

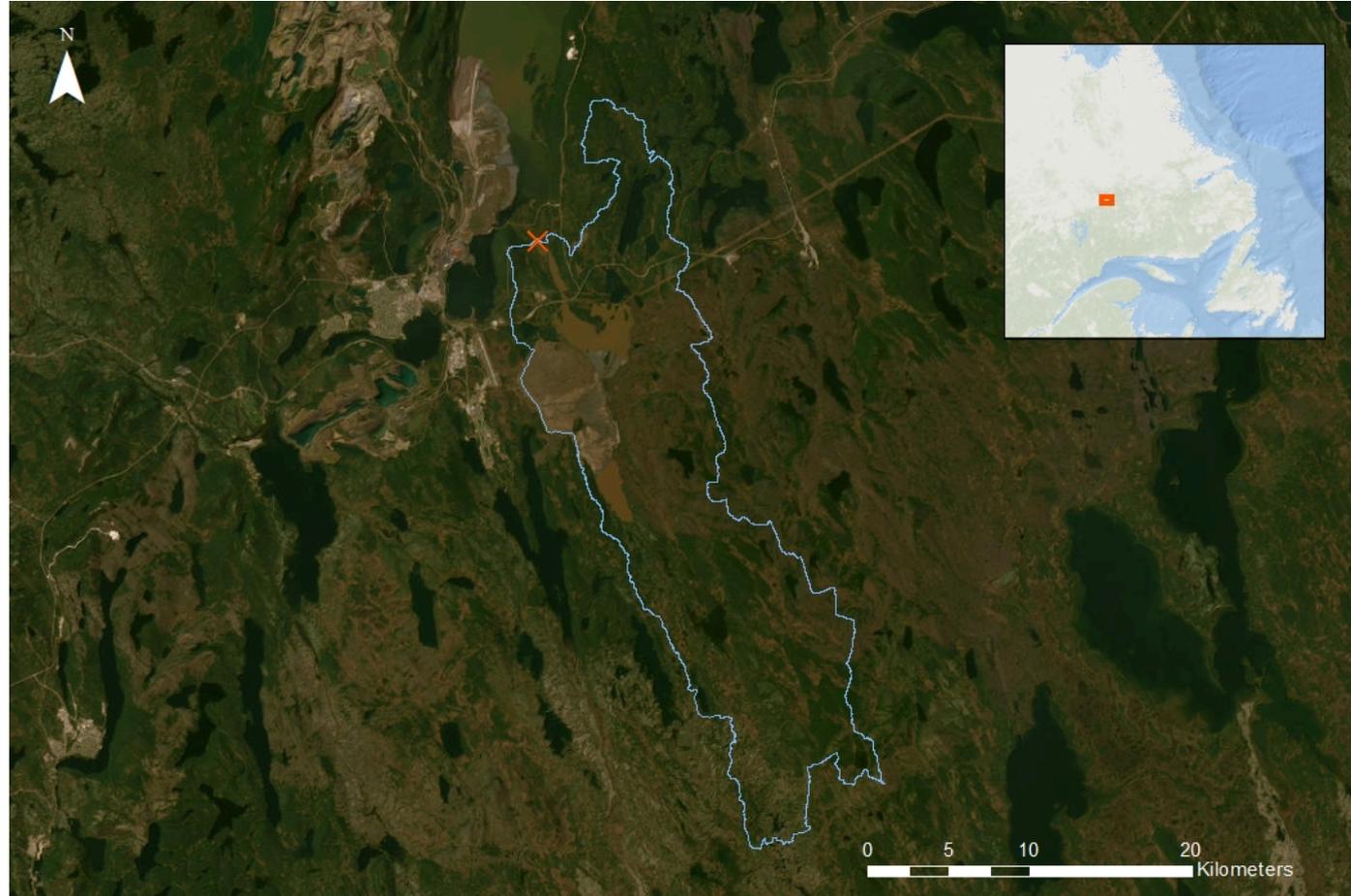
# Real Time Water Quality Deployment Report Flora Creek below Trans Labrador Highway NF03OA0022

2025-06-04 to 2025-07-30



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

# Flora Creek below Trans Labrador Highway



The Water Resources Management Division (WRMD), in partnership with Tacora Resources Inc. and Environment and Climate Change Canada (ECCC), maintains a real-time water quality and water quantity monitoring station at Flora Creek, downstream of the mine's tailings disposal area in Flora Lake. 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.

On June 4<sup>th</sup>, 2025, a clean and calibrated real-time water quality monitoring instrument was deployed at the station Flora Creek below TLH.

The instrument was deployed for a period of 56 days and was removed on July 30<sup>th</sup>, 2025. This was the first deployment for 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	$\leq \pm 3$ $\mu$ S/cm or $\leq \pm 3\%$ , whichever is greater	$\leq \pm 3.1 - 10$ $\mu$ S/cm or $\leq \pm 3.1 - 10\%$ , whichever is greater	$\leq \pm 10 - 15$ $\mu$ S/cm or $\leq \pm 10.1 - 15\%$ , whichever is greater	$\leq \pm 15.1 - 20$ $\mu$ S/cm or $\leq \pm 15.1 - 20\%$ , whichever is greater	$> \pm 20$ $\mu$ 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)	Fair	Excellent	
pH	Marginal	Excellent	Poor
Specific Conductivity ( $\mu$ S/cm)	Excellent	Excellent	Excellent
Temperature ( $^\circ$ C)	Excellent	Excellent	
Turbidity (NTU)	Excellent	Good	Poor

At deployment, all parameters besides dissolved oxygen and pH ranked 'excellent'. Dissolved oxygen ranked fair. The field instrument read a value of 10.16 mg/l, while the QA/QC instrument read a value of 10.69 mg/l. pH ranked 'marginal'. The field instrument read a value of 6.42, while the QA/QC instrument read a value of 7.42. When comparing the field sonde value to the grab sample, the QA/QC ranking was 'poor'. At removal, all parameters ranked either 'good' or 'excellent'.

# Water Temperature

14.86  
Average (°C)

15.24  
Median (°C)

8.54  
Minimum (°C)

23.12  
Maximum (°C)

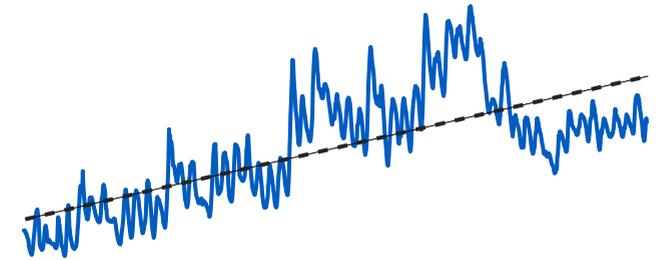


Water temperature is an important parameter for wildlife. Many organisms cannot regulate their own temperatures, and rely on surrounding air and water temperatures. Water temperature may be affected by inputs from industry or by modifying natural conditions like clearing trees and other vegetation, which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

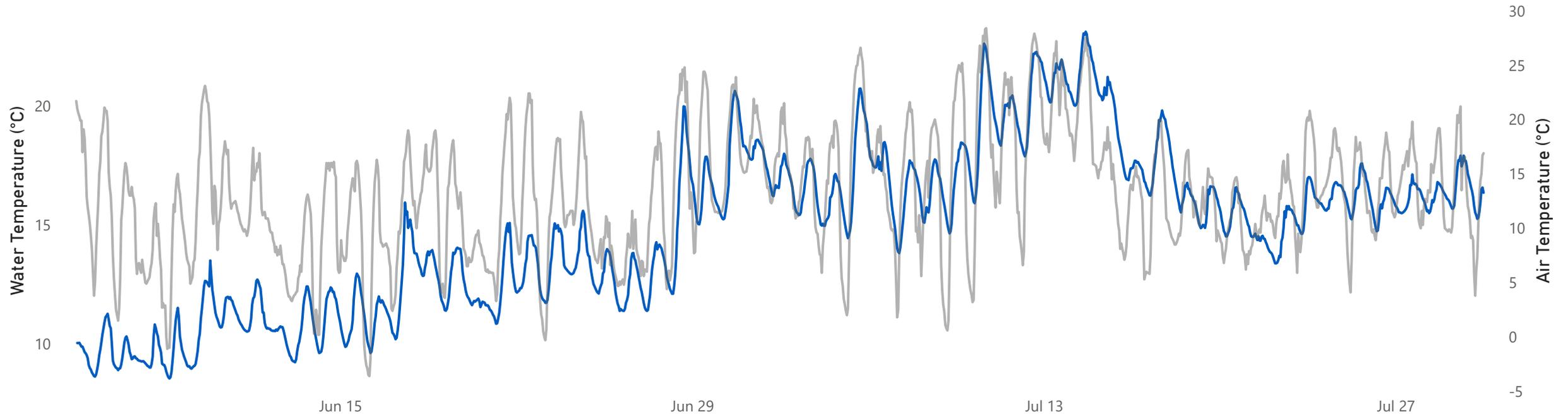
Water temperature data for this deployment was collected from 2025-06-04 until 2025-07-30. The minimum water temperature, 8.54°C, occurred on 2025-06-08. The maximum water temperature, 23.12°C, occurred on 2025-07-14. Water temperature usually falls overnight and rises during the day.

**Water temperature increased during this deployment period, as air temperature warmed into the summer.**

## Water Temperature Trendline



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



# pH

7.33  
Average pH

7.35  
Median pH

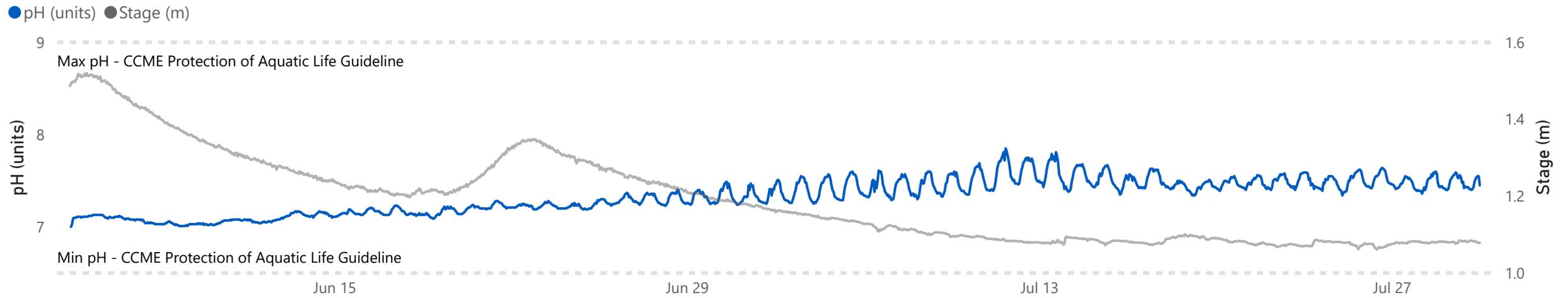
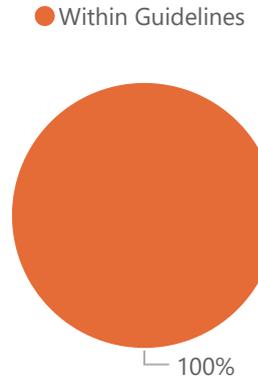
7.00  
Minimum pH

7.85  
Maximum pH

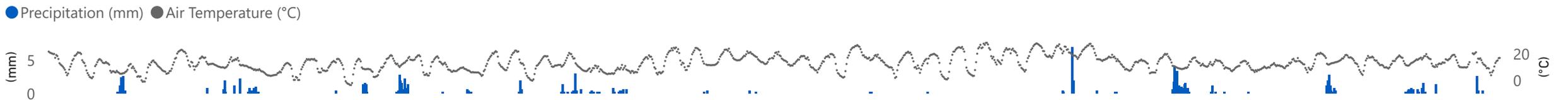


pH relates to the free hydrogen ions in water and it is a measure of acidity in water. A pH of 7 indicates a neutral pH, below 7 is considered acidic, and above 7 is considered basic. The [Canadian Council of Ministers of the Environment \(CCME\)](#) Freshwater Aquatic Life guideline provides a basis 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 2025-06-04 until 2025-07-30. The minimum pH, 7.00 pH units, occurred on 2025-06-04. The maximum pH, 7.85 pH units, occurred on 2025-07-11. Daily fluctuations are common due to changes in temperature and photosynthesizing of aquatic plants. **pH increased slightly over the course of this deployment period. All values during the deployment are within the CCME guidelines for the Protection of Aquatic Life (between 6.5 and 9 pH units).**



## Climate data from Moosehead Lake



# Specific Conductivity

**68.87**  
Average  $\mu\text{S}/\text{cm}$

**68.72**  
Median  $\mu\text{S}/\text{cm}$

**66.44**  
Minimum  $\mu\text{S}/\text{cm}$

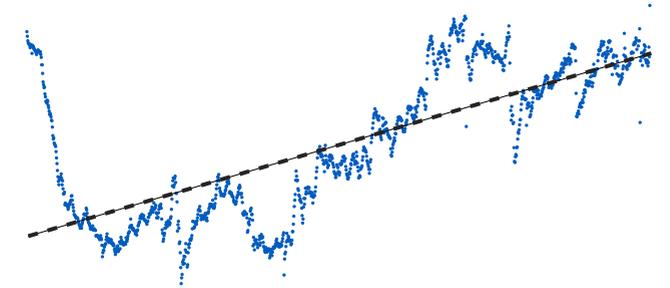
**71.31**  
Maximum  $\mu\text{S}/\text{cm}$



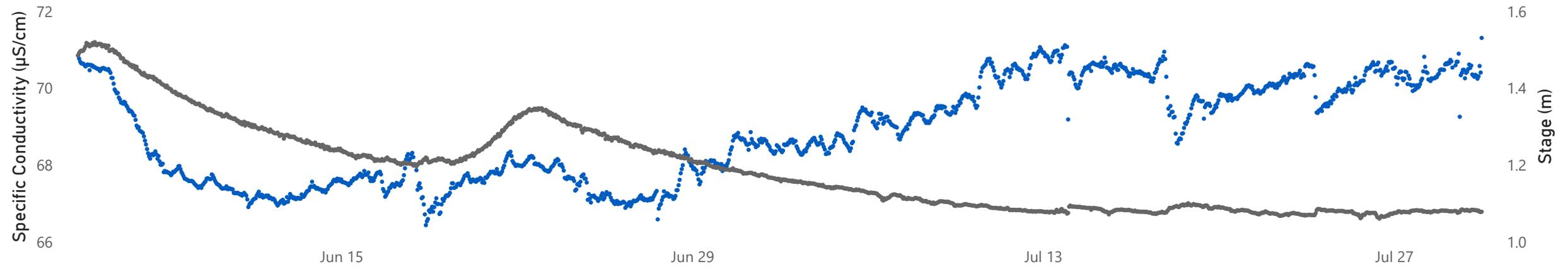
Conductivity relates to the ability of an electric charge to pass through a solution. Pure water has low conductance and water with dissolved ions has higher conductance. Specific conductance is corrected to 25°C to allow comparison across temperatures. Water parameter maps can be found on the [Water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

Specific conductance data for this deployment was collected from 2025-06-04 until 2025-07-30. The minimum specific conductance, 66.44  $\mu\text{S}/\text{cm}$ , occurred on 2025-06-18. The maximum specific conductance, 71.31  $\mu\text{S}/\text{cm}$ , occurred on 2025-07-30. Precipitation and specific conductivity are correlated. During a precipitation event, the amount of water in the creek increases, this dilutes the solids that are present, decreasing the conductivity. Specific conductivity increased during this deployment period, with some decreases noted during precipitation events.

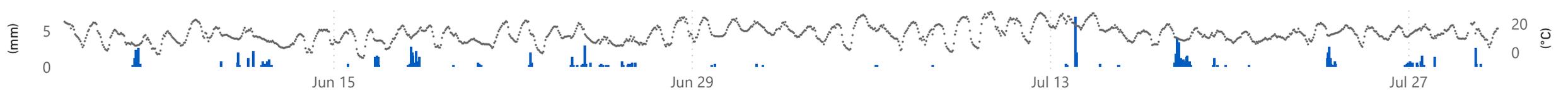
## Specific Conductivity Trendline



● Specific Conductivity ( $\mu\text{S}/\text{cm}$ ) ● Stage (m)



● Precipitation (mm) ● Air Temperature ( $^{\circ}\text{C}$ )



# Dissolved Oxygen Concentration and Saturation

**9.08**  
Average (mg/L)

**9.03**  
Median (mg/L)

**7.87**  
Minimum (mg/L)

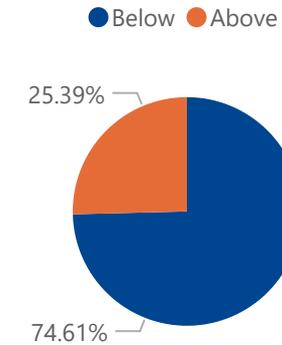
**10.21**  
Maximum (mg/L)



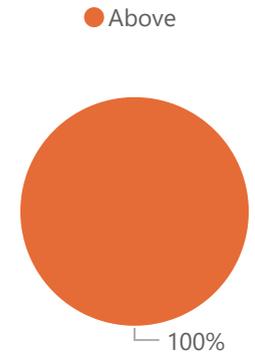
Dissolved oxygen (DO) in water is crucial for aquatic life. The [CCME \(Canadian Council of Ministers of the Environment\)](#) Freshwater Aquatic Life guidelines provide a basis by which to judge the overall health of waterways. The minimum guideline for early life stages in cold water is 9.5 mg/L and 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 2025-06-04 until 2025-07-30. The minimum DO reading, 7.87 mg/L, occurred on 2025-07-15. The maximum DO reading, 10.21 mg/L, occurred on 2025-06-05. Dissolved oxygen content fluctuates diurnally and displays an inverse relationship to water temperature. Dissolved oxygen decreased slightly over the course of the deployment period, as is expected with warming temperatures into Summer. During this deployment period, DO levels were below the minimum CCME Guidelines for the Protection of Early Life Stages for Cold Water Biota 74.61% of the time and above the minimum guidelines for 25.39% of the time. However, DO levels were above the minimum CCME Guideline for the Protection of Other Life Stages for Cold Water Biota 100% of the time.

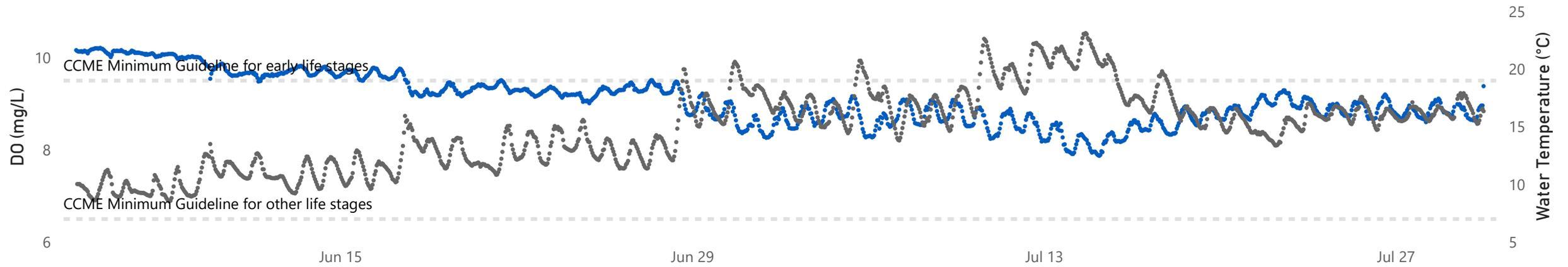
CCME Early Life Stages Guideline



CCME Other Life Stages Guideline



● DO (mg/L) ● Water Temperature (°C)



Percent Saturation (%)



# Turbidity

**53.25**  
Average (NTU)

**38.90**  
Median (NTU)

**3.00**  
Minimum (NTU)

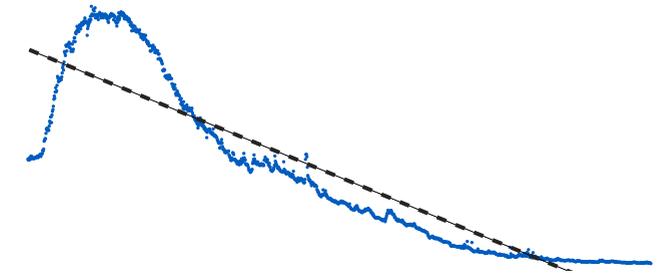
**153.10**  
Maximum (NTU)



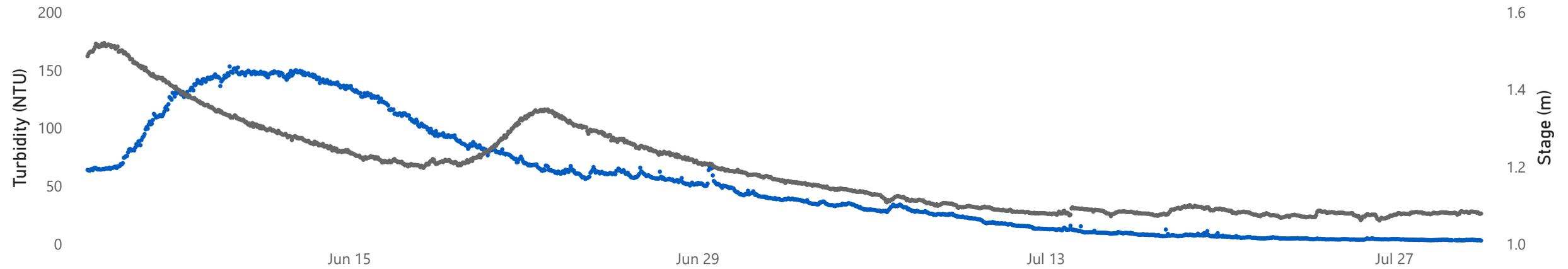
Increases in turbidity (cloudiness) are often caused by increased runoff during precipitation events. Runoff carries silt and other debris into the waterbody. Turbid conditions can prevent light from reaching plants, negatively impact benthic habitats, and clog or damage fish gills and equipment.

Turbidity data for this deployment was collected from 2025-06-04 until 2025-07-30. The minimum turbidity was 3.00 NTUs. The maximum turbidity, 153.10 NTUs, occurred on 6/10/2025 5:00:00 AM. Turbidity values increased at the beginning of June due to the late spring melt/freshet, then steadily decreased until the end of the deployment period.

## Turbidity Trendline



● Turbidity (NTU) ● Stage (m)



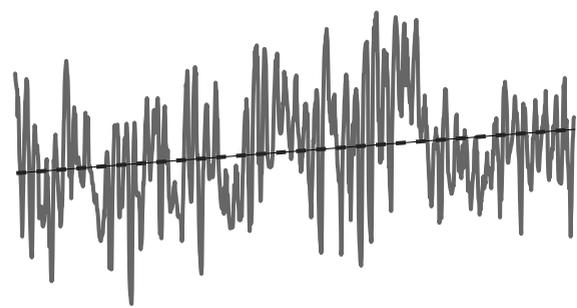
## Climate data from Moosehead Lake

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



# Meteorological and Hydrometric Data

Air Temperature Trendline



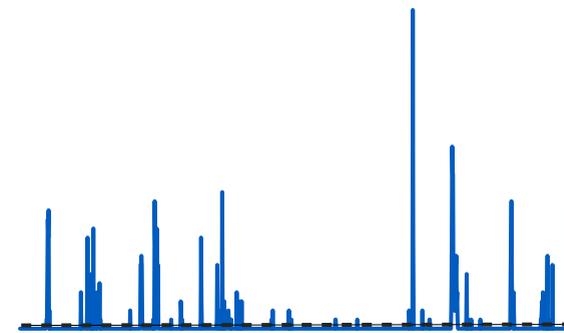
**13.17**  
Average (°C)

**13.00**  
Median (°C)

**-3.60**  
Minimum (°C)

**28.40**  
Maximum (°C)

Precipitation Trendline



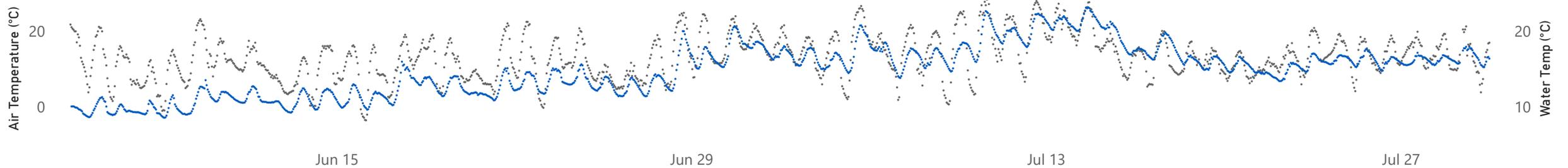
**0.08**  
Average (mm/hr)

**0.00**  
Median (mm/hr)

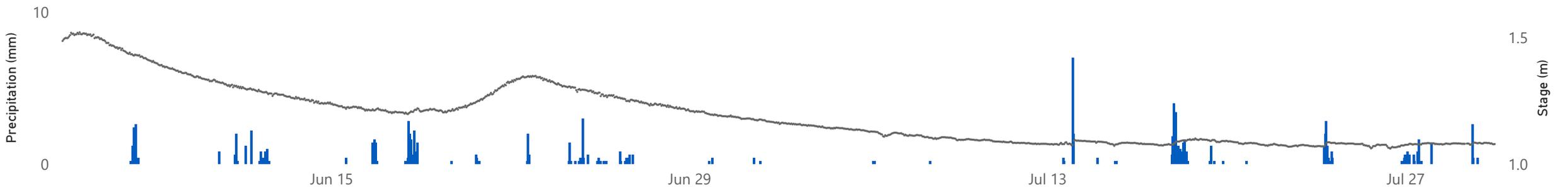
**0.00**  
Minimum (mm/hr)

**7.00**  
Maximum (mm/hr)

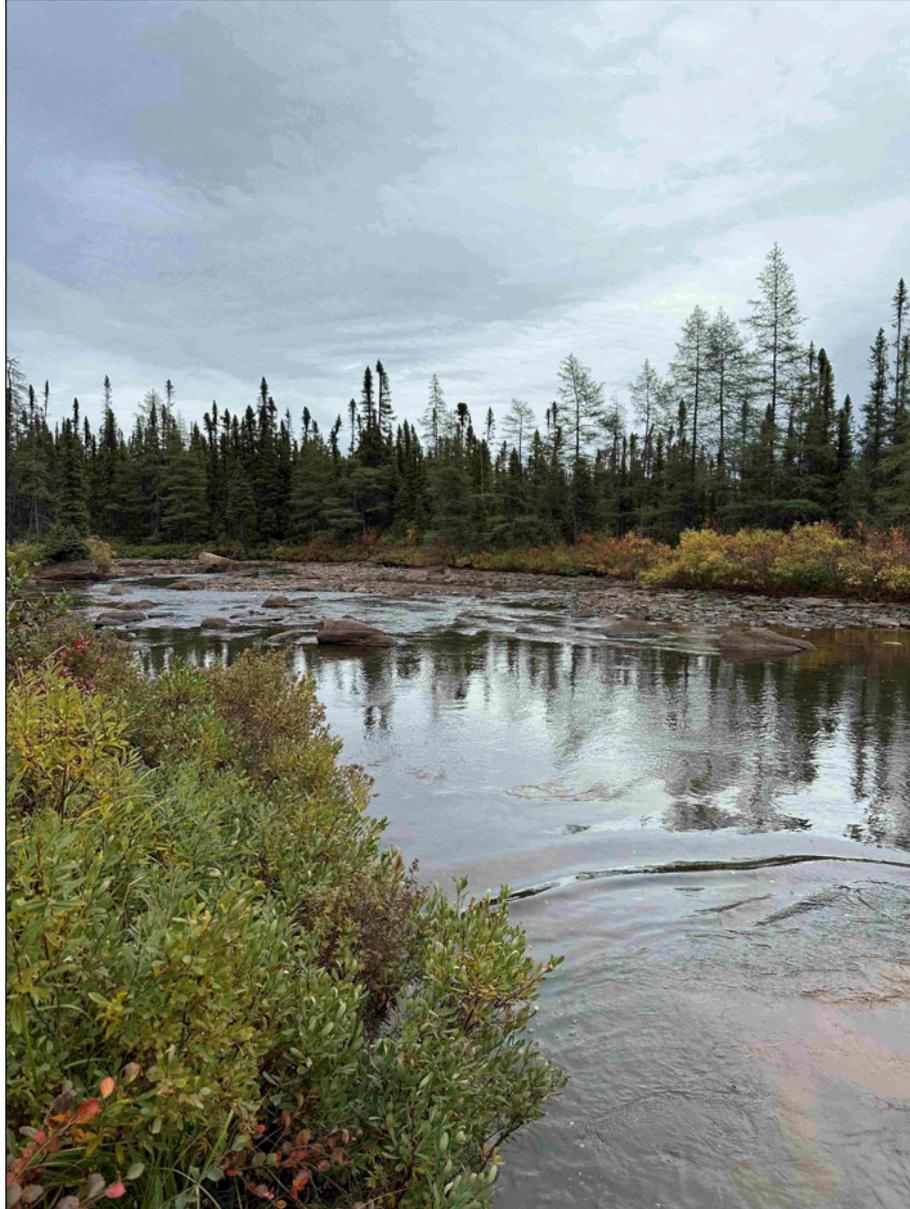
● Air Temperature (°C) ● Water Temperature (°C)



● Precipitation (mm) ● Stage (m)



# Conclusions



- A clean and calibrated instrument was deployed at the Flora Creek below TLH water quality monitoring station on June 4, 2025 and removed on July 30, 2025. This was the first deployment for 2025.
- In most cases, weather related events or increases/decreases in water level explain parameter fluctuations. Almost 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 8.54 and 23.12°C.
- pH values were all within the recommended CCME Guidelines for the Protection of Aquatic Life. pH ranged between 7.00 and 7.85.
- Specific conductivity increased gradually over the course of the deployment period, ranging from 66.44 to 71.31  $\mu\text{s}/\text{cm}$ .
- 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. The majority of the values were below the CCME Guideline for the Protection of Aquatic Life for Cold Water Biota at Early Life Stages of 9.5 mg/l.
- Turbidity values increased during the first week of deployment, it then decreased over the remainder of the deployment period. Values ranged from 3.0 to 153.10 NTU.
- Stage decreased throughout the deployment period with some small increases after precipitation events.
- 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



BUREAU  
VERITAS

Bureau Veritas Job #: C566844  
Report Date: 2025/06/23

NL Department of Environment, Climate Change and  
Municipalities  
Your P.O. #: 224006869-5  
Sampler Initials: MM

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
ARRW67 FLORA CREEK								
Sampling Date		2025/06/04 12:30						
Matrix		W						
Sample #		2025-6303-00-SI-SP						
Registration #		SA-0000						
<b>RESULTS OF ANALYSES OF WATER</b>								
<b>Calculated Parameters</b>								
Hardness (CaCO3)	-	31	1.0	mg/L	N/A	2025/06/12		9944983
Total Kjeldahl Nitrogen (TKN)	-	ND	0.10	mg/L	N/A	2025/06/20		9945095
Nitrate (N)	-	0.28	0.050	mg/L	N/A	2025/06/20		9944989
Total dissolved solids (calc., EC)	-	39	1.0	mg/L	N/A	2025/06/18		9945094
<b>Inorganics</b>								
Conductivity	-	71	1.0	uS/cm	N/A	2025/06/17	M2C	9951140
Chloride (Cl-)	-	ND	1.0	mg/L	N/A	2025/06/13	RSU	9947742
Bromide (Br-)	-	ND	1.0	mg/L	N/A	2025/06/13	RSU	9947742
Sulphate (SO4)	-	4.1	1.0	mg/L	N/A	2025/06/13	RSU	9947742
Total Alkalinity (Total as CaCO3)	-	34	2.0	mg/L	N/A	2025/06/17	M2C	9951142
Colour	-	10	5.0	TCU	N/A	2025/06/19	MCN	9952116
Dissolved Fluoride (F-)	-	ND	0.10	mg/L	N/A	2025/06/17	M2C	9951144
Nitrate + Nitrite (N)	-	0.28	0.050	mg/L	N/A	2025/06/19	MCN	9952081
Nitrite (N)	-	ND	0.010	mg/L	N/A	2025/06/19	EMT	9952115
Nitrogen (Ammonia Nitrogen)	-	0.073	0.050	mg/L	N/A	2025/06/18	MCN	9951534
Total Nitrogen (N)	-	0.31	0.10	mg/L	N/A	2025/06/20	SSI	9953533
Dissolved Organic Carbon (C)	-	2.1	0.50	mg/L	N/A	2025/06/18	S6S	9952231
Total Organic Carbon (C)	-	2.0	0.50	mg/L	N/A	2025/06/19	S6S	9952252
pH	-	7.59		pH	N/A	2025/06/17	M2C	9951138
Total Phosphorus	-	ND	0.004	mg/L	2025/06/13	2025/06/14	SSV	9949568
Total Suspended Solids	-	ND	2.0	mg/L	2025/06/11	2025/06/11	ISM	9946985
Turbidity	-	22	0.10	NTU	N/A	2025/06/19	M2C	9953574
<b>MERCURY BY COLD VAPOUR AA (WATER)</b>								
<b>Metals</b>								
Total Mercury (Hg)	-	ND	0.000013	mg/L	2025/06/18	2025/06/18	JEP	9951528
<b>ELEMENTS BY ICP/MS (WATER)</b>								
<b>Metals</b>								
Total Aluminum (Al)	-	0.015	0.0050	mg/L	2025/06/10	2025/06/11	MOA	9946386
Total Antimony (Sb)	-	ND	0.0010	mg/L	2025/06/10	2025/06/11	MOA	9946386
Total Arsenic (As)	-	ND	0.0010	mg/L	2025/06/10	2025/06/11	MOA	9946386
Total Barium (Ba)	-	0.0085	0.0010	mg/L	2025/06/10	2025/06/11	MOA	9946386
Total Boron (B)	-	ND	0.050	mg/L	2025/06/10	2025/06/11	MOA	9946386
Total Cadmium (Cd)	-	ND	0.000010	mg/L	2025/06/10	2025/06/11	MOA	9946386
Total Calcium (Ca)	-	6.9	0.10	mg/L	2025/06/10	2025/06/11	MOA	9946386
Total Chromium (Cr)	-	ND	0.0010	mg/L	2025/06/10	2025/06/11	MOA	9946386
Total Copper (Cu)	-	ND	0.00050	mg/L	2025/06/10	2025/06/11	MOA	9946386
Total Iron (Fe)	-	0.21	0.050	mg/L	2025/06/10	2025/06/11	MOA	9946386
Total Lead (Pb)	-	ND	0.00050	mg/L	2025/06/10	2025/06/11	MOA	9946386
Total Magnesium (Mg)	-	3.4	0.10	mg/L	2025/06/10	2025/06/11	MOA	9946386



BUREAU  
VERITAS

Bureau Veritas Job #: C566844  
Report Date: 2025/06/23

NL Department of Environment, Climate Change and  
Municipalities  
Your P.O. #: 224006869-5  
Sampler Initials: MM

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
ARRW67 FLORA CREEK								
Sampling Date		2025/06/04 12:30						
Matrix		W						
Sample #		2025-6303-00-SI-SP						
Registration #		SA-0000						
<b>ELEMENTS BY ICP/MS (WATER)</b>								
<b>Metals</b>								
Total Manganese (Mn)	-	0.22	0.0020	mg/L	2025/06/10	2025/06/11	MOA	9946386
Total Nickel (Ni)	-	ND	0.0020	mg/L	2025/06/10	2025/06/11	MOA	9946386
Total Phosphorus (P)	-	ND	0.10	mg/L	2025/06/10	2025/06/11	MOA	9946386
Total Potassium (K)	-	0.71	0.10	mg/L	2025/06/10	2025/06/11	MOA	9946386
Total Selenium (Se)	-	ND	0.00050	mg/L	2025/06/10	2025/06/11	MOA	9946386
Total Sodium (Na)	-	0.81	0.10	mg/L	2025/06/10	2025/06/11	MOA	9946386
Total Strontium (Sr)	-	0.0064	0.0020	mg/L	2025/06/10	2025/06/11	MOA	9946386
Total Uranium (U)	-	ND	0.00010	mg/L	2025/06/10	2025/06/11	MOA	9946386
Total Zinc (Zn)	-	ND	0.0050	mg/L	2025/06/10	2025/06/11	MOA	9946386