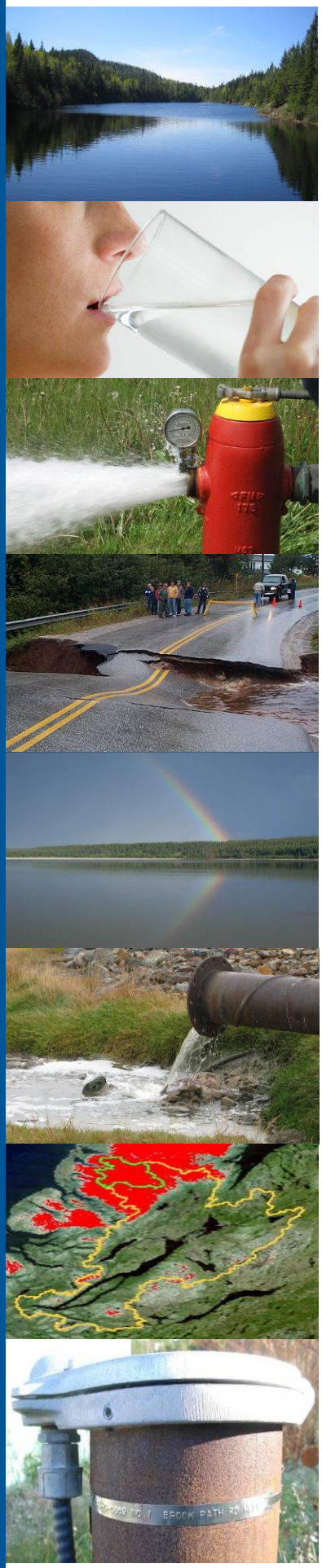


# Waterford River @ Kilbride

# NF02ZM0009

**July to August 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**
**July – August 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** |
|---|---|
| June 19th, 2007 | August 29th, 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 July 19th to August 29th, 2007 are summarized in **Table 2.**

- The absence of turbidity ranking can be attributed to the QA/QC probe lacking a turbidity sensor.

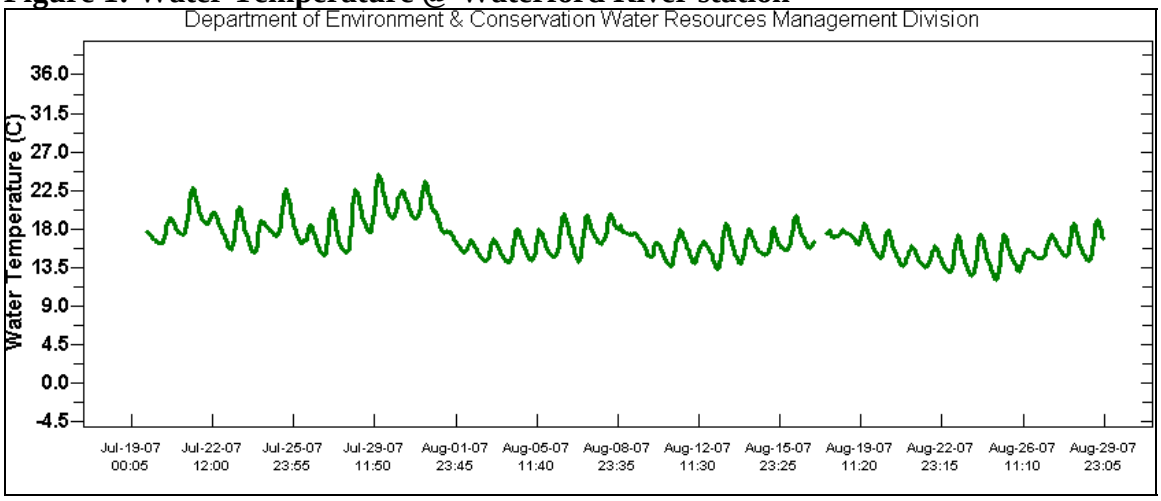
**Table 2: Comparison rankings for Waterford @ Kilbride station, July 19th – August 29th, 2007**

| Station | Date | Action | Comparison Ranking | | | | |
|---|---|---|---|---|---|---|---|
| | | | Temperature | pH | Conductivity | Dissolved Oxygen | Turbidity |
| Waterford @ Kilbride | July 19th, 2007 | Deployment | Good | Excellent | Good | Excellent | N/A |
| | August 29th, 2007 | Removal | Excellent | Good | Good | Poor | N/A |

## Data Interpretation

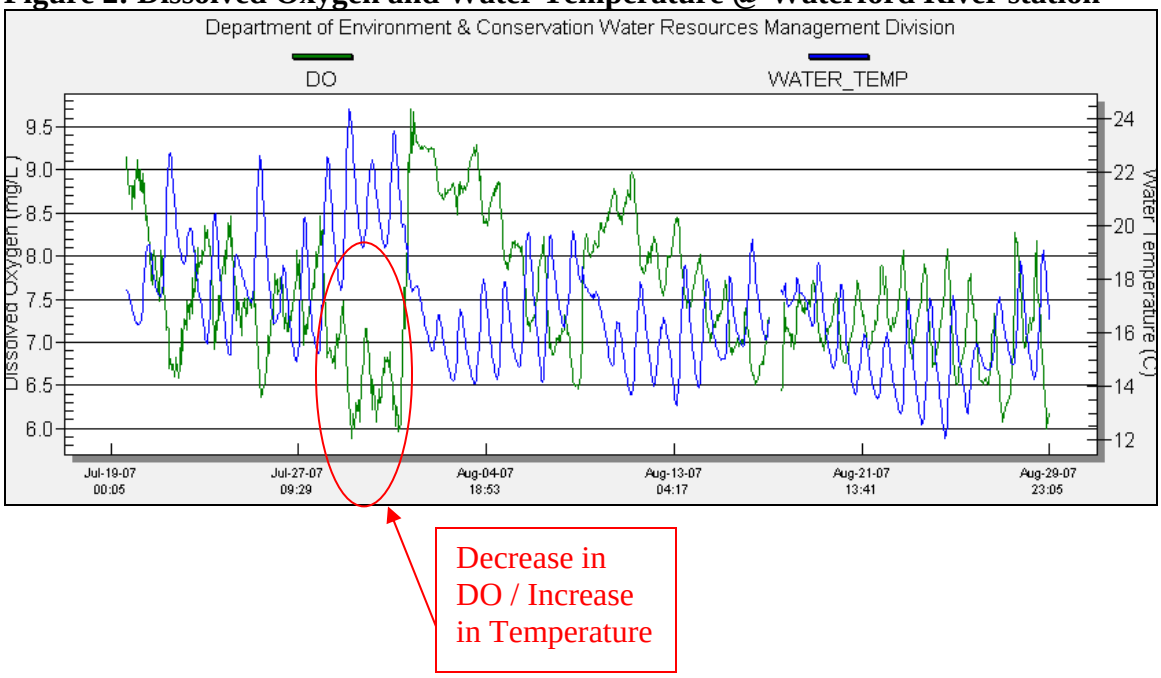
- **Water temperatures** were fairly constant during this deployment, ranging between 12.08 and 24.63°C, which is within the expected temperature range for this time of year. Water temperature data is shown in **Figure 1** below.

**Figure 1: Water Temperature @ Waterford River station**



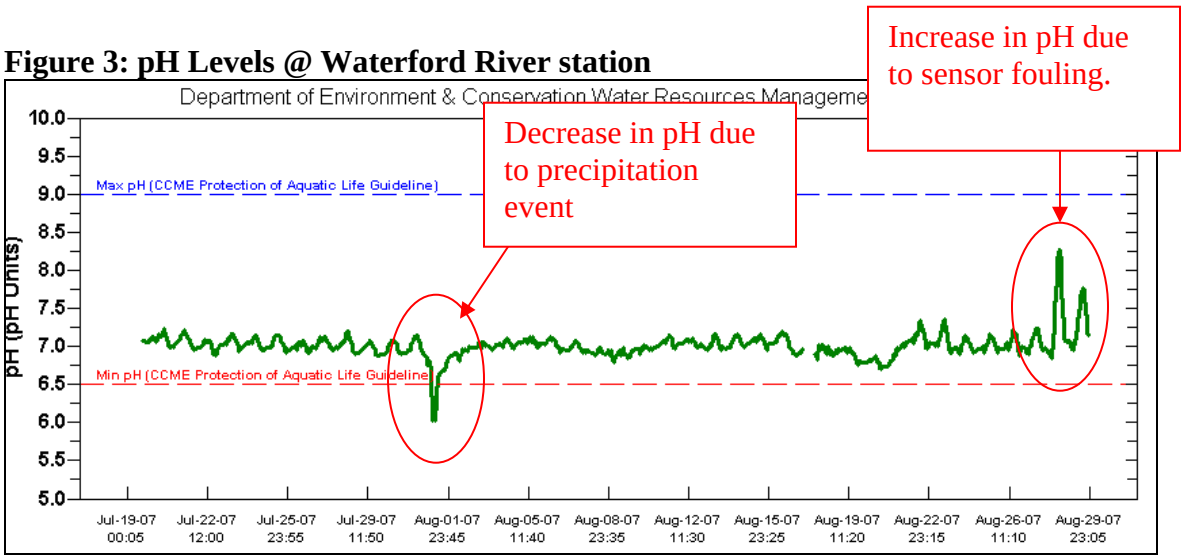
- **Dissolved oxygen (DO)** has an inverse relationship with water temperature whereby DO levels decrease as water temperature increases. Dissolved oxygen is shown in green and water temperature is shown in blue in **Figure 2**, below. The graph indicates that dissolved oxygen levels peaked at 9.70 mg/L on August 1st, the same day that water temperature reached one of its lowest levels of 17.79 $^{o}$C. DO plummeted to its lowest level of 5.89 mg/L on July 29th, corresponding to one of the highest water temperatures during the deployment period of 23.74 $^{o}$C.

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



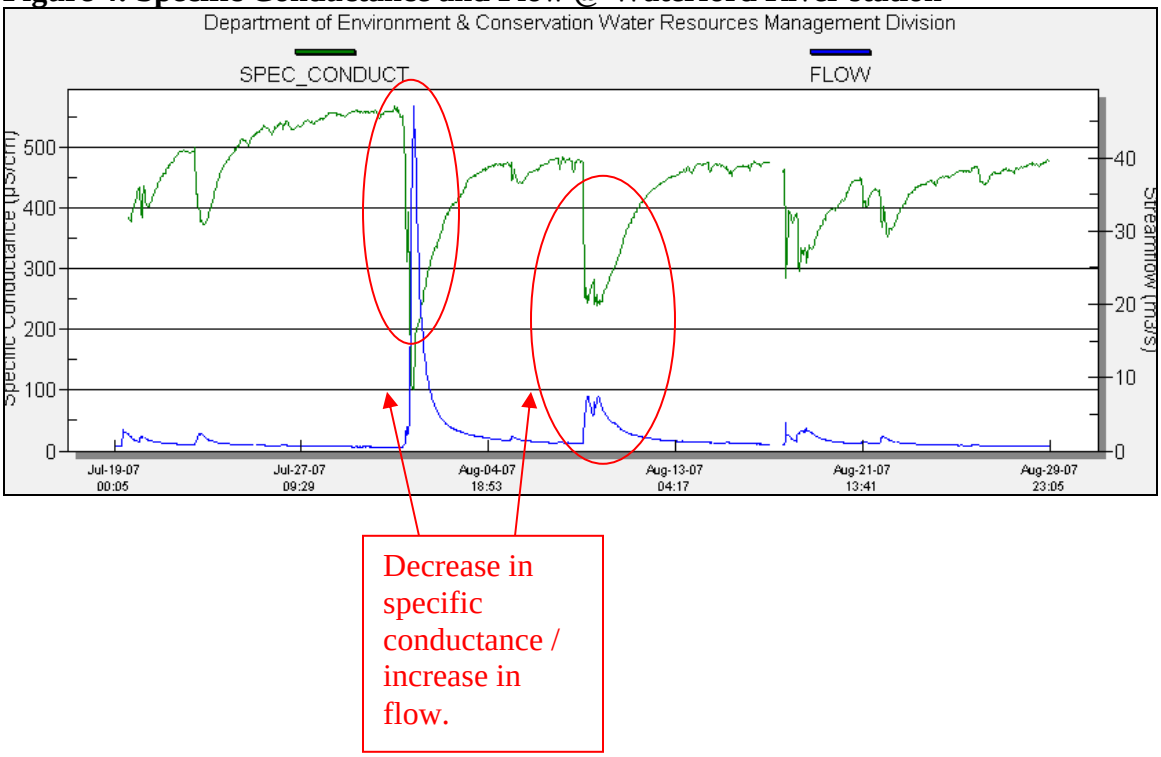

- **pH** levels were fairly constant and were within the expected range for this station, with pH values ranging from of 6.02 – 8.26. There was a sudden drop in pH on August 1$^{st}$ and it should be noted that this sudden drop in pH also fell below the CCME protection of Aquatic Life Guidelines, of 6.5 pH units. This sudden drop can be attributed to the 77mm of rain recorded on August 1$^{st}$, as shown in **Appendix 1**. The sudden increase on pH seen on August 28$^{th}$ can be attributed to sensor fouling. The sensor may have become fouled, due to the probe entering its 6$^{th}$ week of deployment. There was no significant precipitation and no other sensors are showing spikes at this time, so fouling is a likely cause for this spike.

**Figure 3: pH Levels @ Waterford River station**



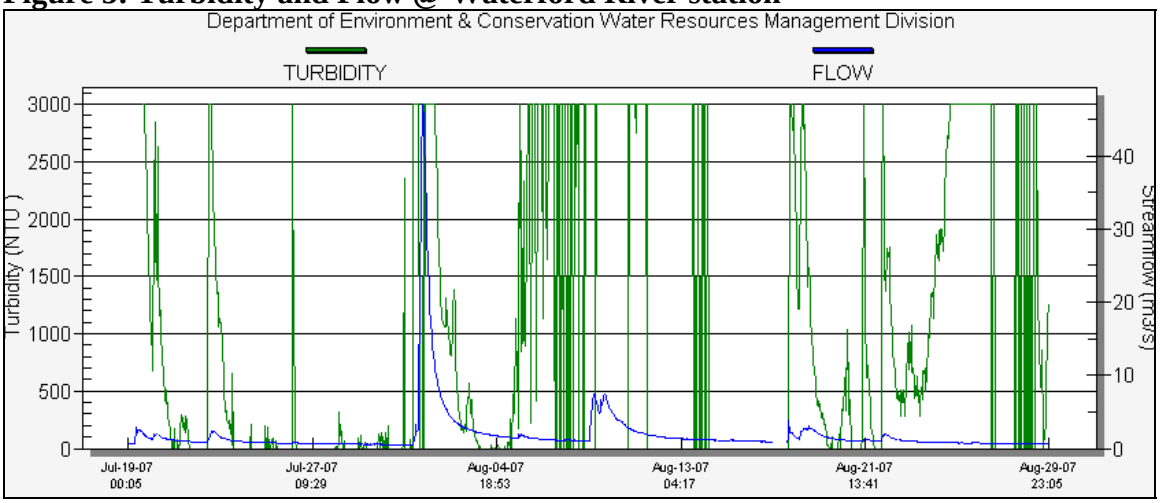

- **Specific conductivity** levels were within the expected range for Waterford River during this deployment. Specific conductivity levels ranged between 100.3 -569.0 µS/cm and showed sudden increases, generally in response to the aftermath of significant precipitation events. The specific conductivity data for this deployment period is shown in **Figure 4** below. The Environment Canada Daily Climate Data for July, for the St. John's region, shown below in **Appendix 1,** indicates that there were significant precipitation events during the month of July, more specifically on July 31st. This precipitation event resulted in an increase of runoff, which in turn caused the specific conductivity to decrease.

**Figure 4: Specific Conductance and Flow @ Waterford River station**



- **Turbidity** levels shown in green in **Figure 5** are deemed to be inaccurate throughout the entire deployment period. This is due to a malfunction of the turbidity sensor. This can be attributed to sediment and debris build-up in the protective housing unit that encases the field sonde.

**Figure 5: Turbidity and Flow @ Waterford River station**

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**APPENDIX 1**: Weather information for St. John's, NL provided by Environment Canada 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sum | | | | 59.7 | 38.2 | 114.0 | 0.0 | 114.0 | | | |
| Avg | 21.9 | 12.7 | 17.3 | | | | | | | | |
| Xtrm | | | | | | | | | | | |
| 01 | 16.7 | 8.5 | 12.6 | 5.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 26E | 33E |
| 02 | 14.2 | 7.8 | 11.0 | 7.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | | <31 |
| 03 | 13.7 | 7.7 | 10.7 | 7.3 | 0.0 | T | 0.0 | T | 0 | | <31 |
| 04 | 21.5 | 7.8 | 14.7 | 3.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 26E | 37E |
| 05 | 22.0 | 9.3 | 15.7 | 2.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 26E | 41E |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 06 | 16.7 | 12.0 | 14.4 | 3.6 | 0.0 | 30.0 | 0.0 | 30.0 | 0 | 18E | 50E |
| 07 | 17.8 | 12.4 | 15.1 | 2.9 | 0.0 | 10.6 | 0.0 | 10.6 | 0 | 23E | 56E |
| 08 | 19.6 | 7.8 | 13.7 | 4.3 | 0.0 | 2.2 | 0.0 | 2.2 | 0 | 26E | 46E |
| 09 | 10.9 | 6.9 | 8.9 | 9.1 | 0.0 | 14.4 | 0.0 | 14.4 | 0 | 34E | 33E |
| 10 | 19.1 | 5.7 | 12.4 | 5.6 | 0.0 | T | 0.0 | T | 0 | 28E | 46E |
| 11 | 20.7 | 10.3 | 15.5 | 2.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0 |  | <31 |
| 12 | 24.2 | 11.2 | 17.7 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0 |  | <31 |
| 13 | 25.7 | 15.2 | 20.5 | 0.0 | 2.5 | T | 0.0 | T | 0 | 26E | 37E |
| 14 | 25.7 | 14.8 | 20.3 | 0.0 | 2.3 | T | 0.0 | T | 0 | 26E | 33E |
| 15 | 25.6 | 13.5 | 19.6 | 0.0 | 1.6 | 0.0 | 0.0 | 0.0 | 0 | 26E | 37E |
| 16 | 22.4 | 14.8 | 18.6 | 0.0 | 0.6 | 2.4 | 0.0 | 2.4 | 0 | 21E | 39E |
| 17 | 20.2 | 14.6 | 17.4 | 0.6 | 0.0 | 3.0 | 0.0 | 3.0 | 0 | 26E | 37E |
| 18 | 26.5 | 13.8 | 20.2 | 0.0 | 2.2 | 0.0 | 0.0 | 0.0 | 0 | 26E | 32E |
| 19 | 21.5 | 14.5 | 18.0 | 0.0 | 0.0 | 14.2 | 0.0 | 14.2 | 0 | 23E | 65E |
| 20 | 22.5 | 17.3 | 19.9 | 0.0 | 1.9 | 2.0 | 0.0 | 2.0 | 0 | 22E | 56E |
| 21 | 24.7 | 20.0 | 22.4 | 0.0 | 4.4 | 0.0 | 0.0 | 0.0 | 0 | 24E | 65E |
| 22 | 23.0 | 13.8 | 18.4 | 0.0 | 0.4 | 13.2 | 0.0 | 13.2 | 0 | 24E | 59E |
| 23 | 25.2 | 13.0 | 19.1 | 0.0 | 1.1 | 0.0 | 0.0 | 0.0 | 0 | 26E | 44E |
| 24 | 24.6 | 14.6 | 19.6 | 0.0 | 1.6 | 1.6 | 0.0 | 1.6 | 0 | 26E | 52E |
| 25 | 27.6 | 15.5 | 21.6 | 0.0 | 3.6 | 0.0 | 0.0 | 0.0 | 0 | 27E | 37E |
| 26 | 21.0 | 11.5 | 16.3 | 1.7 | 0.0 | 1.6 | 0.0 | 1.6 | 0 | 26E | 46E |
| 27 | 17.4 | 11.0 | 14.2 | 3.8 | 0.0 | T | 0.0 | T | 0 |  | <31 |
| 28 | 29.6 | 13.4 | 21.5 | 0.0 | 3.5 | 0.0 | 0.0 | 0.0 | 0 | 25E | 37E |
| 29 | 27.7 | 18.5 | 23.1 | 0.0 | 5.1 | 0.0 | 0.0 | 0.0 | 0 | 25E | 43E |
| 30 | 24.4 | 18.0 | 21.2 | 0.0 | 3.2 | 0.0 | 0.0 | 0.0 | 0 | 25E | 32E |
| 31 | 26.4 | 18.0 | 22.2 | 0.0 | 4.2 | 18.8 | 0.0 | 18.8 | 0 | 21E | 59E |

**APPENDIX 2**: Weather information for St. John's, NL provided by Environment Canada 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sum |  |  |  | 60.1 | 13.7 | 152.3 | 0.0 | 152.3 |  |  |  |
| Avg | 20.8 | 12.2 | 16.5 |  |  |  |  |  |  |  |  |
| Xtrm | 26.3 | 8.1 |  |  |  |  |  |  |  | 25* | 70* |
| 01 | 19.7 | 11.5 | 15.6 | 2.4 | 0.0 | 77.8 | 0.0 | 77.8 | 0 | 30E | 44E |
| 02 | 15.2 | 10.2 | 12.7 | 5.3 | 0.0 | T | 0.0 | T | 0 |  | <31 |
| 03 | 14.8 | 10.0 | 12.4 | 5.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0 |  | <31 |
| 04 | 19.9 | 11.4 | 15.7 | 2.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0 |  | <31 |
| 05 | 22.3 | 11.7 | 17.0 | 1.0 | 0.0 | 2.6 | 0.0 | 2.6 | 0 | 15E | 32E |
| 06 | 24.0 | 14.0 | 19.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0 | 27E | 41E |
| 07 | 25.0 | 12.9 | 19.0 | 0.0 | 1.0 | 1.4 | 0.0 | 1.4 | 0 | 25E | 32E |
| 08 | 24.0 | 16.9 | 20.5 | 0.0 | 2.5 | 27.5 | 0.0 | 27.5 | 0 | 18E | 33E |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 09 | 20.1 | 12.0 | 16.1 | 1.9 | 0.0 | 12.4 | 0.0 | 12.4 | 0 | 19 | 65 |
| 10 | 19.2 | 10.9 | 15.1 | 2.9 | 0.0 | 2.0 | 0.0 | 2.0 | 0 | 29E | 52E |
| 11 | 23.5 | 14.0 | 18.8 | 0.0 | 0.8 | 0.0 | 0.0 | 0.0 | 0 | 25E | 41E |
| 12 | 21.3 | 11.0 | 16.2 | 1.8 | 0.0 | 2.6 | 0.0 | 2.6 | 0 | 26E | 32E |
| 13 | 22.9 | 10.6 | 16.8 | 1.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0 |  | <31 |
| 14 | 20.0 | 11.8 | 15.9 | 2.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 19E | 39E |
| 15 | 21.5 | 13.5 | 17.5 | 0.5 | 0.0 | 0.8 | 0.0 | 0.8 | 0 |  | <31 |
| 16 | 22.8 | 15.4 | 19.1 | 0.0 | 1.1 | T | 0.0 | T | 0 | 24E | 46E |
| 17 | 24.7 | 15.4 | 20.1 | 0.0 | 2.1 | 5.8 | 0.0 | 5.8 | 0 | 23E | 63E |
| 18 | 20.4 | 17.6 | 19.0 | 0.0 | 1.0 | 13.6 | 0.0 | 13.6 | 0 | 21E | 52E |
| 19 | 19.5 | 13.1 | 16.3 | 1.7 | 0.0 | 0.4 | 0.0 | 0.4 | 0 | 25E | 70E |
| 20 | 19.0 | 11.9 | 15.5 | 2.5 | 0.0 | T | 0.0 | T | 0 | 28E | 44E |
| 21 | 16.3 | 11.6 | 14.0 | 4.0 | 0.0 | 0.4 | 0.0 | 0.4 | 0 |  | <31 |
| 22 | 15.7 | 8.9 | 12.3 | 5.7 | 0.0 | 5.0 | 0.0 | 5.0 | 0 |  | <31 |
| 23 | 17.0 | 9.0 | 13.0 | 5.0 | 0.0 | T | 0.0 | T | 0 |  | <31 |
| 24 | 20.3 | 9.1 | 14.7 | 3.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0 |  | <31 |
| 25 | 18.6 | 8.1 | 13.4 | 4.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0 |  | <31 |
| 26 | 17.8 | 9.3 | 13.6 | 4.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0 |  | <31 |
| 27 | 23.3 | 12.4 | 17.9 | 0.1 | 0.0 | T | 0.0 | T | 0 |  | <31 |
| 28 | 21.1 | 11.3 | 16.2 | 1.8 | 0.0 | T | 0.0 | T | 0 |  | <31 |
| 29 | 23.8 | 13.3 | 18.6 | 0.0 | 0.6 | 0.0 | 0.0 | 0.0 | 0 |  | <31 |
| 30 | 24.7 | 13.0 | 18.9 | 0.0 | 0.9 | 0.0 | 0.0 | 0.0 | 0 | M | M |
| 31 | 26.3 | 15.0 | 20.7 | 0.0 | 2.7 | T | 0.0 | T | 0 |  | <31 |