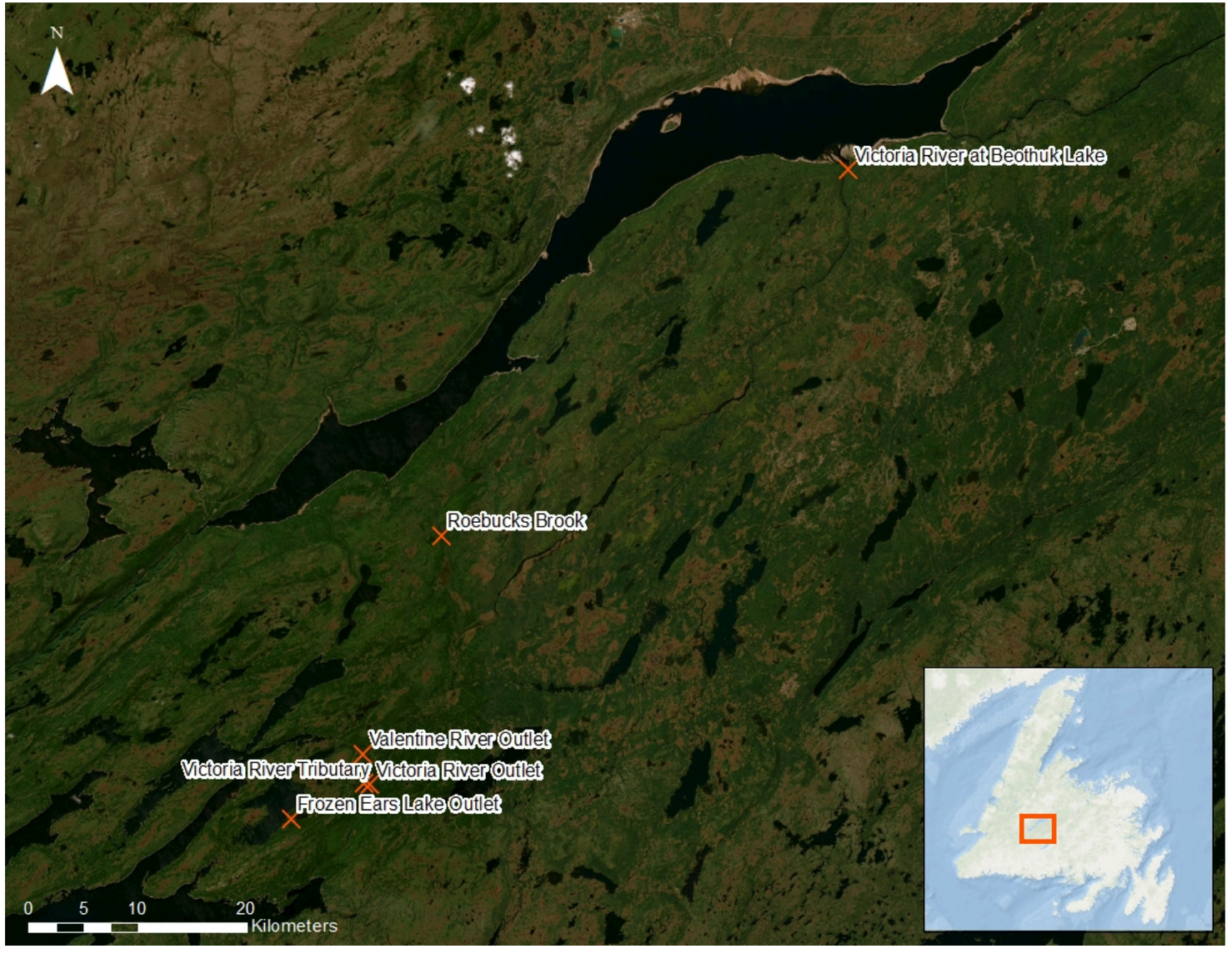
Real Time Water Quality Deployment Report
Equinox Gold: Valentine Gold Mine Network

2025-04-16 to 2025-06-06

Government of Newfoundland & Labrador
Department of Environment & 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 2025-04-16 to 2025-06-06. This is the first deployment for 2025. Instruments were removed for the winter season in November 2024 to prevent damage.

Station Name	Station Number	Latitutde	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	≤ ± 0.2 units	≤ ± 0.21 - 0.5 units	≤ ± 0.51 - 0.8 units	≤ ± 0.81 - 1 units	> ± 1 units
Water Temperature	≤ ± 0.2°C	≤ ± 0.21 - 0.5°C	≤ ± 0.51 - 0.8°C	≤ ± 0.81 - 1°C	> ± 1°C
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
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
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

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 Period Notes

- Due to seasonal accessibility constraints, a sonde was not deployed at Frozen Ears Outlet station until May 6th, 2025; therefore, no data is available from April 16 to May 6. There is no water elevation data available for Frozen Ears Outlet for this deployment period.
- There is no data for the Victoria River at Beothuk Lake station from May 16 to May 23, as declining water levels caused the sonde to be temporarily out of the water.

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, all parameters at all stations ranked good or excellent, except for dissolved oxygen at several stations and pH at Victoria River at Beothuk Lake and Frozen Ears Outlet, which were ranked as fair. The fair rankings for dissolved oxygen may reflect sensor deterioration on the QAQC sonde, given that multiple stations were affected. The fair pH ranking is likely due to insufficient equilibration time for the field sonde prior to initial measurements.

Upon removal, all parameters at all stations ranked good or excellent, indicating minimal differences between field and QAQC sonde measurements.

Grab sample rankings during deployments ranged from poor to excellent. pH ranked fair at Victoria River at Beothuk Lake and Valentine River Outlet, and poor at Frozen Ears Outlet. These rankings may be attributed to differences in sampling location or depth compared to the field sonde, or to insufficient equilibration time before initial readings. Turbidity ranked fair at Frozen Ears Outlet, likely due to similar differences in sampling location or depth relative to the field sonde.

QAQC Rankings

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

Water Temperature

Deployment Period Statistics (°C)				
Station Name	**Average**	**Median**	**Minimum**	**Maximum**
Frozen Ears Outlet	**12.23**	**11.75**	**4.72**	**22.68**
Roebucks Brook	**9.71**	**9.54**	**1.86**	**22.85**
Valentine River Outlet	**9.08**	**8.55**	**1.57**	**21.48**
Victoria River at Beothuk Lake	**9.96**	**9.27**	**3.46**	**21.13**
Victoria River Outlet	**8.16**	**7.49**	**1.84**	**19.87**
Victoria River Tributary	**9.41**	**9.30**	**0.92**	**19.82**

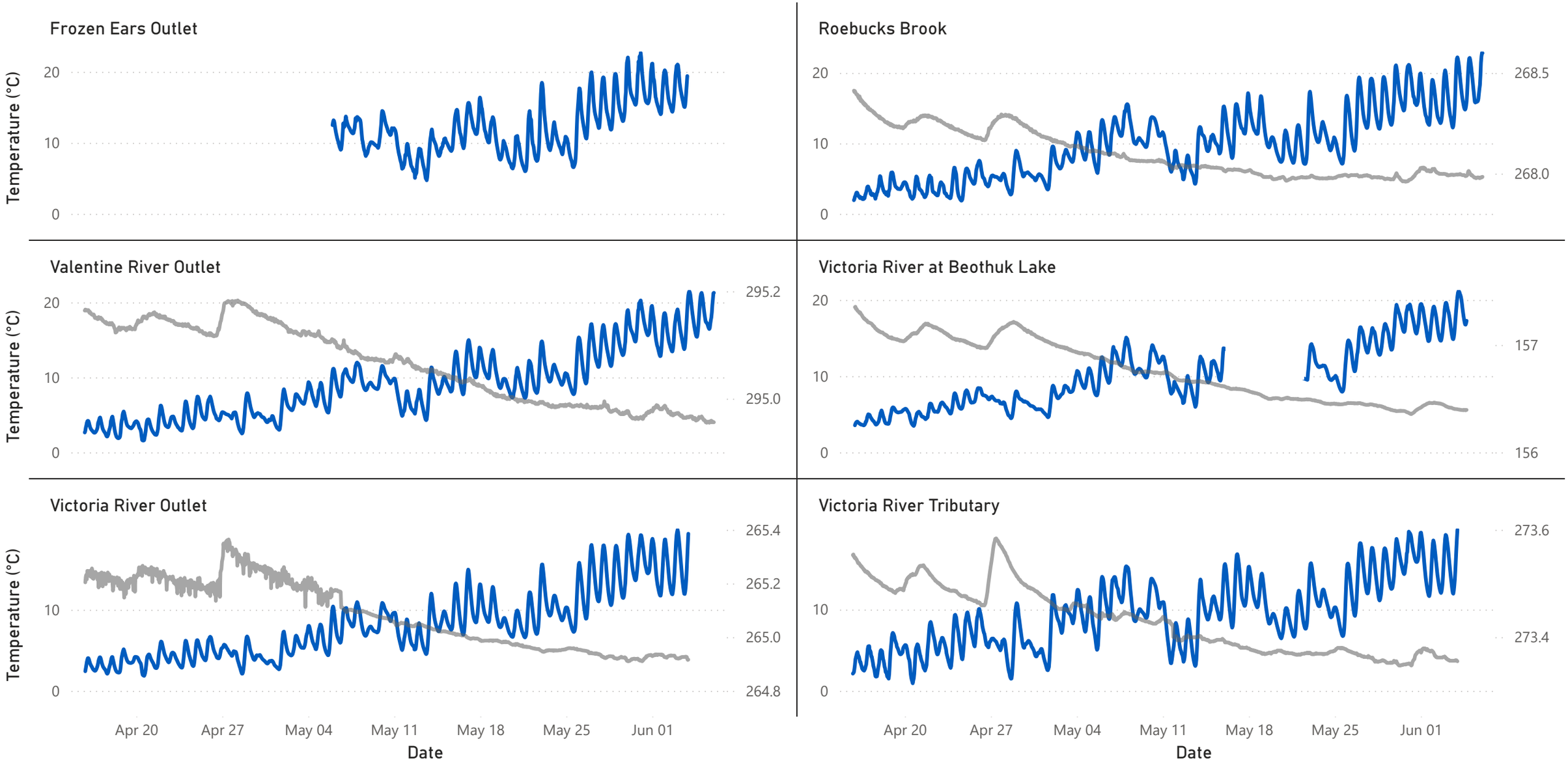
Water temperature is a critical parameter for wildlife, as many organisms cannot regulate their own body temperatures and instead depend on surrounding air and water conditions. Water temperature can be influenced by industrial inputs or alterations to natural environments, such as the removal of trees 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 steadily increased throughout the deployment period, which would be expected as the season transitions from spring to summer. A natural daily cycle was also observed, with higher temperatures during the day and lower temperatures at night. There is no data for the Victoria River at Beothuk Lake station from May 16 to May 23, as declining water levels caused the sonde to be temporarily out of the water. Values are higher at Frozen Ears Outlet, likely due to the absence of data from the first three weeks of the deployment period, when water temperatures were cooler.

Water Temperature Station Graphs

Temperature (°C) and Water Elevation (m)

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



pH

Newfoundland Labrador

Deployment Period Statistics (pH Units)

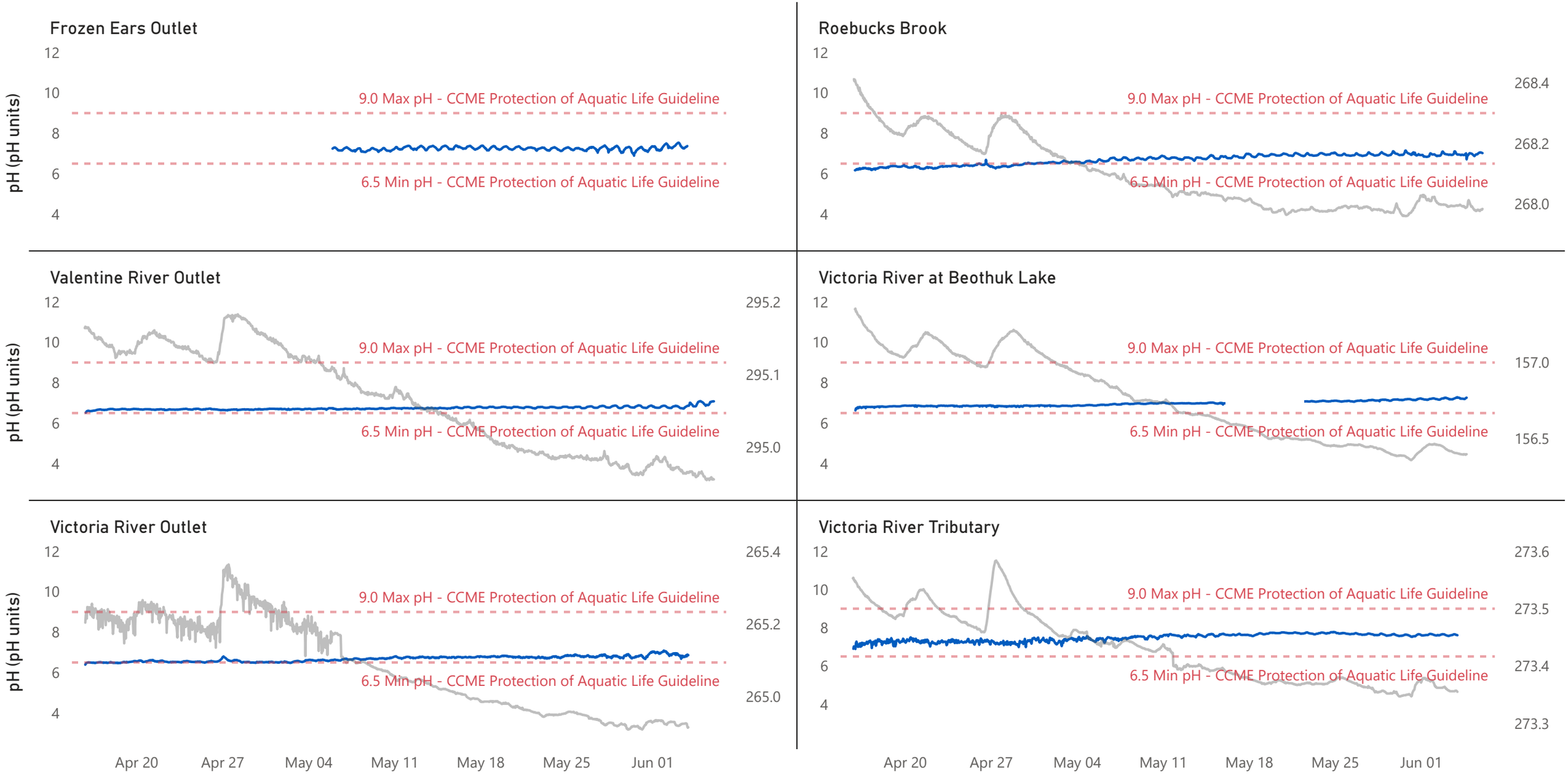
Station Name	Average	Median	Minimum	Maximum
Frozen Ears Outlet	7.25	7.25	6.89	7.54
Roebucks Brook	6.70	6.77	6.17	7.15
Valentine River Outlet	6.74	6.73	6.52	7.09
Victoria River at Beothuk Lake	6.96	6.93	6.63	7.28
Victoria River Outlet	6.68	6.70	6.39	7.09
Victoria River Tributary	7.48	7.54	6.89	7.78

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. Median pH values were similar across all stations, except slightly higher and more alkaline at Frozen Ears Outlet and Victoria River Tributary. This may be influenced by natural factors such as localized geology or groundwater inputs, or potentially by industrial activities associated with the nearby mine site.

pH at most stations remained within the CCME Guidelines for the Protection of Aquatic Life throughout the deployment period, except for Roebucks Brook and a very brief dip below 6.5 pH units at Victoria River Outlet. pH values were slightly under the minimum guideline value of 6.5 pH units at Roebucks Brook and Victoria River Outlet at the beginning of the deployment, but drifted above the minimum value and stayed within the guidelines throughout the remainder of the deployment.

pH Station Graphs



Specific Conductivity

Newfoundland Labrador

Deployment Period Statistics (µS/cm)

Station Name	Average	Median	Minimum	Maximum
Frozen Ears Outlet	51.29	53.10	43.50	58.60
Roebucks Brook	21.44	20.35	15.44	36.65
Valentine River Outlet	23.09	22.90	20.70	26.52
Victoria River at Beothuk Lake	14.86	13.68	11.01	23.87
Victoria River Outlet	25.21	24.90	20.55	37.61
Victoria River Tributary	78.35	77.37	22.78	136.97

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 low and stable at Roebucks Brook, Valentine River Outlet, Victoria River at Beothuk Lake, and Victoria River Outlet. In contrast, Victoria River Tributary exhibited notably higher and more variable specific conductivity, with values increasing as water levels declined. This inverse relationship suggests influence from groundwater inputs or evaporative concentration during lower flows and may also reflect localized effects from nearby industrial activities at the mine site. Across all stations, a slight upward trend in conductivity corresponded with decreasing water elevation over the deployment period, consistent with evaporative concentration processes. As water levels decrease through evaporation, dissolved ions become more concentrated, resulting in elevated conductivity values.

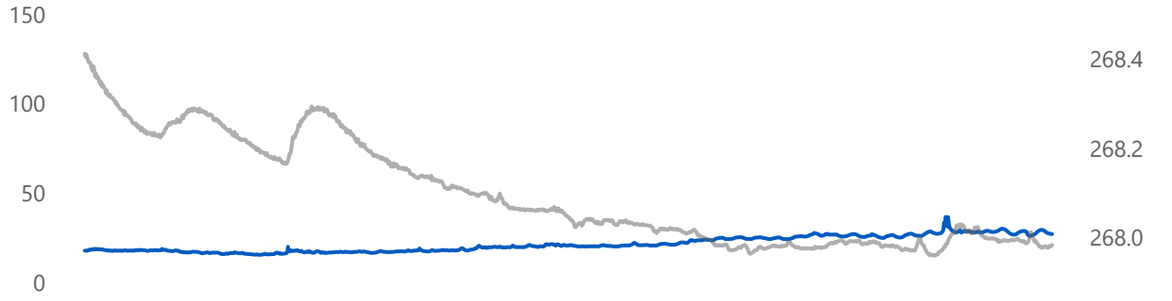
Around April 27, a distinct spike in conductivity was observed at Victoria River Outlet, coinciding with a temporary rise in water elevation, likely due to a precipitation event. The stations proximity to a large embankment may contribute to increased runoff entering the river near the sonde location. Additionally, the sonde is positioned within a soft, muddy substrate, making it more susceptible to disturbance during periods of elevated flow. These factors likely account for the short-term increases in conductivity observed during water level rises, as surface runoff introduces additional dissolved ions into the water column.

Specific Conductivity Station Graphs

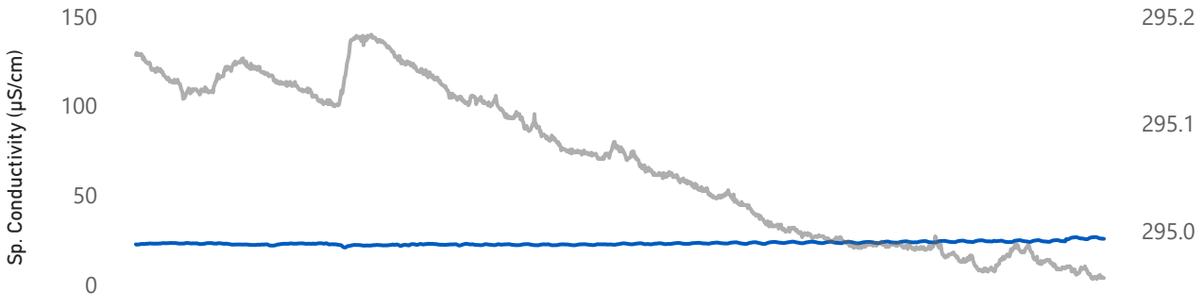
Specific Conductivity (µS/cm) Water Elevation (m)

Frozen Ears Outlet

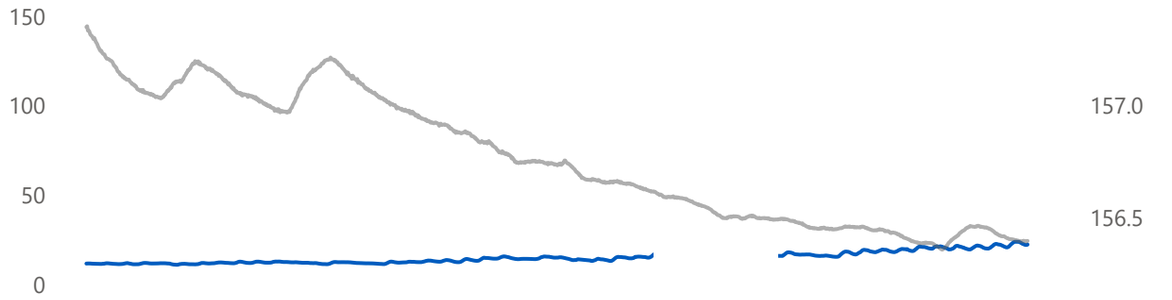
Roebucks Brook



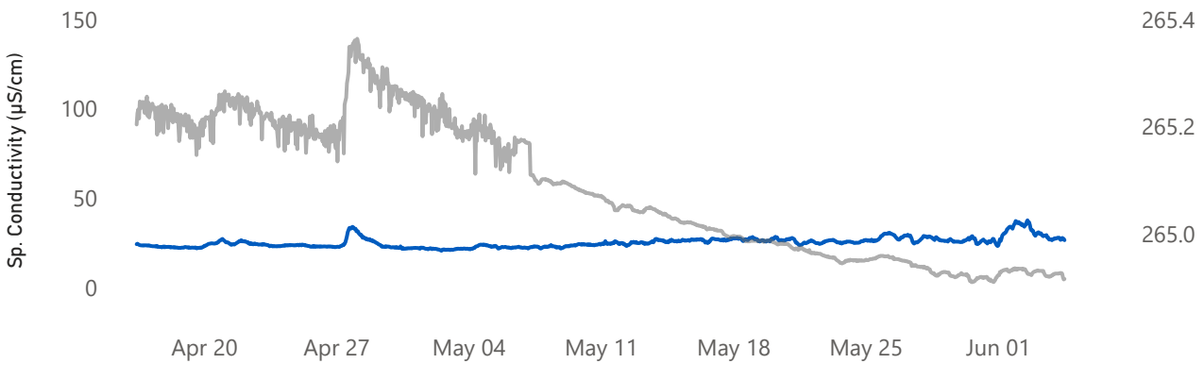
Valentine River Outlet



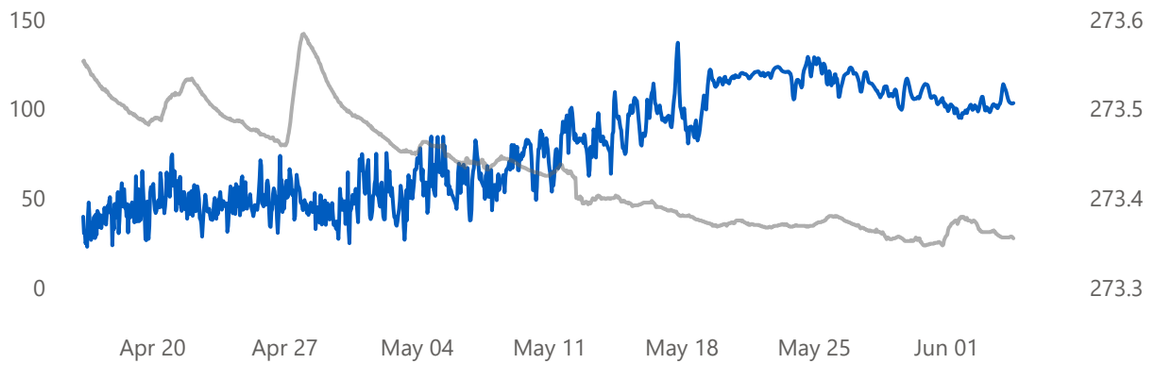
Victoria River at Beothuk Lake



Victoria River Outlet



Victoria River Tributary



Dissolved Oxygen

Newfoundland Labrador

Deployment Period Statistics

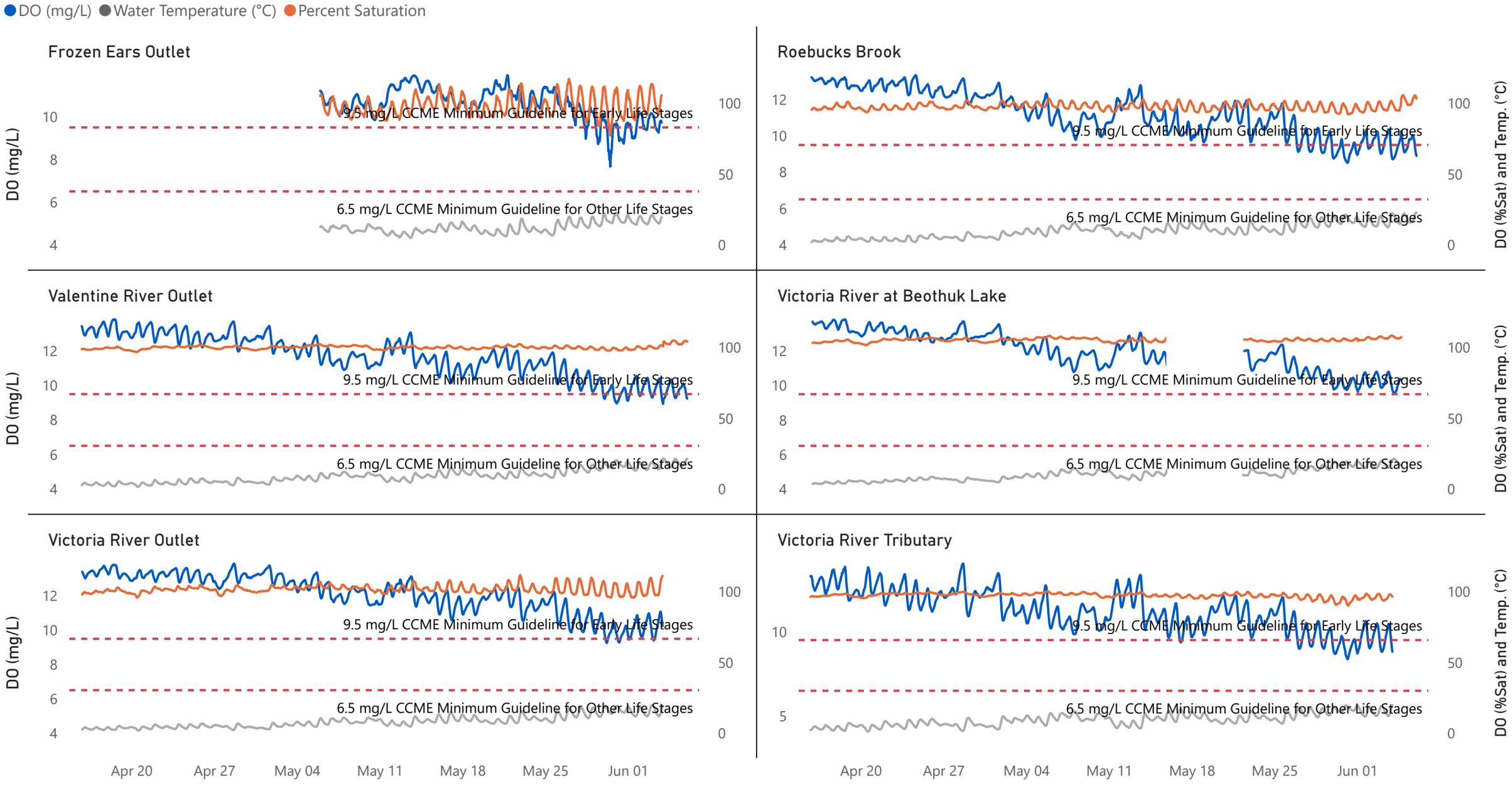
Station Name	Average (mg/L)	Average (% Sat.)	Median (mg/L)	Median (% Sat.)	Minimum (mg/L)	Minimum (% Sat.)	Maximum (mg/L)	Maximum (% Sat.)
Frozen Ears Outlet	10.58	98.34	10.63	97.20	7.66	77.30	11.95	117.40
Roebucks Brook	11.23	97.70	11.17	97.40	8.51	92.30	13.35	105.80
Valentine River Outlet	11.67	100.13	11.74	100.10	8.93	96.70	13.84	105.00
Victoria River at Beothuk Lake	12.02	105.42	12.11	105.50	9.58	101.70	13.85	108.50
Victoria River Outlet	12.11	101.80	12.27	101.60	9.25	95.80	13.89	111.80
Victoria River Tributary	11.26	97.41	11.26	97.80	8.37	90.20	14.03	100.30

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.

Throughout the deployment period, daily fluctuations in DO concentrations were observed at all stations, primarily influenced by temperature variation and the photosynthetic/respiratory activity of aquatic plants. A gradual decrease in DO concentrations was evident across all stations, corresponding with rising water temperatures. This inverse relationship between DO and temperature is clearly illustrated in the station graphs on the following page.

Throughout the monitoring period, DO concentrations remained above the CCME guideline for the protection of other life stages (6.5 mg/L). Values generally stayed above the guideline for early life stages (9.5 mg/L) for most of the deployment but drifted below this minimum value toward the end of the period, which is expected as water temperatures increase and hold less DO.

Dissolved Oxygen Station Graphs



Turbidity

Deployment Period Statistics (NTU)				
Station Name	**Average**	**Median**	**Minimum**	**Maximum**
Frozen Ears Outlet	**5.13**	**4.27**	**0.61**	**12.70**
Roebucks Brook	**4.16**	**2.92**	**0.92**	**101.12**
Valentine River Outlet *	**0.27**	**0.28**	**0.00**	**0.59**
Victoria River at Beothuk Lake	**0.74**	**0.77**	**0.32**	**1.37**
Victoria River Outlet *	**1.06**	**1.14**	**0.00**	**3.74**
Victoria River Tributary	**1.45**	**1.12**	**0.32**	**7.11**

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.

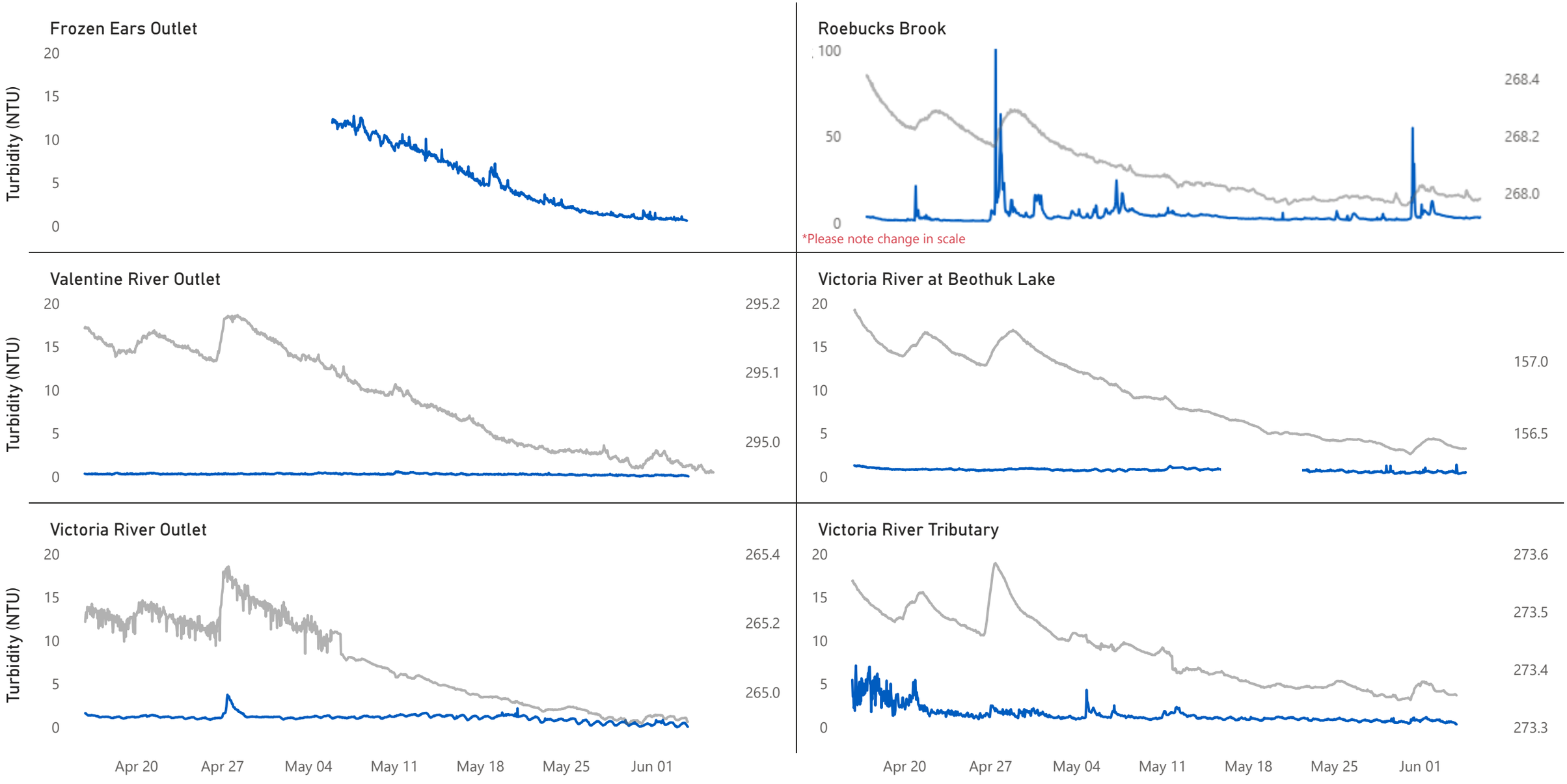
During the deployment period, turbidity generally remained low across all stations, reflecting clear and pristine water conditions. Increases in water elevation caused by precipitation events led to temporary turbidity spikes, which typically returned to baseline levels within a few days. Median turbidity values were similar across stations, except slightly higher at Roebucks Brook and Frozen Ears Outlet. The elevated background turbidity and occasional spikes at Roebucks Brook are likely due to the sonde being positioned downstream of a bridge crossing a dirt access road. These spikes correspond with runoff from the road during high water events, but values generally return to baseline shortly thereafter. Background values were higher at Frozen Ears Outlet, likely due to the sonde's placement at the lake outlet, where suspended particles flow from the lake and may temporarily increase turbidity values following frequent precipitation events.

*A correction factor was applied to the turbidity data at the Valentine River Outlet and Victoria River Outlet stations to account for negative turbidity values recorded during the deployment. While the corrected values may not represent true turbidity concentrations, the data remain suitable for assessing overall trends and relationships with other water quality parameters. A correction factor of +0.21 NTU was applied to the Victoria River Outlet turbidity data, and +0.68 NTU was applied to the Valentine River Outlet turbidity data.

Turbidity Station Graphs

Newfoundland Labrador

● Turbidity (NTU) ● Water Elevation (m)



Water Elevation

Newfoundland Labrador

Deployment Period Statistics (m)

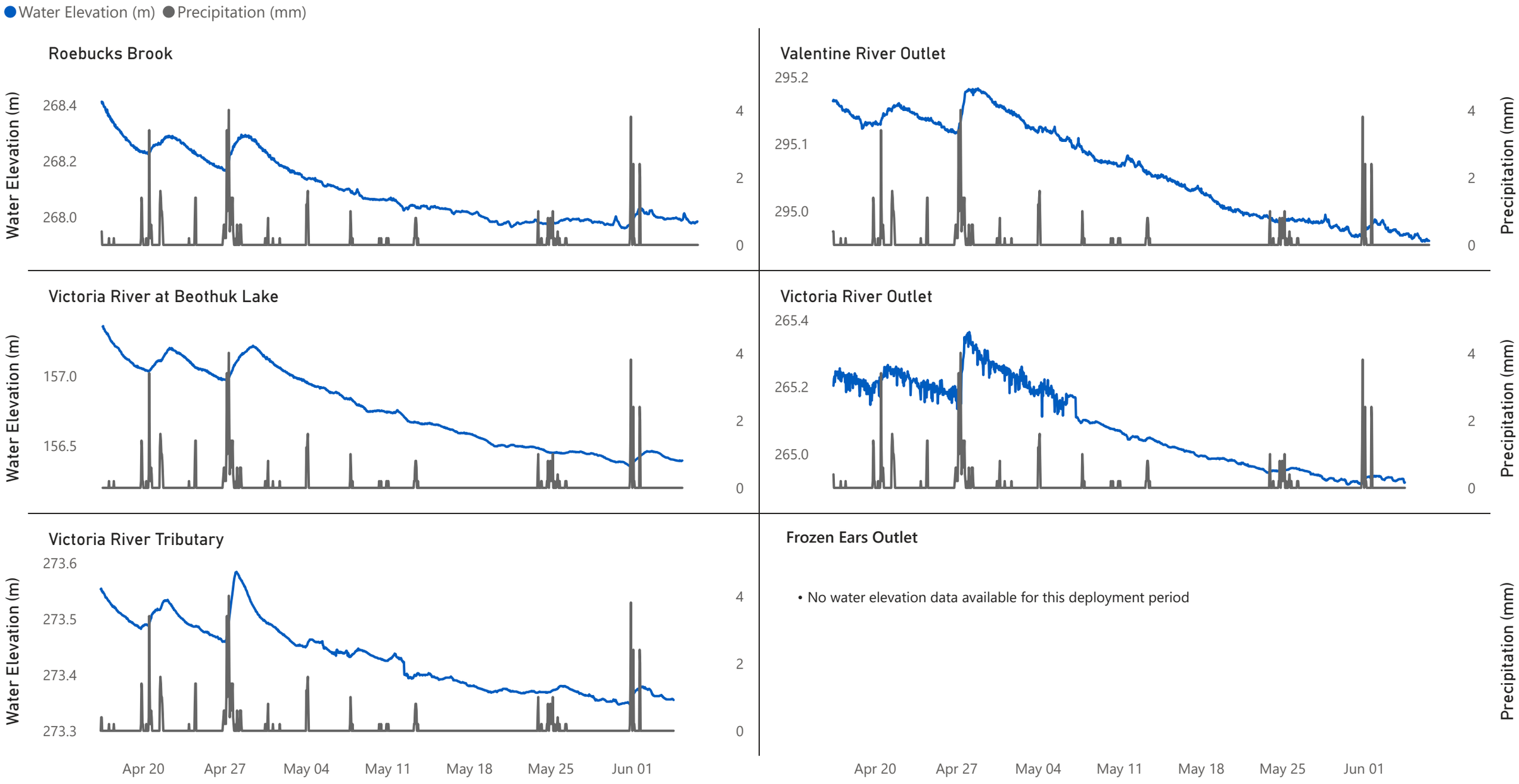
Station Name	Minimum	Maximum	Average	Median
Roebucks Brook	267.96	268.41	268.10	268.05
Valentine River Outlet	294.96	295.18	295.06	295.07
Victoria River at Beothuk Lake	156.36	157.36	156.76	156.74
Victoria River Outlet	264.91	265.36	265.09	265.07
Victoria River Tributary	273.35	273.58	273.43	273.43

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 fluctuated and exhibited a decreasing trend throughout the deployment period. The decreasing trend is likely the result of rising air temperatures causing increased evaporation from the water column, combined with limited rainfall to replenish the system. The station graphs on the following page demonstrates the effect of precipitation events on elevation, showing distinct elevation spikes occurring during or shortly after rainfall.

There is no water elevation data for Frozen Ears Outlet station for this deployment period.

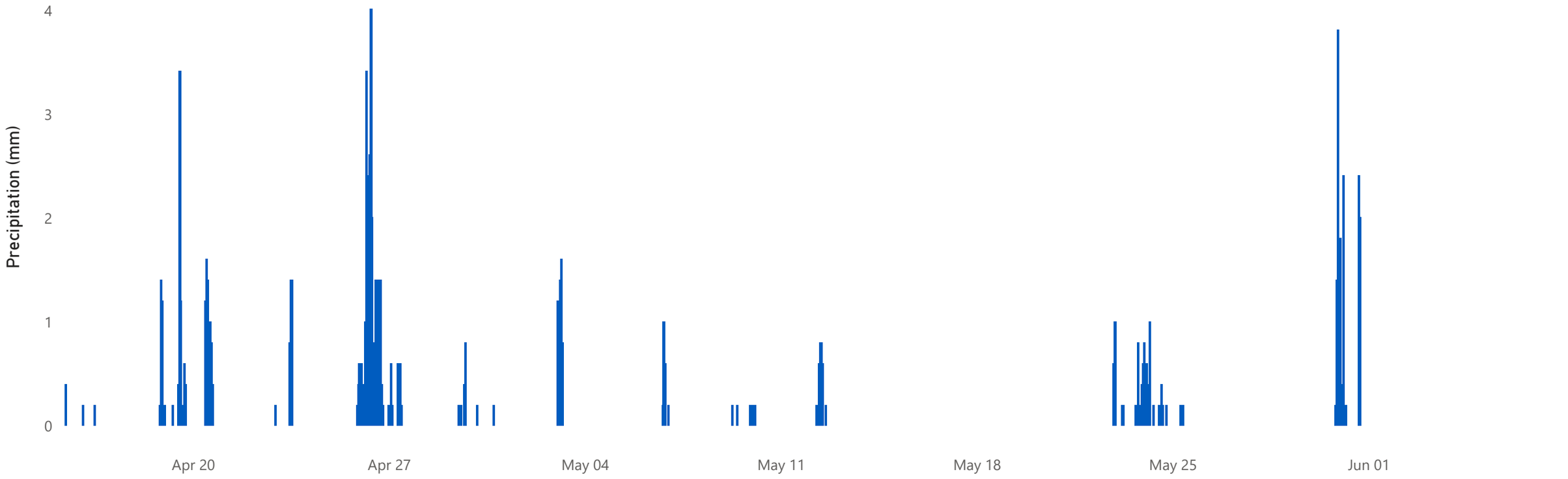
Water Elevation Station Graphs



Precipitation Data

Retrieved from the Valentine Gold Project MET Station

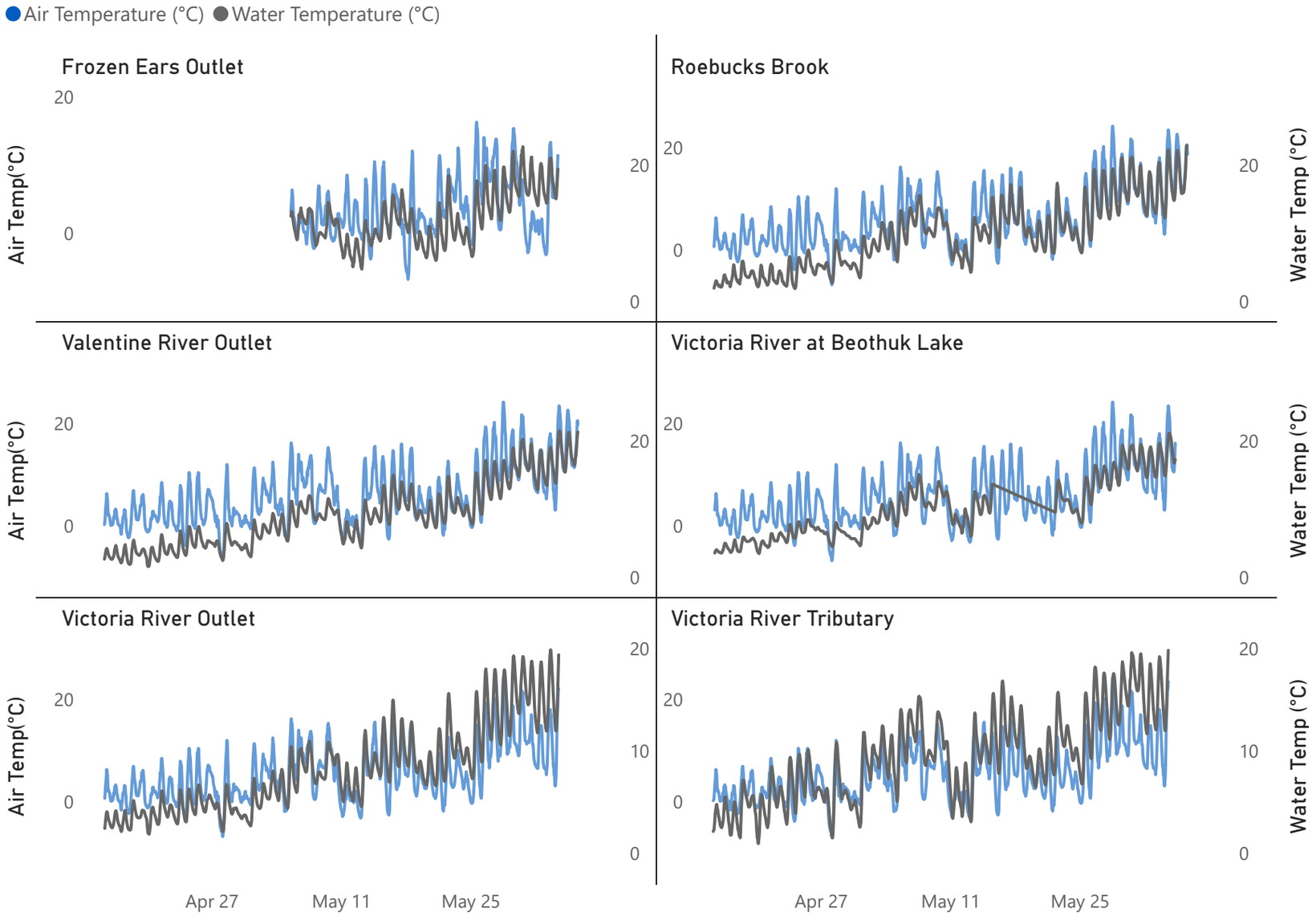
0.08	0.00	0.00	4.02	90.65
Average (mm/hr)	Minimum (mm/hr)	Median (mm/hr)	Maximum (mm/hr)	Total Precip. (mm)

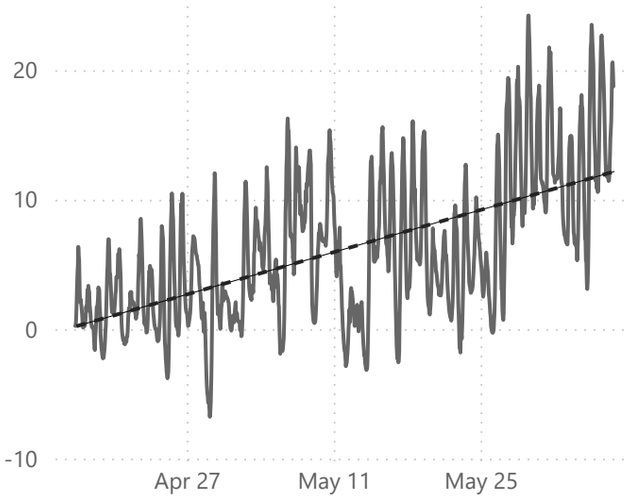


Air Temperature Data

Retrieved from the Valentine Gold Project MET Station

Newfoundland Labrador





5.98	5.24
Average (°C)	Median (°C)
-6.78	24.22
Minimum (°C)	Maximum (°C)