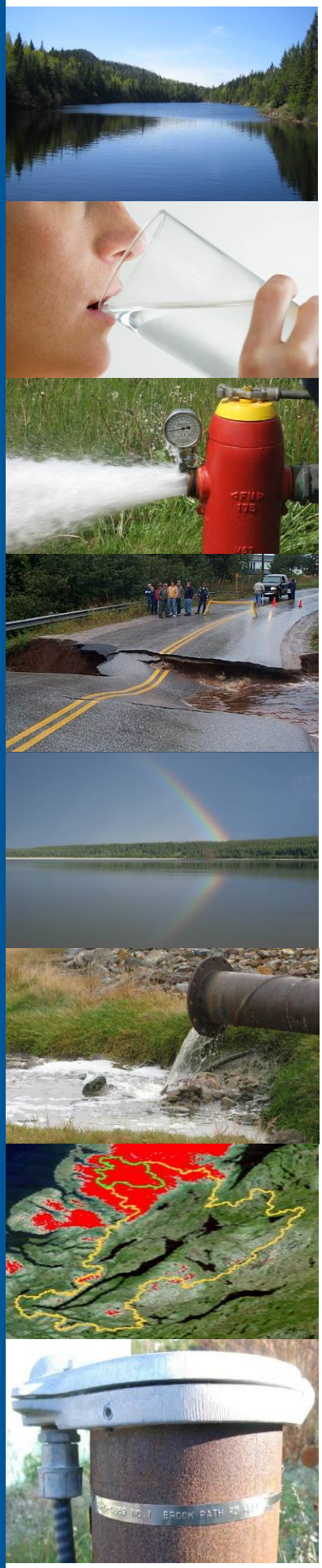


Waterford River @ Kilbride

NF02ZM0009

November to December 2007

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
November - December 2007

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**
November 23rd, 2007	December 6th, 2007

- 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 November 23rd to December 6th, 2007 are summarized in **Table 2.**
- The absence of turbidity ranking can be attributed to the QA/QC probe lacking a turbidity sensor.

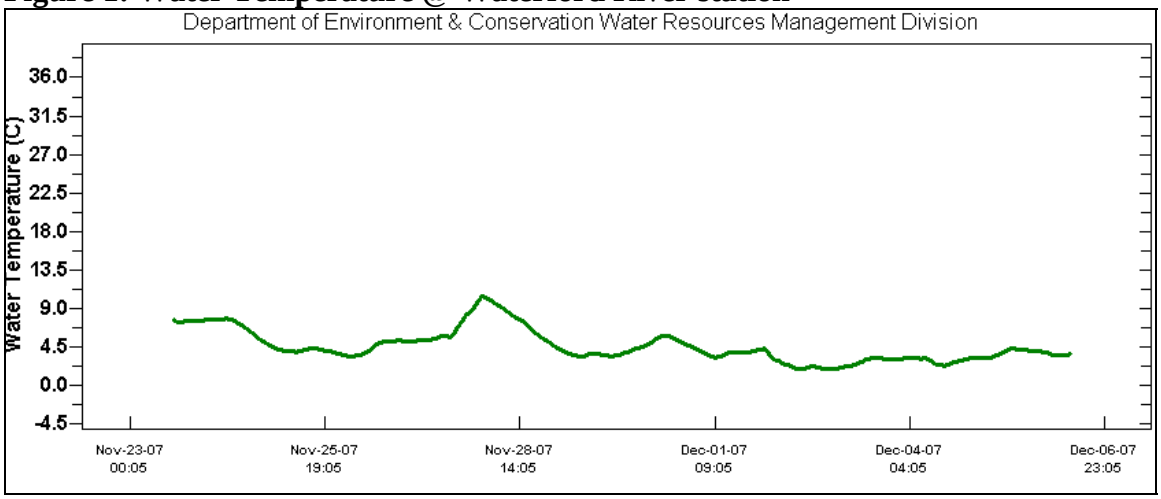
Table 2: Comparison rankings for Waterford @ Kilbride station, November 23rd – December 6th, 2007

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Waterford @ Kilbride	November 23rd, 2007	Deployment	Fair	Excellent	Good	Poor	N/A
	December 6th, 2007	Removal	Excellent	Excellent	Fair	Fair	N/A

Data Interpretation

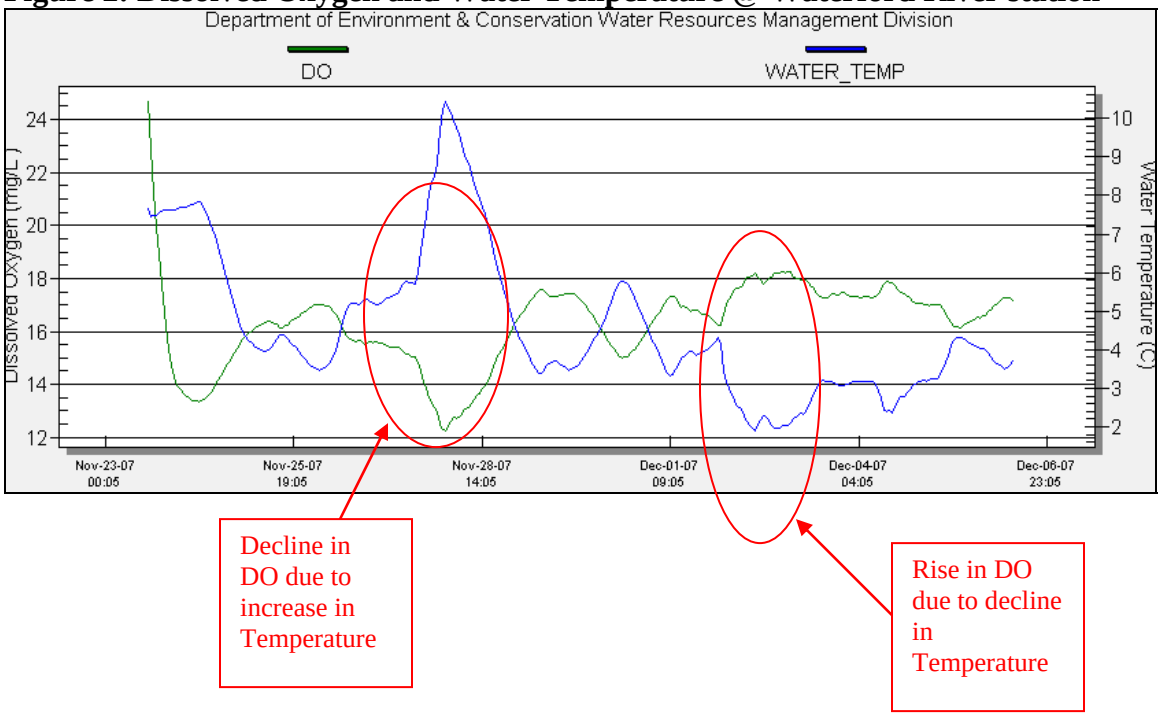
- **Water temperatures** were fairly constant during this deployment, showing an overall decreasing trend in response to seasonally decreasing air temps as is shown in **Appendix 1** and **2**. Water temperatures ranged between 1.91 and 10.42°C, which is within the expected temperature range for this time of year. Water temperature data is shown in **Figure 1** below.

Figure 1: Water Temperature @ Waterford River station



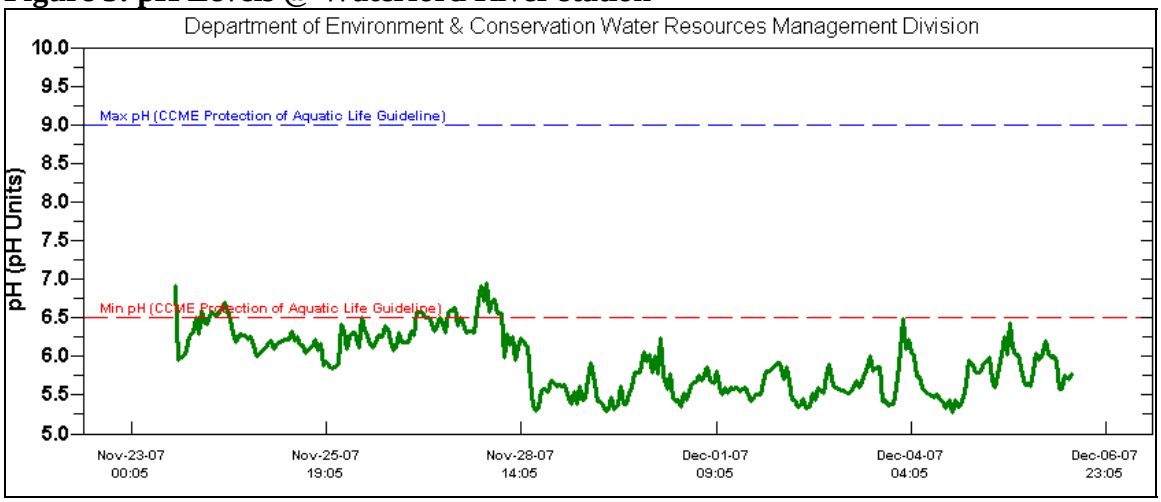
- **Dissolved oxygen (DO)** has an inverse relationship with water temperature whereby DO levels decrease as water temperature increases. Dissolved oxygen is shown in green and water temperature is shown in blue in **Figure 2**, below. The graph indicates that dissolved oxygen levels peaked at 18.25 mg/L on December 6th, corresponding to the lowest water temperature of the deployment at 2.04 °C. DO plummeted to its lowest level of 9.43 mg/L on November 17th, corresponding to the day the one of the highest water temperatures during the deployment period were reached at roughly 9.57 °C.

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



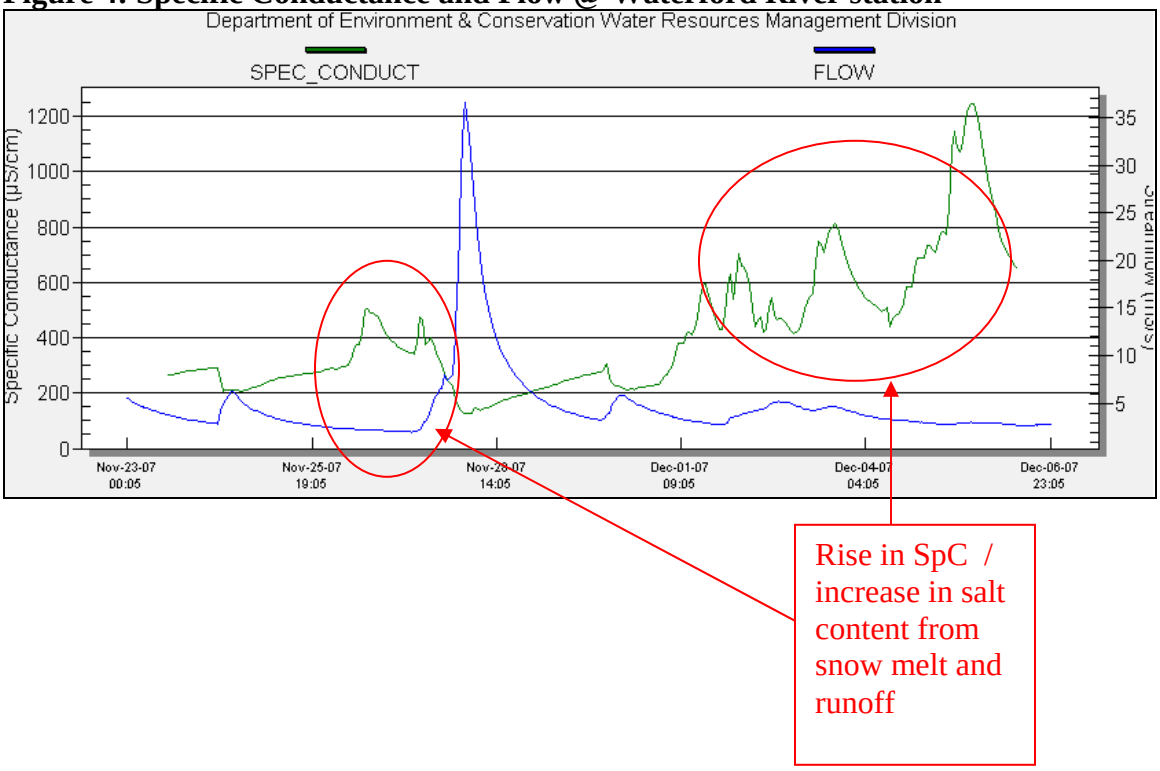
- **pH** levels were fairly constant and were within the expected range for this station, with pH values ranging from of 5.27 – 6.94. It should be noted that the pH fell below the minimum CCME Protection of Aquatic Life Guideline, of 6.5 pH units for most of the deployment. Daylight hours are shortest at this time of year, resulting in less photosynthetic activity, and lower pH values.

Figure 3: pH Levels @ Waterford River station



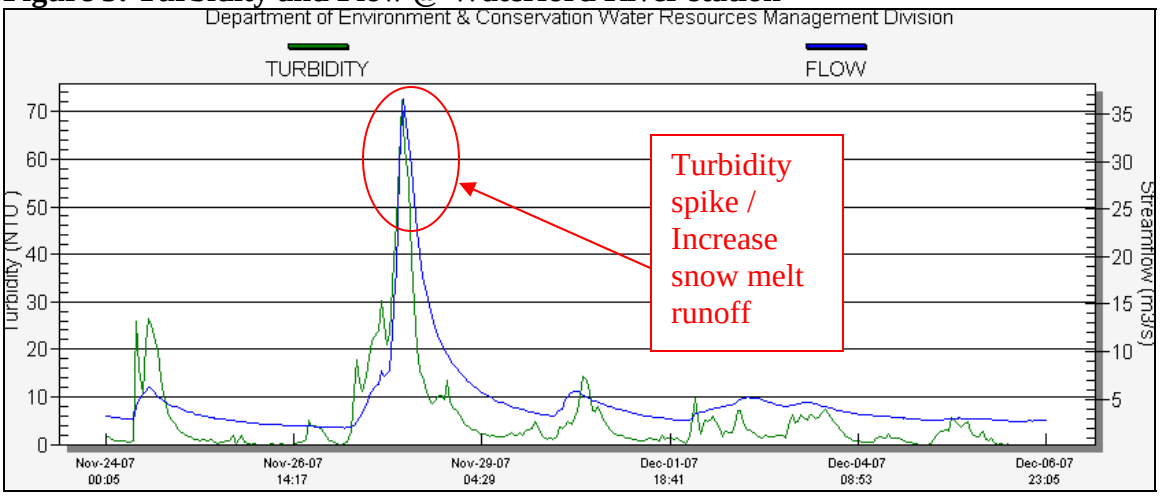
- **Specific conductivity** levels were within the expected range for Waterford River during this deployment. Specific conductivity levels ranged between 124.0 - 1245.0 µS/cm and showed sudden increases, generally in response to the aftermath of significant precipitation events. The specific conductivity data for this deployment period is shown in **Figure 4** below. The Environment Canada Daily Climate Data for November, for the St. John's region, shown below in **Appendix 1,** indicates that there was significant precipitation events during the month of November, more specifically on November 21st, which resulted in rainfall in excess of 62mm. Significantly large amounts of precipitation has a dilution effect on specific conductance as can be seen in the spikes after November 21st. During the winter months, increased flow tends to cause an increase in specific conductance, due to road salting operations. This is in direct contrast to the dilution effect that increased flow and precipitation has on specific conductance during late spring/summer and early fall.

Figure 4: Specific Conductance and Flow @ Waterford River station



- **Turbidity** levels were within the expected range for Waterford River during this deployment. Turbidity levels ranged between 0 – 72.40 NTU and showed sudden increases, generally in response to the aftermath of significant precipitation events. The Turbidity data for this deployment period is shown in green in **Figure 5** below. The Environment Canada Daily Climate Data for November, for the St. John's region, shown below in **Appendix 1,** indicates that there was significant precipitation events during the month of November, more specifically on November 21st , which resulted in rainfall in excess of 62mm. This rainfall melted the snow and resulted in an increase of runoff, which in turn caused the turbidity to spike.

Figure 5: Turbidity 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 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
Sum				411.1	0.0	232.1	4.2	236.3			
Avg	8.1	0.5	4.3								
Xtrm											
01	12.9	-2.1	5.4	12.6	0.0	0.0	0.0	0.0	0	23E	57E
02	16.3	1.7	9.0	9.0	0.0	20.0	0.0	20.0	0	M	M
03	6.6	-0.5	3.1	14.9	0.0	0.0	0.0	0.0	0	15E	56E
04	13.3	4.8	9.1	8.9	0.0	3.9	0.0	3.9	0	18E	80E
05	10.1	3.0	6.6	11.4	0.0	0.2	0.0	0.2	0		<31
06	5.7	2.2	4.0	14.0	0.0	0.4	0.0	0.4	0	35E	37E
07	4.1	1.3	2.7	15.3	0.0	T	0.0	T	0		<31
08	9.6	3.2	6.4	11.6	0.0	1.6	0.0	1.6	0	17E	63E
09	10.6	2.1	6.4	11.6	0.0	45.4	0.0	45.4	0	33E	59E
10	3.0	0.7	1.9	16.1	0.0	T	T	T	0	31E	41E
11	11.3	1.3	6.3	11.7	0.0	21.2	T	21.2	0	11E	57E
12	7.0	1.1	4.1	13.9	0.0	0.4	0.0	0.4	0	20E	57E
13	4.9	0.3	2.6	15.4	0.0	T	0.4	0.4	0	29E	44E
14	4.4	-0.8	1.8	16.2	0.0	3.4	0.2	3.6	0		<31
15	9.0	0.7	4.9	13.1	0.0	T	0.0	T	0	20E	48E
16	14.6	8.7	11.7	6.3	0.0	T	0.0	T	0	18E	67E
17	11.3	1.8	6.6	11.4	0.0	5.6	0.0	5.6	0	18E	82E
18	7.1	0.1	3.6	14.4	0.0	0.0	0.0	0.0	0		<31
19	1.5	-1.5	0.0	18.0	0.0	0.0	2.2	2.2	T	1E	39E
20	3.2	-1.5	0.9	17.1	0.0	1.2	T	1.2	T	3E	33E
21	10.0	1.1	5.6	12.4	0.0	63.4	0.0	63.4	0	10E	50E
22	2.6	0.4	1.5	16.5	0.0	0.2	0.0	0.2	0		<31
23	10.6	1.1	5.9	12.1	0.0	T	0.0	T	0	21E	33E
24	10.6	-2.5	4.1	13.9	0.0	8.6	T	8.6	0	29E	61E
25	0.0	-3.9	-2.0	20.0	0.0	0.0	T	T	0	29E	50E
26	4.8	-2.2	1.3	16.7	0.0	0.0	1.2	1.2	1	24E	35E
27	14.5	3.3	8.9	9.1	0.0	50.8	0.0	50.8	0	24E	78E

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
28	12.1	-2.5	4.8	13.2	0.0	0.6	0.0	0.6	0	27E	82E
29	1.6	-5.4	-1.9	19.9	0.0	0.0	0.0	0.0	0	31E	57E
30	8.7	-1.6	3.6	14.4	0.0	5.2	0.2	5.4	0	18E	63E

APPENDIX 2: Weather information for St. John's, NL provided by Environment Canada 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
Sum				675.2	0.0	18.6	134.6	140.2			
Avg	-1.0	-6.6	-3.8								
Xtrm	8.4	-14.6								14*	89*
01	2.5	-3.0	-0.3	18.3	0.0	1.6	T	1.6	T	27E	54E
02	1.1	0.0	0.6	17.4	0.0	T	21.2	21.2	T	M	M
03	1.4	-1.2	0.1	17.9	0.0	0.0	2.2	2.2	12	M	M
04	1.8	-1.6	0.1	17.9	0.0	0.0	8.8	8.8	10	M	M
05	2.4	0.2	1.3	16.7	0.0	1.6	T	1.6	14	23E	48E
06	0.8	-0.7	0.1	17.9	0.0	0.2	7.0	7.2	12	26E	41E
07	0.1	-5.7	-2.8	20.8	0.0	0.0	T	T	17	30E	39E
08	4.4	-5.0	-0.3	18.3	0.0	2.0	1.8	3.8	17	27E	72E
09	0.4	-10.1	-4.9	22.9	0.0	0.0	0.0	0.0	15	31E	61E
10	-5.4	-10.0	-7.7	25.7	0.0	0.0	T	T	8	30E	61E
11	-5.7	-9.0	-7.4	25.4	0.0	0.0	T	T	5	31E	54E
12	-1.2	-8.1	-4.7	22.7	0.0	0.0	16.8	13.0	5	14E	32E
13	-1.6	-11.2	-6.4	24.4	0.0	0.0	7.2	4.0	26	30E	63E
14	-9.9	-13.4	-11.7	29.7	0.0	0.0	0.0	0.0	25		<31
15	-6.7	-14.0	-10.4	28.4	0.0	0.0	T	T	24		<31
16	-7.9	-14.6	-11.3	29.3	0.0	0.0	T	T	22	29E	32E
17	4.3	-9.0	-2.4	20.4	0.0	3.6	13.8	17.4	26	14E	89E
18	-0.9	-3.6	-2.3	20.3	0.0	0.0	0.6	0.2	20	26E	70E
19	-3.1	-10.9	-7.0	25.0	0.0	0.0	T	T	20	29E	52E
20	-7.0	-13.4	-10.2	28.2	0.0	0.0	0.0	0.0	20		<31
21	-2.7	-7.4	-5.1	23.1	0.0	0.0	T	T	19	4E	61E
22	-4.7	-10.6	-7.7	25.7	0.0	0.0	T	T	18		<31
23	1.1	-6.2	-2.6	20.6	0.0	0.0	0.0	0.0	18	29E	57E
24	8.4	-0.2	4.1	13.9	0.0	9.2	0.0	9.2	17	21E	83E
25	3.4	-1.2	1.1	16.9	0.0	0.0	1.0	1.0	9	28E	72E
26	-0.4	-2.6	-1.5	19.5	0.0	T	T	T	9	29E	59E
27	-1.9	-6.0	-4.0	22.0	0.0	0.0	2.0	2.0	9	11E	44E
28	-1.6	-4.7	-3.2	21.2	0.0	0.0	32.0	26.4	25	2E	82E
29	-4.3	-10.1	-7.2	25.2	0.0	0.0	T	T	32	34E	56E
30	1.4	-5.4	-2.0	20.0	0.0	0.4	12.2	12.6	41	M	M
31	1.6	-4.6	-1.5	19.5	0.0	T	8.0	8.0	37	M	M