



Real Time Water Quality Report

Humber River at Humber Village

Deployment Period
2023-08-25 to 2023-10-23



Government of Newfoundland & Labrador
Department of Environment and Climate Change
Water Resources Management Division

General

The following report is a summary of water quality monitoring data collected in real-time at the Humber River at Humber Village Bridge station from August 25 to October 23, 2023.



Figure 1: Humber River at Humber Village Bridge Real Time Water Quality station location

This station operates year-round as part of the Provincial Real Time Water Quality (RTWQ) monitoring network. A multi-parameter sonde is deployed in the river and records parameters of interest including: temperature (°C); pH; dissolved oxygen (mg/L); specific conductivity ($\mu\text{S}/\text{cm}$); total dissolved solids (g/L) and turbidity (NTU). Staff at the Department of Environment and Climate Change (Water Resources Management Division-WRMD) monitor the data for potential environmental impacts. The sonde undergoes routine maintenance/calibration on a regular basis, after which the instrument is redeployed, generally within 24 hours.

Quality Assurance/Quality Control (QA/QC)

A routine QA/QC performance test is administered on the instrument at the beginning and end of each deployment period. The methodology of this protocol can be found in Appendix A.

The purpose is to determine the accuracy of the instrument's sensors by cross-examining its initial readings against a control sonde which is deployed at the same time to compare parameters. Depending on these readings, the sensors of each parameter receive a qualitative rank (Appendix A) based on whether readings fall within a specified threshold. This will further ensure the integrity of the data's accuracy, so that the monitoring station delivers reliable results.

With the exception of water quantity data (i.e. stage), all other data used in the preparation of graphs and subsequent discussion below adhere to the stringent QA/QC protocol. The stage data is raw data that is transmitted via satellite and published on WRMD's webpage. It has not been corrected for backwater effect. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

Table 1: QA/QC water quality performance results for the beginning and end of deployment period.

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Humber River at Humber Village Bridge	August 25	Deployment	Excellent	Good	Good	Excellent	Excellent
	October 23	Removal	Good	Fair	Poor	Fair	Excellent

All performance rankings at deployment were 'good' or 'excellent'.

At removal, rankings were varied from 'poor' to 'excellent'. The 'poor' and 'fair' rankings for specific conductivity, pH and dissolved oxygen may be due to either sensor drift, or more likely, an issue with the QA/QC sonde.

Deployment Notes

This deployment took place over the course of 58 days (August 25 to October 23, 2023), during which there were no significant interruptions or data loss.

Data Interpretation

The following interpretations for the Humber River stations will cover the following six parameters: Stage (m); (2) Temperature (°C); (3) pH; (4) Specific Conductivity (µS/cm); (5) Dissolved Oxygen (mg/L); (6) Turbidity (NTU).

Temperature

- Throughout the deployment period, the water temperature ranged between 9.80 °C and 19.44 °C, with an average temperature of 14.95 °C.
- Temperatures rose into the first week of September before starting a gradual, seasonal decline into Fall. Values dipped lower than normal for short periods of time after significant stage increases August 31 and October 19, indicating weather events that brought precipitation and cooler than normal temperatures to the area.
- Water temperature values display a natural diurnal pattern with temperatures increasing during the day and decreasing overnight. The magnitude of variation was influenced by daily air temperature fluctuations as well as precipitation events.

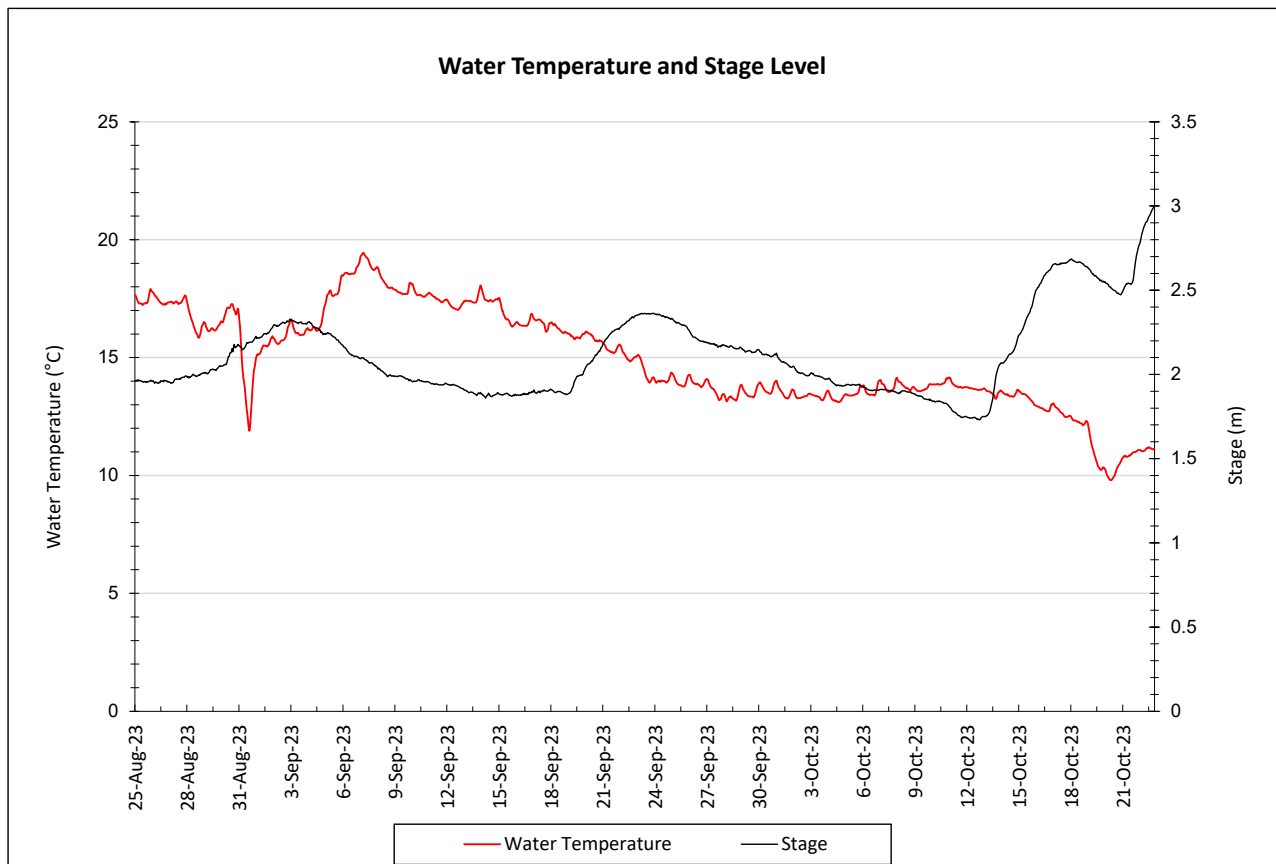


Figure 2: Water Temperature and Stage at Humber River at Humber Village Bridge

pH

- pH ranged between 6.85 and 7.32 during the deployment period, with an average of 7.14 pH units.
- The pH data was very stable throughout this deployment, with a few instances (August 31; September 24 and October 19) where it dipped due to the addition of significant amounts of freshwater to the river, evident as large stage increases. pH values dipped for a short period of time before returning to background levels.
- Throughout the deployment, pH remained within the acceptable range for the protection of aquatic life as outlined by the Canadian Council of Ministers of the Environment (CCME) (2007).

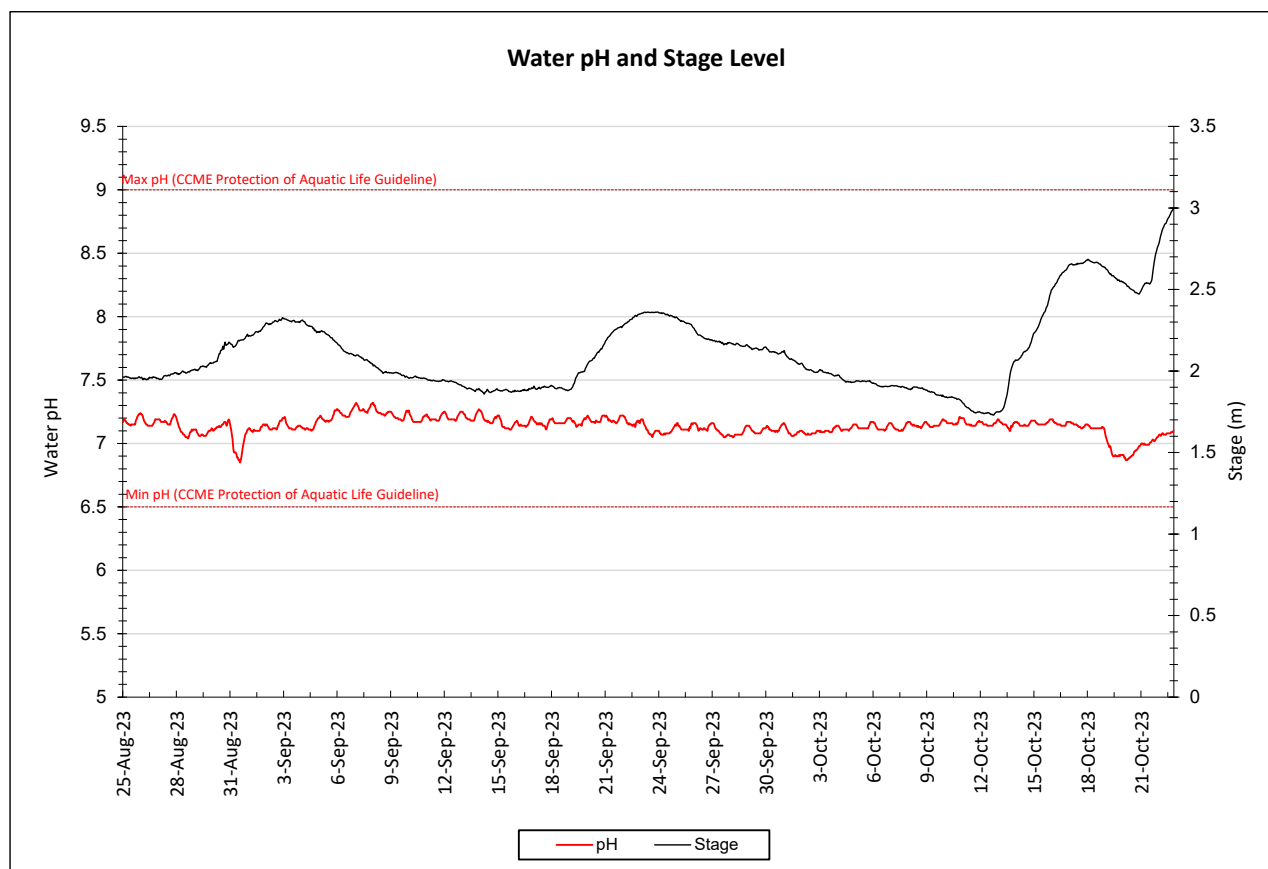


Figure 3: pH values recorded at Humber River at Humber Village Bridge

Specific Conductivity

- Throughout the deployment period, specific conductivity ranged between 43.6 $\mu\text{S}/\text{cm}$ and 46.3 $\mu\text{S}/\text{cm}$, with an average of 44.7 $\mu\text{S}/\text{cm}$.
- Specific conductivity was generally stable influenced occasionally by increases in stage as additional freshwater into the river results in dilution. The large volume of water in the river prevents large changes and ranges in specific conductivity values.
- The increases in stage which began around August 31 and October 13 resulted in noticeable drops in specific conductivity (Figure 4), indicating that the system was diluted by additional freshwater for several days.

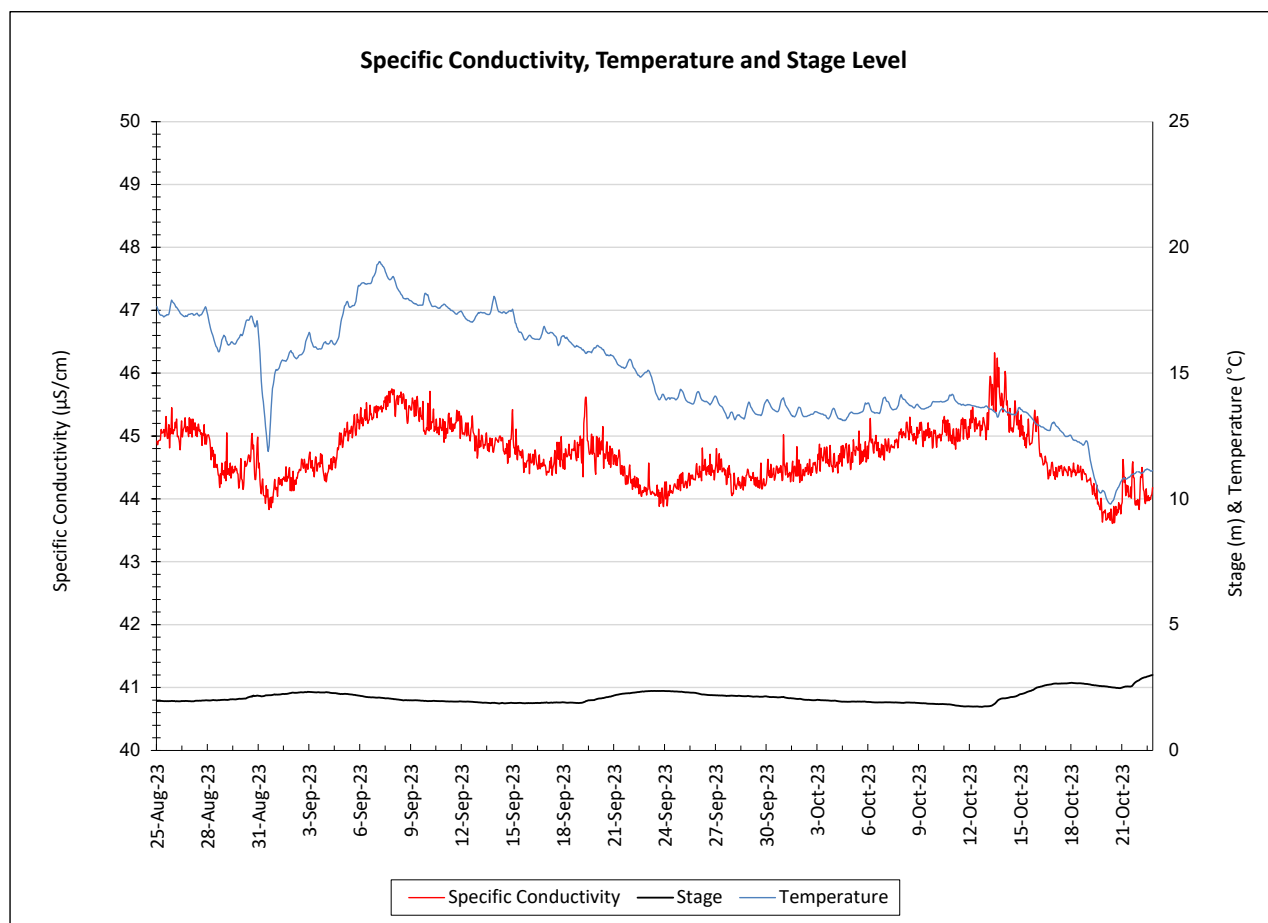


Figure 4: Specific Conductivity at Humber River at Humber Village Bridge

Dissolved Oxygen

- During the deployment period, dissolved oxygen concentrations ranged from 9.65 mg/L to 11.22 mg/L, with an average of 10.46 mg/L. Dissolved oxygen percent-saturation ranged from 97.6% to 110.5%, with an average of 103.5%.
- Dissolved oxygen is inversely related to water temperature: oxygen levels increase in lower water temperatures and decrease in higher water temperatures.
- This data shows normal seasonal trends: as water temperatures begin to decrease into the Fall months, dissolved oxygen demonstrates a corresponding gradual increase in values. A few short-lived instances of cooler-than-normal water temperatures on August 31 and October 19 resulted in higher-than-normal oxygen levels for a short period of time.
- All values remained above the thresholds of the CCME guidelines for the protection of other life stages and the protection of early life stages (CCME, 2007).

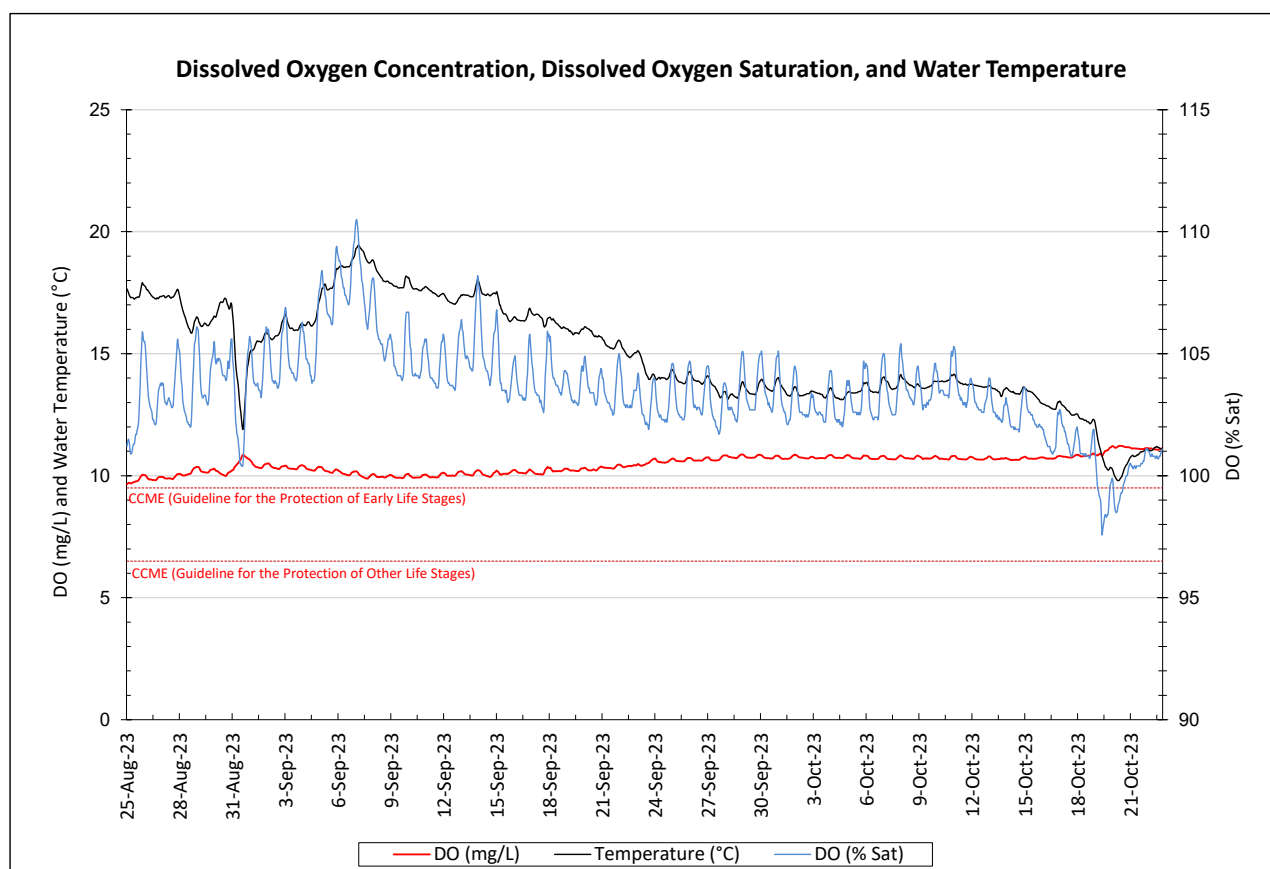


Figure 5: DO (mg/L & % saturation) with Water Temperature (°C) at Humber River at Humber Village Bridge

Turbidity & Stage

- Throughout the deployment period, turbidity ranged from 0.0 NTU to 12.1 NTU, with an average turbidity of 0.2 NTU.
- Turbidity was relatively stable with minimal increases until the last week of deployment when turbidity increased and remained slightly elevated for the remainder of the deployment. This indicates there may have been substantial mixing of the water column due to the large increase in stage at this time. Turbidity remained higher than normal while stage continued to increase.
- Stage ranged from 1.73 m to 3.00 m, averaging at 2.12 m.

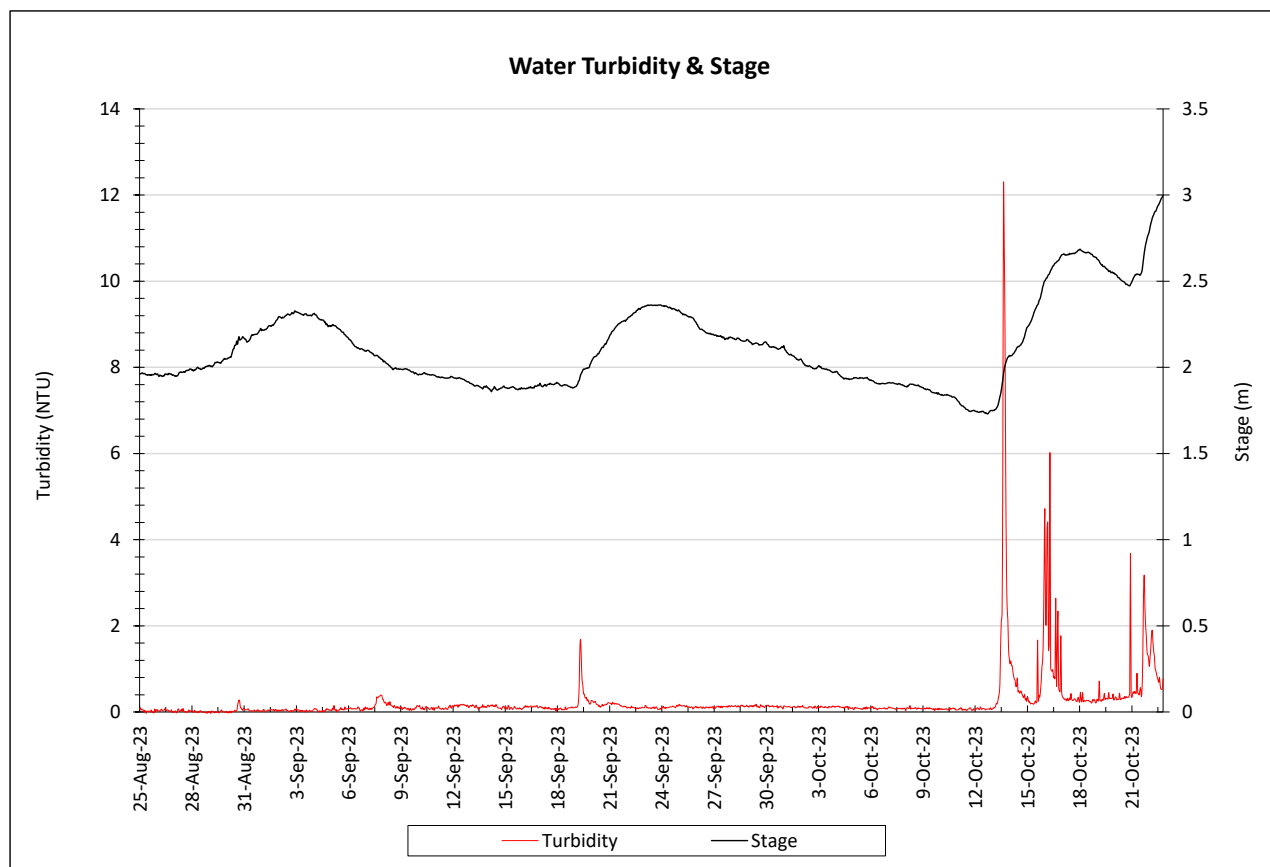


Figure 6: Turbidity & Stage at Humber River at Humber Village Bridge

Conclusions

- This deployment report summarizes the real time water quality and quantity monitoring data recorded at the Humber River at Humber Village Bridge station over a period of 58 days. No unusual events or data anomalies were evident. Some parameters were influenced by increased stage as the result of precipitation events.
- All parameters displayed trends typical for this waterbody at this time of year. pH and dissolved oxygen values were within the recommended CCME guidelines for the Protection of Aquatic Life.

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References

Canadian Council of Ministers of the Environment. 2007. Canadian water quality guidelines for the protection of aquatic life: Summary table. Updated December, 2007. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg. (Website: <http://cegg-rcqe.ccme.ca/download/en/222/>)

Quality Assurance / Quality Control Procedures

As part of the Quality Assurance / Quality Control (QA/QC) protocol, the performance of a station's water quality instrument (i.e., field sonde) is rated at the beginning and end of its deployment period. The procedure is based on the approach used by the United States Geological Survey (Wagner *et al.* 2006)¹.

At the beginning of the deployment period, a fully cleaned and calibrated QA/QC water quality instrument (i.e., QA/QC sonde) is placed *in-situ* with the fully cleaned and calibrated field sonde. After sonde readings have stabilized, water quality parameters, as measured by both sondes, are recorded. Field sonde performance for all parameters is rated based on differences recorded by the field sonde and QA/QC sonde. If the readings from both sondes are in close agreement, the QA/QC sonde can be removed from the water. If the readings are not in close agreement, there will be attempts to reconcile the problem on site (e.g., removing air bubbles from sensors, etc.). If no fix is made, the field sonde may be removed for recalibration.

At the end of the deployment period, a fully cleaned and calibrated QA/QC sonde is once again deployed *in-situ* with the field sonde. After Sonde readings have stabilized, water quality parameters, are measured by both sondes and recorded. Field sonde performance for all parameters is rated based on differences recorded by the field sonde and QA/QC sonde.

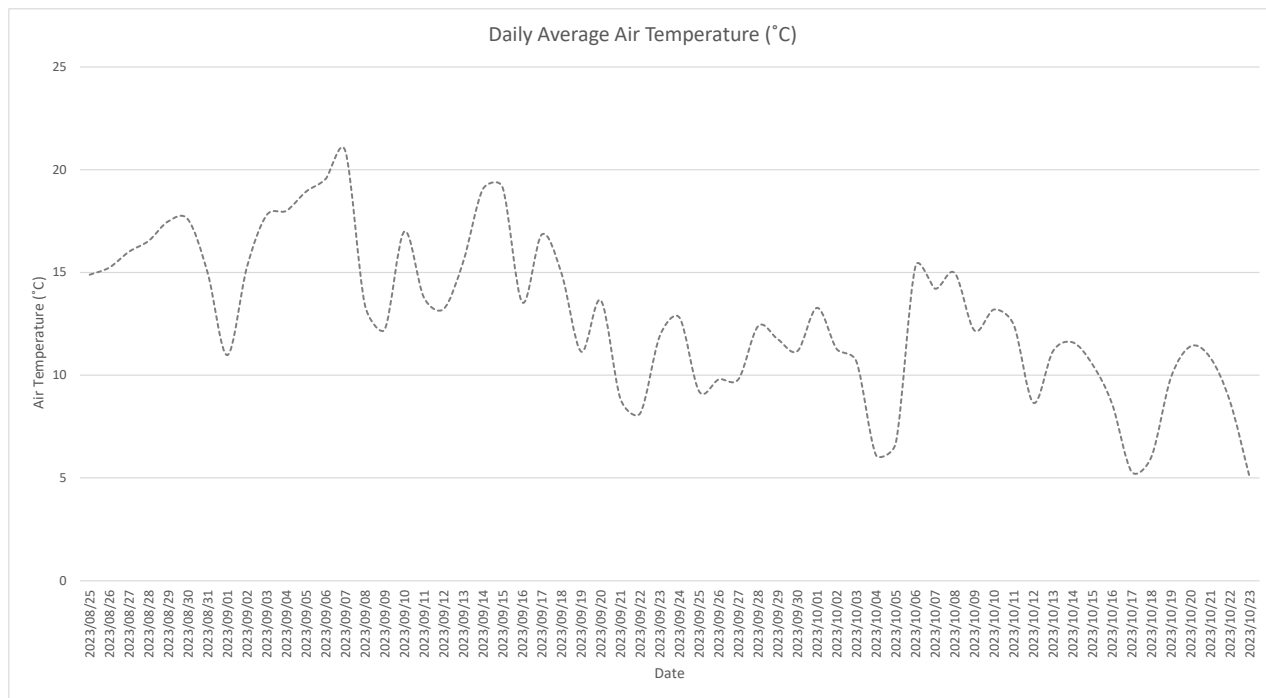
Performance ratings are based on differences listed in the table below:

Parameter	Rating				
	Excellent	Good	Fair	Marginal	Poor
Temperature (°C)	$\leq \pm 0.2$	$> \pm 0.2$ to 0.5	$> \pm 0.5$ to 0.8	$> \pm 0.8$ to 1	$> \pm 1$
pH (unit)	$\leq \pm 0.2$	$> \pm 0.2$ to 0.5	$> \pm 0.5$ to 0.8	$> \pm 0.8$ to 1	$> \pm 1$
Sp. Conductance ($\mu\text{S}/\text{cm}$)	$\leq \pm 3$	$> \pm 3$ to 10	$> \pm 10$ to 15	$> \pm 15$ to 20	$> \pm 20$
Sp. Conductance $> 35 \mu\text{S}/\text{cm}$ (%)	$\leq \pm 3$	$> \pm 3$ to 10	$> \pm 10$ to 15	$> \pm 15$ to 20	$> \pm 20$
Dissolved Oxygen (mg/l) (% Sat)	$\leq \pm 0.3$	$> \pm 0.3$ to 0.5	$> \pm 0.5$ to 0.8	$> \pm 0.8$ to 1	$> \pm 1$
Turbidity < 40 NTU (NTU)	$\leq \pm 2$	$> \pm 2$ to 5	$> \pm 5$ to 8	$> \pm 8$ to 10	$> \pm 10$
Turbidity > 40 NTU (%)	$\leq \pm 5$	$> \pm 5$ to 10	$> \pm 10$ to 15	$> \pm 15$ to 20	$> \pm 20$

¹ Wagner, R.J., Boulger, R.W., Jr., Oblinger, C.J., and Smith, B.A., 2006, Guidelines and standard procedures for continuous water-quality monitors—Station operation, record computation, and data reporting: U.S. Geological Survey Techniques and Methods 1–D3, 51 p. + 8 attachments; accessed April 10, 2006, at <http://pubs.water.usgs.gov/tm1d3>

APPENDIX B

WRMD Climate Station – Humber Village at Humber Village Bridge



*Precipitation data unavailable due to sensor malfunction