

# Real Time Water Quality Deployment Report

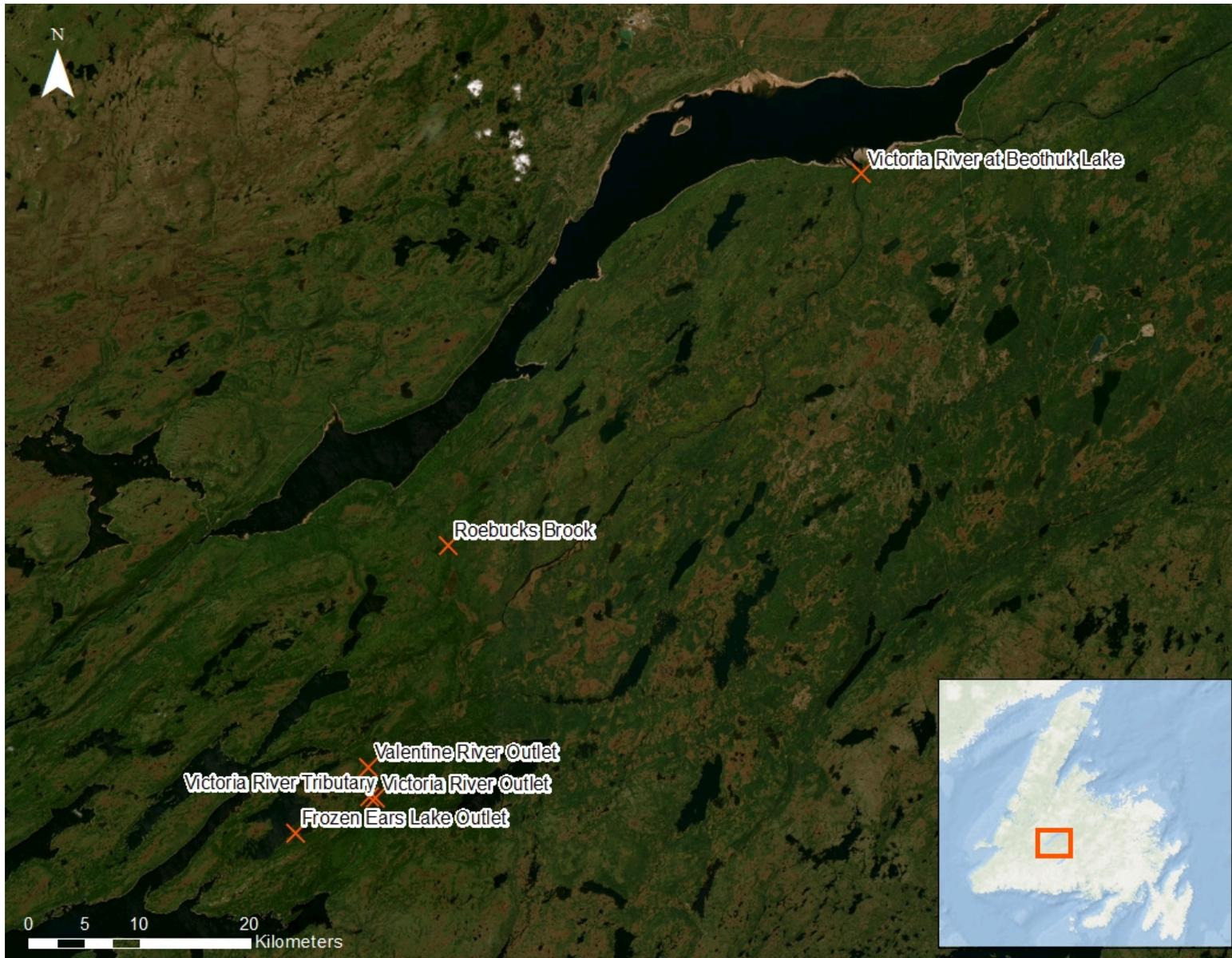
## Equinox Gold: Valentine Gold Mine Network

2025-09-16 to 2025-11-20



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

# Valentine Gold Mine Network



The Water Resources Management Division (WRMD), in collaboration with Equinox Gold (formerly Calibre/Marathon Gold) maintain fourteen real-time water quality (RTWQ) and water quantity monitoring stations. These stations are part of a real-time network designed to monitor, process, and share water quality and quantity data with both WRMD and Equinox Gold, supporting the evaluation and management of water resources. The network also provides early detection of potential or emerging water issues, allowing for prompt response and implementation of mitigation measures.

Six of these stations focus on surface water and will be addressed in this report. The remaining eight stations are groundwater monitoring wells which are reported annually. The six surface water stations are located at Victoria River at Beothuk Lake, Roebucks Brook at Access Road, Valentine River Outlet, Victoria River Tributary, Victoria River Outlet, and Frozen Ears Outlet.

This report covers the monitoring period from 2025-09-16 to 2025-11-20.

Station Name	Station Number	Latitude	Longitude
Frozen Ear Lake Outlet	NF02YN0052	48.39	-57.14
Victoria River Outlet	NF02YN0047	48.41	-57.07
Victoria River Tributary	NF02YN0050	48.41	-57.08
Valentine River Outlet	NF02YN0048	48.42	-57.08
Roebucks Brook	NF02YN0049	48.54	-57.01
Victoria River at Beothuk Lake	NF02YN0051	48.74	-56.68

# Quality Assurance and Quality Control Procedures

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. 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. Corrected data can be obtained upon request.

Parameter	Excellent	Good	Fair	Marginal	Poor
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
Water Temperature	$\leq \pm 0.2^\circ\text{C}$	$\leq \pm 0.21 - 0.5^\circ\text{C}$	$\leq \pm 0.51 - 0.8^\circ\text{C}$	$\leq \pm 0.81 - 1^\circ\text{C}$	$> \pm 1^\circ\text{C}$
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
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
Specific Conductance	$\leq \pm 3 \mu\text{S/cm}$ or $\leq \pm 3\%$ , whichever is greater	$\leq \pm 3.1-10 \mu\text{S/cm}$ or $\leq \pm 3.1-10\%$ , whichever is greater	$\leq \pm 10 - 15 \mu\text{S/cm}$ or $\leq \pm 10.1-15\%$ , whichever is greater	$\leq \pm 15.1 - 20 \mu\text{S/cm}$ or $\leq \pm 15.1-20\%$ , whichever is greater	$> \pm 20 \mu\text{S/cm}$ or $> \pm 20\%$ , whichever is greater

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.

Additionally, grab samples are collected during deployment to compare pH, specific conductivity and turbidity values between the field instrument and grab samples. Variability in results may be attributed to differences in the sampling location or depth relative to the sonde's deployment site or insufficient equilibration time for the sonde when initial field data was collected.

## Deployment Notes

The Frozen Ears Lake Outlet Station is situated on-site and requires site personnel to escort WRMD staff to access the station. As a result, it often follows a different deployment schedule than the other five stations, which are easily accessible along the mine access road. The instrument at the Frozen Ears station was not switched out at the same time as the other stations; therefore, no removal data is available for Frozen Ears for this deployment period.

## Hydrometric Data

Water Resources Management Division hydrometric (stage and flow) data is quality controlled on a less frequent basis than water quality data due to differences in protocols. The hydrometric data shown in this report is provisional and has not undergone quality control checks.

# QAQC

## Deployment Rankings



During deployment, most parameters across all stations ranked as *good* or *excellent*, indicating minimal differences between the field and QA/QC sonde measurements. Dissolved oxygen (DO) ranked *fair* at Victoria River Tributary, Victoria River Outlet, and Frozen Ears Lake Outlet indicating minor discrepancies that are likely attributable to sensor deterioration on the QA/QC sonde, given the consistent pattern observed across multiple stations. Turbidity at Roebucks Brook also ranked as *fair* which is likely attributed to difference of placement of the QAQC and field sonde when measurements were taken.

Grab sample rankings collected during deployment ranked as *good* or *excellent* for all parameters, indicating minimal differences between initial field sonde measurements and grab sample measurements.

Upon removal, the majority of parameters at all stations ranked *good* or *excellent*, indicating minimal differences between field and QA/QC sonde measurements and suggesting stable sensor performance throughout the deployment period. Dissolved oxygen ranked *fair* at Valentine River Outlet and *poor* at Victoria River Outlet, Victoria River Tributary, Roebucks Brook and Victoria River at Beothuk Lake. This is likely attributable to sensor deterioration on the QA/QC sonde, given the consistent pattern observed across multiple stations. pH also ranked *fair* at Valentine River Outlet which is likely a result of insufficient time for the QAQC sonde to equilibrate before recording measurements. There is no removal data for Frozen Ears Lake Outlet (see deployment notes on previous page).

### QAQC Rankings

Station	Parameter	Deployment Rank	Grab Sample Deployment	Removal Rank
Frozen Ears Lake Outlet	Dissolved Oxygen (mg/l)	Fair	-	-
Frozen Ears Lake Outlet	pH	Excellent	Good	-
Frozen Ears Lake Outlet	Specific Conductivity (µS/cm)	Excellent	Excellent	-
Frozen Ears Lake Outlet	Temperature (°C)	Good	-	-
Frozen Ears Lake Outlet	Turbidity (NTU)	Good	Excellent	-
Roebucks Brook	Dissolved Oxygen (mg/l)	Good	-	Poor
Roebucks Brook	pH	Excellent	Good	Excellent
Roebucks Brook	Specific Conductivity (µS/cm)	Excellent	Excellent	Excellent
Roebucks Brook	Temperature (°C)	Excellent	-	Excellent
Roebucks Brook	Turbidity (NTU)	Fair	Excellent	Excellent
Valentine River Outlet	Dissolved Oxygen (mg/l)	Excellent	-	Fair
Valentine River Outlet	pH	Excellent	Excellent	Fair
Valentine River Outlet	Specific Conductivity (µS/cm)	Excellent	Excellent	Excellent
Valentine River Outlet	Temperature (°C)	Excellent	-	Excellent
Valentine River Outlet	Turbidity (NTU)	Excellent	Excellent	Good
Victoria River at Beothuk Lake	Dissolved Oxygen (mg/l)	Excellent	-	Poor
Victoria River at Beothuk Lake	pH	Good	Good	Excellent
Victoria River at Beothuk Lake	Specific Conductivity (µS/cm)	Excellent	Excellent	Excellent
Victoria River at Beothuk Lake	Temperature (°C)	Good	-	Excellent
Victoria River at Beothuk Lake	Turbidity (NTU)	Excellent	Excellent	Good
Victoria River Outlet	Dissolved Oxygen (mg/l)	Fair	-	Poor
Victoria River Outlet	pH	Excellent	Good	Good
Victoria River Outlet	Specific Conductivity (µS/cm)	Excellent	Excellent	Excellent
Victoria River Outlet	Temperature (°C)	Excellent	-	Excellent
Victoria River Outlet	Turbidity (NTU)	Excellent	Excellent	Excellent
Victoria River Tributary	Dissolved Oxygen (mg/l)	Fair	-	Poor
Victoria River Tributary	pH	Good	Excellent	Good
Victoria River Tributary	Specific Conductivity (µS/cm)	Excellent	Excellent	Good
Victoria River Tributary	Temperature (°C)	Good	-	Excellent
Victoria River Tributary	Turbidity (NTU)	Excellent	Excellent	Excellent

# Water Temperature

<b>Deployment Period Statistics (°C)</b>				
<b>Station Name</b>	<b>Average</b>	<b>Median</b>	<b>Minimum</b>	<b>Maximum</b>
<b>Frozen Ears Lake Outlet</b>	<b>8.76</b>	<b>9.28</b>	<b>0.04</b>	<b>20.59</b>
<b>Roebucks Brook</b>	<b>8.38</b>	<b>8.99</b>	<b>0.31</b>	<b>18.62</b>
<b>Valentine River Outlet</b>	<b>8.18</b>	<b>8.60</b>	<b>-0.14</b>	<b>19.41</b>
<b>Victoria River at Beothuk Lake</b>	<b>8.76</b>	<b>9.10</b>	<b>0.97</b>	<b>18.77</b>
<b>Victoria River Outlet</b>	<b>9.08</b>	<b>9.41</b>	<b>1.31</b>	<b>18.35</b>
<b>Victoria River Tributary</b>	<b>8.17</b>	<b>8.56</b>	<b>0.02</b>	<b>16.88</b>

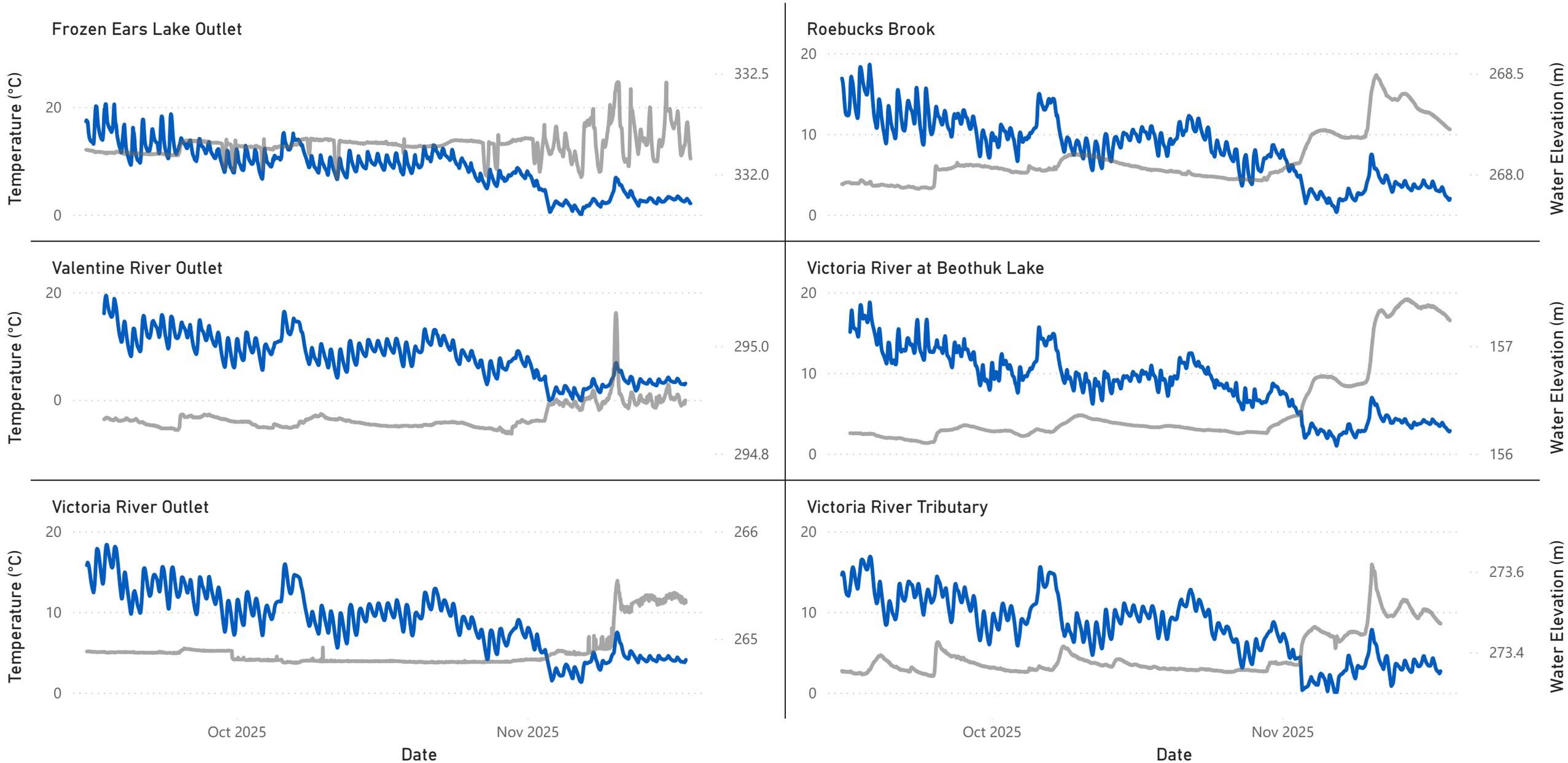
Water temperature is a critical parameter for wildlife, as many organisms cannot regulate their own body temperatures and instead depend on surrounding air and water conditions. Water temperature can be influenced by industrial inputs or alterations to natural environments, such as the removal of trees and vegetation, which eliminates the protective canopy they provide. Additionally, water temperature impacts other monitored parameters, including dissolved oxygen and specific conductivity.

Water temperatures across the network remained steady, with a slight decreasing trend throughout the deployment period. A decreasing trend would be expected as water and air temperatures cool during the seasonal transition from fall to winter. A natural daily cycle was also observed, with higher temperatures during the day and lower temperatures at night.

# Water Temperature Station Graphs

Temperature (°C) and Water Elevation (m)

● Temperature (°C) ● Water Elevation (m)



# pH

## Deployment Period Statistics (pH Units)

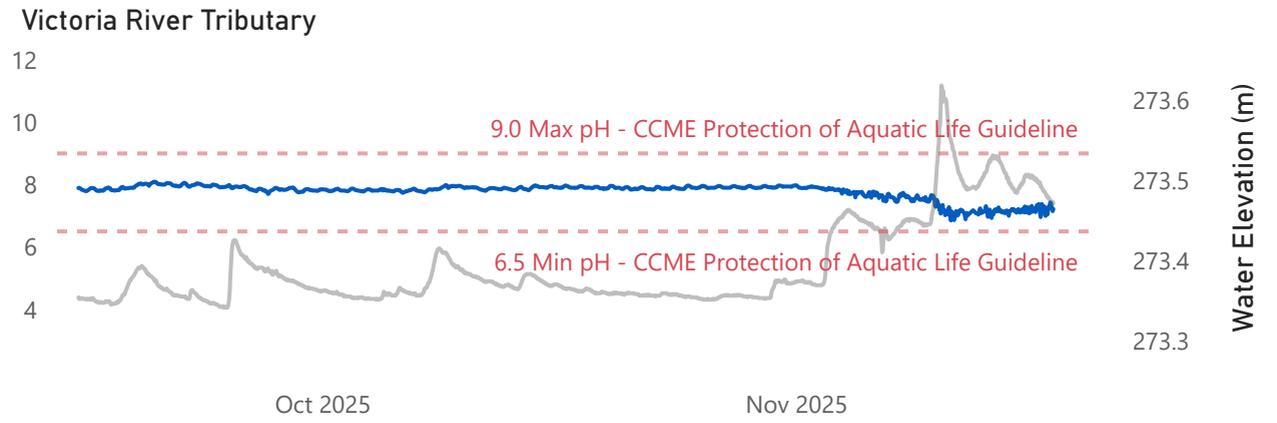
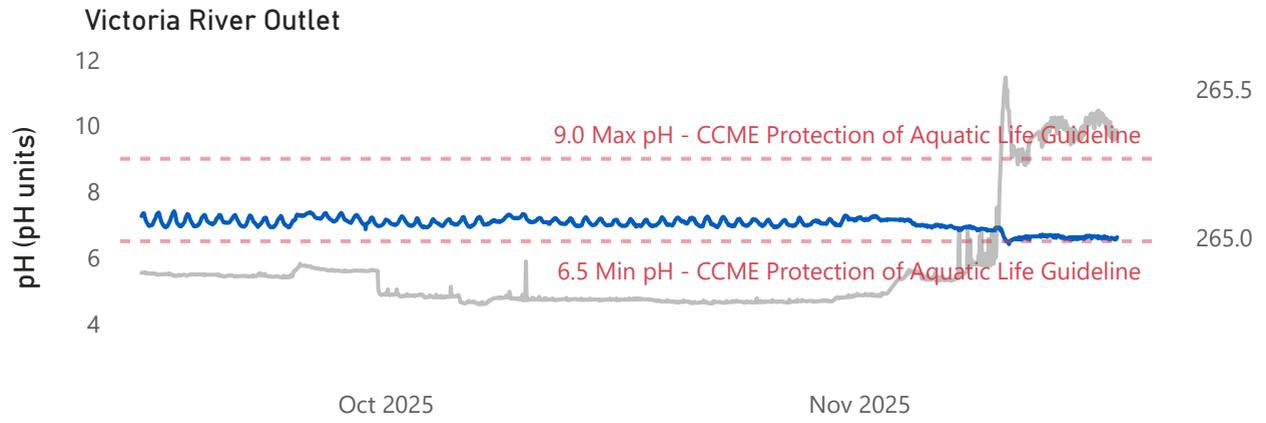
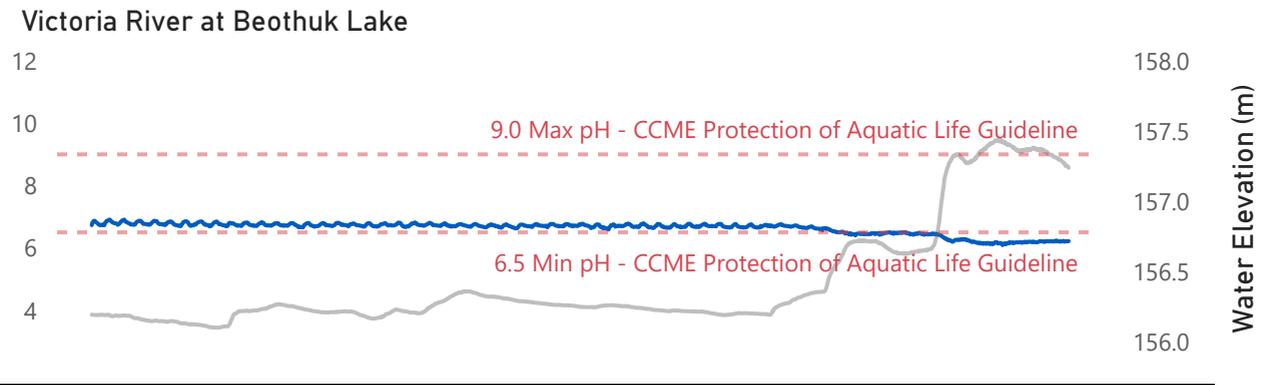
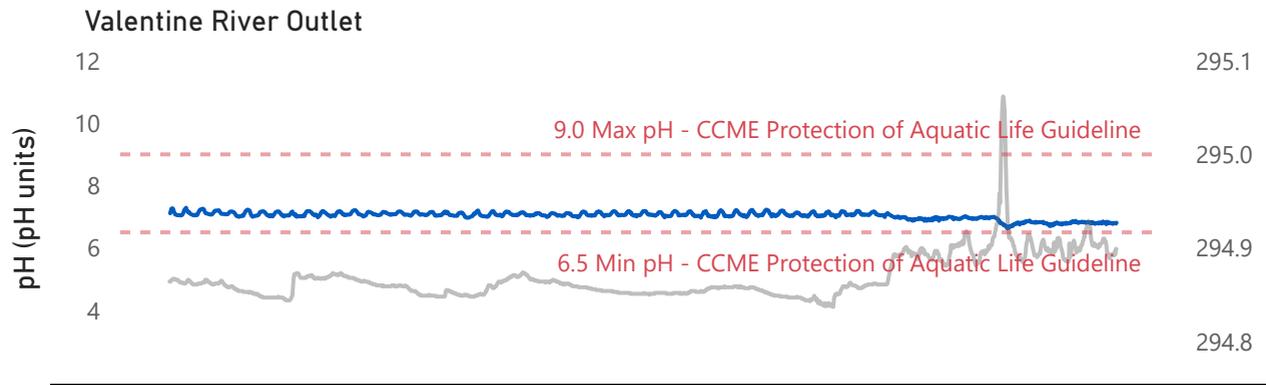
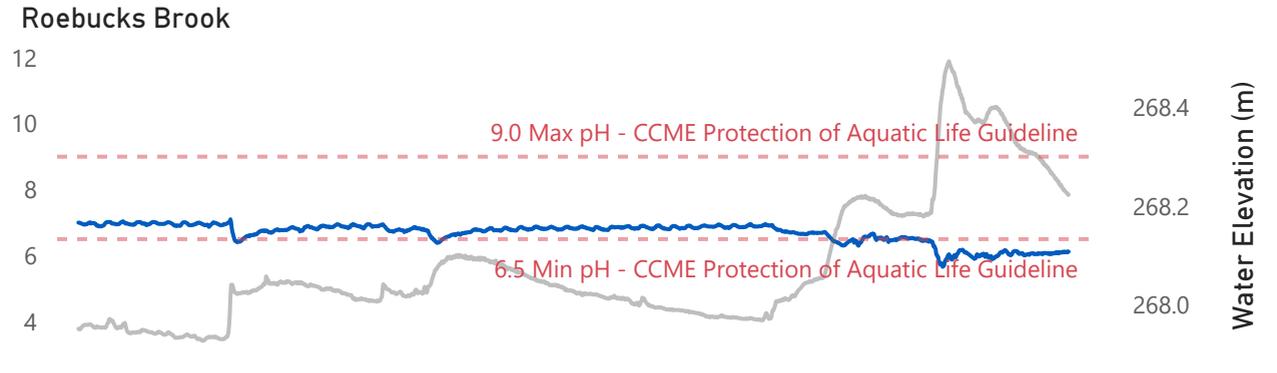
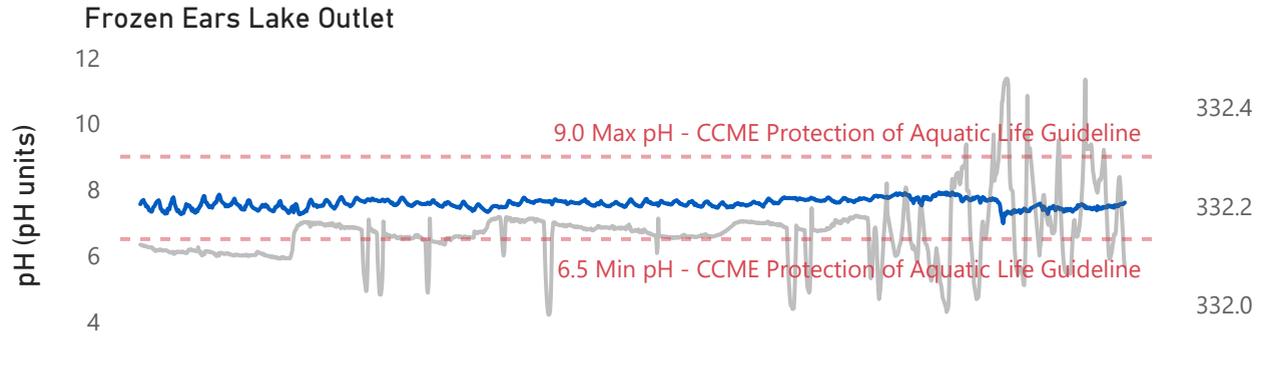
Station Name	Average	Median	Minimum	Maximum
Frozen Ears Lake Outlet	7.58	7.58	6.98	7.92
Roebucks Brook	6.69	6.81	5.66	7.10
Valentine River Outlet	7.04	7.05	6.63	7.29
Victoria River at Beothuk Lake	6.63	6.71	6.09	6.91
Victoria River Outlet	7.03	7.05	6.41	7.41
Victoria River Tributary	7.78	7.87	6.85	8.09

pH relates to the free hydrogen ions in water, and it is a measure of acidity in water. pH is a critical parameter because it influences the solubility of minerals and chemicals, the availability of nutrients, and the biological processes that occur in aquatic ecosystems. 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.

pH remained stable and consistent at all stations, with small fluctuations likely resulting from precipitation events. Rainwater, with its naturally lower pH, temporarily dilutes the water column, causing a short-term decrease in pH. However, pH levels typically return to baseline within a few days to weeks. pH at most stations remained within the CCME Guidelines for the Protection of Aquatic Life for the majority of the deployment period. A large precipitation event caused pH to drop below the minimum guideline (6.5 pH units) at multiple stations like Victoria River at Beothuk Lake or Roebucks River at the end of the deployment period.

# pH Station Graphs

● pH (pH units) ● Water Elevation (m)



# Specific Conductivity

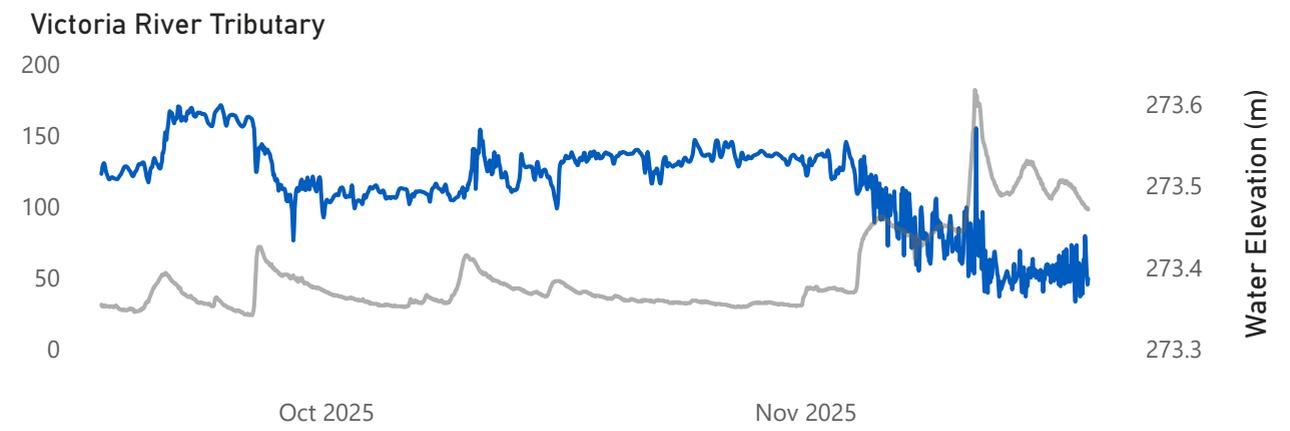
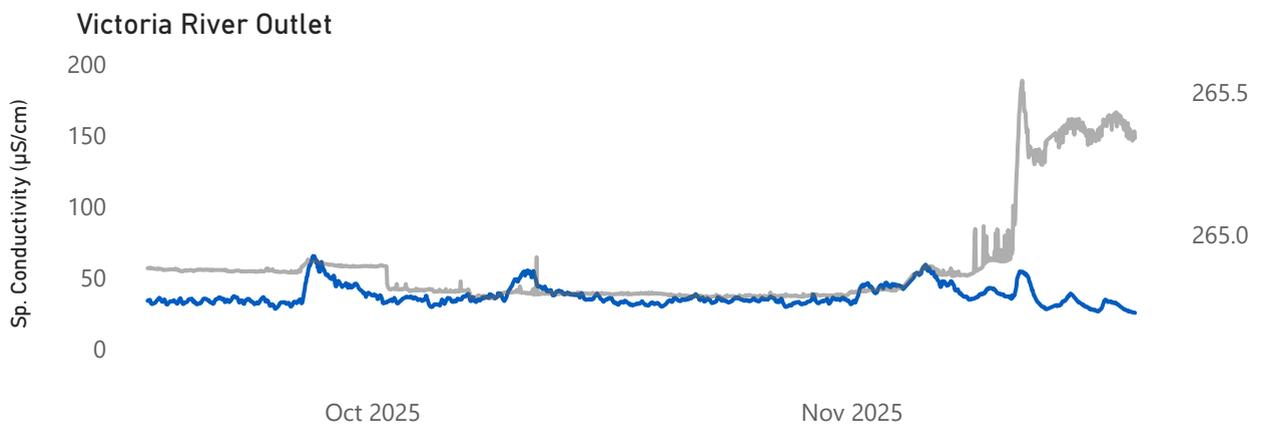
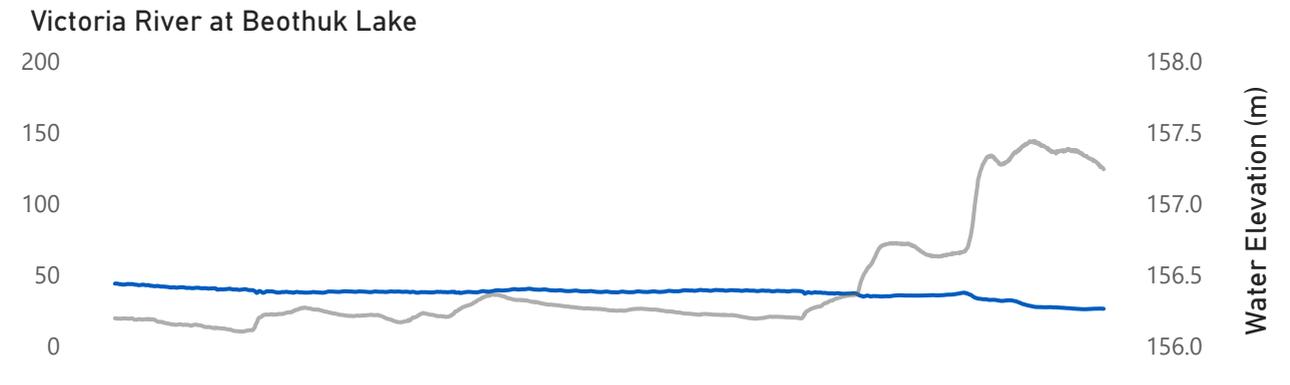
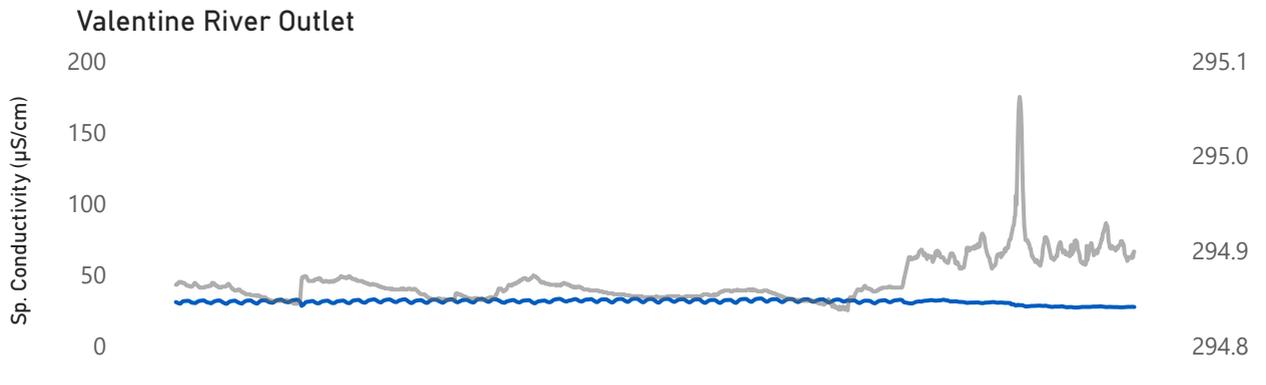
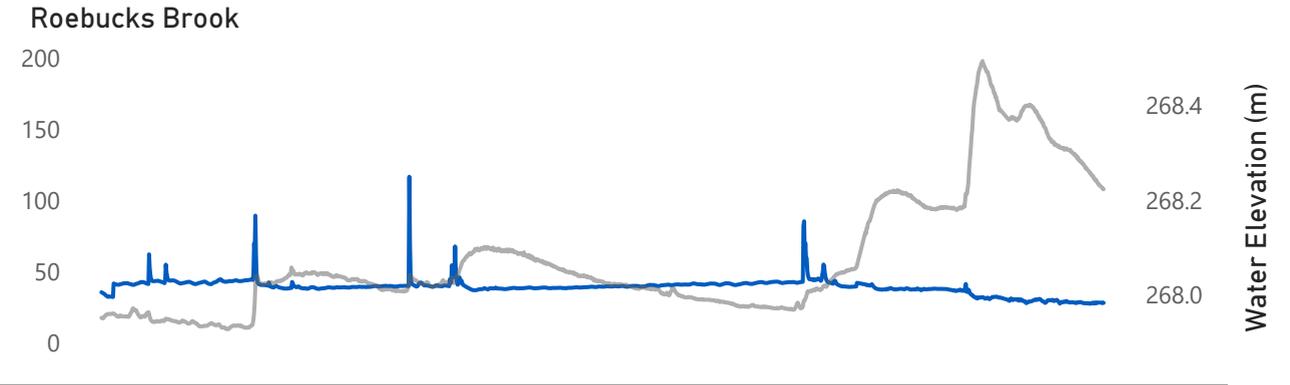
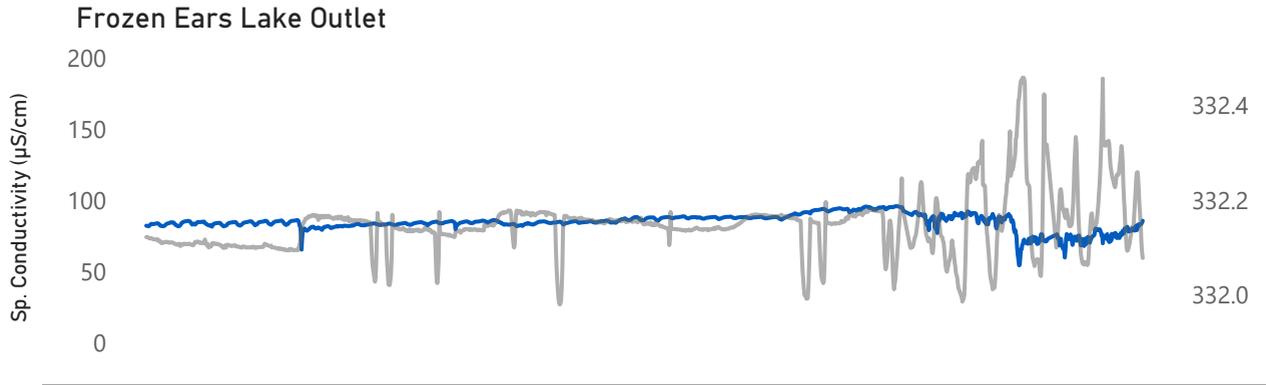
Deployment Period Statistics ( $\mu\text{S}/\text{cm}$ )				
Station Name	Average	Median	Minimum	Maximum
Frozen Ears Lake Outlet	84.59	84.65	54.17	95.69
Roebucks Brook	38.95	39.30	27.14	116.40
Valentine River Outlet	30.78	31.13	26.67	33.06
Victoria River at Beothuk Lake	36.82	37.74	25.51	43.55
Victoria River Outlet	36.93	34.74	25.08	65.09
Victoria River Tributary	116.23	122.62	32.94	171.02

Specific conductivity is a common indicator of the concentration of dissolved ions in water, such as salts, acids, and bases. Higher concentrations of dissolved ions result in higher specific conductivity, while pure water exhibits low conductivity. Specific conductivity is often affected by precipitation. During precipitation events, rainwater can temporarily dilute the water column, resulting in a short-term decrease in conductivity. However, high precipitation events can also cause a temporary increase in conductivity if sediment from the bottom of the waterbody is disturbed around the sensor or if runoff carrying dissolved ions enters the water column.

Conductivity remained relatively stable across most stations; however, some variability was observed at Victoria River Outlet and Victoria River Tributary. Conductivity at Roebucks Brook was stable, other than some brief spikes associated with water elevation increases from precipitation. Medians are comparable at all stations, except slightly higher at Frozen Ears Lake Outlet and Victoria River Tributary. The higher values at these two stations may be a result of environmental factors or localized effects from nearby industrial activities at the mine site.

# Specific Conductivity Station Graphs

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



# Dissolved Oxygen

Station Name	Deployment Period Statistics							
	Average (mg/L)	Average (% Sat.)	Median (mg/L)	Median (% Sat.)	Minimum (mg/L)	Minimum (% Sat.)	Maximum (mg/L)	Maximum (% Sat.)
<b>Frozen Ears Lake Outlet</b>	<b>11.75</b>	<b>100.28</b>	<b>11.60</b>	<b>99.20</b>	<b>8.56</b>	<b>83.80</b>	<b>14.61</b>	<b>124.50</b>
<b>Roebucks Brook</b>	<b>12.04</b>	<b>101.78</b>	<b>11.87</b>	<b>102.10</b>	<b>9.35</b>	<b>95.40</b>	<b>14.97</b>	<b>107.10</b>
<b>Valentine River Outlet</b>	<b>11.64</b>	<b>97.89</b>	<b>11.44</b>	<b>97.60</b>	<b>9.03</b>	<b>93.30</b>	<b>14.60</b>	<b>103.20</b>
<b>Victoria River at Beothuk Lake</b>	<b>12.61</b>	<b>107.62</b>	<b>12.42</b>	<b>107.70</b>	<b>9.88</b>	<b>103.40</b>	<b>15.41</b>	<b>110.70</b>
<b>Victoria River Outlet</b>	<b>12.26</b>	<b>105.62</b>	<b>12.19</b>	<b>104.85</b>	<b>9.51</b>	<b>94.60</b>	<b>14.71</b>	<b>120.10</b>
<b>Victoria River Tributary</b>	<b>13.55</b>	<b>113.75</b>	<b>13.30</b>	<b>114.50</b>	<b>9.98</b>	<b>102.10</b>	<b>17.37</b>	<b>121.20</b>

Dissolved oxygen (DO) is crucial for supporting aquatic life, and the CCME (Canadian Council of Ministers of the Environment) Freshwater Aquatic Life guidelines establish reference values to evaluate waterway health. The minimum DO guideline is 9.5 mg/L for early life stages in cold water species and 6.5 mg/L for other life stages. DO concentrations can fluctuate due to factors such as water temperature, atmospheric pressure, and the presence of other dissolved substances. Warmer water typically holds less dissolved oxygen than cooler water.

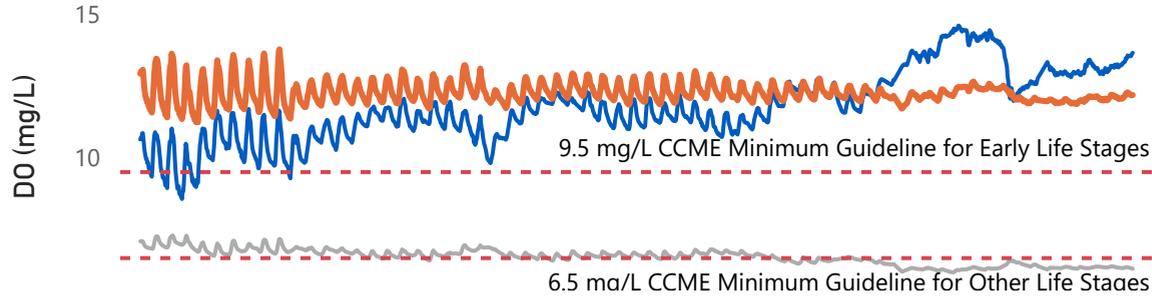
Daily fluctuations in DO concentrations were observed at all stations throughout the deployment period and were primarily driven by temperature variability and the photosynthetic and respiratory activity of aquatic plants. DO concentrations remained relatively stable and consistent at most stations; although slightly more pronounced daily fluctuations were observed at the Frozen Ears Lake Outlet station.

Throughout the monitoring period, DO concentrations remained above the Canadian Council of Ministers of the Environment (CCME) guideline for the protection of other life stages (6.5 mg/L). There were brief dips below the guideline for the protection of early life stages (9.5mg/L) at some stations early on in the deployment when water temperatures were warmer, but concentrations drifted and stayed above the guideline value for the remainder as water temperatures cooled throughout the seasonal transition to winter.

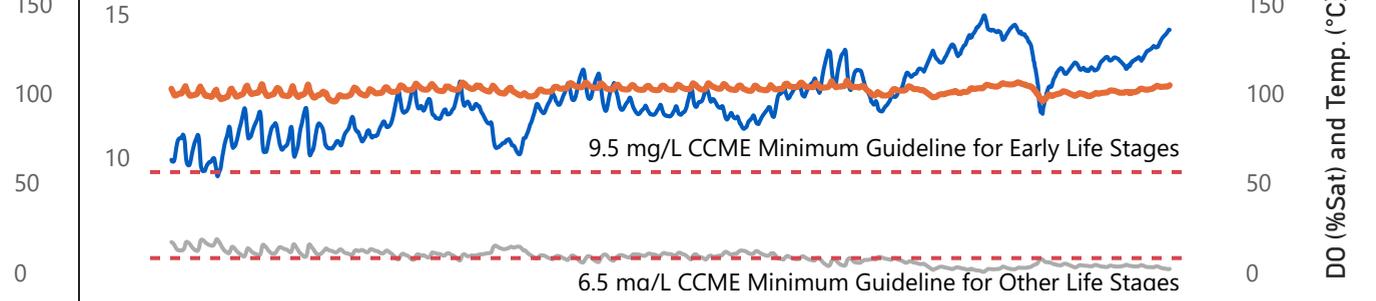
# Dissolved Oxygen Station Graphs

● DO (mg/L) ● Water Temperature (°C) ● Percent Saturation

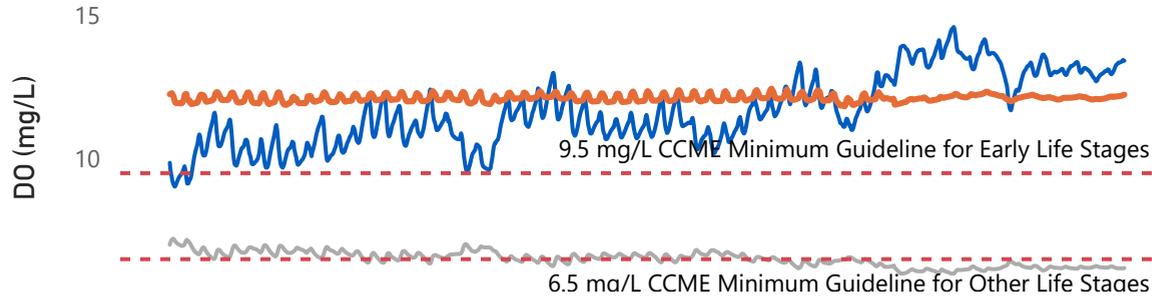
### Frozen Ears Lake Outlet



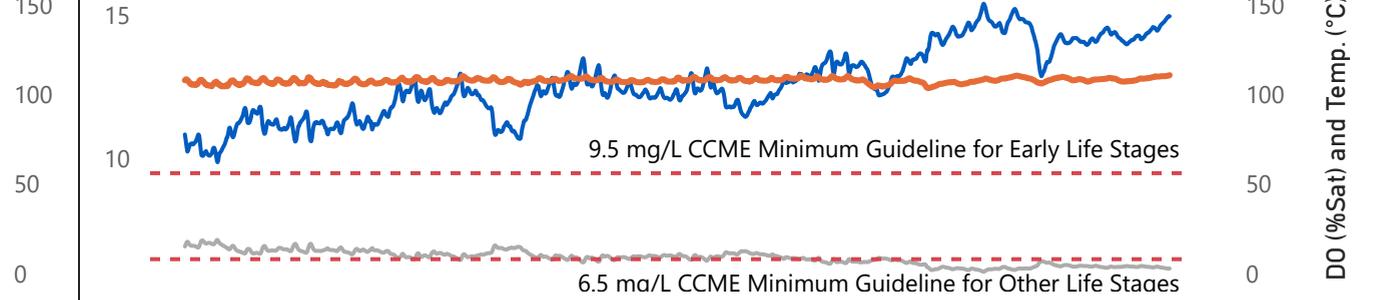
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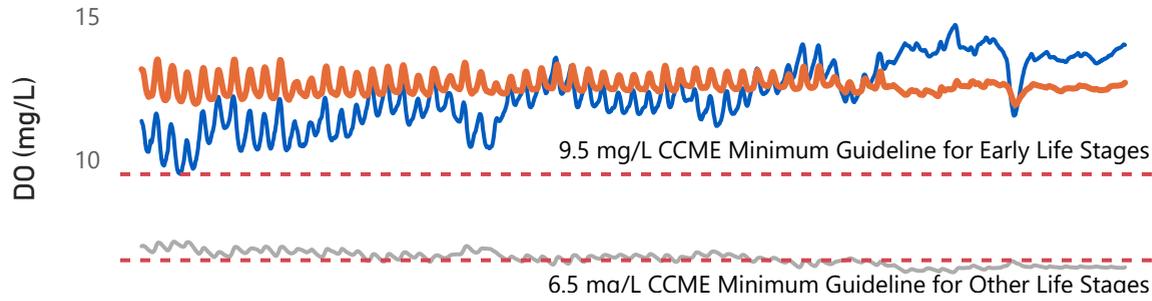
### Valentine River Outlet



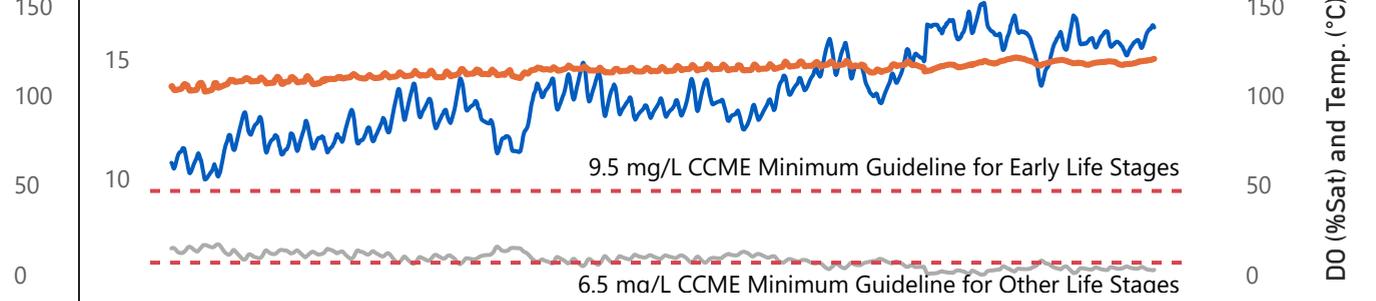
### Victoria River at Beothuk Lake



### Victoria River Outlet



### Victoria River Tributary



Oct 2025

Nov 2025

Oct 2025

Nov 2025

# Turbidity

Deployment Period Statistics (NTU)					
Station Name	Correction	Average	Median	Minimum	Maximum
Frozen Ears Lake Outlet	-	6.89	0.89	0.06	275.53
Roebucks Brook	-	2.83	1.49	0.20	205.31
Valentine River Outlet	[+0.46]	0.57	0.31	0.00	42.88
Victoria River at Beothuk Lake	-	1.08	1.05	0.16	6.81
Victoria River Outlet	[+0.13]	0.53	0.11	0.00	19.15
Victoria River Tributary	[+0.79]	2.05	0.46	0.00	36.18

Turbidity, a measure of water cloudiness, often increases during precipitation events as runoff carries silt and debris into the waterbody. High turbidity values can reduce light penetration for aquatic plants, disrupt benthic habitats and potentially harm fish gills or damage monitoring equipment.

Throughout the deployment period, turbidity levels remained generally low at all stations, indicating clear, pristine water conditions. Precipitation events caused increases in water levels and resulted in short-term turbidity spikes; however, values typically returned to baseline within a few days.

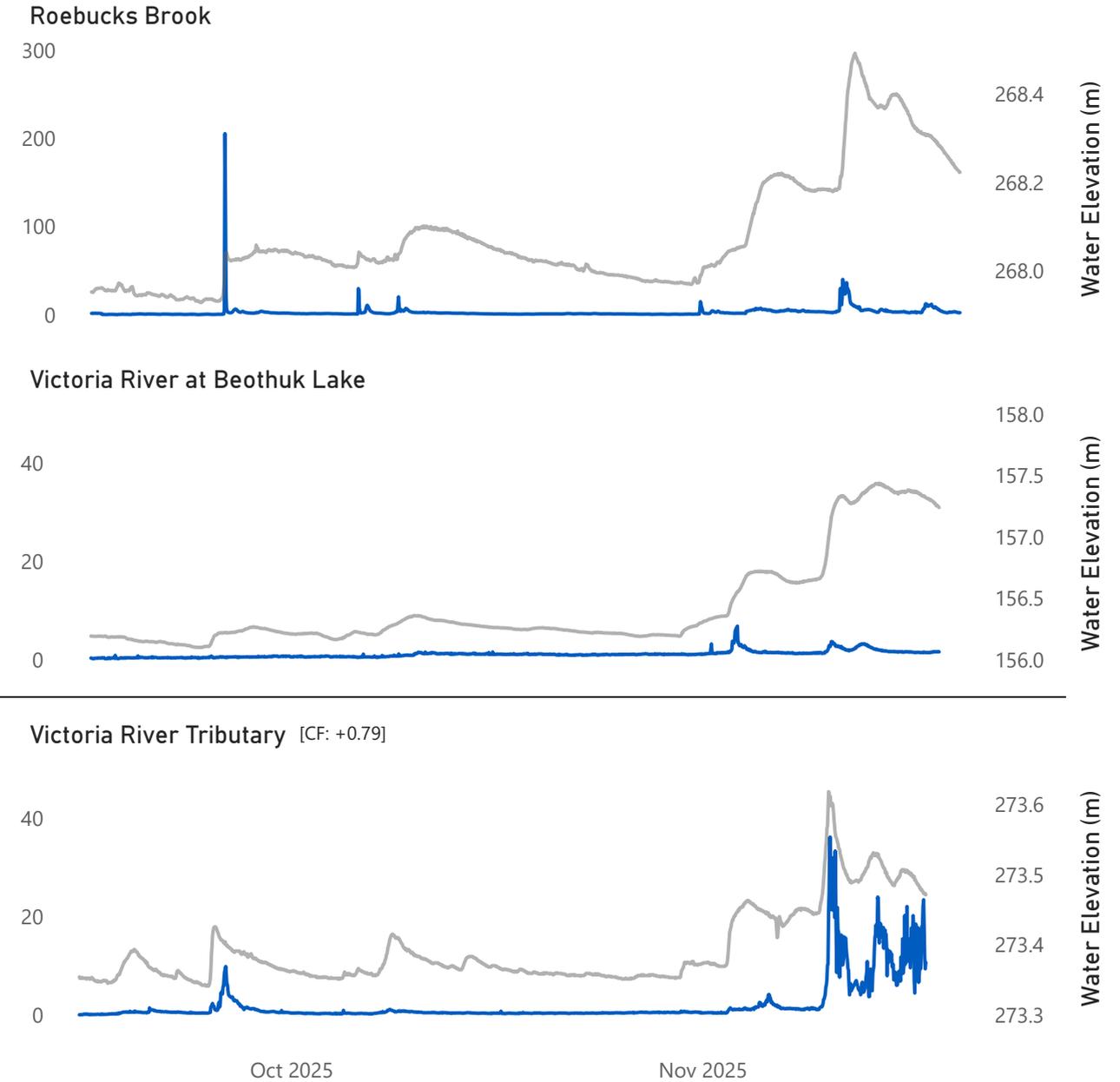
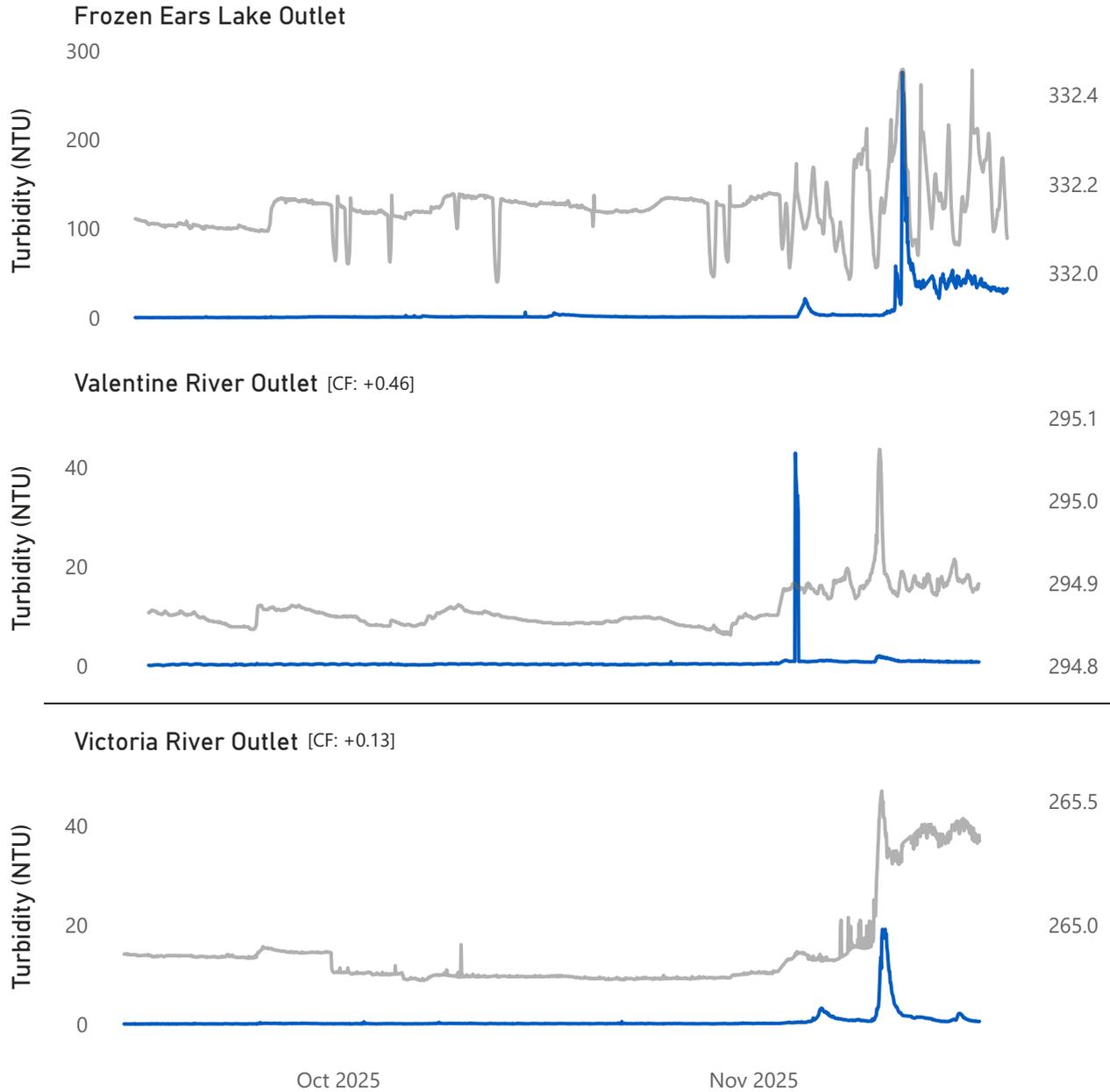
Toward the end of the deployment period, turbidity increased at several stations in response to near-daily precipitation between November 11 and 18. A marked rise in turbidity levels, along with greater variability, was observed at Victoria River Tributary during this period. This increase may have been caused by sediment-laden runoff flowing through the brook or by sediment and debris accumulating within the sonde's protective casing, potentially leading to elevated readings.

A correction factor was applied to turbidity data at Valentine River Outlet, Victoria River Outlet and Victoria River Tributary stations to address negative turbidity values recorded during the deployment. The correction was calculated by setting the lowest measured value to zero and adding this offset to all remaining values within each dataset. Although the corrected values may not represent absolute turbidity concentrations, the data are considered suitable for evaluating relative trends and examining relationships with other water quality parameters. The applied correction factor (in NTU) for each station is provided in square brackets next to the station name in the table above and is also indicated on the graphs on the following page.

# Turbidity Station Graphs

● Turbidity (NTU) ● Water Elevation (m)

Please note change in scale for Frozen Ears and Roebucks Brook graphs



# Water Elevation

Station Name	Deployment Period Statistics (m)			
	Minimum	Maximum	Average	Median
Frozen Ears Lake Outlet	331.98	332.46	332.15	332.15
Roebucks Brook	267.93	268.49	268.07	268.03
Valentine River Outlet	294.84	295.06	294.87	294.86
Victoria River at Beothuk Lake	156.10	157.44	156.42	156.25
Victoria River Outlet	264.78	265.54	264.89	264.81
Victoria River Tributary	273.34	273.62	273.39	273.37

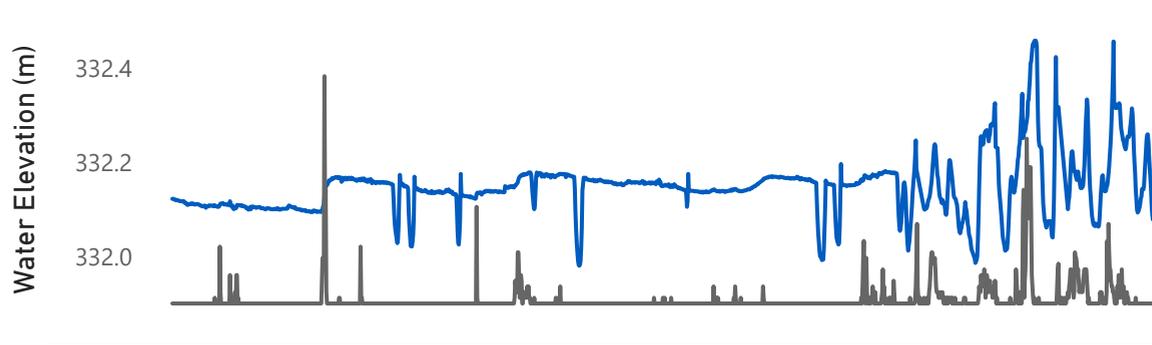
Water elevation provides an estimate of the water level at a monitoring station and plays a vital role in analyzing trends in water quality data, particularly for parameters such as specific conductivity, pH, and turbidity. Water elevation generally rises during precipitation events as rainwater and runoff enter the water column. By monitoring water elevation alongside precipitation events, we can better interpret our data, distinguish whether an elevation increase is caused by rainfall or potential industrial activities, and assess its impact on water quality. Precipitation data was obtained from the Valentine Gold Project meteorological (MET) station, which is located on-site and maintained collaboratively by WRMD and Equinox Gold.

Water elevation at all six stations remained relatively stable with a slightly increasing trend throughout the deployment period. The station graphs on the following page demonstrates the effect of precipitation events on water elevation, showing distinct elevation spikes occurring during or shortly after rainfall. There was a noticeable increase in water elevations between November 11 and 18 due to near-daily precipitation.

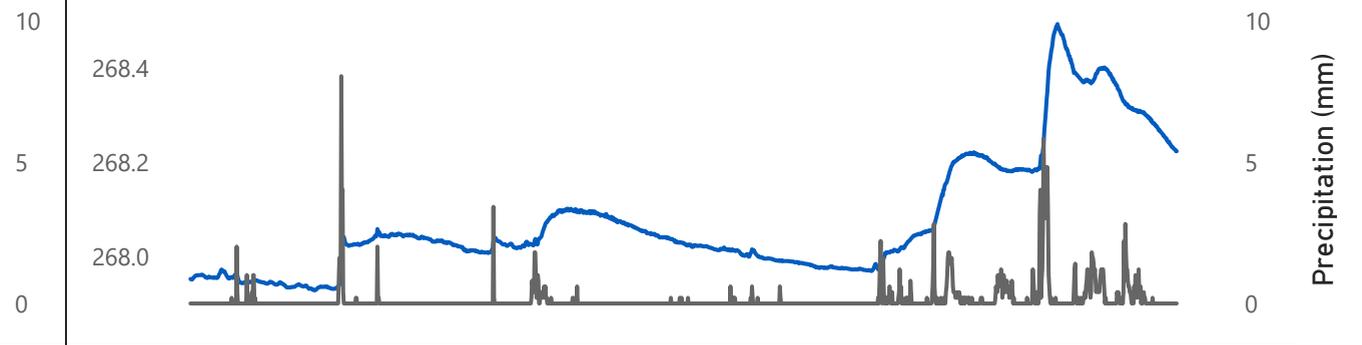
# Water Elevation Station Graphs

● Water Elevation (m) ● Precipitation (mm)

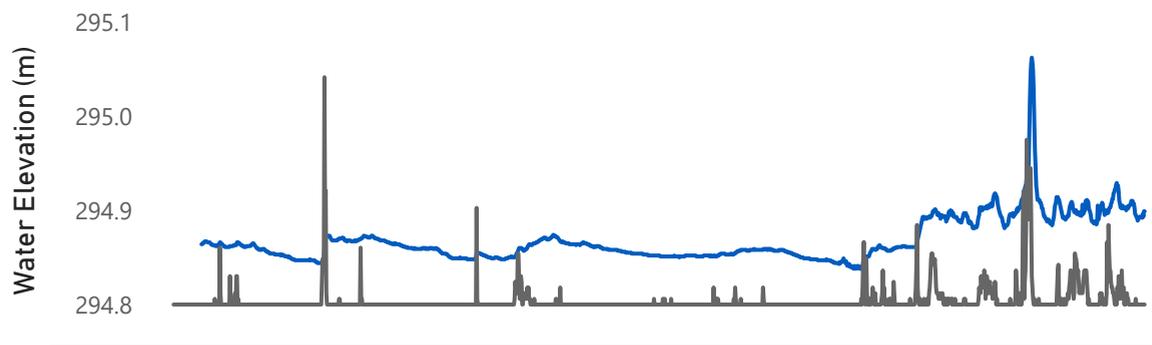
### Frozen Ears Lake Outlet



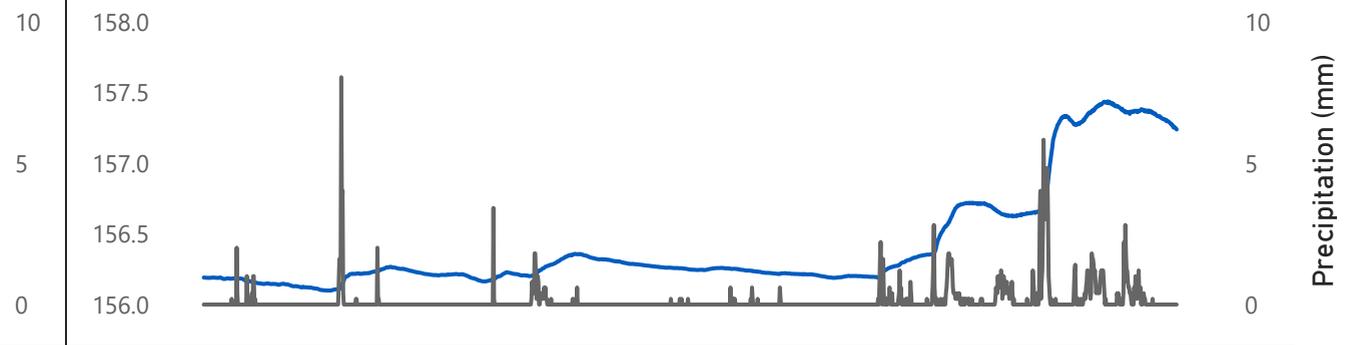
### Roebucks Brook



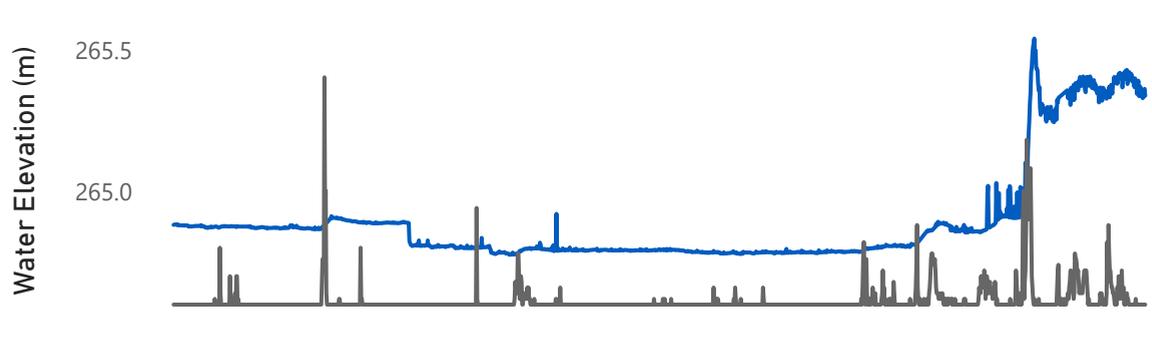
### Valentine River Outlet



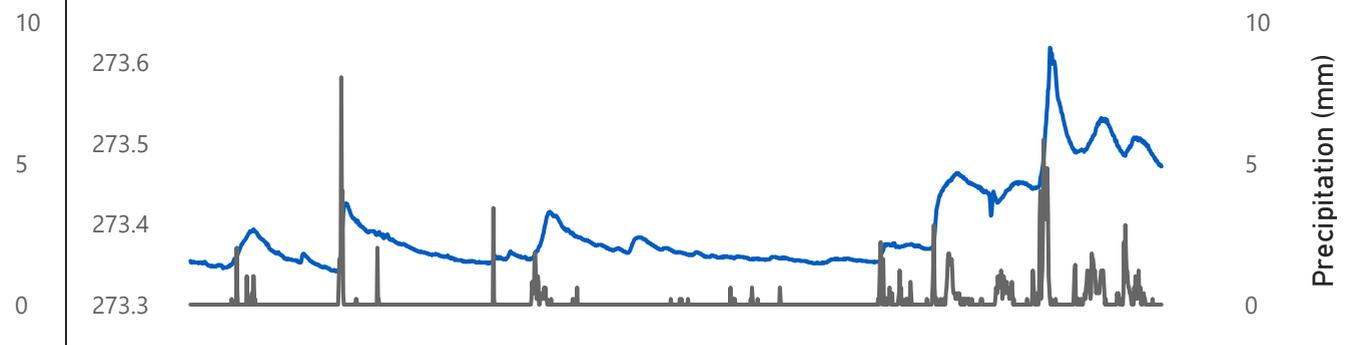
### Victoria River at Beothuk Lake



### Victoria River Outlet



### Victoria River Tributary



Oct 2025

Nov 2025

Oct 2025

Nov 2025

# Precipitation Data

Retrieved from the Valentine Gold Project MET Station



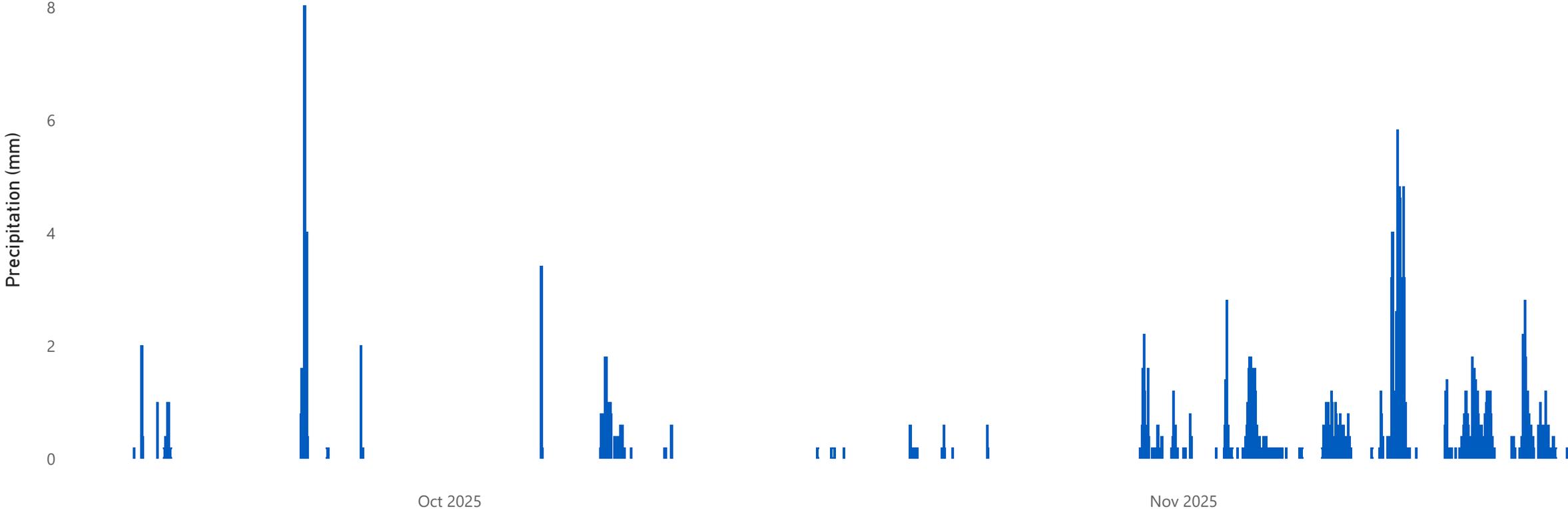
**0.14**  
Average (mm/hr)

**0.00**  
Minimum (mm/hr)

**0.00**  
Median (mm/hr)

**8.04**  
Maximum (mm/hr)

**217.28**  
Total Precip. (mm)

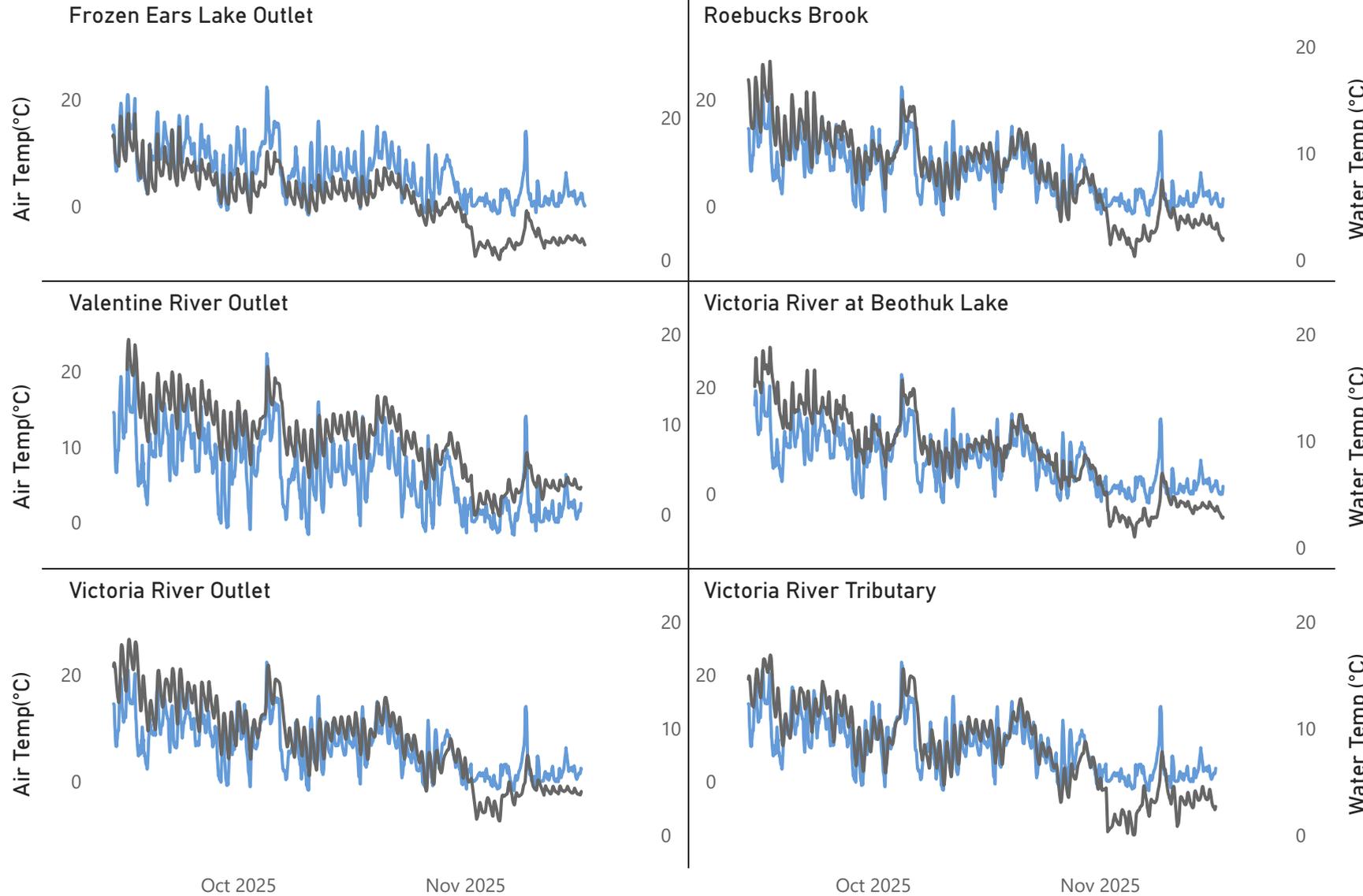


# Air Temperature Data

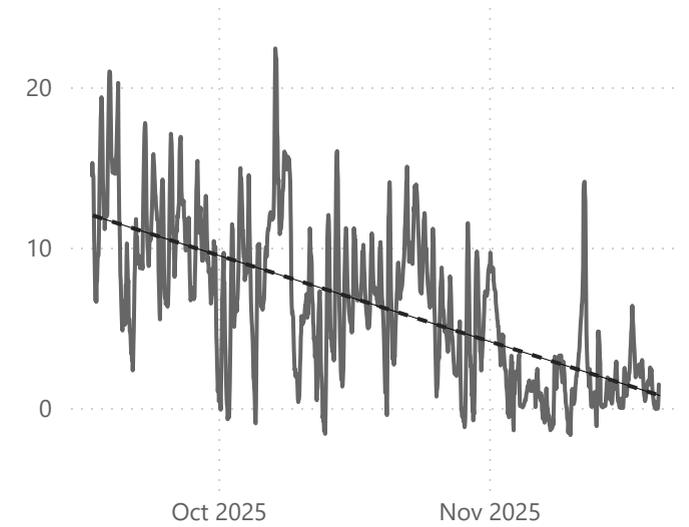
Retrieved from the Valentine Gold Project MET Station



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



## Air Temperature Trendline



**6.41**  
Average (°C)

**6.36**  
Median (°C)

**-1.70**  
Minimum (°C)

**22.41**  
Maximum (°C)