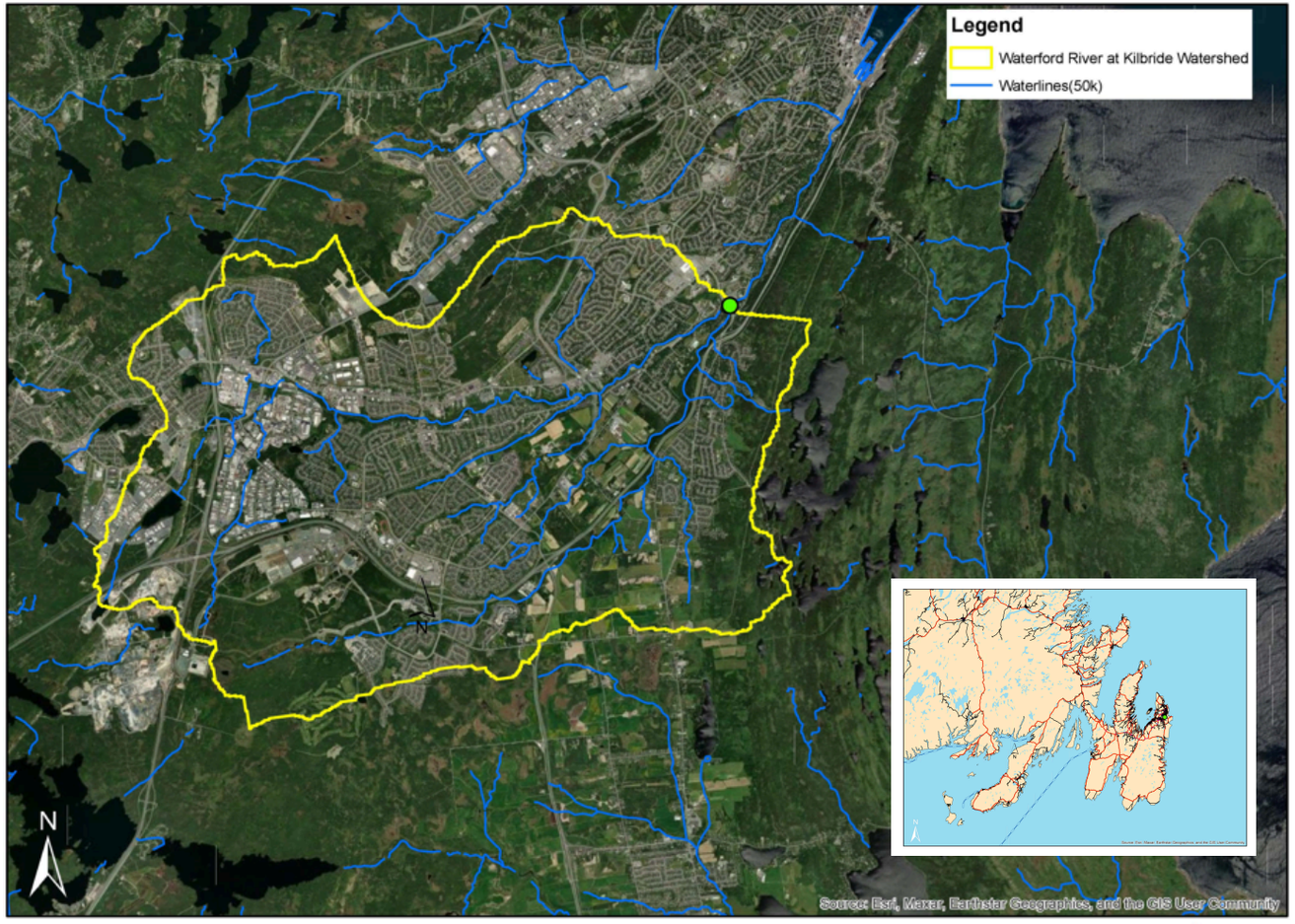
Real Time Water Quality Deployment Report
Waterford River at Kilbride
NF02ZM0009

2025-03-04 to 2025-04-17

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

Waterford River at Kilbride NF02ZM009



Waterford River at Kilbride NF02ZM0009

es Management Division (WRMD), in
/ater Survey of Canada - Environment and
anada (WSC-ECCC), maintain a real-time water
quantity monitoring station on Waterford

e real-time water quality station is to monitor,
h real-time water quality data.

clean and calibrated real-time water quality
nent was deployed at the station Waterford
ne instrument was deployed for a period of 45
oved on 04/17/2025 .

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	≤ ± 0.3 mg/L	≤ ± 0.31 -0.5 mg/L	≤ ± 0.51 - 0.8 mg/L	≤ ± 0.81 - 1 mg/L	> ± 1 mg/L
pH	≤ ± 0.2 units	≤ ± 0.21 - 0.5 units	≤ ± 0.51 - 0.8 units	≤ ± 0.81 - 1 units	> ± 1 units
Specific Conductance	≤ ± 3 µS/cm or ≤ ± 3%, whichever is greater	≤ ± 3.1-10 µS/cm or ≤ ± 3.1-10%, whichever is greater	≤ ± 10 - 15 µS/cm or ≤ ± 10.1-15 %, whichever is greater	≤ ± 15.1 - 20 µS/cm or ≤ ± 15.1-20 %, whichever is greater	> ± 20 µS/cm or > ± 20 %, whichever is greater
Turbidity	≤ ± 2 turbidity units or ≤ ± 5%, whichever is greater	≤ ± 2.1-5 turbidity units or ≤ ± 5.1-10 %, whichever is greater	≤ ± 5.1-8 turbidity units or ≤ ± 10.1-15 %, whichever is greater	≤ ± 8.1-10 turbidity units or ≤ ± 15.1-20 %, whichever is greater	> ± 10 turbidity units or > ± 20 %, whichever is greater
Water Temperature	≤ ± 0.2°C	≤ ± 0.21 - 0.5°C	≤ ± 0.51 - 0.8°C	≤ ± 0.81 - 1°C	> ± 1°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)	Fair	Excellent	
pH	Good	Excellent	Good
Specific Conductivity (µS/cm)	Excellent	Excellent	Fair
Turbidity (NTU)	Excellent	Excellent	Excellent
Temperature ('C)	Excellent	Good	

At deployment and removal, when compared to the QA/QC sonde, all parameters ranked either 'good' or 'excellent', with exception to dissolved oxygen, which ranked 'fair at deployment'. This is likely the result inefficient time provided for the sonde to acclimate to existing conditions.

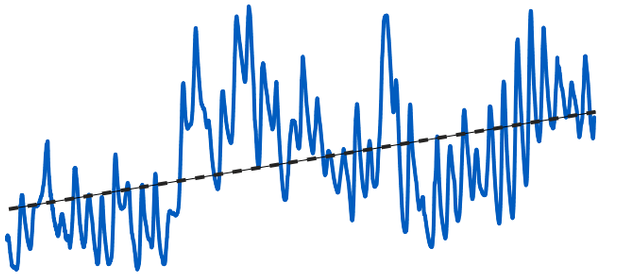
Water Temperature

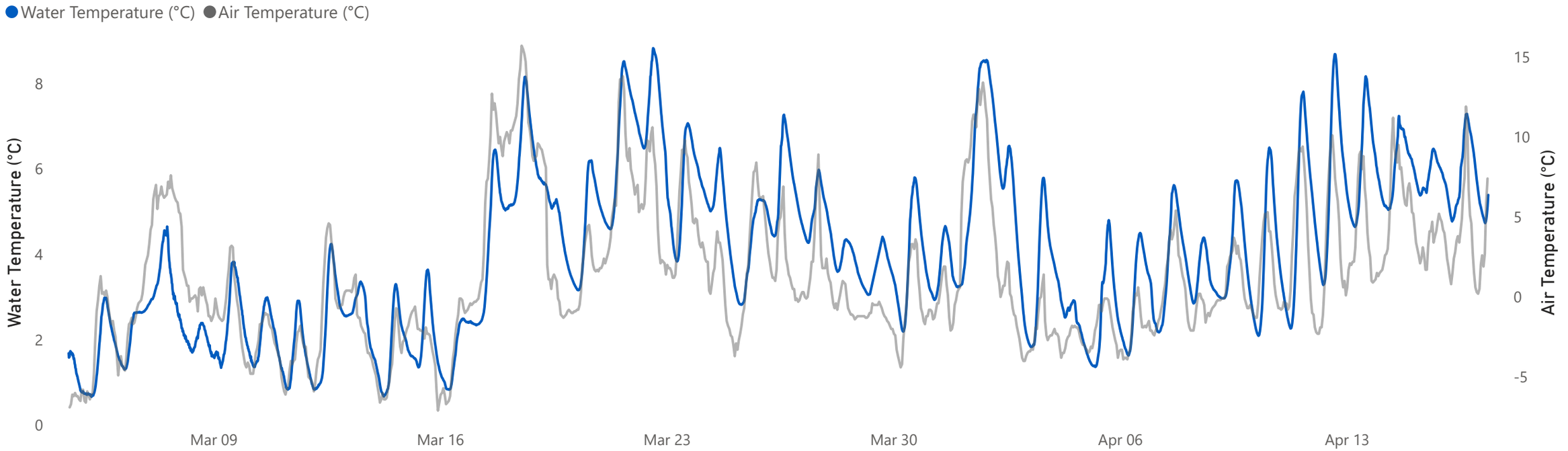
4.03	3.83	0.66	8.83
Average (°C)	Median (°C)	Minimum (°C)	Maximum (°C)

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 data for this deployment was collected from 2025-03-04 until 2025-04-17. The minimum water temperature, 0.66°C, occurred on 2025-03-05. The maximum water temperature, 8.83°C, occurred on 2025-03-22. The average water temperature was 4.03 °C. Water temperature usually falls overnight and rises during the day, known as diurnal variation. Water temperature gradually increased in correlation with air temperature, as the season transitioned from late winter to early spring.

Water Temperature Trendline





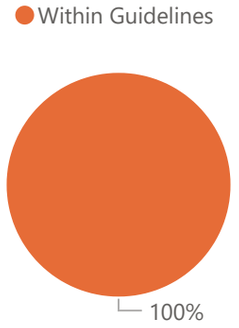
pH

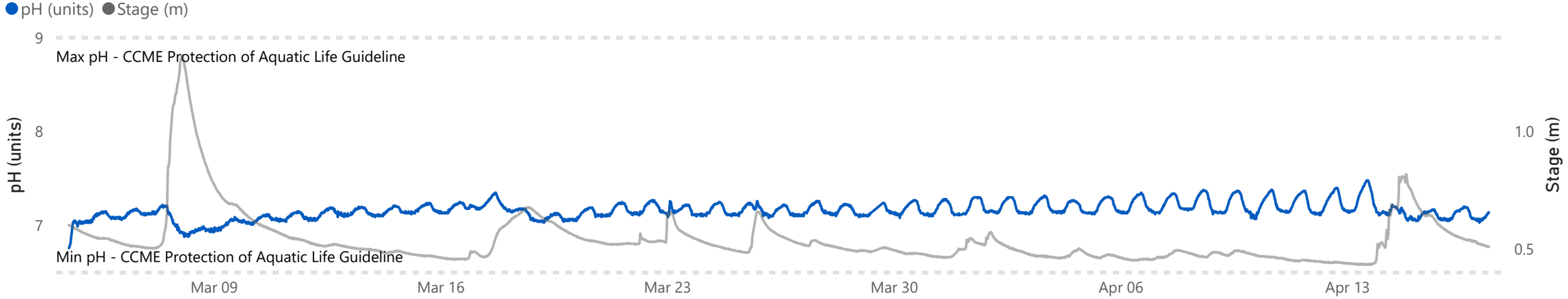
7.16	7.15	6.76	7.48
Average pH	Median pH	Minimum pH	Maximum pH

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.

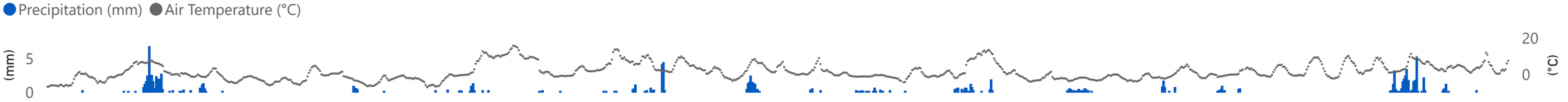
pH data for this deployment was collected from 2025-03-04 until 2025-04-17. The minimum pH, 6.76 pH units, occurred on 2025-03-04 . The maximum pH, 7.48 pH units, occurred on 2025-04-13. Daily fluctuations are common due to changes in temperature and photosynthesizing of aquatic plants. pH was stable throughout this deployment period. A sudden decrease and stabilization in pH was observed on 2025-03-07, 2025-03-17 and on 2025-04-13 due to a significant precipitation eventas. All values during the deployment are within the CCME guidelines for the Protection of Aquatic Life (between 6.5 and 9 pH units).

CCME Freshwater Aquatic Life Guideline





Climate data from St. John's West Climate Station



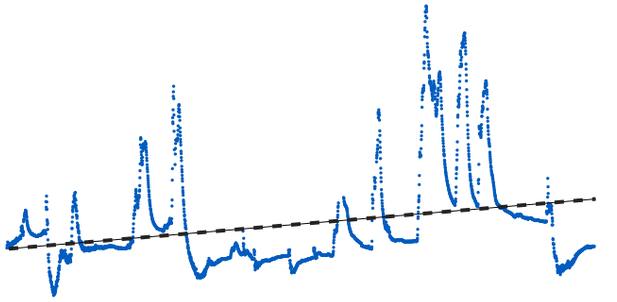
Specific Conductivity

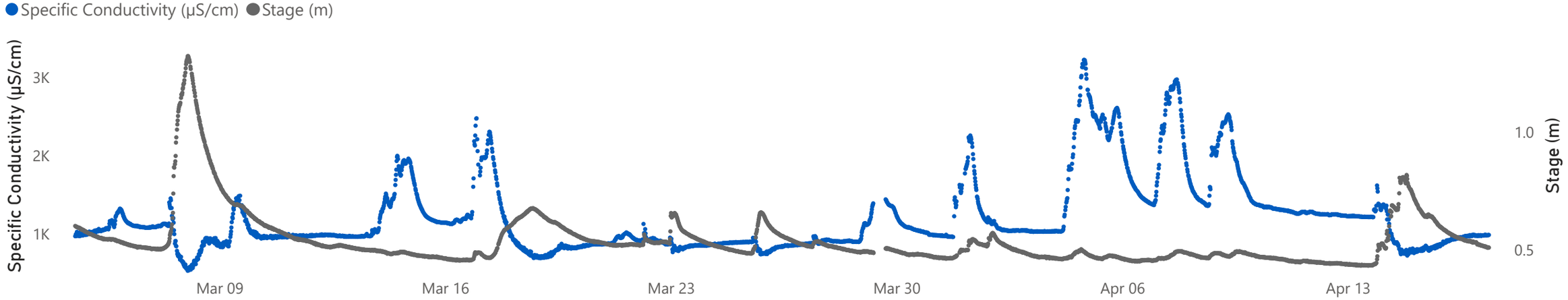
1.20K	1.04K	534.01	3.23K
Average µS/cm	Median µS/cm	Minumum µS/cm	Maximum µS/cm

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 conductance data for this deployment was collected from 2025-03-04 until 2025-04-17. The minimum specific conductance, 534.01 µS/cm, occurred on 2025-03-08 . The maximum specific conductance, 3,226.80 µS/cm, occurred on 2025-04-04. Precipitation and specific conductivity are correlated. The specific conductivity trend increased minimally over the deployment period. During a precipitation event, the amount of water in the river increases, this dilutes the solids that are present, decreasing the conductivity. However, sudden spikes and decreases were observed due to precipitation events and runoff containing high concentrations of dissolved salts, minerals and other conductive substances. This is expected as Waterford River is an urban river and road salts and other de-icing substances are utilized during winter months.

Specific Conductivity Trendline





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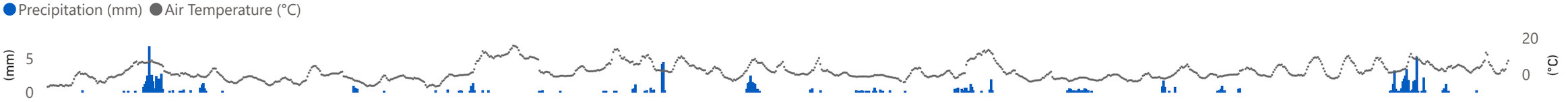
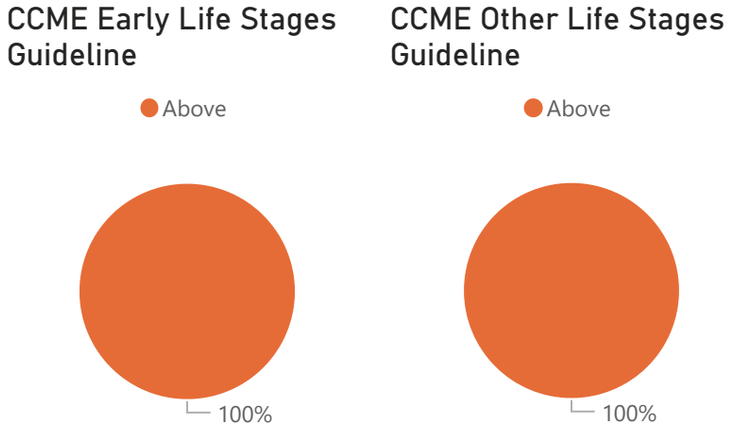


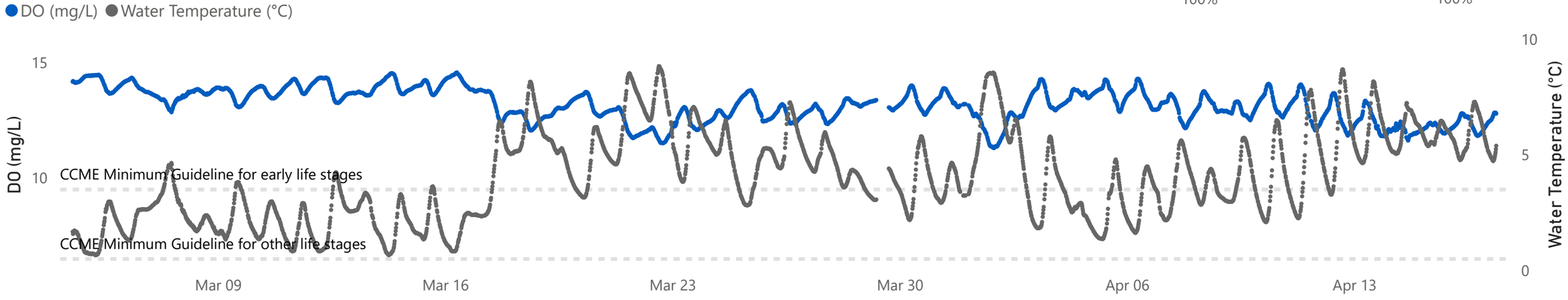
Dissolved Oxygen Concentration and Saturation

13.15	13.19	11.29	14.56
Average (mg/L)	Median (mg/L)	Minimum (mg/L)	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.

DO data for this deployment was collected from 2025-03-04 until 2025-04-17. The minimum DO reading, 11.29 mg/L, occurred on 2025-04-01. The maximum DO reading, 14.56 mg/L, occurred on 2025-03-16. Dissolved oxygen content fluctuates diurnally and displays an inverse relationship to water temperature. Dissolved oxygen was generally stable with a slight decreasing trend throughout the deployment period. As water temperature began to increase , DO began to decrease. Dissolved oxygen concentrations stayed above the Guidelines for the Protection of Early Life Stage for Cold Water Biota and Other Life Stages Guideline for the entirety of the monitoring period.



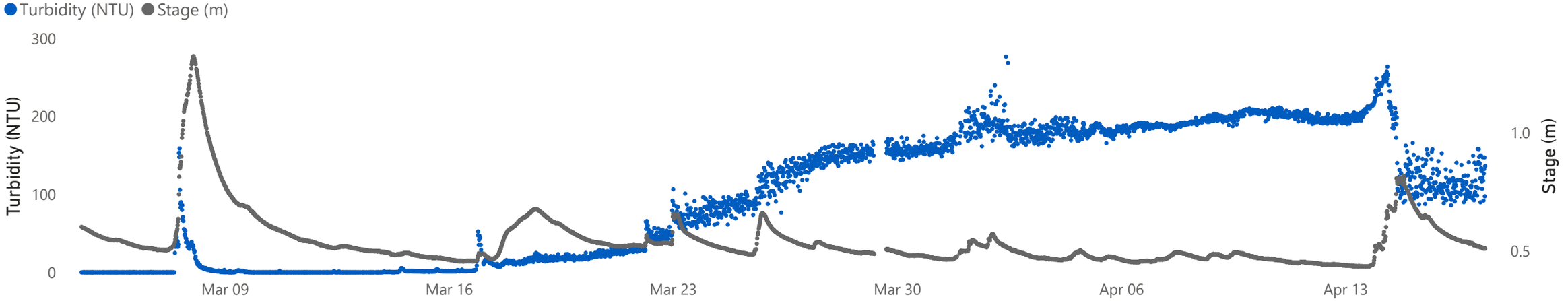


Turbidity

97.13	100.58	0.00	276.71
Average (NTU)	Median (NTU)	Minimum (NTU)	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 data for this deployment was collected from 2025-03-04 until 2025-04-17. The minimum turbidity was 0.00 NTUs. The maximum turbidity, 276.71 NTUs, occurred on 4/2/2025 9:45:00 AM. Overall turbidity, with an average of 97.13 NTU, indicates that turbidity data is above normal baseline values and statistical analysis has been significantly influenced by the sediment and organic matter build up within the sonde casing beginning March 17, 2025 until the end of the deployment period. Upon removal, biofouling of the turbidity sensor was also observed.



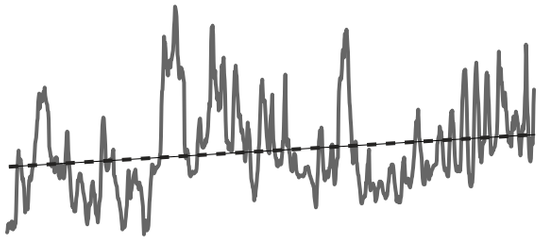
Climate data from St. John's West Climate Station

Meteorological and Hydrometric Data

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

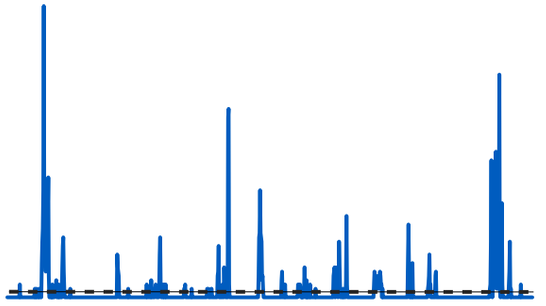
Newfoundland Labrador

Air Temperature Trendline

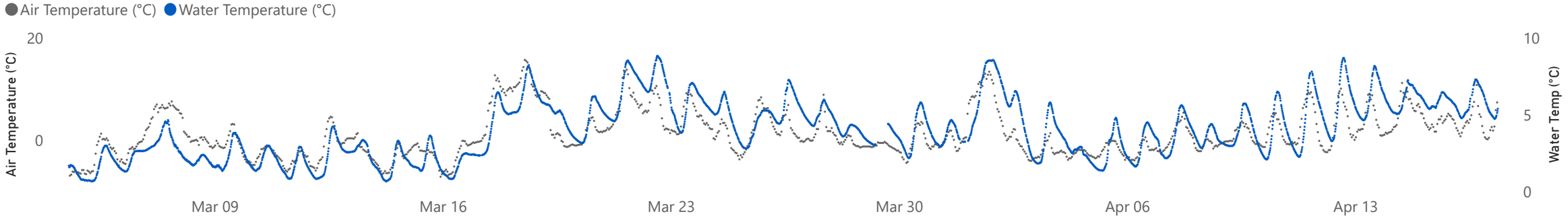


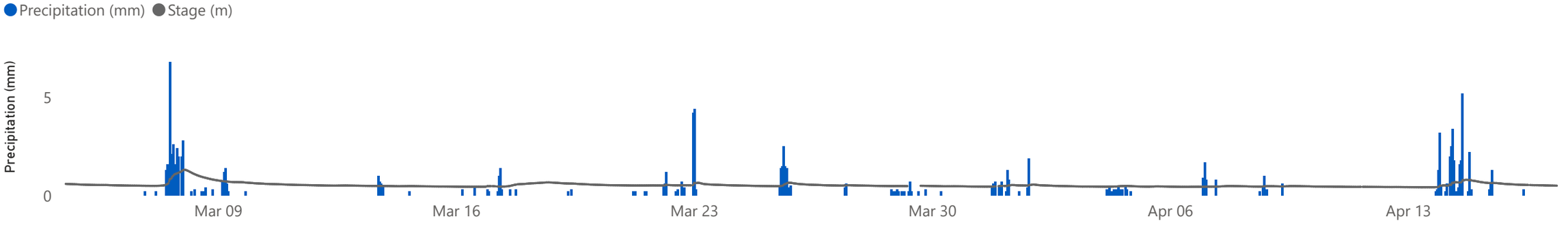
1.28	0.20
Average (°C)	Median (°C)
-7.10	15.70
Minimum (°C)	Maximum (°C)

Precipitation Trendline



0.13	0.00
Average (mm/hr)	Median (mm/hr)
0.00	6.80
Minimum (mm/hr)	Maximum (mm/hr)





Conclusions

- **A clean and calibrated instrument was deployed at the Waterford River at Kilbride water quality monitoring station on March 4, 2025 and removed on April 17, 2025.**
- **In most cases, weather related events or increases/decreases in water level explain parameter fluctuations. All values recorded were within ranges as suggested by the CCME Guidelines for the Protection of Aquatic Life for pH and dissolved oxygen.**
- **Water temperature corresponded with ambient air temperatures, ranging between 0.66°C and 8.83°C.**
- **pH values were all within the recommended CCME Guidelines for the Protection of Aquatic Life. pH ranged between 6.76 and 7.48.**
- **Specific conductivity increased gradually over the course of the deployment period, ranging from 534.01 and 3230 µS/cm.**
- **Dissolved oxygen values were above the minimum CCME Guideline for the Protection of Aquatic Life for Cold Water Biota at Other Life Stages of 6.5 mg/l and the CCME Guideline for the Protection of Aquatic Life for Cold Water Biota at Early Life Stages of 9.5 mg/l.**
- **Turbidity values were considered erroneous after March 17, 2025 to the end of the deployment period due to the lodging of sediment and organic matter within the sonde casing, in addition to biofouling of the sensor.**
- **Stage was stable throughout the deployment period with some small increases after precipitation events. A notable increase was observed on March 8, 2025 and April 14, 2025, after a significant events, where stage elevated and then returned to baseline level for the remainder of the deployment period.**
- **With the exception of water quantity data (stage), all data used in the preparation of the graphs and subsequent discussion adhere to this stringent QA/QC protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.**

Appendix 1
Grab Sample Results