Real Time Water Quality Deployment Report

Learys Brook at Prince Philip Drive

NF02ZM0178

2024-07-11 to 2024-08-30

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

Learys Brook at Prince Philip Drive

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The Water Resources Management Division (WRMD), in partnership with Environment and Climate Change Canada (ECCC), maintains a real-time water quality and water quantity monitoring station at Leary's Brook, adjacent to Prince Phillip Drive. This was WRMD's first real time water quality station, established in 2001. The real-time station allows for assessment and management of the water body. The purpose of this real-time station is to monitor, process, and publish hydrometric (water quantity) and real-time water quality data at the station.

The watershed is outlined in the figure to the left in light blue. The headwaters for Learys Brook are Hummocky Marsh and Yellow Marsh. Waters from these two marshes converge near the Avalon Mall and the river is then culverted underneath the mall parking lot. Oxen Pond which is located in Pippy Park also drains into the brook before it is culverted. The brook flows northeast from the mall parking lot through a developed section of St. John's and drains into Long Pond.

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)	Excellent	Excellent	
pH	Good	Excellent	Good
Specific Conductivity (µS/cm)	Poor	Excellent	Excellent
Temperature ('C)	Excellent	Excellent	
Turbidity (NTU)	Excellent	Excellent	Excellent

The specific conductivity ranked as poor at the time of deployment. This is most likely due to the QAQC sensor's calibration because the grab sample ranked as excellent and the removal ranking was also excellent.

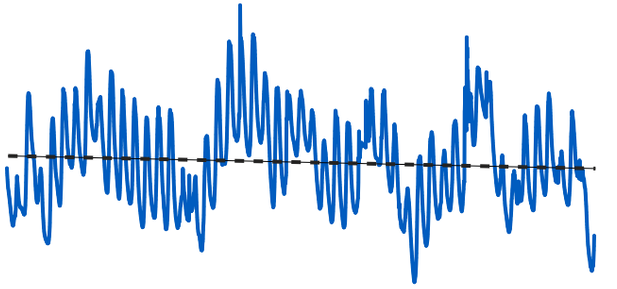
Water Temperature

17.36	17.26	12.90	23.20
Average (°C)	Median (°C)	Minimum (°C)	Maximum (°C)

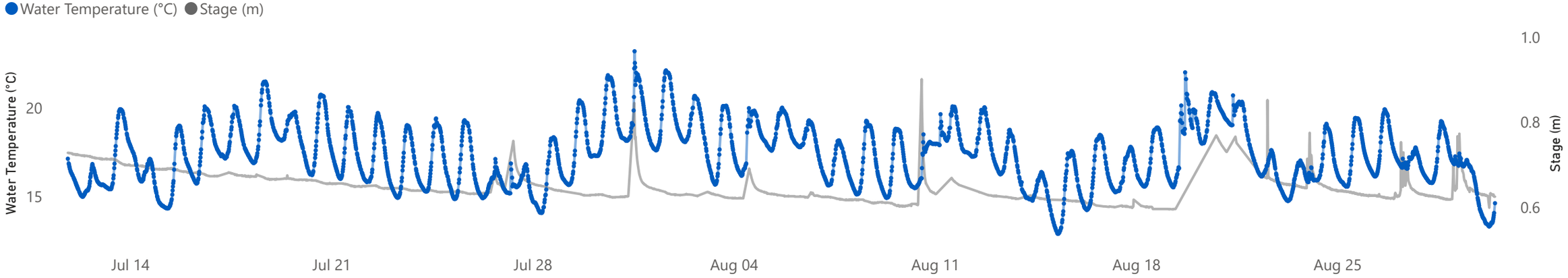
Water temperature is an important parameter for wildlife. Many organisms cannot regulate their own temperatures, and rely on surrounding air and water temperatures. Water temperature may be affected by inputs from industry or by modifying natural conditions like clearing trees and other vegetation, which 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 2024-07-11 until 2024-08-30. The minimum water temperature, 12.90°C, occurred on 2024-08-15. The maximum water temperature, 23.20°C, occurred on 2024-07-31. Water temperature usually falls overnight and rises during the day. Leary's Brook is a shallow, urban waterway; water temperatures in shallow streams respond quickly to changes in air temperature. During this deployment period, water temperature shows a very slight cooling trend.

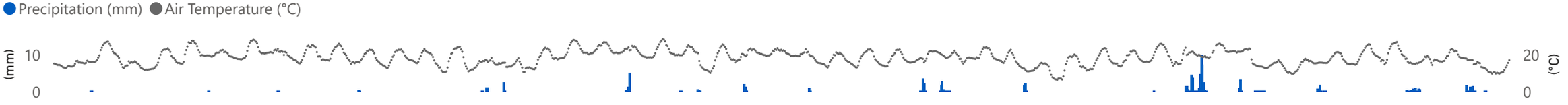
Water Temperature Trendline



Water Temperature and Stage at Learys Brook at Prince Philip Drive



Precipitation and Air Temperature at Pippy Park in St. Johns

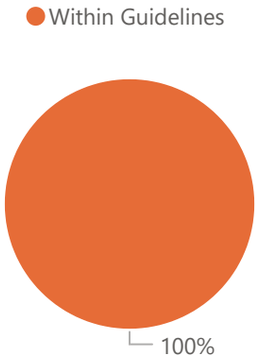


pH

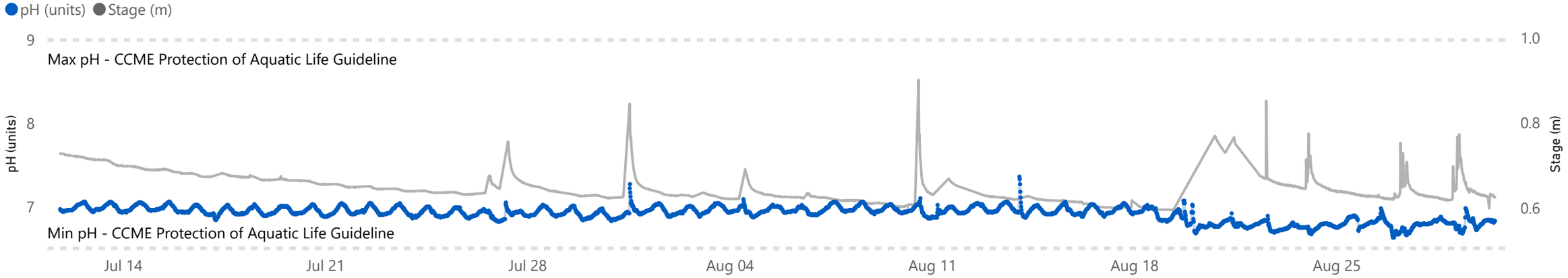
6.92	6.93	6.63	7.36
Average pH	Median pH	Minimum pH	Maximum pH

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.

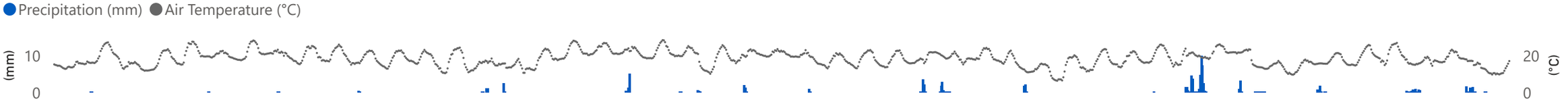
pH data for this deployment was collected from 2024-07-11 until 2024-08-30. The minimum pH, 6.63 pH units, occurred on 2024-08-26. The maximum pH, 7.36 pH units, occurred on 2024-08-14. Daily fluctuations are common due to changes in temperature and photosynthesizing of aquatic plants. During this deployment period, pH was within the guidelines 100% of the time. The pH dipped during large precipitation events due to the naturally acidic nature of rainwater.



pH and Stage at Learys Brook at Prince Philip Drive



Precipitation and Air Temperature at Pippy Park in St. Johns



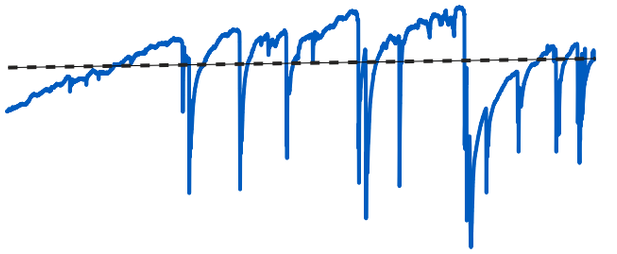
Specific Conductivity

804.99	825.00	120.00	1.01K
Average µS/cm	Median µS/cm	Minumum µS/cm	Maximum µS/cm

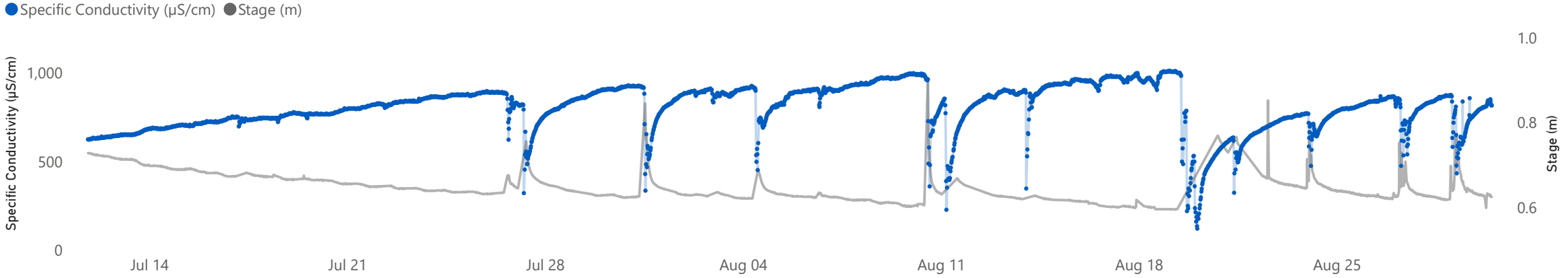
Conductivity relates to the ability of an electric charge to pass through a solution. Pure water has low conductance and water with dissolved ions has higher conductance. Specific conductance is corrected to 25°C to allow comparison across temperatures. Water parameter maps can be found on the Water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

Specific conductance data for this deployment was collected from 2024-07-11 until 2024-08-30. The minimum specific conductance, 120.00 µS/cm, occurred on 2024-08-20. The maximum specific conductance, 1,013.00 µS/cm, occurred on 2024-08-19. Precipitation and specific conductivity are correlated. Rain water generally has a lower specific conductivity than surface water. However, urban waterways tend to experience spikes in specific conductivity in the winter due to the presence of road salts. There was a very slight increase in specific conductivity during this deployment.

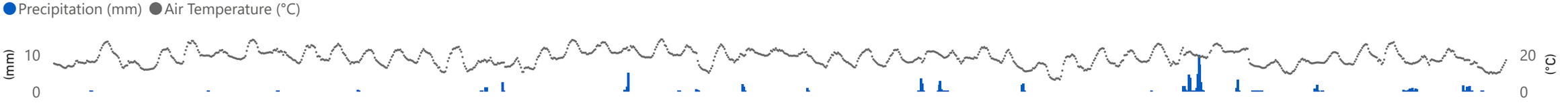
Specific Conductivity Trendline



Specific Conductivity and Stage at Learys Brook at Prince Philip Drive



Precipitation and Air Temperature at Pippy Park in St. Johns

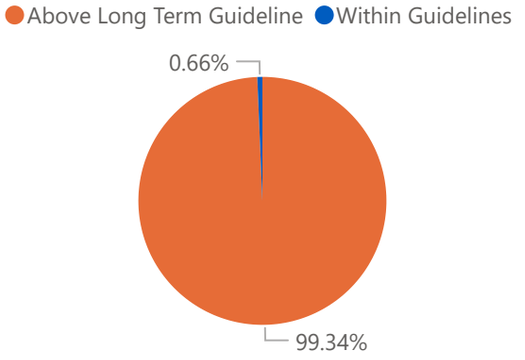


Chloride Concentration

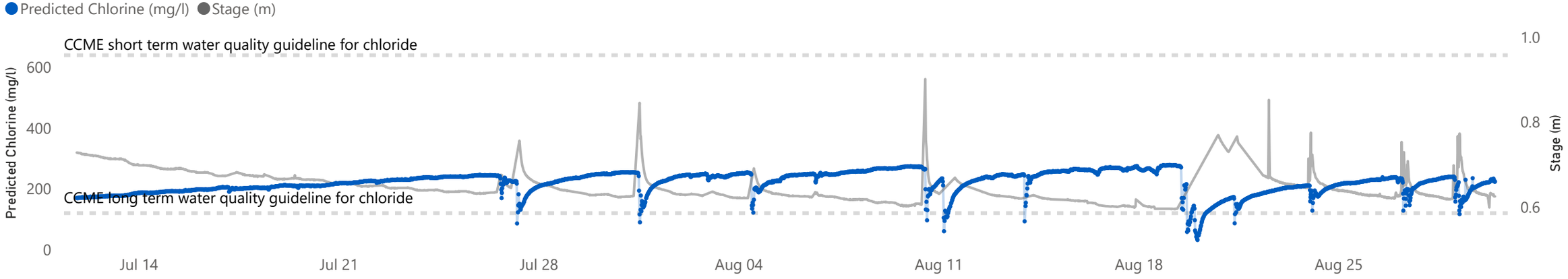
220.27	225.80	31.33	278.64
Average mg/L	Median mg/L	Minimum mg/L	Maximum mg/L

Chloride ions are calculated from specific conductivity values. Chloride is naturally found in waterways due to local geology, sea spray, and other processes. Human activities including roadway de-icing can also lead to increased concentrations of chloride. High concentrations of chloride can be toxic to aquatic life, and harm vegetation. CCME has established freshwater quality guidelines for the protection of Aquatic Life. The CCME short term water quality guideline for chloride is 640mg/L and the CCME long term water quality guideline for chloride is 120mg/L.

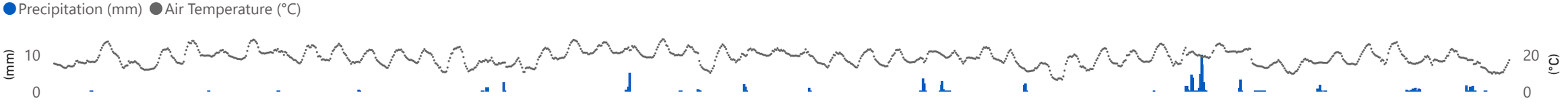
Data used to calculate chloride concentration for this deployment was collected from 2024-07-11 until 2024-08-30. The minimum predicted chloride concentration, 31.33 mg/L, occurred on 2024-08-26. The maximum predicted chloride concentration, 278.64 mg/L, occurred on 2024-08-19. In urban settings, road salts are a major source of chloride ions. Because predicted chloride concentration is calculated from specific conductivity, the trends will be similar. During this deployment the chloride concentration was within guidelines for 0.66% of the time, and above the long term guideline for 99.34% of the time.



Predicted Chloride Concentration and Stage at Learys Brook at Prince Philip



Precipitation and Air Temperature at Pippy Park in St. Johns

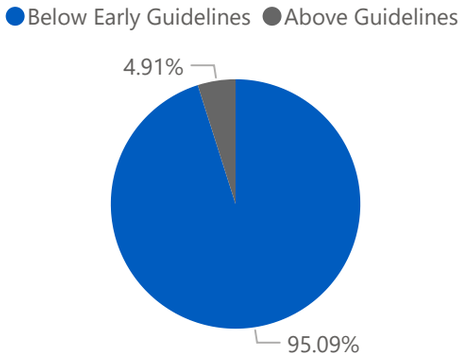


Dissolved Oxygen

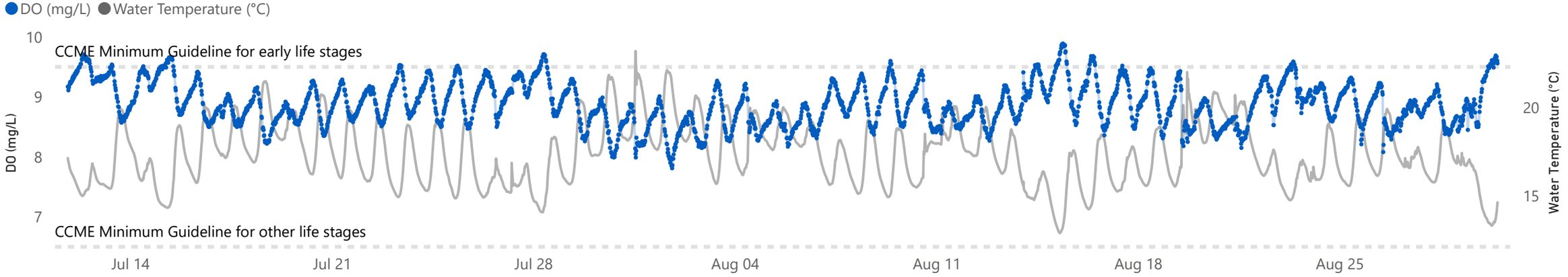
8.88	8.86	7.81	9.89
Average (mg/L)	Median (mg/L)	Minimum (mg/L)	Maximum (mg/L)

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.

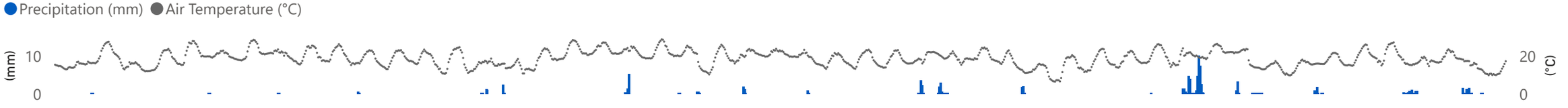
DO data for this deployment was collected from 2024-07-11 until 2024-08-30. The minimum DO reading, 7.81 mg/L, occurred on 2024-08-01. The maximum DO reading, 9.89 mg/L, occurred on 2024-08-15. Daily fluctuations are common due to changes in temperature and respiration of aquatic plants. During this deployment period, DO was above the minimum guidelines for other life stages, but below early life stages 95.09% of the time and above all minimum guidelines 4.89% of the time.



Dissolved Oxygen and Water Temperature at Learys Brook at Prince Philip Drive



Precipitation and Air Temperature at Pippy Park in St. Johns



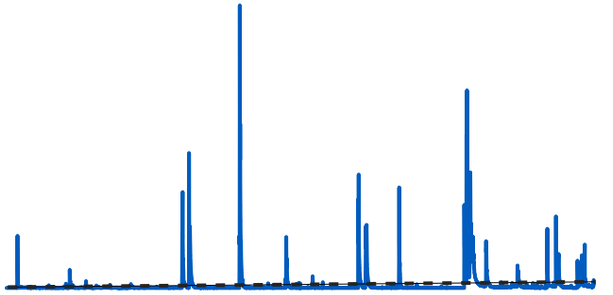
Turbidity

1.16	0.00	0.00	123.10
Average (NTU)	Median (NTU)	Minimum (NTU)	Maximum (NTU)

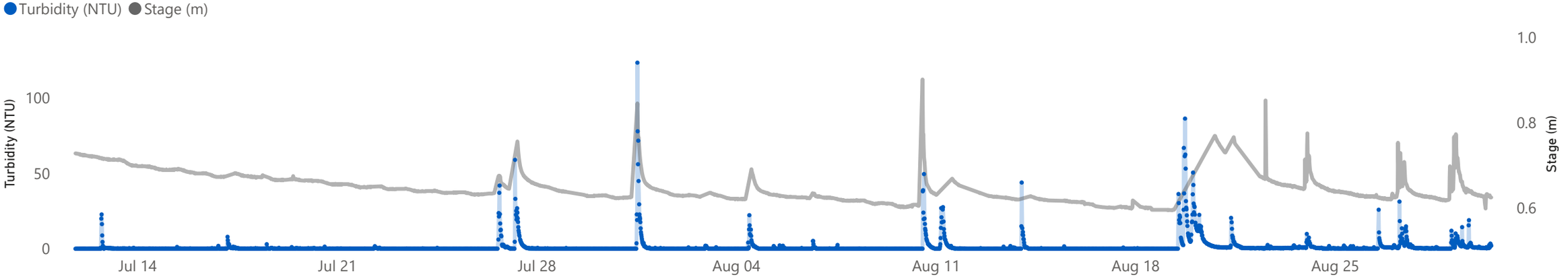
Increases in turbidity (cloudiness) are often caused by increased runoff during precipitation events. Runoff carries silt and other debris into the waterbody. Turbid conditions can prevent light from reaching plants, negatively impact benthic habitats, and clog or damage fish gills and equipment.

Turbidity data for this deployment was collected from 2024-07-11 until 2024-08-30. The minimum turbidity was 0.00 NTUs. The maximum turbidity, 123.10 NTUs, occurred on 2024-07-31. During this deployment period, turbidity shows a very slight increasing trend. This is due to the increased precipitation events towards the end of the deployment.

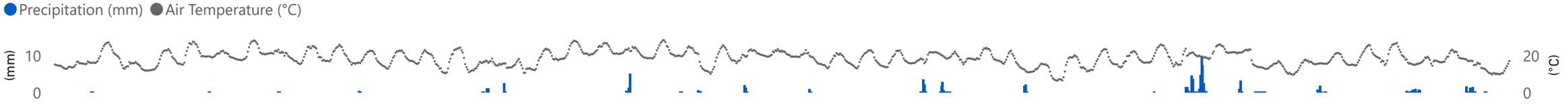
Turbidity Trendline



Turbidity and Stage at Learys Brook at Prince Philip Drive



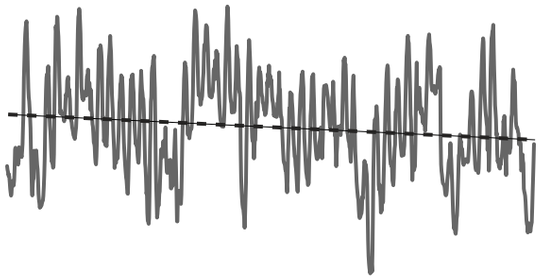
Precipitation and Air Temperature at Pippy Park in St. Johns



Meteorological and Hydrometric Data

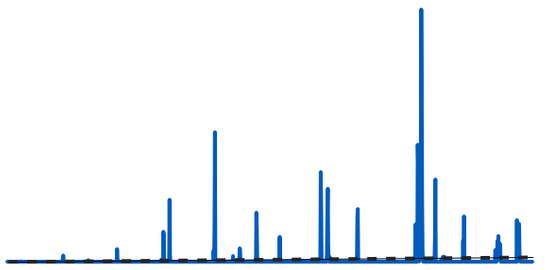
Newfoundland Labrador

Air Temperature Trendline



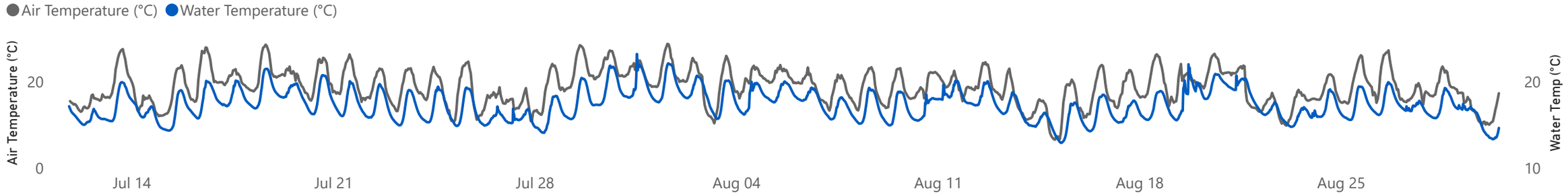
18.71	18.75
Average (°C)	Median (°C)
6.53	28.76
Minimum (°C)	Maximum (°C)

Precipitation Trendline



0.08	0.00
Average (mm/hr)	Median (mm/hr)
0.00	10.08
Minimum (mm/hr)	Maximum (mm/hr)

Water Temperature from Learys Brook at Prince Philip Drive and Air Temperature from Pippy Park in St. Johns



Precipitation from Pippy Park in St. Johns and Stage from Learys Brook at Prince Philip Drive