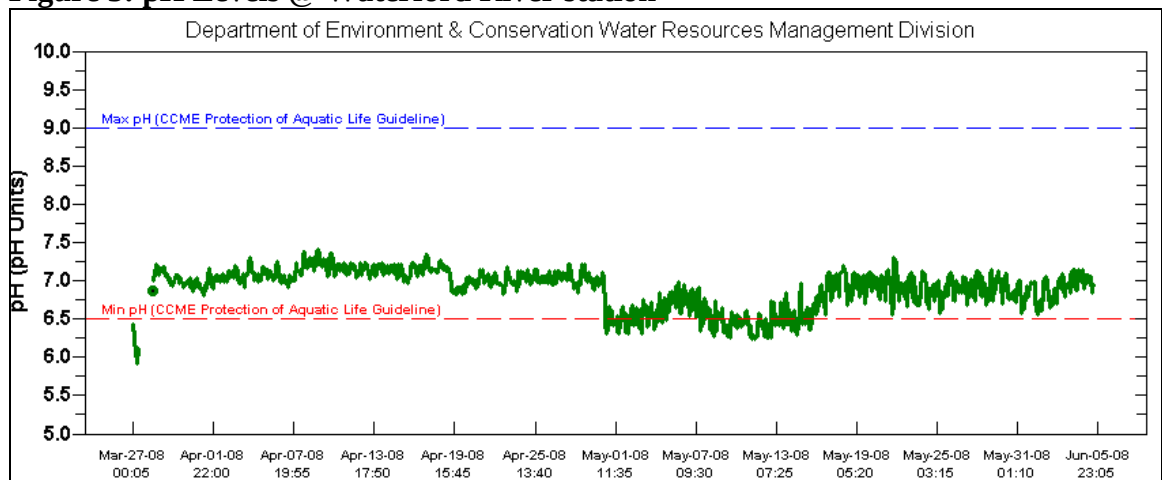
- **Dissolved oxygen (DO)** has an inverse relationship with water temperature whereby DO levels decrease as water temperature increases. Dissolved oxygen is shown in green and water temperature is shown in blue in **Figure 2**, below. The graph indicates that dissolved oxygen levels peaked at 15.82 mg/L on April 1st, the same day the water temperature reached one of its lowest values, at 0.11 °C. DO plummeted to its lowest level of 8.48mg/L on June 4th, corresponding to a where there was higher than normal water temperatures during the deployment period were reached at roughly 15.41 °C.

Figure 2: Dissolved Oxygen and Water Temperature @ Waterford River station



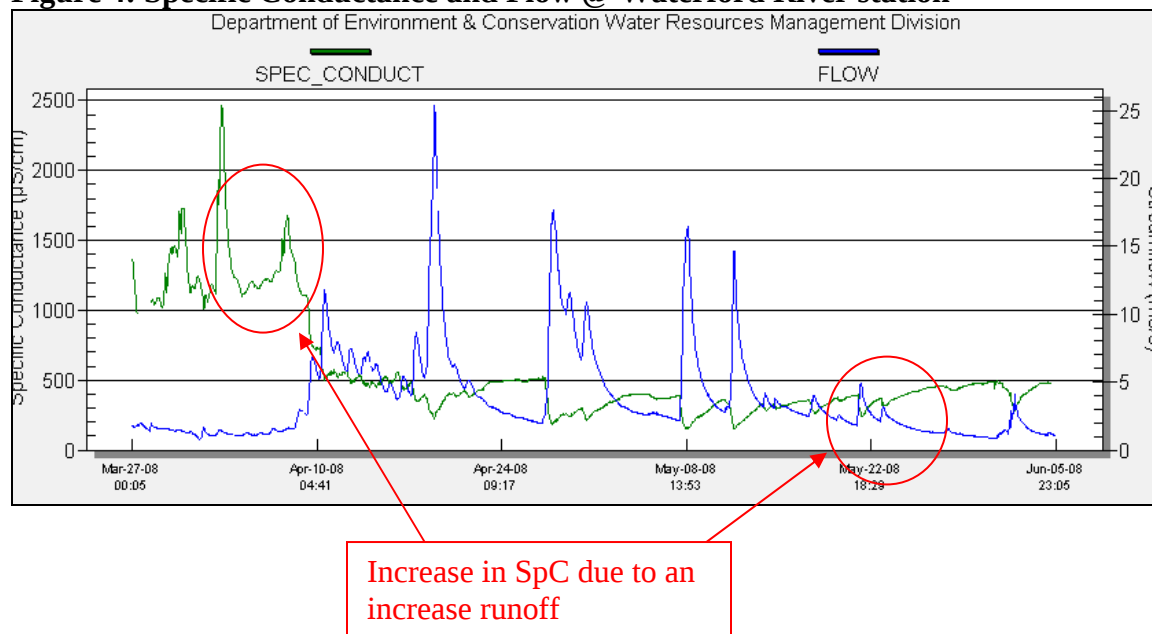
- **pH** levels were fairly constant and were within the expected range for this station, with pH values ranging from of 6.23 – 7.41. It should be noted that during a portion of the deployment period, the pH was below the CCME Protection of Aquatic Life Guidelines.

Figure 3: pH Levels @ Waterford River station



- **Specific conductivity** levels were within the expected range for Waterford River during this deployment. Specific conductivity levels ranged between 150.1 - 2465.0 $\mu\text{S}/\text{cm}$ and showed sudden increases, generally in response to the aftermath of significant precipitation events. The specific conductivity data for this deployment period is shown in **Figure 4** below. The Environment Canada Daily Climate Data for February and March, for the St. John's region, shown below in **Appendix 1-4**, indicates that there were significant precipitation events during these months. These events were a combination of both rain and snow. The rainfall melted the snow and resulted in an increase of runoff, which in turn caused the specific conductivity to plummet, producing values low in magnitude. The spikes in specific conductance during the beginning of the deployment period can be attributed to an increase in salt content that was deposited through snow-melt, by way of runoff from the surrounding roads.

Figure 4: Specific Conductance and Flow @ Waterford River station



Report prepared by: Michael Clarke
 Water Quality Co-op Student
 Water Resources Management Division
 Department of Environment and Conservation
 Confederation Building West Block 4th Floor
 St. John's NL A1B 4J6
 Ph. (709) 729-2316

APPENDIX 1: Weather information for St. John's, NL provided by Environment Canada for March 2008:

	<u>Max</u> <u>Temp</u> °C	<u>Min</u> <u>Temp</u> °C	<u>Mean</u> <u>Temp</u> °C	<u>Heat</u> <u>Deg</u> <u>Days</u> °C	<u>Cool</u> <u>Deg</u> <u>Days</u> °C	<u>Total</u> <u>Rain</u> mm	<u>Total</u> <u>Snow</u> cm	<u>Total</u> <u>Precip</u> mm	<u>Snow</u> <u>on</u> <u>Grnd</u> cm	<u>Dir of</u> <u>Max</u> <u>Gust</u> 10's deg	<u>Spd of</u> <u>Max</u> <u>Gust</u> km / h
Sum				666.1	0.0	103.2	119.7	207.6			
Avg	0.1	-7.1	-3.5								
Xtrm	13.8	-15.6								4*	96*
01	-3.8	-15.6	-9.7	27.7	0.0	0.0	T	T	13	16E	56E
02	2.1	-4.0	-1.0	19.0	0.0	11.4	7.0	18.4	9	16E	70E
03	-0.4	-4.5	-2.5	20.5	0.0	0.2	2.0	2.0	11	22E	48E
04	3.5	-6.1	-1.3	19.3	0.0	T	T	T	11	29E	63E
05	-2.0	-7.0	-4.5	22.5	0.0	T	0.0	T	10	17E	72E
06	9.5	-3.4	3.1	14.9	0.0	5.2	0.0	5.2	7	17E	72E
07	0.9	-5.3	-2.2	20.2	0.0	0.0	0.0	0.0	5		<31
08	13.8	-3.6	5.1	12.9	0.0	4.6	0.0	4.6	5	26E	78E
09	5.3	-5.6	-0.2	18.2	0.0	9.8	1.2	12.8	2	26E	76E
10	0.1	-12.8	-6.4	24.4	0.0	0.0	6.0	3.0	6	34E	48E
11	-2.3	-12.2	-7.3	25.3	0.0	0.0	0.0	0.0	5		<31
12	2.4	-6.4	-2.0	20.0	0.0	0.0	T	T	5	16E	46E
13	1.4	-7.4	-3.0	21.0	0.0	12.2	14.8	26.6	10	30E	76E
14	-3.7	-10.5	-7.1	25.1	0.0	0.0	0.5	0.5	7	29E	80E
15	-2.8	-11.8	-7.3	25.3	0.0	0.0	T	T	7	25E	33E
16	-5.4	-8.4	-6.9	24.9	0.0	0.0	20.4	17.8	18	3E	63E
17	-1.4	-8.7	-5.1	23.1	0.0	0.0	37.4	30.3	25	4E	96E
18	-0.2	-1.6	-0.9	18.9	0.0	16.0	1.2	18.8	53	M	M
19	0.6	-1.7	-0.6	18.6	0.0	32.6	0.0	32.6	40	M	M
20	1.1	-1.7	-0.3	18.3	0.0	T	0.0	T	33	M	M
21	3.0	-2.9	0.1	17.9	0.0	11.2	T	11.2	33	16E	63E
22	2.0	-4.2	-1.1	19.1	0.0	0.0	1.8	1.8	28	23E	35E
23	-0.1	-5.8	-3.0	21.0	0.0	0.0	1.0	1.0	27	26E	63E
24	-1.4	-7.6	-4.5	22.5	0.0	0.0	T	T	27	27E	69E
25	-6.3	-9.6	-8.0	26.0	0.0	0.0	6.4	4.2	26	2E	35E
26	-5.6	-10.7	-8.2	26.2	0.0	0.0	0.4	0.4	32	34E	32E
27	1.6	-7.6	-3.0	21.0	0.0	0.0	2.4	2.4	31	17E	70E
28	2.3	-5.9	-1.8	19.8	0.0	0.0	0.0	0.0	32	28E	54E
29	-1.8	-5.8	-3.8	21.8	0.0	T	10.2	8.8	32	2E	44E
30	-1.8	-7.6	-4.7	22.7	0.0	0.0	7.0	5.2	42	1E	57E
31	-6.6	-13.4	-10.0	28.0	0.0	0.0	T	T	38	M	M

APPENDIX 2: Weather information for St. John's, NL provided by Environment Canada for April 2008:

<u>D</u> <u>a</u> <u>y</u>	<u>Max</u> <u>Temp</u> °C	<u>Min</u> <u>Temp</u> °C	<u>Mean</u> <u>Temp</u> °C	<u>Heat</u> <u>Deg</u> <u>Days</u> °C	<u>Cool</u> <u>Deg</u> <u>Days</u> °C	<u>Total</u> <u>Rain</u> mm	<u>Total</u> <u>Snow</u> cm	<u>Total</u> <u>Precip</u> mm	<u>Snow</u> <u>on</u> <u>Grnd</u> cm	<u>Dir of</u> <u>Max</u> <u>Gust</u> 10's deg	<u>Spd of</u> <u>Max</u> <u>Gust</u> km / h
Sum				499.0	0.0	105.0	4.6	109.2			
Avg	4.9	-2.2	1.4								
Xtrm	15.9	-14.1								26	74
01	-1.7	-14.1	-7.9	25.9	0.0	0.0	0.0	0.0	35		<31
02	3.4	-4.1	-0.4	18.4	0.0	5.0	3.2	8.2	38	15E	63E
03	-0.8	-5.5	-3.2	21.2	0.0	0.0	0.4	T	34	26E	74E
04	1.7	-4.2	-1.3	19.3	0.0	0.0	T	T	34	28E	67E
05	1.9	-6.2	-2.2	20.2	0.0	0.0	0.0	0.0	32		<31
06	1.4	-4.3	-1.5	19.5	0.0	0.0	T	T	30	2E	41E
07	0.7	-2.1	-0.7	18.7	0.0	5.6	T	5.6	26	1E	52E
08	4.4	0.5	2.5	15.5	0.0	0.8	0.0	0.8	22		<31
09	8.3	0.7	4.5	13.5	0.0	0.0	0.0	0.0	17		<31
10	11.0	3.3	7.2	10.8	0.0	0.0	0.0	0.0	15		<31
11	4.0	1.2	2.6	15.4	0.0	3.6	0.0	3.6	5		<31
12	4.8	0.9	2.9	15.1	0.0	0.4	0.0	0.4	2	29E	32E
13	6.4	0.0	3.2	14.8	0.0	6.4	T	6.4	1		<31
14	3.4	-1.4	1.0	17.0	0.0	T	T	T	1	27E	72E
15	4.8	-2.5	1.2	16.8	0.0	0.0	T	T	1	27E	72E
16	8.8	-2.7	3.1	14.9	0.0	0.0	0.0	0.0	1	27E	59E
17	13.4	2.1	7.8	10.2	0.0	0.0	0.0	0.0	1	27E	67E
18	15.9	2.4	9.2	8.8	0.0	20.8	0.0	20.8	T	27E	52E
19	4.8	-4.1	0.4	17.6	0.0	11.8	0.8	12.6	T	4E	39E
20	7.2	-5.0	1.1	16.9	0.0	0.0	0.0	0.0	1	32E	37E
21	10.7	-2.3	4.2	13.8	0.0	0.0	0.0	0.0	0	29E	39E
22	4.4	-5.2	-0.4	18.4	0.0	0.0	T	T	0	35E	37E
23	4.4	-6.8	-1.2	19.2	0.0	0.0	0.0	0.0	0	30E	32E
24	6.9	-2.7	2.1	15.9	0.0	0.0	T	T	T		<31
25	-0.2	-2.8	-1.5	19.5	0.0	0.0	0.2	0.2	0		<31
26	0.9	-2.9	-1.0	19.0	0.0	0.0	T	T	T	6E	37E
27	3.8	-0.9	1.5	16.5	0.0	21.2	0.0	21.2	0	8E	52E
28	3.9	1.9	2.9	15.1	0.0	16.0	0.0	16.0	0	9E	46E
29	4.3	1.1	2.7	15.3	0.0	4.2	0.0	4.2	0	7E	32E
30	3.6	0.8	2.2	15.8	0.0	9.2	0.0	9.2	0	10E	48E

APPENDIX 3: Weather information for St. John's, NL provided by Environment Canada for May 2008:

<u>D</u> <u>a</u> <u>y</u>	<u>Max</u> <u>Temp</u> °C	<u>Min</u> <u>Temp</u> °C	<u>Mean</u> <u>Temp</u> °C	<u>Heat</u> <u>Deg</u> <u>Days</u> °C	<u>Cool</u> <u>Deg</u> <u>Days</u> °C	<u>Total</u> <u>Rain</u> mm	<u>Total</u> <u>Snow</u> cm	<u>Total</u> <u>Precip</u> mm	<u>Snow</u> <u>on</u> <u>Grnd</u> cm	<u>Dir of</u> <u>Max</u> <u>Gust</u> 10's deg	<u>Spd of</u> <u>Max</u> <u>Gust</u> km / h
Sum				378.3	0.0	118.9	2.0	120.9			
Avg	9.7	1.8	5.8								
Xtrm	21.5	-1.8								23	67
01	3.9	-0.7	1.6	16.4	0.0	T	0.0	T	0	10E	37E
02	1.7	-1.2	0.3	17.7	0.0	T	T	T	0	36E	33E
03	5.1	-1.8	1.7	16.3	0.0	0.2	0.0	0.2	0	36E	32E
04	6.4	-0.3	3.1	14.9	0.0	T	0.0	T	0		<31
05	17.5	0.9	9.2	8.8	0.0	0.0	0.0	0.0	0		<31
06	8.7	-0.4	4.2	13.8	0.0	0.0	0.0	0.0	0		<31
07	3.3	-0.6	1.4	16.6	0.0	2.0	0.0	2.0	0	6E	41E
08	3.1	0.4	1.8	16.2	0.0	31.0	0.0	31.0	0	2E	63E
09	3.4	1.1	2.3	15.7	0.0	0.8	0.0	0.8	0	2E	35E
10	6.2	-0.7	2.8	15.2	0.0	0.3	0.0	0.3	0		<31
11	2.0	-0.7	0.7	17.3	0.0	12.4	2.0	14.4	0	7E	57E
12	2.5	0.6	1.6	16.4	0.0	26.4	0.0	26.4	0	7E	52E
13	3.4	-0.5	1.5	16.5	0.0	0.2	0.0	0.2	0	36E	50E
14	2.0	-0.7	0.7	17.3	0.0	2.6	0.0	2.6	0	4E	46E
15	3.8	0.4	2.1	15.9	0.0	3.8	0.0	3.8	0		<31
16	8.4	1.7	5.1	12.9	0.0	3.0	0.0	3.0	0	27E	33E
17	19.6	4.3	12.0	6.0	0.0	5.2	0.0	5.2	0	27E	33E
18	8.4	4.3	6.4	11.6	0.0	3.8	0.0	3.8	0	26E	57E
19	21.5	3.8	12.7	5.3	0.0	0.0	0.0	0.0	0	26E	44E
20	16.6	3.3	10.0	8.0	0.0	2.4	0.0	2.4	0	25E	48E
21	14.3	3.2	8.8	9.2	0.0	11.4	0.0	11.4	0	16E	63E
22	10.9	4.1	7.5	10.5	0.0	0.0	0.0	0.0	0	25E	59E
23	11.1	3.2	7.2	10.8	0.0	8.4	0.0	8.4	0	8E	37E
24	12.8	3.1	8.0	10.0	0.0	T	0.0	T	0	26E	44E
25	11.9	2.2	7.1	10.9	0.0	0.0	0.0	0.0	0	26E	46E
26	18.0	2.4	10.2	7.8	0.0	0.0	0.0	0.0	0	25E	57E
27	15.0	8.9	12.0	6.0	0.0	1.4	0.0	1.4	0	23E	67E
28	11.1	3.4	7.3	10.7	0.0	3.6	0.0	3.6	0	25E	65E
29	16.3	2.5	9.4	8.6	0.0	0.0	0.0	0.0	0	27E	44E
30	14.9	5.1	10.0	8.0	0.0	0.0	0.0	0.0	0	26E	61E
31	17.3	4.6	11.0	7.0	0.0	0.0	0.0	0.0	0	28E	52E

APPENDIX 4: Weather information for St. John's, NL provided by Environment Canada for June 2008:

<u>D</u> <u>a</u> <u>y</u>	<u>Max</u> <u>Temp</u> °C	<u>Min</u> <u>Temp</u> °C	<u>Mean</u> <u>Temp</u> °C	<u>Heat</u> <u>Deg</u> <u>Days</u> °C	<u>Cool</u> <u>Deg</u> <u>Days</u> °C	<u>Total</u> <u>Rain</u> mm	<u>Total</u> <u>Snow</u> cm	<u>Total</u> <u>Precip</u> mm	<u>Snow</u> <u>on</u> <u>Grnd</u> cm	<u>Dir of</u> <u>Max</u> <u>Gust</u> 10's deg	<u>Spd of</u> <u>Max</u> <u>Gust</u> km / h
Sum				227.7	0.9	129.2	0.0	129.2			
Avg	14.4	6.5	10.4								
Xtrm	24.2	0.2								1	65
01	13.9	3.9	8.9	9.1	0.0	11.4	0.0	11.4	0	18E	52E
02	15.4	7.3	11.4	6.6	0.0	31.2	0.0	31.2	0	26E	37E
03	17.9	7.9	12.9	5.1	0.0	0.0	0.0	0.0	0	27E	46E
04	21.2	6.8	14.0	4.0	0.0	T	0.0	T	0	26E	35E
05	17.9	5.0	11.5	6.5	0.0	3.4	0.0	3.4	0		<31
06	8.2	1.0	4.6	13.4	0.0	T	0.0	T	0	36E	46E
07	9.5	0.2	4.9	13.1	0.0	0.0	0.0	0.0	0		<31
08	14.9	2.8	8.9	9.1	0.0	0.0	0.0	0.0	0	18E	35E
09	10.3	3.5	6.9	11.1	0.0	0.0	0.0	0.0	0		<31
10	8.4	4.3	6.4	11.6	0.0	0.4	0.0	0.4	0	1E	65E
11	11.7	4.7	8.2	9.8	0.0	0.6	0.0	0.6	0	1E	39E
12	16.3	5.6	11.0	7.0	0.0	T	0.0	T	0		<31
13	10.3	5.6	8.0	10.0	0.0	9.0	0.0	9.0	0	1E	35E
14	8.9	5.6	7.3	10.7	0.0	13.8	0.0	13.8	0		<31
15	10.7	5.5	8.1	9.9	0.0	7.2	0.0	7.2	0	6E	39E
16	10.3	6.2	8.3	9.7	0.0	19.0	0.0	19.0	0		<31
17	14.7	6.5	10.6	7.4	0.0	0.8	0.0	0.8	0		<31
18	14.7	7.2	11.0	7.0	0.0	1.2	0.0	1.2	0		<31
19	14.0	7.3	10.7	7.3	0.0	0.2	0.0	0.2	0		<31
20	10.2	7.2	8.7	9.3	0.0	4.6	0.0	4.6	0	14E	37E
21	12.5	7.9	10.2	7.8	0.0	2.4	0.0	2.4	0		<31
22	21.6	9.0	15.3	2.7	0.0	0.0	0.0	0.0	0	27E	33E
23	24.2	9.3	16.8	1.2	0.0	0.0	0.0	0.0	0	27E	39E
24	24.2	13.5	18.9	0.0	0.9	T	0.0	T	0	24E	46E
25	22.6	12.4	17.5	0.5	0.0	0.0	0.0	0.0	0	26E	52E
26	21.2	8.0	14.6	3.4	0.0	0.8	0.0	0.8	0	29E	48E
27	10.2	8.1	9.2	8.8	0.0	13.0	0.0	13.0	0		<31
28	10.5	7.6	9.1	8.9	0.0	0.8	0.0	0.8	0		<31
29	11.7	7.0	9.4	8.6	0.0	T	0.0	T	0		<31
30	12.4	7.4	9.9	8.1	0.0	9.4	0.0	9.4	0	15E	57E