

Real Time Water Quality Deployment Report

Waterford River at Kilbride - NF02ZM0009

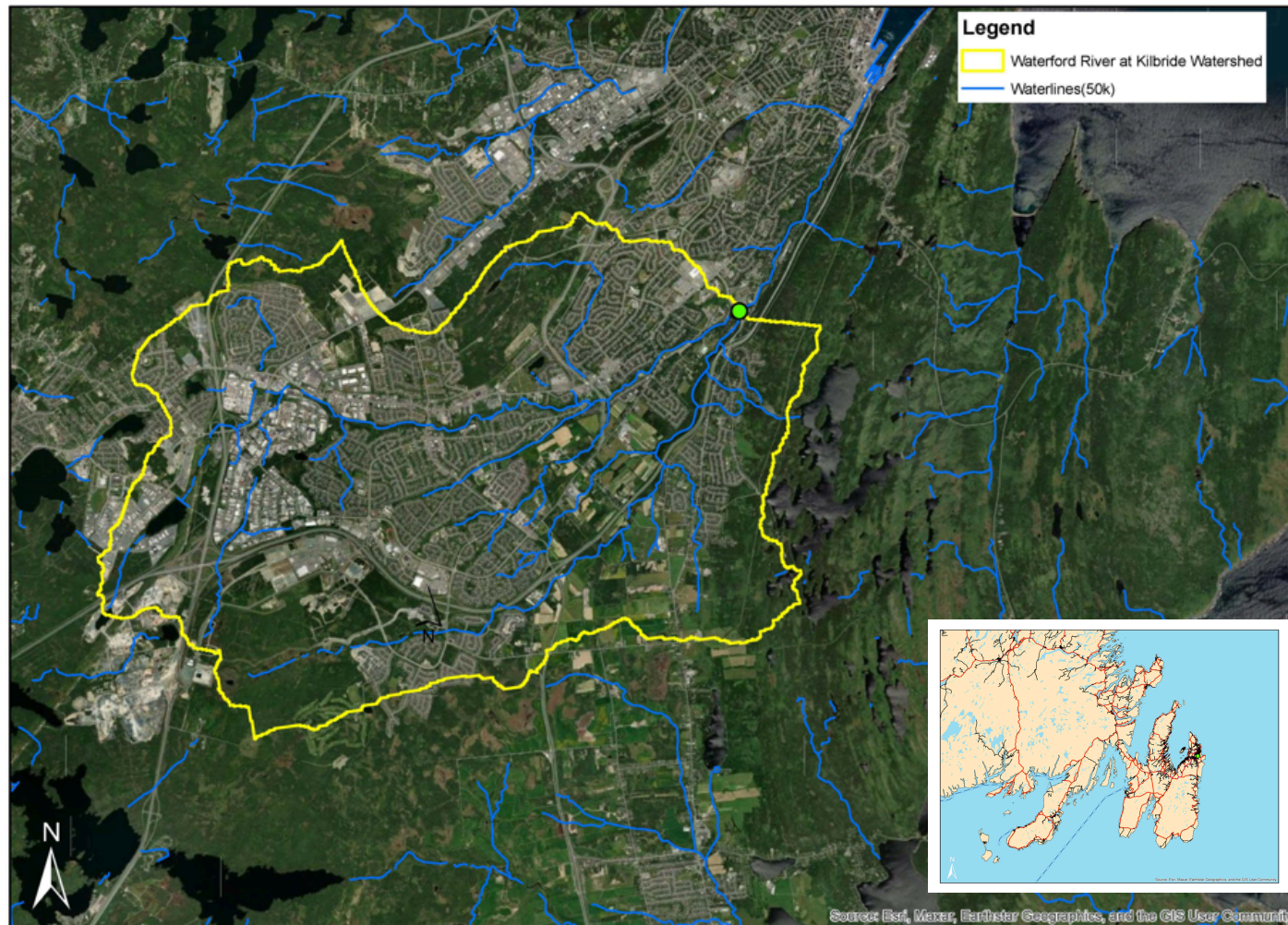
2025-12-22 to 2026-04-14



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



Waterford River at Kilbride NF02ZM009



Waterford River at Kilbride NF02ZM0009

The Water Resources Management Division (WRMD), in partnership with Water Survey of Canada - Environment and Climate Change Canada (WSC-ECCC), maintain a real-time water quality and water quantity monitoring station on Waterford River at Kilbride.

The purpose of the real-time water quality station is to monitor, process and publish real-time water quality data.

On 2025-12-22, a clean and calibrated real-time water quality monitoring instrument was deployed at the station Waterford River at Kilbride. The instrument was deployed for a period of 134 days and was removed on 2026-04-14.

Note: Turbidity values 60 NTU and above were removed from dataset and not used for statistical analysis as these values are considered outliers and not typical of baseline conditions.

Quality Assurance and Quality Control



As part of the Quality Assurance and Quality Control protocol (QA/QC), an assessment of the reliability of data recorded by an instrument is made at the beginning and end of the deployment period. The procedure is based on the approach used by the United States Geological Survey. Water Survey Canada operates the hydrometric component of this station. Due to differences in protocols, Water Survey Canada hydrometric data is quality controlled on a less frequent basis than water quality data. The hydrometric data shown in this report is provisional and has not undergone quality control checks. Corrected hydrometric data can be obtained at <https://wateroffice.ec.gc.ca/> or upon request to Water Survey Canada.

Parameter	Excellent	Good	Fair	Marginal	Poor
Dissolved oxygen	$\leq \pm 0.3$ mg/L	$\leq \pm 0.31 - 0.5$ mg/L	$\leq \pm 0.51 - 0.8$ mg/L	$\leq \pm 0.81 - 1$ mg/L	$> \pm 1$ mg/L
pH	$\leq \pm 0.2$ units	$\leq \pm 0.21 - 0.5$ units	$\leq \pm 0.51 - 0.8$ units	$\leq \pm 0.81 - 1$ units	$> \pm 1$ units
Specific Conductance	$\leq \pm 3$ μ S/cm or $\leq \pm 3\%$, whichever is greater	$\leq \pm 3.1 - 10$ μ S/cm or $\leq \pm 3.1 - 10\%$, whichever is greater	$\leq \pm 10 - 15$ μ S/cm or $\leq \pm 10.1 - 15\%$, whichever is greater	$\leq \pm 15.1 - 20$ μ S/cm or $\leq \pm 15.1 - 20\%$, whichever is greater	$> \pm 20$ μ S/cm or $> \pm 20\%$, whichever is greater
Turbidity	$\leq \pm 2$ turbidity units or $\leq \pm 5\%$, whichever is greater	$\leq \pm 2.1 - 5$ turbidity units or $\leq \pm 5.1 - 10\%$, whichever is greater	$\leq \pm 5.1 - 8$ turbidity units or $\leq \pm 10.1 - 15\%$, whichever is greater	$\leq \pm 8.1 - 10$ turbidity units or $\leq \pm 15.1 - 20\%$, whichever is greater	$> \pm 10$ turbidity units or $> \pm 20\%$, whichever is greater
Water Temperature	$\leq \pm 0.2^\circ$ C	$\leq \pm 0.21 - 0.5^\circ$ C	$\leq \pm 0.51 - 0.8^\circ$ C	$\leq \pm 0.81 - 1^\circ$ C	$> \pm 1^\circ$ C

At deployment and removal, a QA/QC Sonde is temporarily deployed adjacent to the Field Sonde. Values for temperature, pH, conductivity, dissolved oxygen and turbidity are compared between the two instruments. Based on the degree of difference between parameters recorded by the Field Sonde and QA/QC Sonde at deployment and at removal, a qualitative statement is made on the data quality.

There are a few circumstances which may cause QA/QC rankings below excellent, including the placement of the QA/QC sonde in relation to the field sonde, the amount of time each sonde was given to stabilize before readings were recorded, and deteriorating performance of one of the sensors.

The temperature sensor on any sonde is the most important. All other parameters can be divided into subgroups of: temperature dependent, temperature compensated, and temperature independent. Due to the temperature sensor's location on the sonde, the entire sonde must be at a constant temperature before the temperature sensor will stabilize. The values may take some time to climb to the appropriate reading; if a reading is taken too soon it may not accurately portray the water body.

QAQC Rankings

Parameter	Deployment Ranks	Removal Ranks	Grab Sample Ranks
Dissolved Oxygen (mg/l)	Excellent	Marginal	
pH	Excellent	Excellent	Excellent
Specific Conductivity (μ S/cm)	Poor	Poor	Poor
Temperature ($^\circ$ C)	Poor	Poor	
Turbidity (NTU)	Excellent	Excellent	Excellent

At deployment and removal, when the field sonde was compared to the QA/QC sonde, all parameters were rated as 'Poor' or 'Excellent'. Upon removal, Dissolved Oxygen ranking dropped to 'Marginal'. Specific conductivity and water temperature received "Poor" rankings during both deployment and removal assessments. These lower rankings are likely attributable to calibration error or sensor failure and will be investigated.

Water Temperature (°C)

1.72
Average

-0.08
Minimum

7.44
Maximum

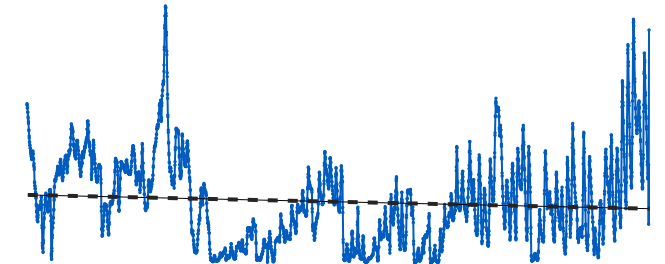
1.56
Median



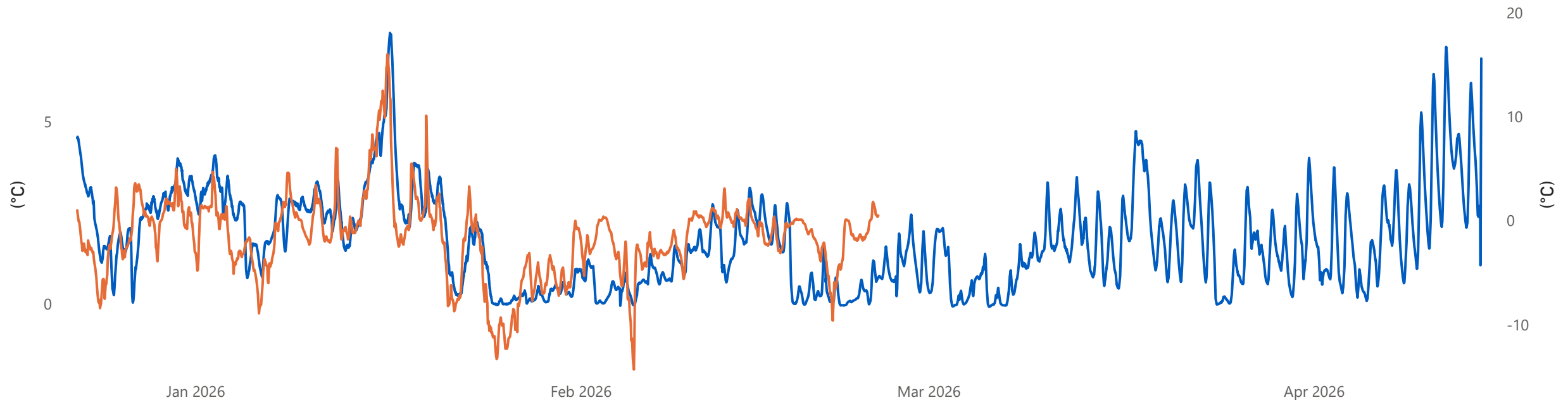
Water temperature is an important parameter for wildlife. Many organisms cannot regulate their own temperatures, and rely on surrounding air and water temperatures. Water temperature may be affected by inputs from industry or by modifying natural conditions like clearing trees and other vegetation, which eliminates the canopy protection they offer. Water temperature also affects other parameters monitored including dissolved oxygen and specific conductivity.

Water temperature at Waterford River during the monitoring period exhibited typical winter and early spring conditions, with generally cold water temperatures and noticeable short-term variability associated with changing air temperatures and flow conditions. Water temperatures ranged from a minimum of -0.08 °C to a maximum of 7.44 °C, with an average of 1.72 °C and a median of 1.56 °C. Temperatures remained near freezing for extended periods throughout late winter, with gradual warming observed into early spring. Short-term fluctuations were evident throughout the deployment, particularly during periods of rapid air temperature change and snowmelt activity. St. John's West climate station air temperature data was not available from February 25, 2026 to the the end of the deployment period. Overall, the data indicate a seasonal warming trend through the monitoring period, consistent with the transition from winter into spring conditions.

Water Temperature Trendline



● WATER_TEMP ● AIR_TEMP



pH

7.08
Average pH

7.10
Median pH

6.70
Minimum pH

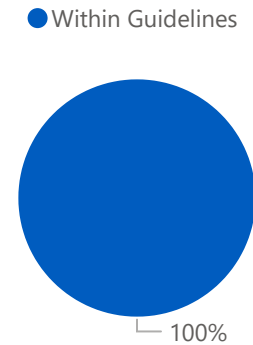
7.51
Maximum pH



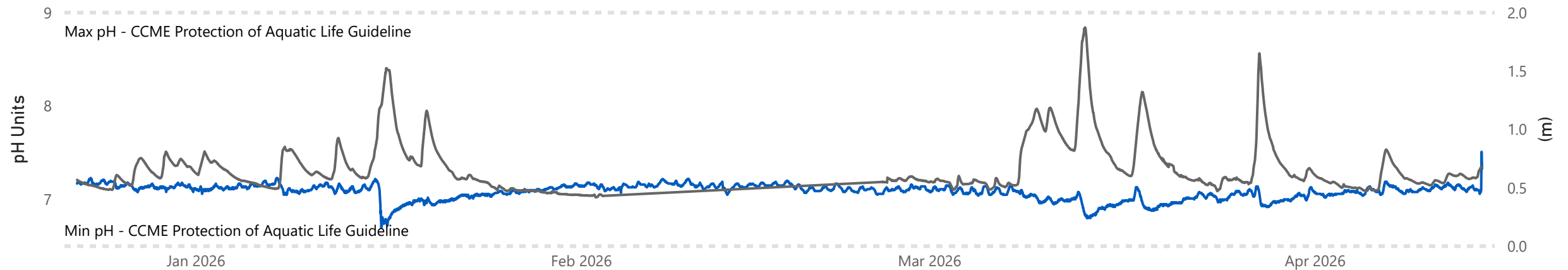
pH relates to the free hydrogen ions in water and it is a measure of acidity in water. A pH of 7 indicates a neutral pH, below 7 is considered acidic, and above 7 is considered basic. The [Canadian Council of Ministers of the Environment](#) (CCME) Freshwater Aquatic Life guideline provides a basis by which to judge the overall health of the brook. Their freshwater guidelines recommend a minimum pH of 6.5 and a maximum pH of 9.0; however, many rivers in Newfoundland and Labrador are naturally more acidic due to the local geology. Water parameter maps can be found on the [Water Resources Management website](#).

pH conditions at Waterford River remained generally stable throughout the monitoring period and were consistently within the CCME freshwater aquatic life guideline range of 6.5 to 9.0 pH units. pH values ranged from a minimum of 6.70 to a maximum of 7.51, with an average of 7.08 and a median of 7.10, indicating near-neutral conditions and minimal overall variability. Short-term fluctuations in pH were observed throughout the deployment and were often associated with changes in river stage and precipitation events; however, no prolonged departures from baseline values were observed. Overall, the pH data indicate stable water chemistry conditions representative of a healthy freshwater system during the monitoring period.

CCME Freshwater Aquatic Life Guideline

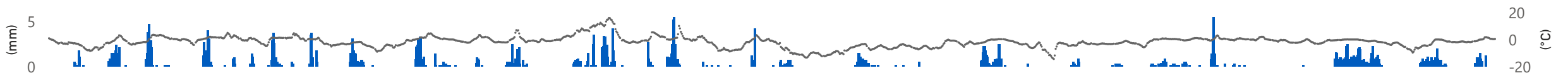


● pH ● STAGE



Climate data from St. John's West Climate Station

● Precipitation (mm) ● Air Temperature (°C)



Specific Conductivity

1.52K
Average $\mu\text{S}/\text{cm}$

1.18K
Median $\mu\text{S}/\text{cm}$

160.90
Minimum $\mu\text{S}/\text{cm}$

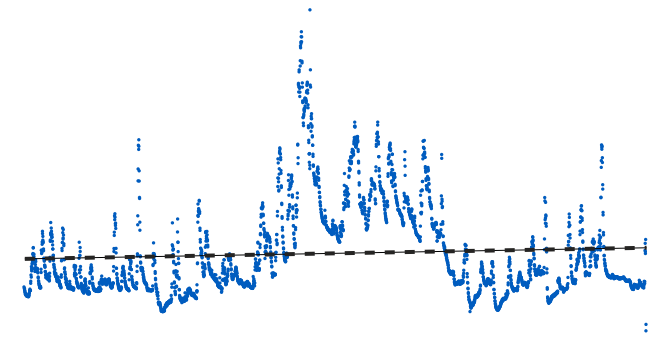
5.79K
Maximum $\mu\text{S}/\text{cm}$



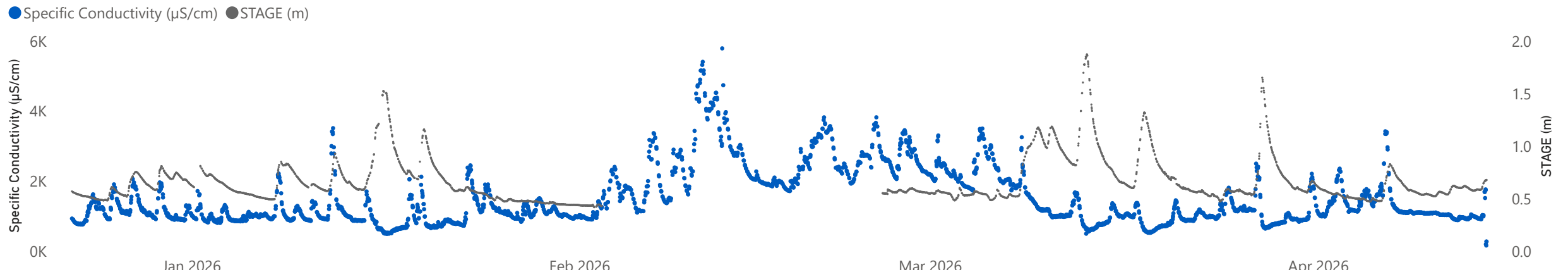
Conductivity relates to the ability of an electric charge to pass through a solution. Pure water has low conductance and water with dissolved ions has higher conductance. Specific conductance is corrected to 25°C to allow comparison across temperatures. Water parameter maps can be found on the [Water Resources Management website](#).

Specific conductivity at Waterford River exhibited elevated and highly variable conditions throughout the monitoring period, reflecting the strong influence of dissolved ions within this urban watershed. Conductivity values ranged from a minimum of 160.90 $\mu\text{S}/\text{cm}$ to a maximum of 5,790 $\mu\text{S}/\text{cm}$, with an average of approximately 1,520 $\mu\text{S}/\text{cm}$ and a median of 1,180 $\mu\text{S}/\text{cm}$. Frequent spikes and periods of sustained elevated conductivity were observed, particularly during late winter and early spring, and were often associated with precipitation events and increases in river stage. These elevated values are consistent with runoff inputs from road salt application for snow and ice control, which can significantly increase dissolved ion concentrations in urban rivers during winter conditions. Overall, the data indicate strong seasonal and event-driven variability in conductivity, with the highest values occurring during periods of increased runoff and snowmelt activity.

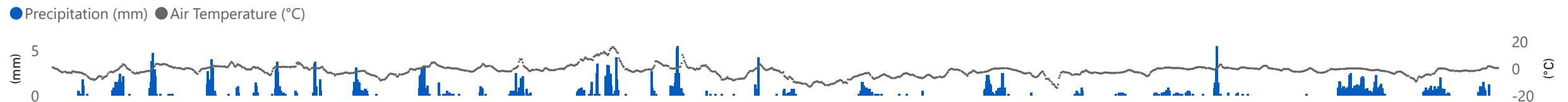
Specific Conductivity Trendline



Specific Conductivity ($\mu\text{S}/\text{cm}$) and STAGE (m) by NST_DAT1



Climate data from St. John's West Climate Station



Dissolved Oxygen Concentration and Saturation

13.74
Average (mg/L)

13.80
Median (mg/L)

11.84
Minimum (mg/L)

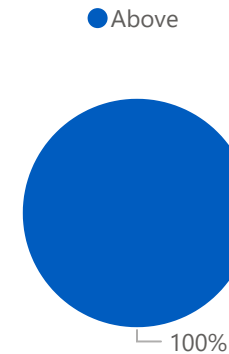
14.80
Maximum (mg/L)



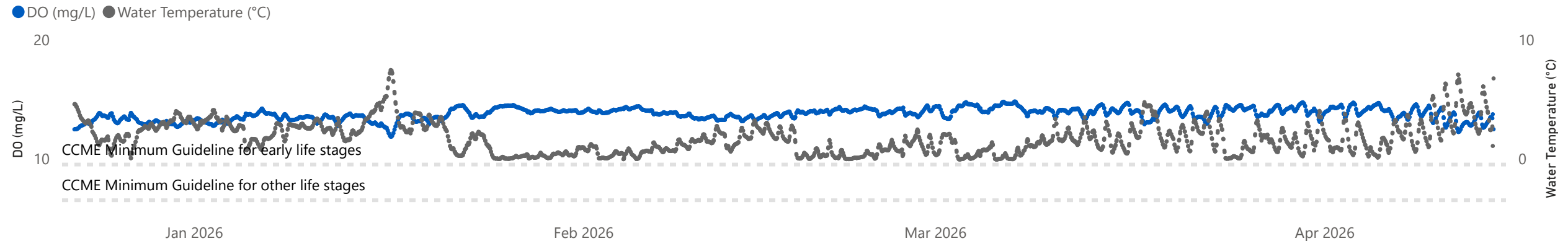
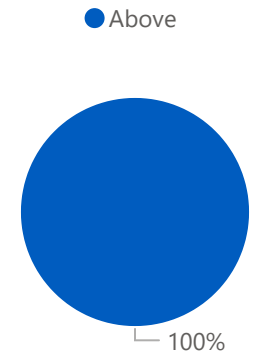
Dissolved oxygen (DO) in water is crucial for aquatic life. The [CCME \(Canadian Council of Ministers of the Environment\)](#) Freshwater Aquatic Life guidelines provide a basis by which to judge the overall health of waterways. The minimum guideline for early life stages in cold water is 9.5 mg/L and the minimum guideline for other life stages is 6.5 mg/L. DO and water temperatures are correlated; colder waters can hold higher concentrations of DO than warm waters.

Dissolved oxygen conditions at Waterford River remained stable and consistently well-oxygenated throughout the monitoring period, indicating favorable conditions for aquatic life. Dissolved oxygen concentrations ranged from 11.84 to 14.80 mg/L, with an average of 13.74 mg/L and a median of 13.80 mg/L, demonstrating minimal variability and consistently elevated oxygen levels. Dissolved oxygen saturation remained near 100% throughout the deployment, indicating healthy oxygen exchange and stable aquatic conditions. Short-term fluctuations in dissolved oxygen were observed and were generally associated with changes in water temperature, river stage, and flow conditions. Colder water temperatures during the winter and early spring months likely contributed to the elevated dissolved oxygen concentrations observed throughout the monitoring period. All recorded dissolved oxygen values remained well above the CCME guidelines for both early life stages (9.5 mg/L) and other life stages (6.5 mg/L), indicating healthy and well-oxygenated conditions throughout the deployment period.

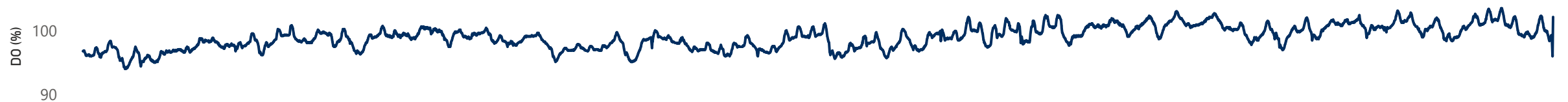
CCME Early Life Stages Guideline



CCME Other Life Stages Guideline



Percent Saturation (%)



Turbidity

4.06
Average (NTU)

1.93
Median (NTU)

0.70
Minimum (NTU)

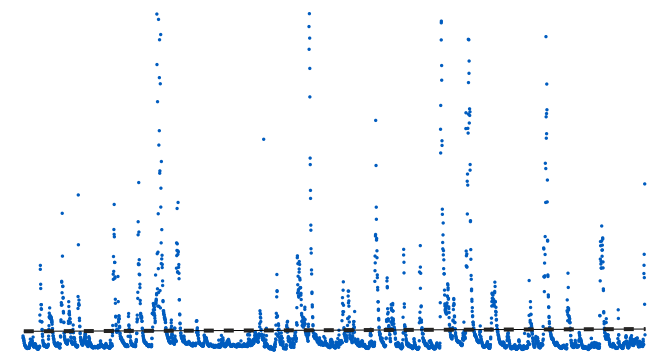
59.85
Maximum (NTU)



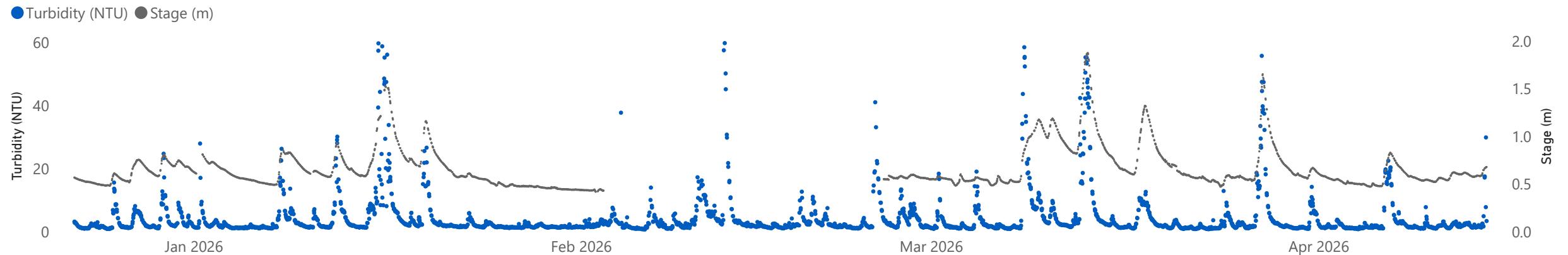
Water turbidity is characterized by the cloudiness or haziness caused by suspended particles and can significantly impact water quality. High turbidity reduces light penetration, hindering photosynthesis and affecting aquatic vegetation growth and habitat suitability. It can lead to temperature fluctuations, oxygen depletion from microbial decomposition of organic matter, and sedimentation, smothering benthic habitats and compromising biodiversity.

Turbidity conditions at Waterford River were generally low throughout the monitoring period, with intermittent short-duration spikes associated with runoff events and changes in river stage. Turbidity values ranged from 0.70 to 59.85 NTU, with an average of 4.06 NTU and a median of 1.93 NTU, indicating that baseline water conditions were typically clear for much of the deployment. Elevated turbidity events were observed periodically, particularly during precipitation events and rapid increases in stage, suggesting sediment mobilization and increased surface runoff into the river system. The highest turbidity spikes were generally short-lived and coincided with periods of increased flow and storm activity. Overall, turbidity at Waterford River exhibited typical event-driven variability for an urban river system, with generally low baseline conditions punctuated by temporary increases during runoff events.

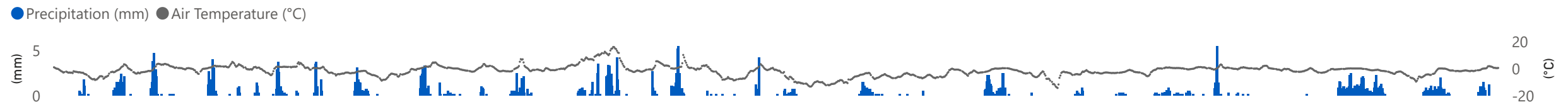
Turbidity Trendline



Turbidity (NTU) and Stage (m) by NST_DATI



Climate data from St. John's West Climate Station

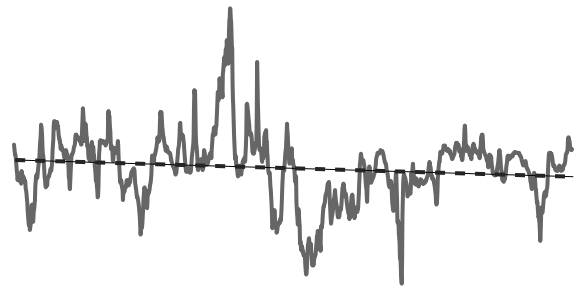


Meteorological and Hydrometric Data

*Climate data obtained from St. John's West Station



Air Temperature Trendline



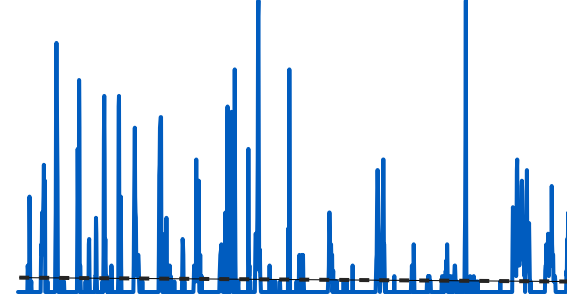
-1.61
Average (°C)

-1.20
Median (°C)

-14.30
Minimum (°C)

16.00
Maximum (°C)

Precipitation Trendline



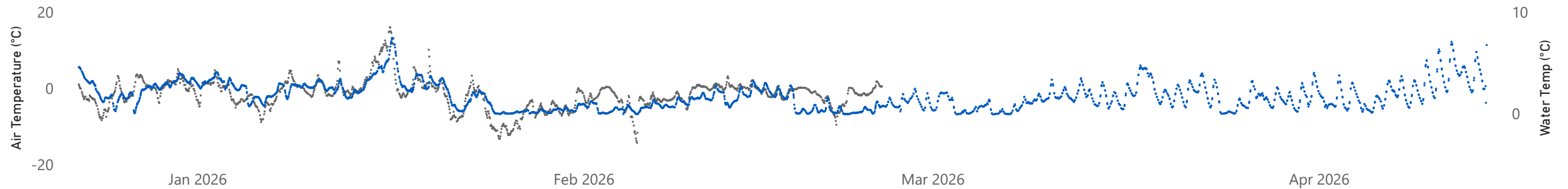
0.23
Average (mm/hr)

0.00
Median (mm/hr)

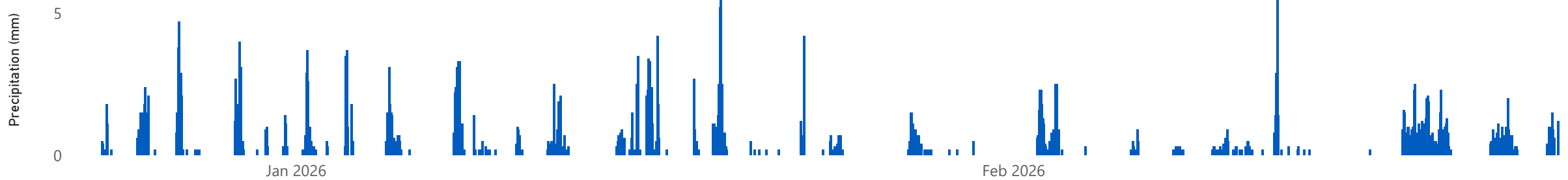
0.00
Minimum (mm/hr)

5.50
Maximum (mm/hr)

● Air Temperature (°C) ● Water Temperature (°C)



Precipitation (mm) by NST_DAT1



Conclusions



A clean and calibrated real-time water quality monitoring instrument was deployed at the Waterford River at Kilbride station on 2025-12-22 and removed on 2026-04-14. The deployment successfully captured winter and early spring water quality conditions within the Waterford River watershed and provided continuous monitoring during periods of freezing conditions, snowmelt, and runoff activity.

- **Water Temperature** ranged from $-0.08\text{ }^{\circ}\text{C}$ to $7.44\text{ }^{\circ}\text{C}$, with an average of $1.72\text{ }^{\circ}\text{C}$. Water temperatures remained near freezing for extended periods throughout the winter months, with gradual warming observed during early spring. The dataset displayed expected seasonal and short-term variability associated with air temperature changes, precipitation events, and snowmelt activity.
- **pH** conditions remained stable throughout the monitoring period and consistently remained within the CCME freshwater aquatic life guideline range of 6.5 to 9.0 pH units. pH values ranged from 6.70 to 7.51, with an average of 7.08, indicating generally neutral and healthy freshwater conditions with minimal overall variability.
- **Specific Conductivity** exhibited elevated and highly variable conditions throughout the deployment, ranging from $160.90\text{ }\mu\text{S/cm}$ to $5,790\text{ }\mu\text{S/cm}$, with an average of approximately $1,520\text{ }\mu\text{S/cm}$. Elevated conductivity conditions are consistent with runoff inputs from road salt application within this urban watershed during winter and early spring conditions. Frequent conductivity spikes corresponded closely with precipitation events, snowmelt activity, and increases in river stage.
- **Dissolved Oxygen** conditions remained stable and consistently well oxygenated throughout the monitoring period. Dissolved oxygen ranged from 11.84 mg/L to 14.80 mg/L , with an average of 13.74 mg/L . All recorded dissolved oxygen values remained above CCME guidelines for the Protection of Aquatic Life for both early and other life stages, indicating favorable aquatic conditions throughout the deployment period.
- **Turbidity** conditions remained generally low throughout the deployment, with baseline conditions typically clear for much of the monitoring period. Turbidity values ranged from 0.70 NTU to 59.85 NTU , with short-duration spikes occurring during runoff events, precipitation, and rapid increases in river stage. These elevated events likely reflect temporary sediment mobilization associated with stormwater runoff and snowmelt conditions typical of an urban river system.
- **Meteorological and Hydrometric Conditions** demonstrated clear seasonal transitions from winter into spring conditions. Air temperatures remained predominantly below freezing through much of the deployment period before gradually warming into April. Periodic precipitation and runoff events influenced short-term fluctuations in river stage, conductivity, and turbidity throughout the deployment.

Overall, the 2025–2026 winter deployment successfully characterized seasonal water quality and hydrologic variability within the Waterford River watershed during winter and early spring conditions. The monitoring program continues to provide valuable long-term environmental information to support assessment of urban watershed conditions, runoff responses, and seasonal water quality trends within the Waterford River system.

Appendix 1
Grab Sample Results