

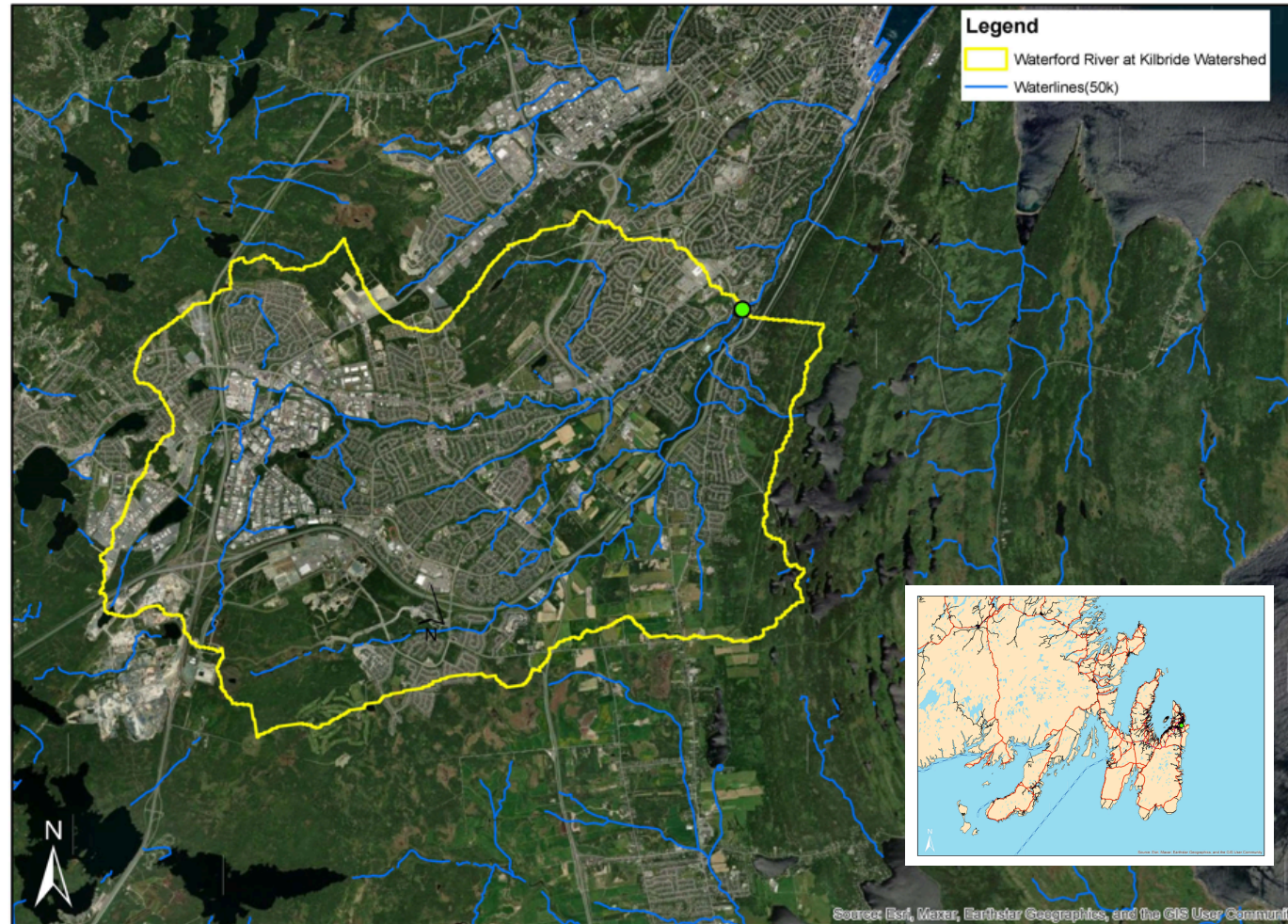
Real Time Water Quality Deployment Report Waterford River at Kilbride NF02ZM0009

2025-09-11 to 2025-11-19



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

Waterford River at Kilbride NF02ZM009



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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 2025-09-11, 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 69 days and was removed on 11/19/2025 .

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	$\leq \pm 0.3$ 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
Temperature ($^\circ$ C)	Fair	Excellent	
Dissolved Oxygen (mg/l)	Good	Fair	
Specific Conductivity (μ S/cm)	Good	Marginal	Good
pH	Excellent	Poor	Excellent
Turbidity (NTU)	Excellent	Poor	Excellent

At deployment and removal, when the field sonde was compared to the QA/QC sonde, all parameters were rated as 'Good' or 'Excellent'. Upon removal, Dissolved Oxygen ranking dropped to "Fair", Specific Conductivity to "Marginal". pH and Turbidity ranking dropped to 'Poor' upon removal. These lower rankings are likely the result of calibration differences, calibration drift and post-deployment sensor issues such as biofouling.

Water Temperature

10.44
Average (°C)

10.08
Median (°C)

5.12
Minimum (°C)

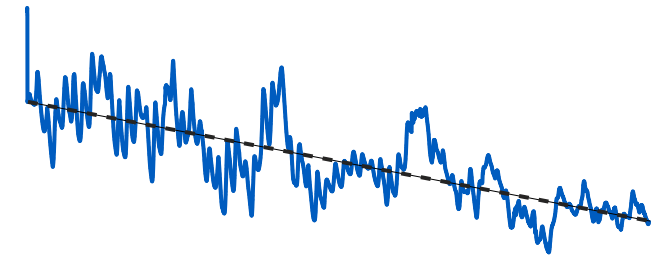
19.42
Maximum (°C)



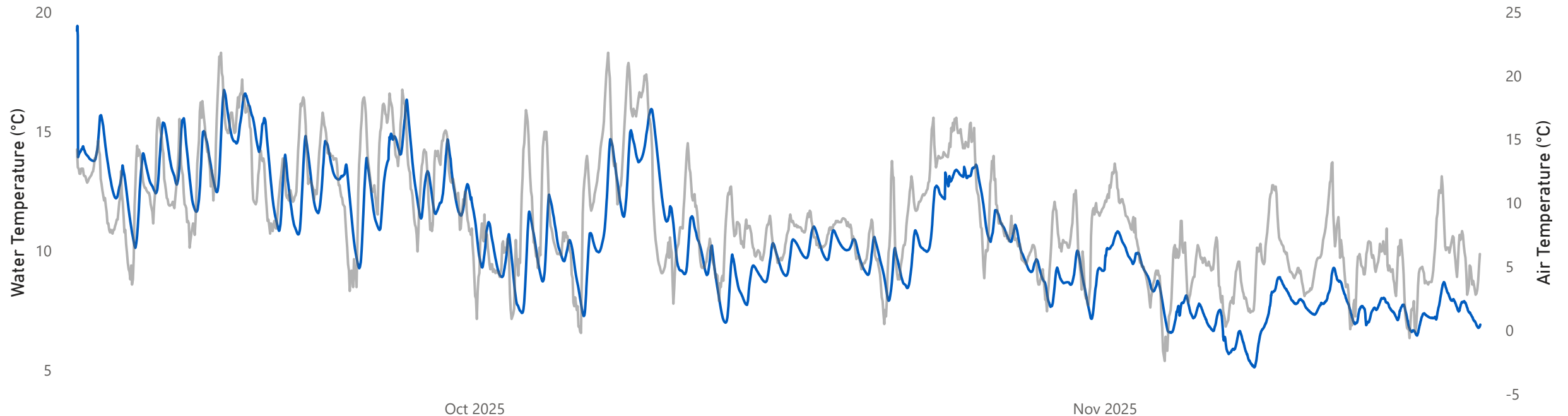
Water temperature is an important parameter for wildlife. Many organisms cannot regulate their own temperatures, and rely on surrounding air and water temperatures. Water temperature may be affected by inputs from industry or by modifying natural conditions like clearing trees and other vegetation, which 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 2025-09-11 until 2025-11-19. The minimum water temperature, 5.12°C, occurred on 2025-11-08. The maximum water temperature, 19.42°C, occurred on 2025-09-11. The average water temperature was 10.44 °C with peaks in mid-August corresponding to warmer air temperatures. Water temperature usually falls overnight and rises during the day, known as diurnal variation. Over the deployment period, a clear downward trend was observed, reflecting the seasonal transition from late summer into fall as air temperatures declined.

Water Temperature Trendline



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



pH

7.30
Average pH

7.21
Median pH

6.78
Minimum pH

8.40
Maximum pH

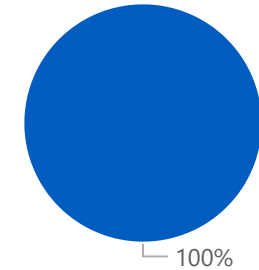


pH relates to the free hydrogen ions in water and it is a measure of acidity in water. A pH of 7 indicates a neutral pH, below 7 is considered acidic, and above 7 is considered basic. The [Canadian Council of Ministers of the Environment](#) (CCME) Freshwater Aquatic Life guideline provides a basis by 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](#).

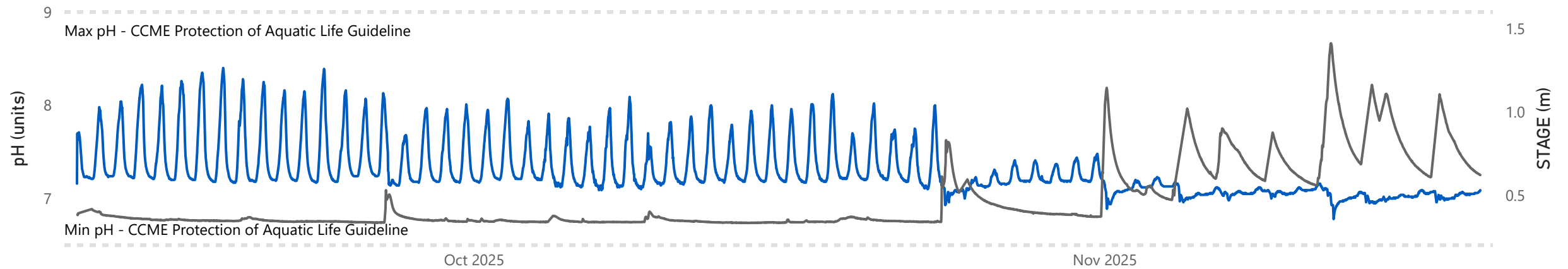
pH data for this deployment was collected from 2025-09-11 until 2025-11-19. The minimum pH, 6.78 pH units, occurred on 2025-11-12. The maximum pH, 8.40 pH units, occurred on 2025-09-18. Daily fluctuations are common due to changes in temperature and photosynthesizing of aquatic plants. pH was stable throughout this deployment period. A sudden decrease and stabilization in pH was observed on 2025-10-24, 2025-11-01, and on 2025-11-12 due to significant precipitation events. 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

● Within Guidelines



● pH (units) ● STAGE (m)



Climate data from St. John's West Climate Station

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



Specific Conductivity

743.23
Average $\mu\text{S}/\text{cm}$

862.50
Median $\mu\text{S}/\text{cm}$

140.70
Minimum $\mu\text{S}/\text{cm}$

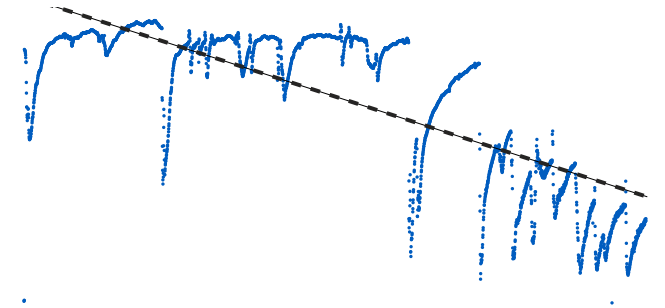
966.30
Maximum $\mu\text{S}/\text{cm}$



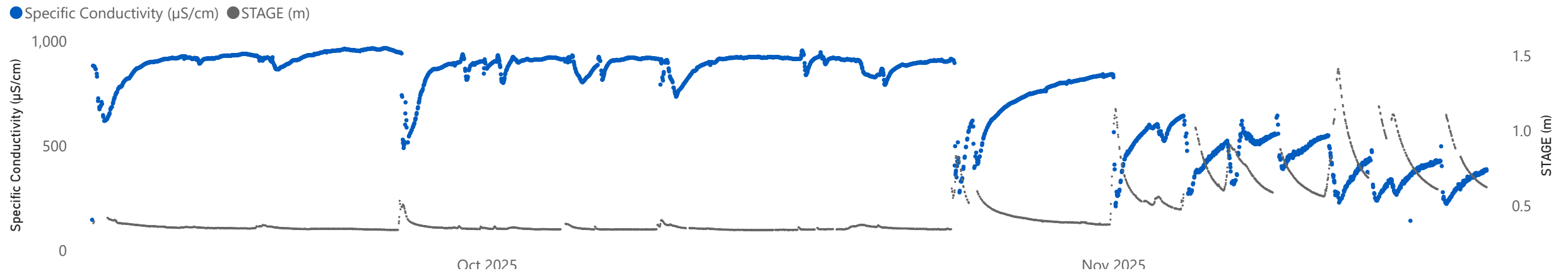
Conductivity relates to the ability of an electric charge to pass through a solution. Pure water has low conductance and water with dissolved ions has higher conductance. Specific conductance is corrected to 25°C to allow comparison across temperatures. Water parameter maps can be found on the [Water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

Specific conductivity remained relatively high and stable during the early part of the monitoring period, with values generally between 850 and 950 $\mu\text{S}/\text{cm}$, indicating consistent dissolved ion concentrations. Beginning in late October, the graph shows frequent and sharp decreases in conductivity, with values dropping as low as 140.7 $\mu\text{S}/\text{cm}$. These declines correspond closely with precipitation events and reflect dilution from precipitation events. Following each event, conductivity gradually recovers toward baseline levels. Overall, the graph highlights a transition from stable conditions to increased variability, with a downward trend.

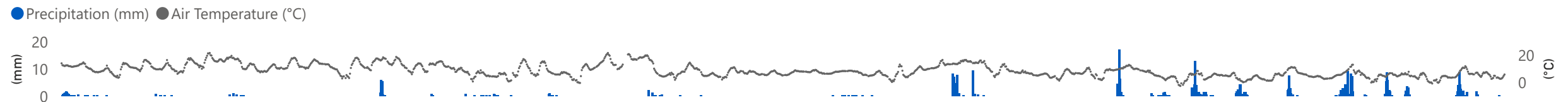
Specific Conductivity Trendline



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



Climate data from St. John's West Climate Station



Dissolved Oxygen Concentration and Saturation

11.02
Average (mg/L)

11.09
Median (mg/L)

8.81
Minimum (mg/L)

12.64
Maximum (mg/L)

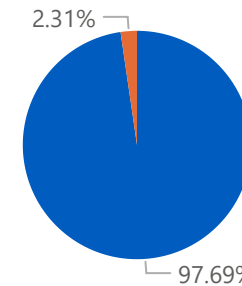


Dissolved oxygen (DO) in water is crucial for aquatic life. The [CCME \(Canadian Council of Ministers of the Environment\)](#) Freshwater Aquatic Life guidelines provide a basis by which to judge the overall health of waterways. The minimum guideline for early life stages in cold water is 9.5 mg/L and 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 concentrations remained relatively stable throughout the monitoring period, with values ranging from 8.81 to 12.64 mg/L and an average of 11.02 mg/L. The graph shows regular diurnal fluctuations, with dissolved oxygen levels increasing and decreasing in response to daily temperature cycles. From late October to the end of the monitoring period, these fluctuations became less pronounced, likely due to the influence of precipitation events, thus addition of cooler water. An inverse relationship between dissolved oxygen and water temperature is evident, with higher oxygen concentrations occurring during cooler periods. Dissolved oxygen levels consistently remained above the CCME guideline for the protection of aquatic life for other life stages (6.5 mg/L), indicating generally healthy conditions. However, concentrations periodically fell below the early life stages guideline (9.5 mg/L), particularly during warmer periods.

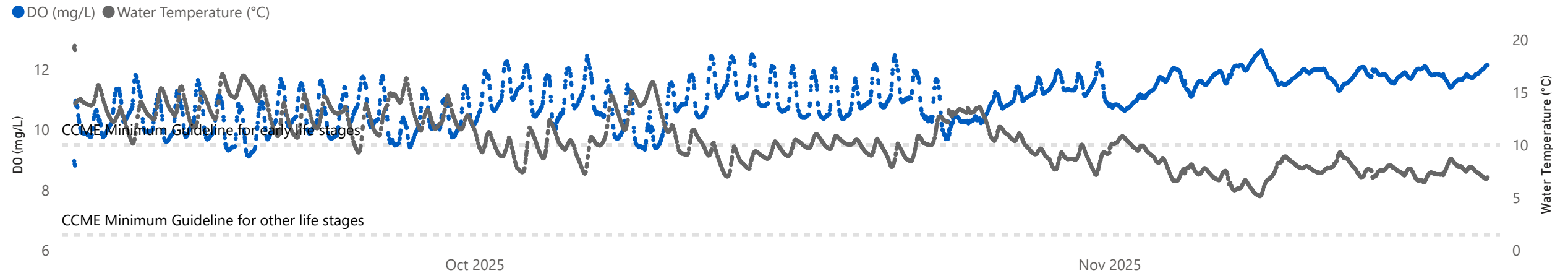
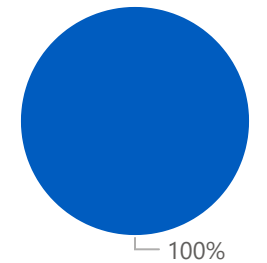
CCME Early Life Stages Guideline

● Above ● Below

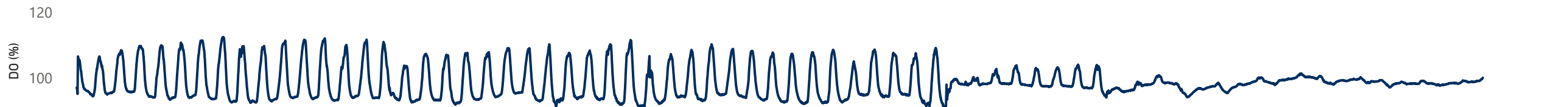


CCME Other Life Stages Guideline

● Above



Percent Saturation (%)



Turbidity

3.37
Average (NTU)

1.95
Median (NTU)

0.36
Minimum (NTU)

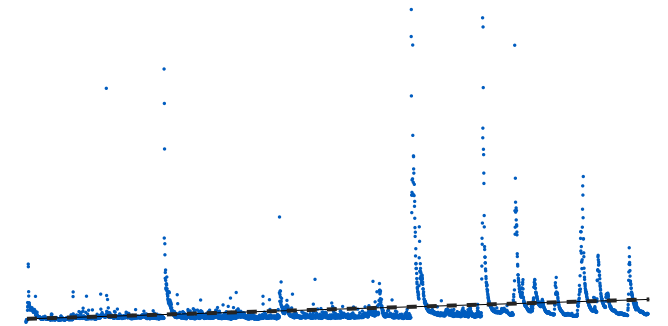
73.56
Maximum (NTU)



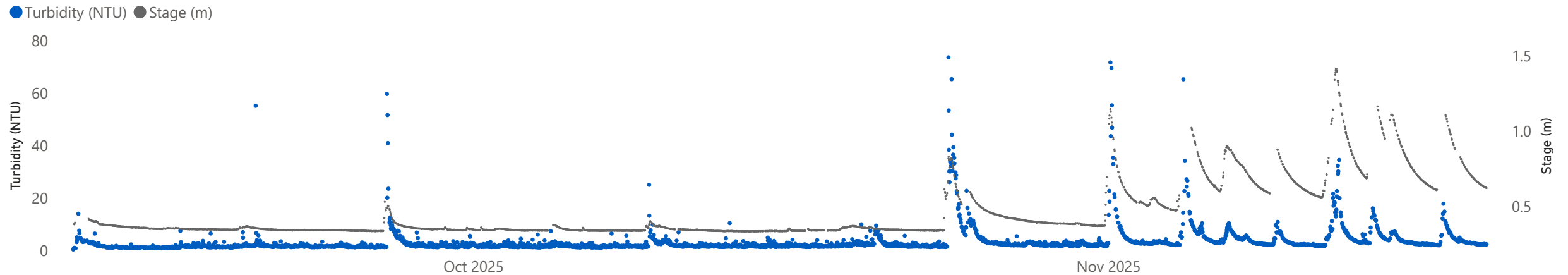
Water turbidity is characterized by the cloudiness or haziness caused by suspended particles and can significantly impact water quality. High turbidity reduces light penetration, hindering photosynthesis and affecting aquatic vegetation growth and habitat suitability. It can lead to temperature fluctuations,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

Turbidity levels were generally low throughout the monitoring period, with a median of 1.95 NTU, indicating clear baseline conditions. However, the graph shows several pronounced spikes, with a maximum value of 73.56 NTU, primarily occurring in late October and November. These spikes align with precipitation events and likely reflect increased runoff introducing suspended sediments and organic matter into the waterbody. Following each event, turbidity levels gradually returned to baseline conditions, demonstrating a typical response to short-term disturbances. Periods of sustained elevated turbidity may also suggest minor sensor fouling or material accumulation within the sonde.

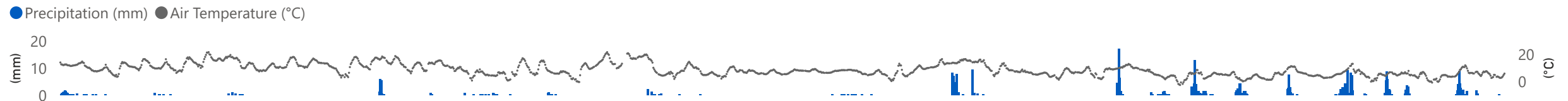
Turbidity Trendline



Turbidity (NTU) and Stage (m) by NST_DATI



Climate data from St. John's West Climate Station

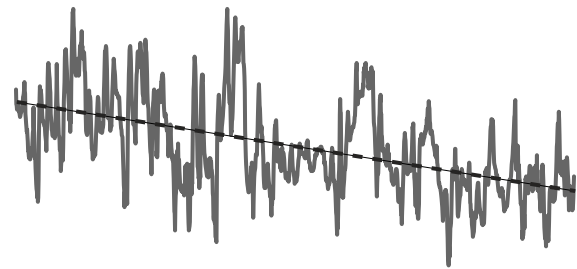


Meteorological and Hydrometric Data

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



Air Temperature Trendline



8.84

Average (°C)

8.10

Median (°C)

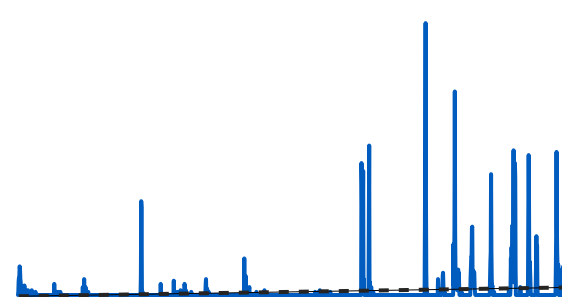
-2.40

Minimum (°C)

21.80

Maximum (°C)

Precipitation Trendline



0.20

Average (mm/hr)

0.00

Median (mm/hr)

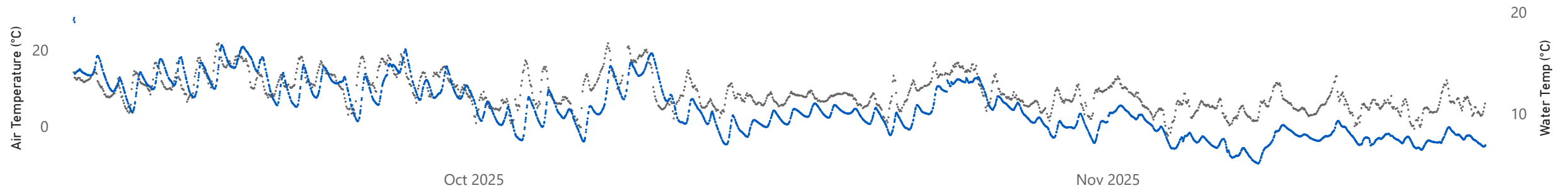
0.00

Minimum (mm/hr)

17.10

Maximum (mm/hr)

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



Precipitation (mm) by NST_DATI



Conclusions



- A clean and calibrated EXO2 instrument was deployed at the Waterford River at Kilbride station on 2025-09-11, and removed on 2025-11-19. The AquaTROLL 800 previously deployed was removed due to functional issues and sent to manufacturer for evaluation and repairs.
- **Water Temperature** ranged from 5.12 °C to 19.42 °C, with an average of 10.44 °C. Temperatures followed expected seasonal and diurnal patterns and showed strong correlation with air temperature.
- **pH** values remained stable throughout the deployment, ranging from 6.78 to 8.40, with an average of 7.30. All values were within the Canadian Council of Ministers of the Environment (CCME) Guidelines for the Protection of Aquatic Life (6.5–9.0).
- **Specific Conductivity** ranged from 140.70 to 966.30 $\mu\text{S}/\text{cm}$, averaging 743.23 $\mu\text{S}/\text{cm}$. Stable values were observed until October 24, when sudden decreases were observed due to dilution from precipitation events.
- **Dissolved Oxygen** ranged between 8.81 and 12.64 mg/L, averaging 11.02 mg/L. DO remained above the CCME minimum guideline for other life stages (6.5 mg/L) but fell below the early life stage guideline (9.5 mg/L) for 2.31% of the deployment, primarily during warmer events.
- **Turbidity** values ranged from 0.36 to 73.56 NTU, with an average of 3.37 NTU. Turbidity spikes were linked to precipitation and stage increases; however, prolonged elevated values above historical baselines were largely the result of sediment and organic matter accumulating within the sonde casing, interfering with sensor optics.
- **Stage** conditions were stable, with minor fluctuations associated with precipitation events notably from 2025-10-24 throughout the remainder of the monitoring 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