Real-Time Water Quality Deployment Report

Voisey's Bay Network

September 13 to October 26, 2022

Newfoundland Labrador

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

Contents

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Real Time Water Quality Monitoring

Staff with the Department of Environment and Climate Change monitor the real-time web pages regularly.

This deployment report discusses water quality related events occurring at four stations in the Voisey's Bay Network: Reid Brook at Outlet to Reid Pond; Camp Pond Brook below Camp Pond; Tributary to Reid Brook; and Reid Brook below Tributary.

On September 13, 2022, Vale Environment staff deployed real-time water quality monitoring instruments at the four real-time stations in the Voisey's Bay network. Instruments were removed by Vale Environment Staff on October 26, 2022. This was the third and final deployment for the 2022 season.

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. This procedure is based on the approach used by the United States Geological Survey.

At deployment and removal, a QA/QC instrument is temporarily deployed adjacent to the field instrument. 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 instrument and QA/QC instrument at deployment and at removal, a qualitative statement is made about the data quality (Table 1).

Table 1: Ranking classifications for deployment and removal

	Rank				
Parameter	**Excellent**	**Good**	**Fair**	**Marginal**	**Poor**
Temperature (oC)	<=+/-0.2	>+/-0.2 to 0.5	>+/-0.5 to 0.8	>+/-0.8 to 1	<+/-1
pH (unit)	<=+/-0.2	>+/-0.2 to 0.5	>+/-0.5 to 0.8	>+/-0.8 to 1	>+/-1
Sp. Conductance (µS/cm)	<=+/-3	>+/-3 to 10	>+/-10 to 15	>+/-15 to 20	>+/-20
Sp. Conductance > 35 µS/cm (%)	<=+/-3	>+/-3 to 10	>+/-10 to 15	>+/-15 to 20	>+/-20
Dissolved Oxygen (mg/l) (% Sat)	<=+/-0.3	>+/-0.3 to 0.5	>+/-0.5 to 0.8	>+/-0.8 to 1	>+/-1
Turbidity <40 NTU (NTU)	<=+/-2	>+/-2 to 5	>+/-5 to 8	>+/-8 to 10	>+/-10
Turbidity > 40 NTU (%)	<=+/-5	>+/-5 to 10	>+/-10 to 15	>+/-15 to 20	>+/-20

It should be noted that the temperature sensor on any instrument is the most important. All other parameters can be broken down into three groups: temperature dependent; temperature compensated; and temperature independent. Because the temperature sensor is not isolated from the rest of the instrument, the entire instrument must be at the same temperature before the 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.

Deployment and removal comparison rankings for the Voisey's Bay Network stations are summarized in Table 2.

Table 2: Comparison rankings for Voisey's Bay Network stations

Station Voisey's Bay	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Reid Brook at Outlet	September 13	Deployment	Poor	Excellent	Excellent	Fair	Good
	October 26	Removal	Cannot Rank	Cannot Rank	Cannot Rank	Cannot Rank	Cannot Rank
Camp Pond Brook	September 13	Deployment	Excellent	Excellent	Excellent	Good	Excellent
	October 26	Removal	Cannot Rank	Cannot Rank	Cannot Rank	Cannot Rank	Cannot Rank
Reid Brook below Tributary	September 13	Deployment	Poor	Excellent	Good	Good	Fair
	October 26	Removal	Cannot Rank	Cannot Rank	Cannot Rank	Cannot Rank	Cannot Rank
Tributary to Reid Brook	September 13	Deployment	Excellent	Good	Excellent	Good	Good
	October 26	Removal	Cannot Rank	Cannot Rank	Cannot Rank	Cannot Rank	Cannot Rank

Reid Brook at Outlet of Reid Pond

- At deployment, pH and conductivity were 'excellent', turbidity was 'good', dissolved oxygen was 'fair' and temperature was 'poor'. This discrepancy is likely due to the field sonde not being given sufficient time to acclimate to its environment, or not being placed in close enough proximity to the field sonde.
- Rankings are not available for removal because of a failure with the handheld computer.

Camp Pond Brook below Camp Pond

- At deployment, all parameters ranked as either 'excellent' or 'good'.
- Rankings are not available for removal because of a failure with the handheld computer.

Reid Brook below Tributary

- At deployment, pH was 'excellent', conductivity and dissolved oxygen were 'good', turbidity was 'fair' and temperature was 'poor'. This discrepancy is likely due to the field sonde not being given sufficient time to acclimate to its environment, or not being placed in close enough proximity to the field sonde.
- Rankings are not available for removal because of a failure with the handheld computer.

Tributary to Reid Brook

- At deployment, all parameters ranked as either 'excellent' or 'good'.
- Rankings are not available for removal because of a failure with the handheld computer.

It is important to note that, in general, there are several conditions under which a less than ideal QA/QC ranking may be obtained. These include, but are not limited to: placement of the QA/QC sonde in relation to the field sonde; the amount of time each sonde is given to stabilize before readings are recorded; and deteriorating performance of one or more of the sensors.

Data Interpretation

The following graphs and discussion illustrate significant water quality-related events from September 13th to October 26th, 2022 in the Voisey's Bay Real-Time Water Quality Monitoring Network.

With the exception of water quantity data (stage and flow), all data used in the preparation of the graphs and subsequent discussion below adhere to stringent QA/QC protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

Figure 1: Voisey's Bay Network Station Locations

Reid Brook at Outlet of Reid Pond

Water Temperature

Over the deployment period, water temperature ranged from 5.67°C to 16.65°C, with a median value of 8.17°C (Figure 2). As evidenced in the graph below, air temperature fluctuates to a much greater extent each day compared to water temperature. Air temperature data was obtained from the Voisey's Bay airstrip weather station.

Water temperature slowly decreased over the course of the deployment period, as did air temperature. This water body takes longer to acclimatize to changes in temperature as it has a much larger surface area compared to the brooks at the other RTWQ stations in this network.

Please note the stage data used below is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request to WSC.

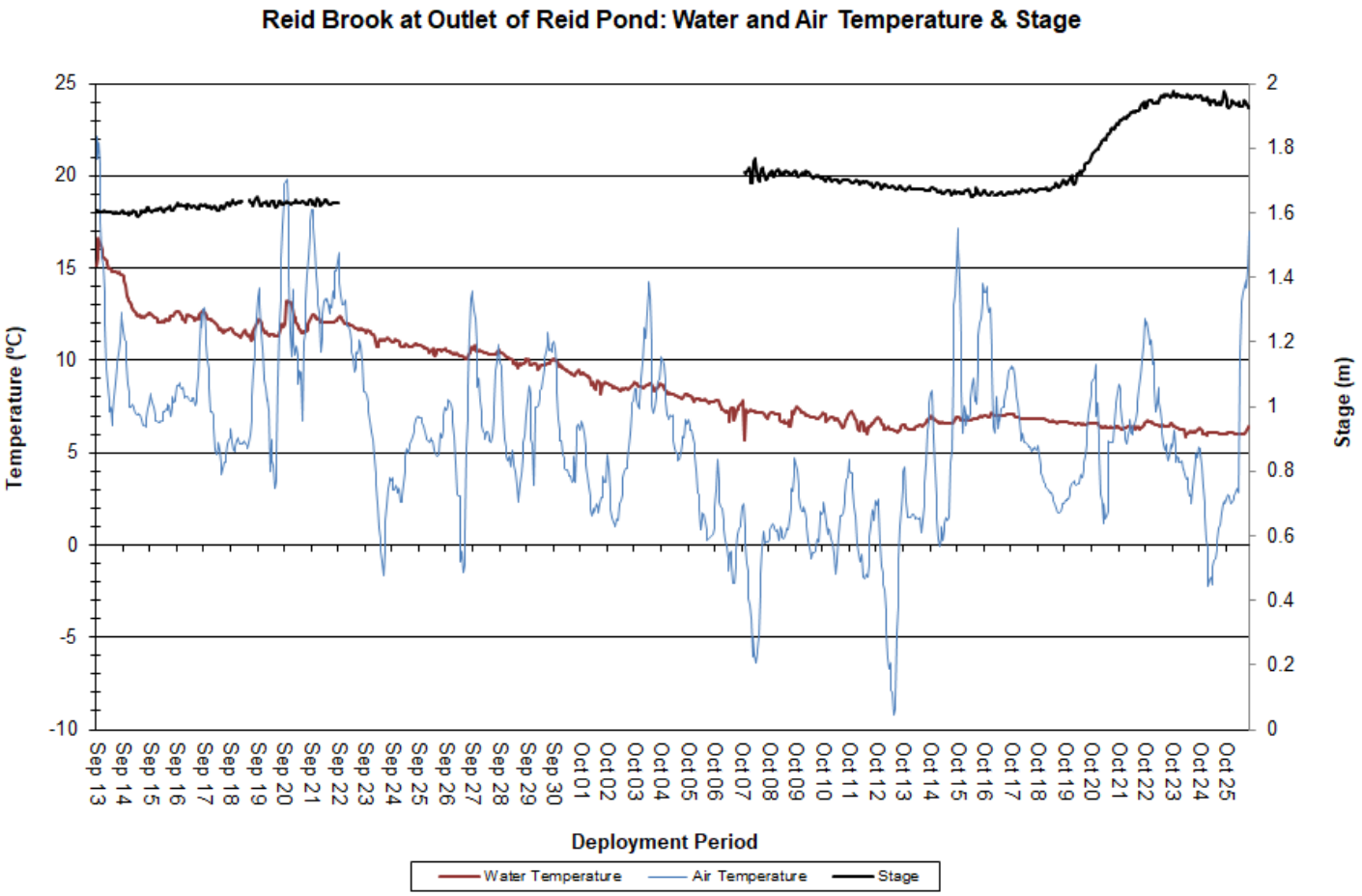

Figure 2: Water and Air Temperature & Stage at Reid Brook at Outlet of Reid Pond

pH

Over the deployment period, pH values ranged from 4.53 pH units to 6.75 pH units, with a median value of 6.15 pH units (Figure 3).

pH levels remained below the CCME's Minimum Guideline for the Protection of Aquatic Life for the majority of the deployment period. This is not unusual for this station.

Please note the stage data used below is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request to WSC.

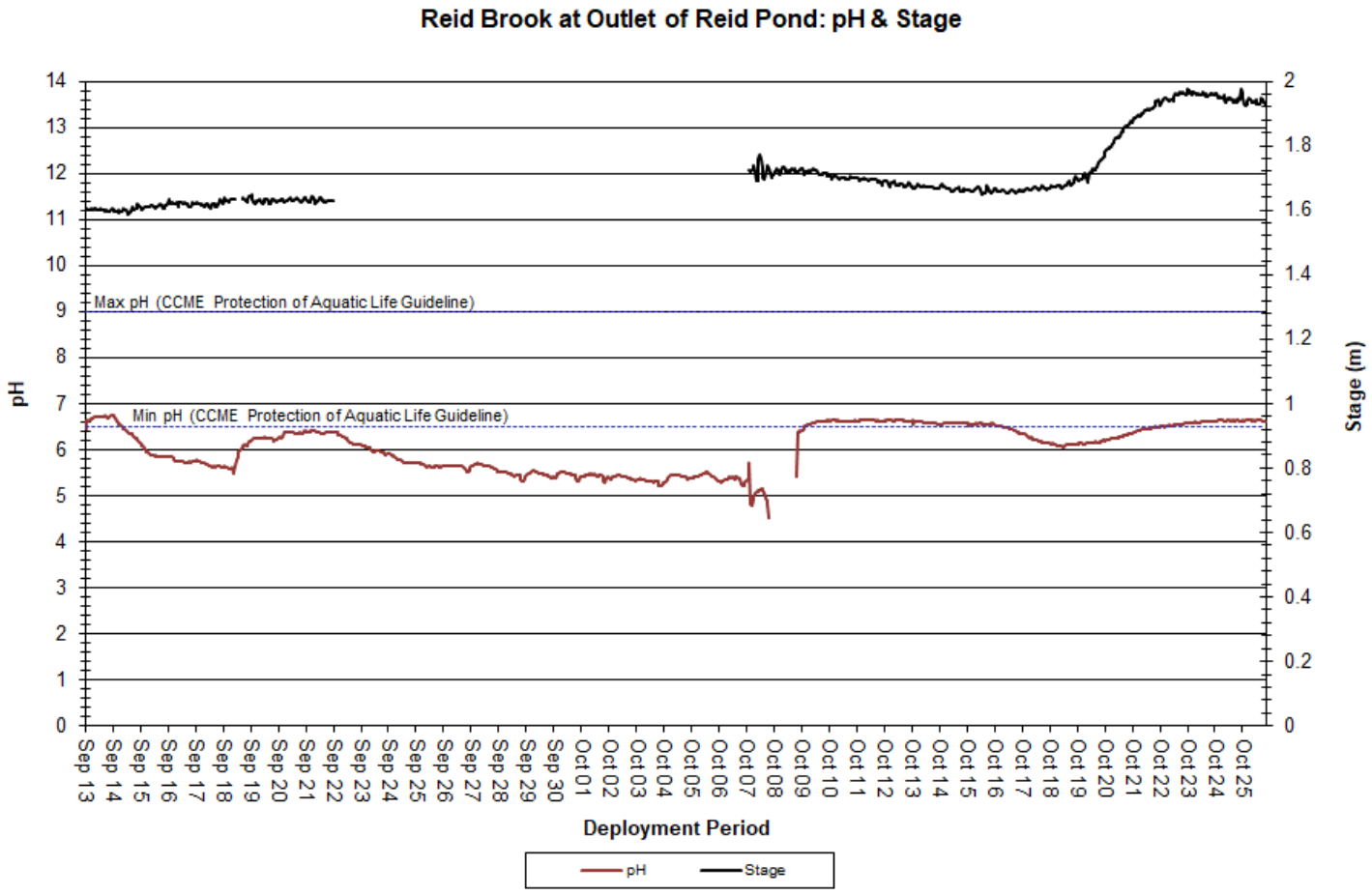

Figure 3: pH & Stage at Reid Brook at Outlet of Reid Pond

Specific Conductivity

Over the deployment period, specific conductivity levels ranged from 11.0µS/cm to 12.5µS/cm, with a median value of 12.0µS/cm. Conductivity at Reid Brook remained very stable across the deployment period. This is to be expected as this water body is pristine in nature and is far removed from any anthropogenic disturbances that could affect water quality.

The relationship between conductivity and stage level is generally inversed. When stage levels decrease, specific conductivity levels increase, as the decreased amount of water in the river system concentrates the solids that are present. Similarly, as stage levels rise, conductivity levels will dip in response. This relationship is not as evident at Reid Brook as it is at other stations in the Voisey's Bay network (Figure 4).

Please note the stage data used below is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request to WSC.

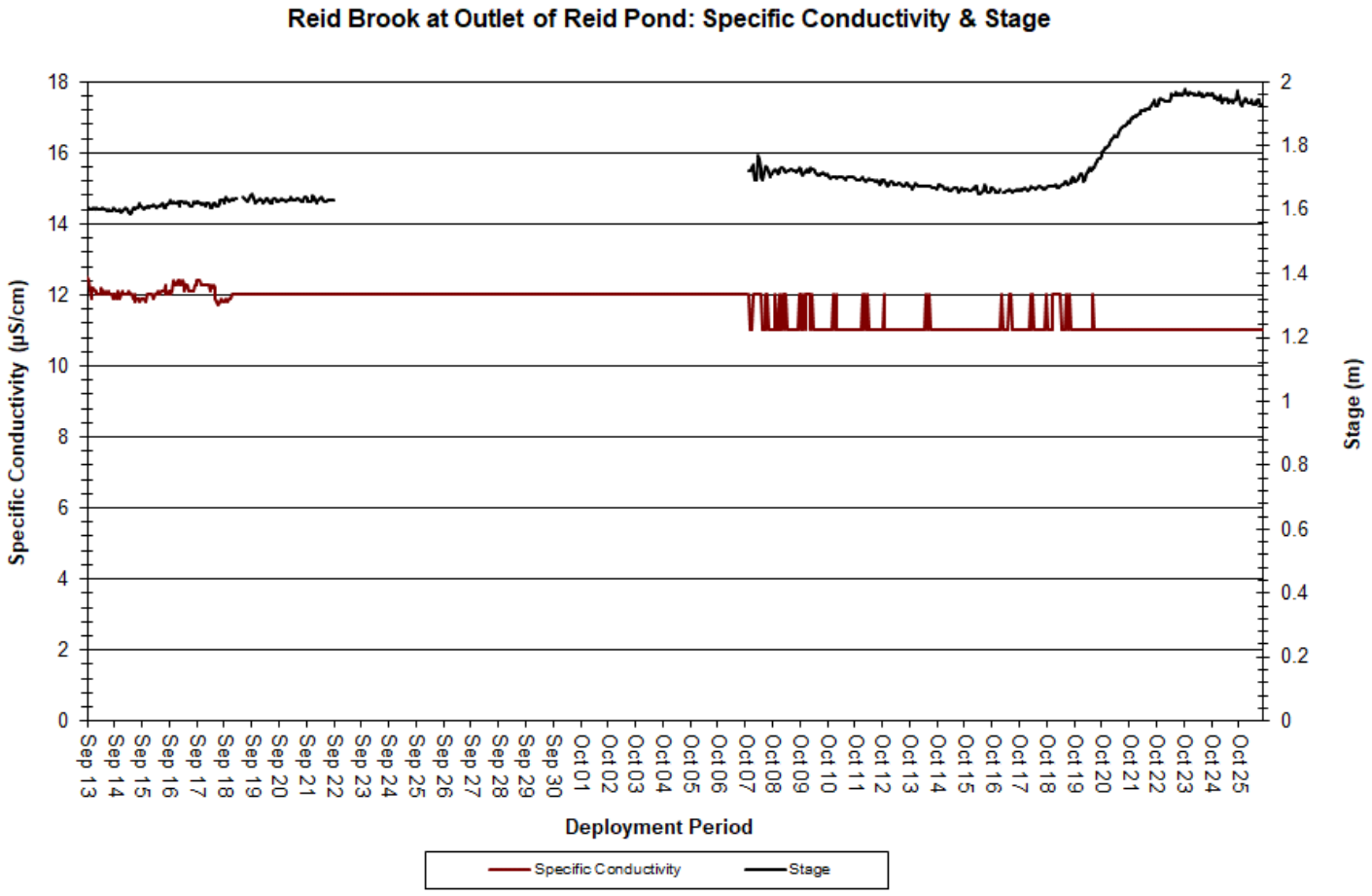

Figure 4: Specific Conductivity & Stage at Reid Brook at Outlet of Reid Pond

Dissolved Oxygen

Over the deployment period, dissolved oxygen concentration levels ranged from 10.22mg/L to 12.25mg/L, with a median value of 11.3mg/L. Percent saturation levels for dissolved oxygen ranged from 93.1% saturation to 107.1% saturation, with a median value of 95.4% saturation (Figure 5).

The water quality instrument measures dissolved oxygen concentration (mg/L) with a dissolved oxygen probe. The instrument then calculates percent saturation (% Sat) taking into account water temperature.

Dissolved oxygen concentration values remained above the CCME's Guidelines for the Protection of Early Life Stages (9.5 mg/L) and Other Life Stages (6.5 mg/L) for the duration of deployment. Dissolved oxygen concentrations were slowly increasing across the deployment period; this is not unexpected given that water temperatures were slowly decreasing across the same period. Dissolved oxygen concentrations are generally higher in water at lower temperatures, and vice versa.

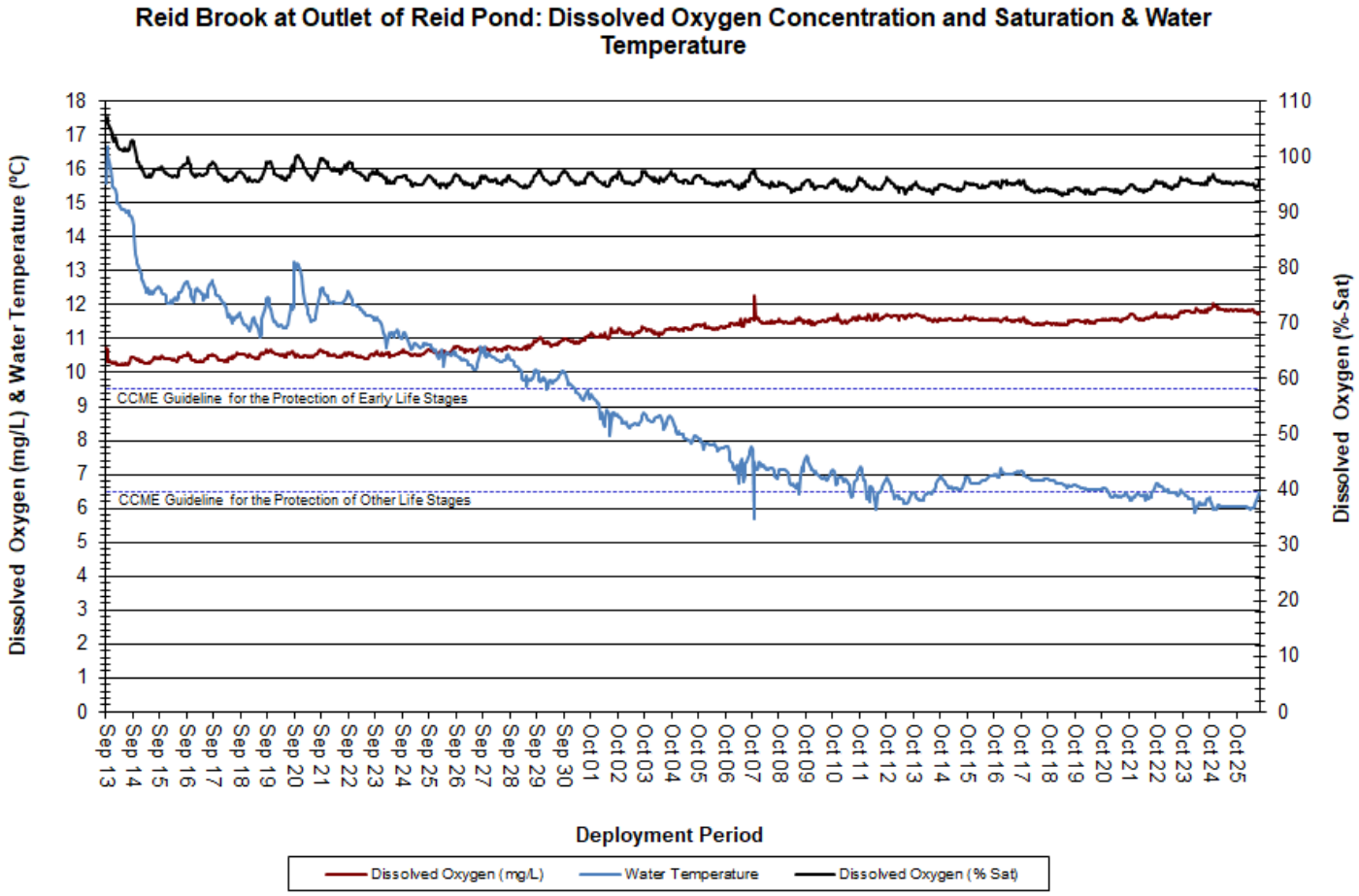

Figure 5: Dissolved Oxygen Concentration and Saturation & Water Temperature at Reid Brook at Outlet of Reid Pond

Turbidity

Over the deployment period, turbidity levels ranged from 0.0NTU to 1.4NTU, with a median value of 0.0NTU (Figure 6). This indicates that there was very little background turbidity at this station during deployment.

All water bodies have a natural level of turbidity. A significant increase in turbidity is of concern when monitoring water quality. Higher turbidity readings would normally be expected during heavy rainfall or runoff events. Generally, turbidity levels increase for a short period of time and then return to within a baseline range. Turbidity values can also increase when there is a decrease in water level, which causes natural material in the water body to become concentrated.

It is not unusual for this station to see very low turbidity levels, as it is pristine in nature and far removed from anthropogenic influences that may affect water quality.

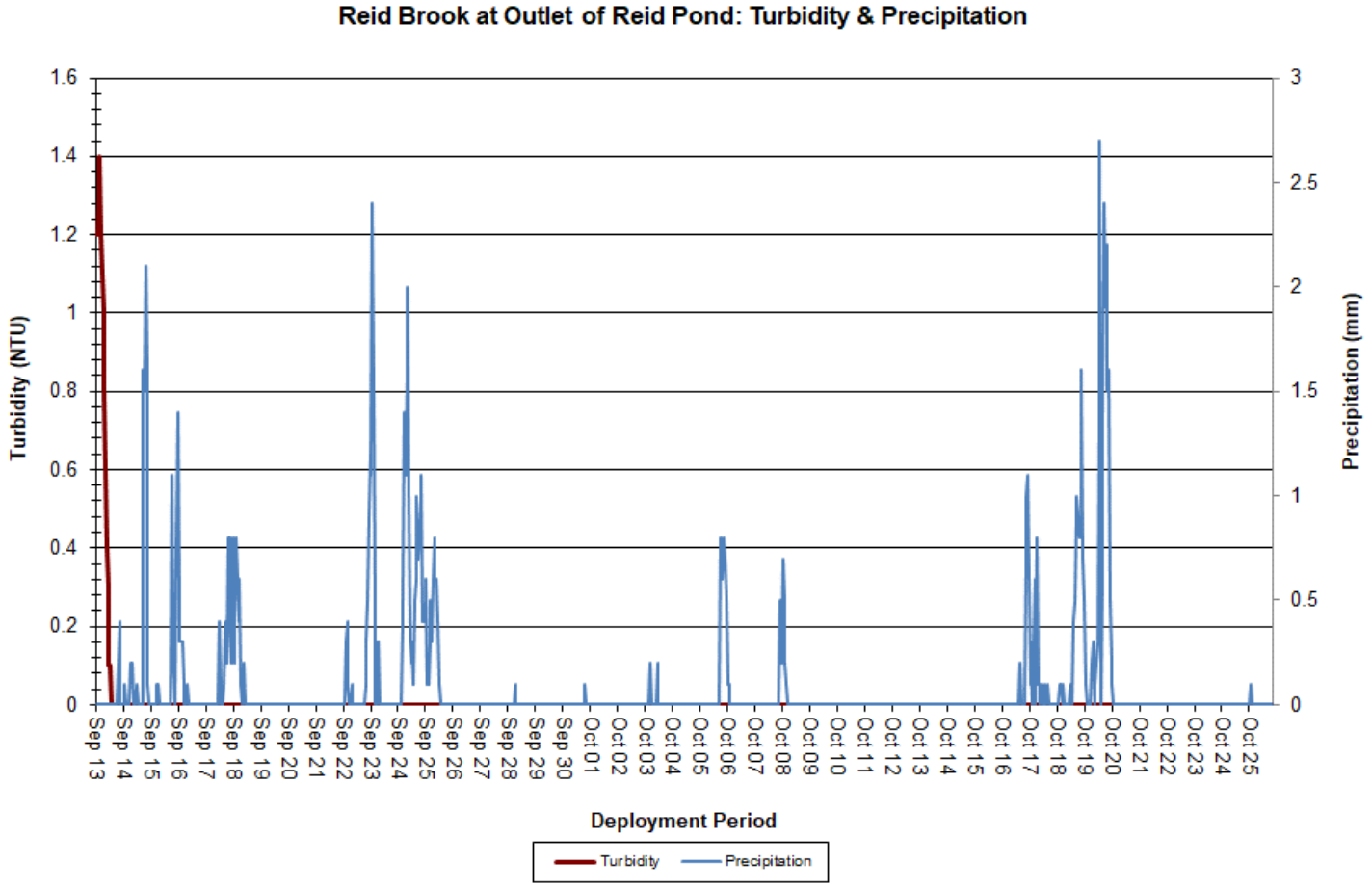

Figure 6: Turbidity & Precipitation at Reid Brook at Outlet of Reid Pond

Stage and Flow

Stage is an important parameter, as it provides an estimate of water level at a station and can explain some of the events that are occurring with other parameters (e.g. specific conductivity, DO, and turbidity). Stage will generally increase during rainfall events (Figure 7) and during any surrounding snow or ice melt; however, direct snowfall will not cause a significant increase in stage.

Over the deployment period, stage values ranged from 1.586m to 1.978m, with a median value of 1.674m. Flow values ranged from 0.419m^3/s to 3.126m^3/s, with a median value of 0.686m^3/s. Precipitation data was obtained from the Voisey's Bay airstrip weather station (Figure 7).

Please note the stage and flow data used below is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request to WSC.

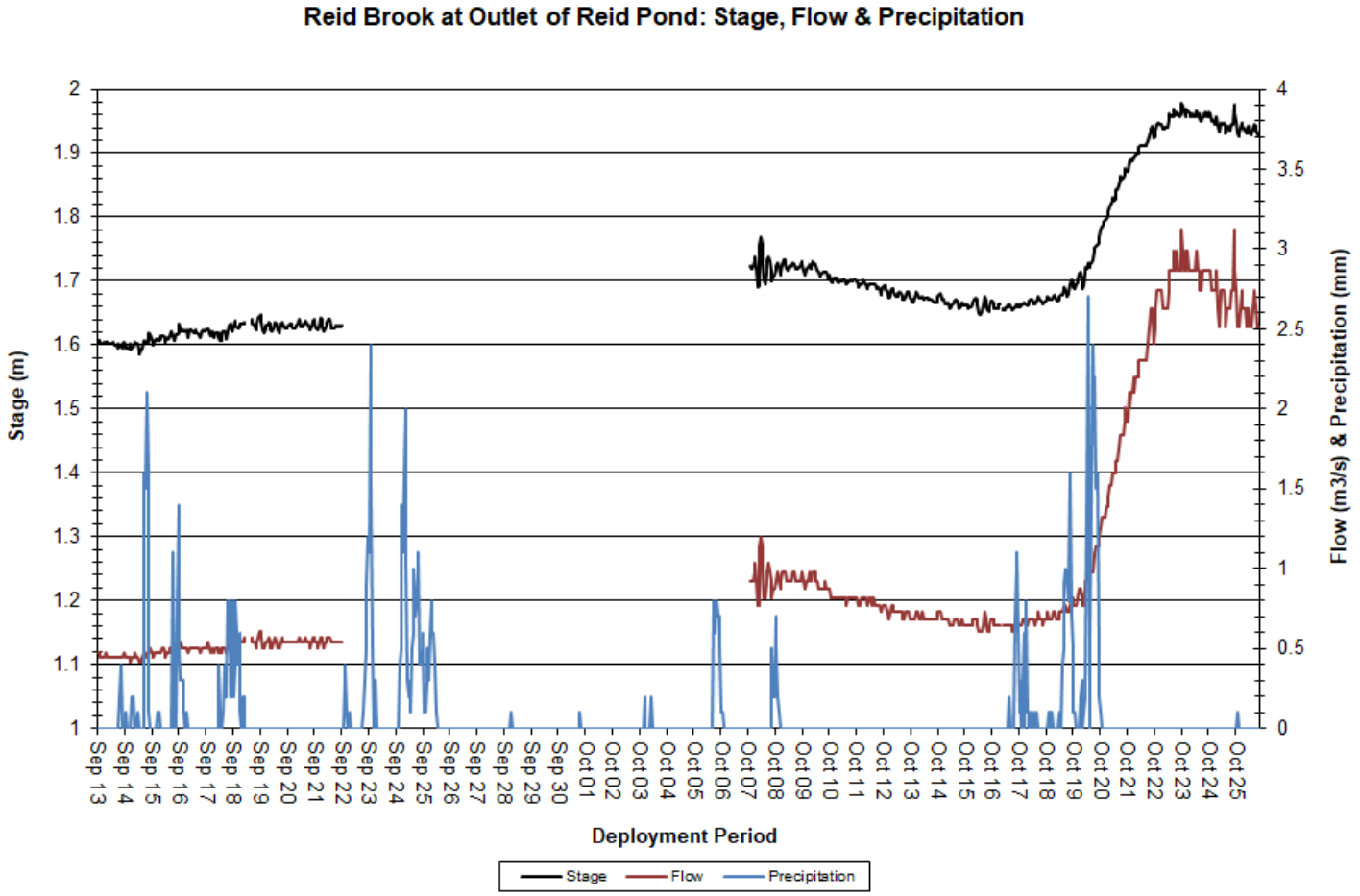

Figure 7: Stage, Flow & Precipitation at Reid Brook at Outlet of Reid Pond

Camp Pond Brook below Camp Pond

Water Temperature

Over the deployment period, water temperature ranged from 1.09°C to 15.11°C, with a median value of 6.03°C (Figure 8).

Water temperature at this station displays diurnal variations. Water temperature was variable, but steadily decreasing, over the course of deployment, and correlated closely with air temperatures across the same period (Figure 8). Air temperature data was obtained from the Voisey's Bay airstrip weather station.

Camp Pond Brook is sensitive to changes in ambient air temperature and fluctuates considerably depending on the weather and time of day. This station typically has the highest water temperatures and greatest fluctuations when compared to the other stations in the network.

Please note the stage data used below is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request to WSC.

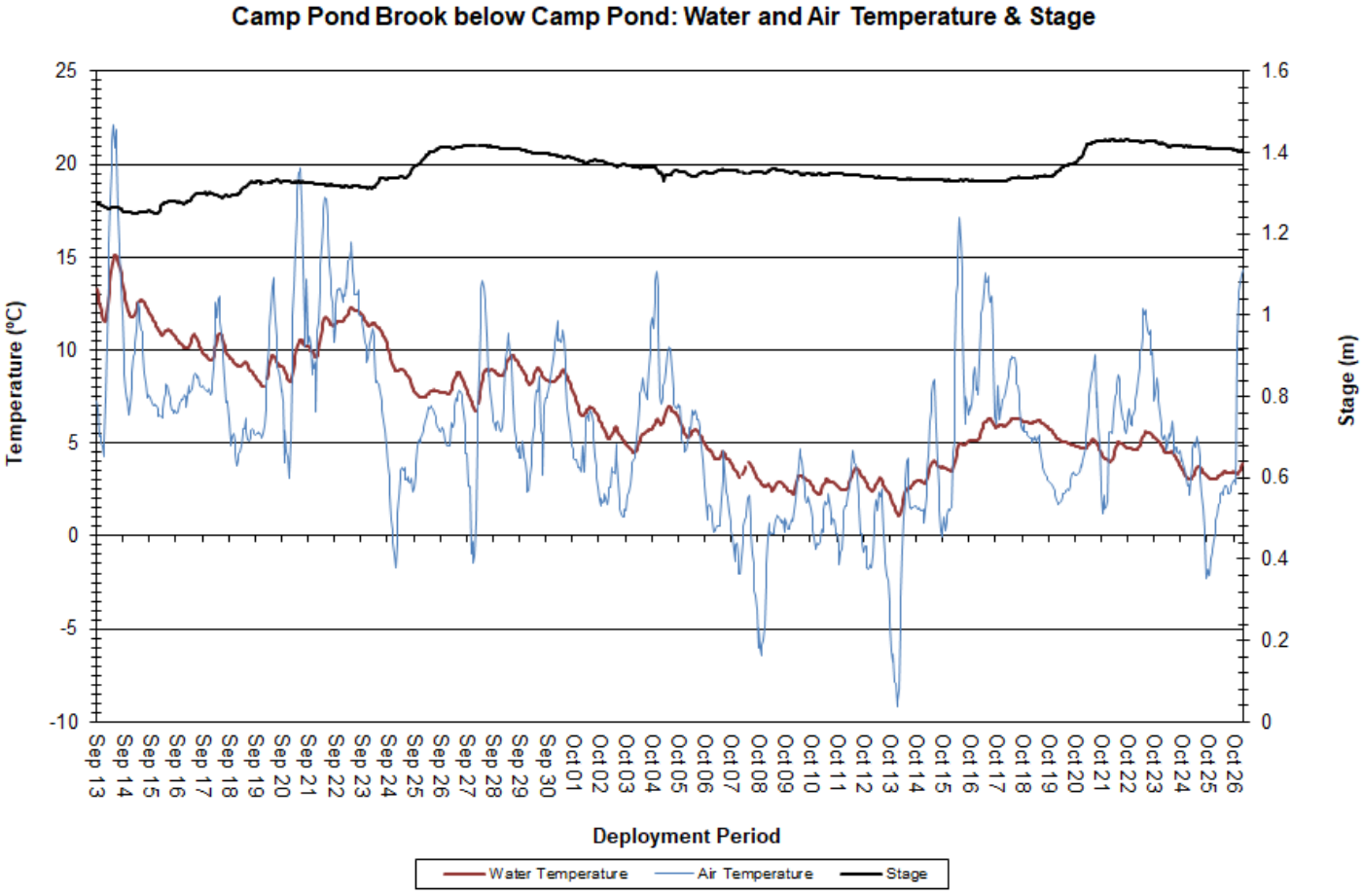

Figure 8: Water and Air Temperature & Stage at Camp Pond Brook below Camp Pond

pH

Over the deployment period, pH values ranged from 6.85 pH units to 7.53 pH units, with a median value of 7.25 pH units (Figure 9).

pH levels were relatively stable over the course of deployment, remaining within the CCME's Guidelines for the Protection of Aquatic Life for the duration of the deployment period.

Natural events such as rainfall and snow melt will alter the pH of a brook for a period of time - pH levels will decrease slightly during and after high stage levels. This is a natural process.

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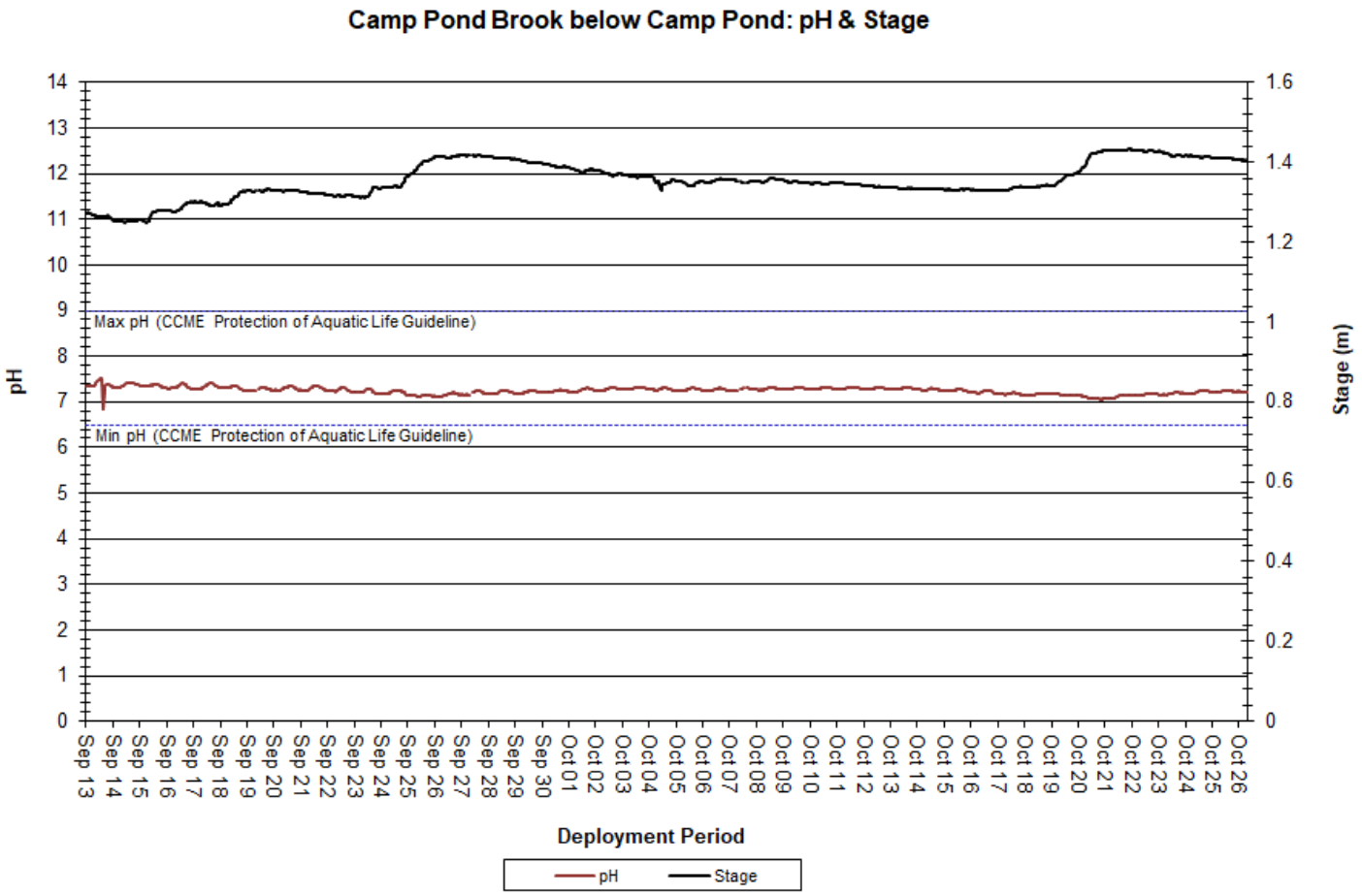

Figure 9: pH & Stage at Camp Pond Brook below Camp Pond

Specific Conductivity

Over the deployment period, specific conductivity ranged from 38.7µS/cm to 93.1µS/cm, with a median value of 45.5µS/cm (Figure 10).

Conductivity levels were variable across the deployment period as stage was similarly variable. A decrease in water level generally serves to concentrate suspended materials in the water column, in turn increasing specific conductivity (Figure 10). Sudden increases in stage also typically correspond with sudden temporary increases in specific conductivity at this station, which is evident in the graph below.

Please note the stage data used below is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request to WSC.

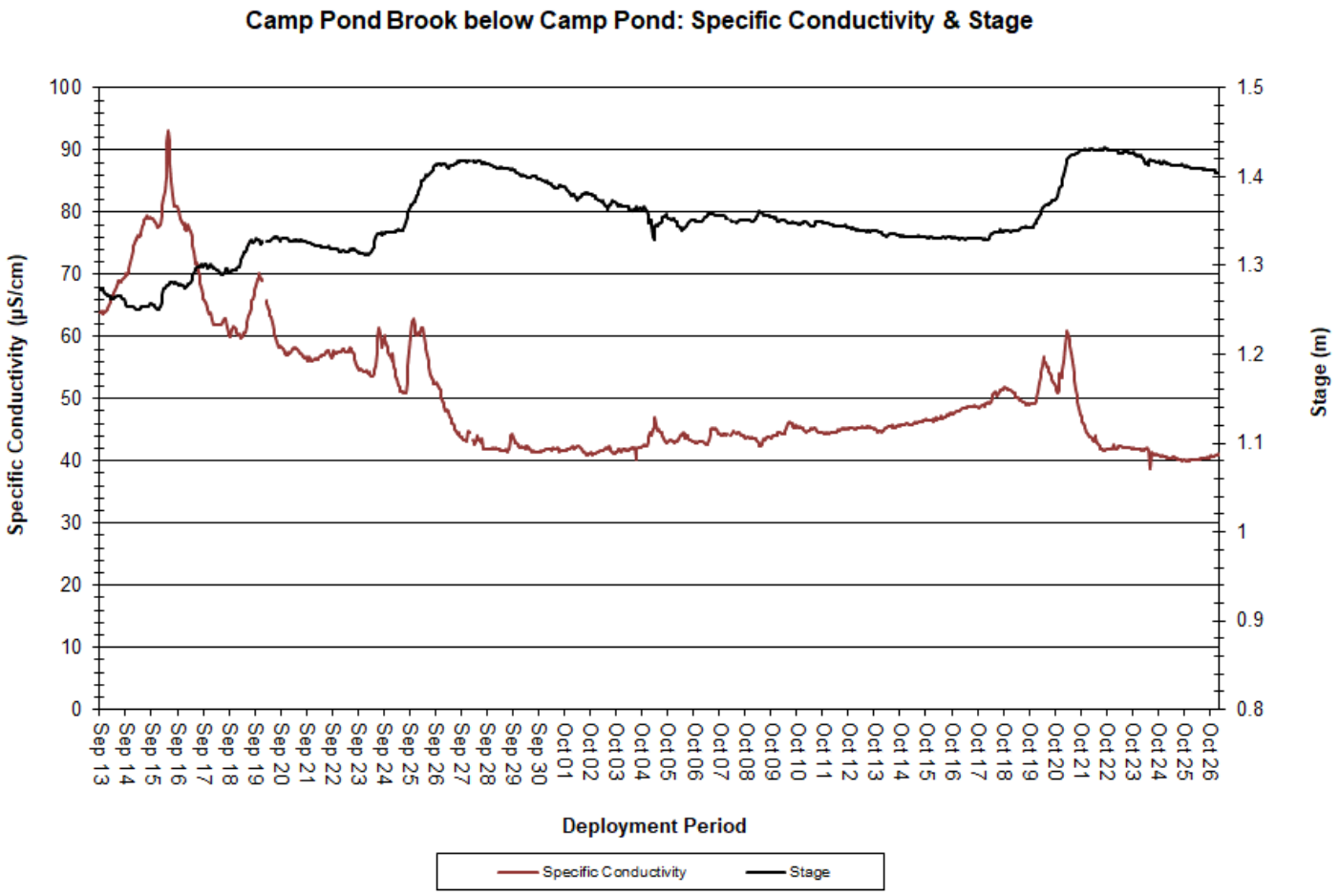

Figure 10: Specific Conductivity & Stage at Camp Pond Brook below Camp Pond

Dissolved Oxygen

Over the deployment period, dissolved oxygen concentration ranged from 0mg/L to 14.81mg/L, with a median value of 9.46mg/L. Saturation of dissolved oxygen ranged from -4.8% saturation to 117.1% saturation, with a median value of 85.9% (Figure 11).

Dissolved oxygen concentrations were increasing across the beginning of the deployment period, as water temperatures were decreasing across the same period. This observation is to be expected as water temperature directly influences the level of dissolved oxygen present in the water column; as water temperatures increase, dissolved oxygen concentrations decrease, and vice versa.

Very low dissolved oxygen levels from October 7th onwards are not characteristic of this station and likely indicate a lack of power available to the field sonde.

Dissolved oxygen concentrations were above the CCME's Guidelines for the Protection of Early and Other Life Stages for the duration of deployment (Figure 11).

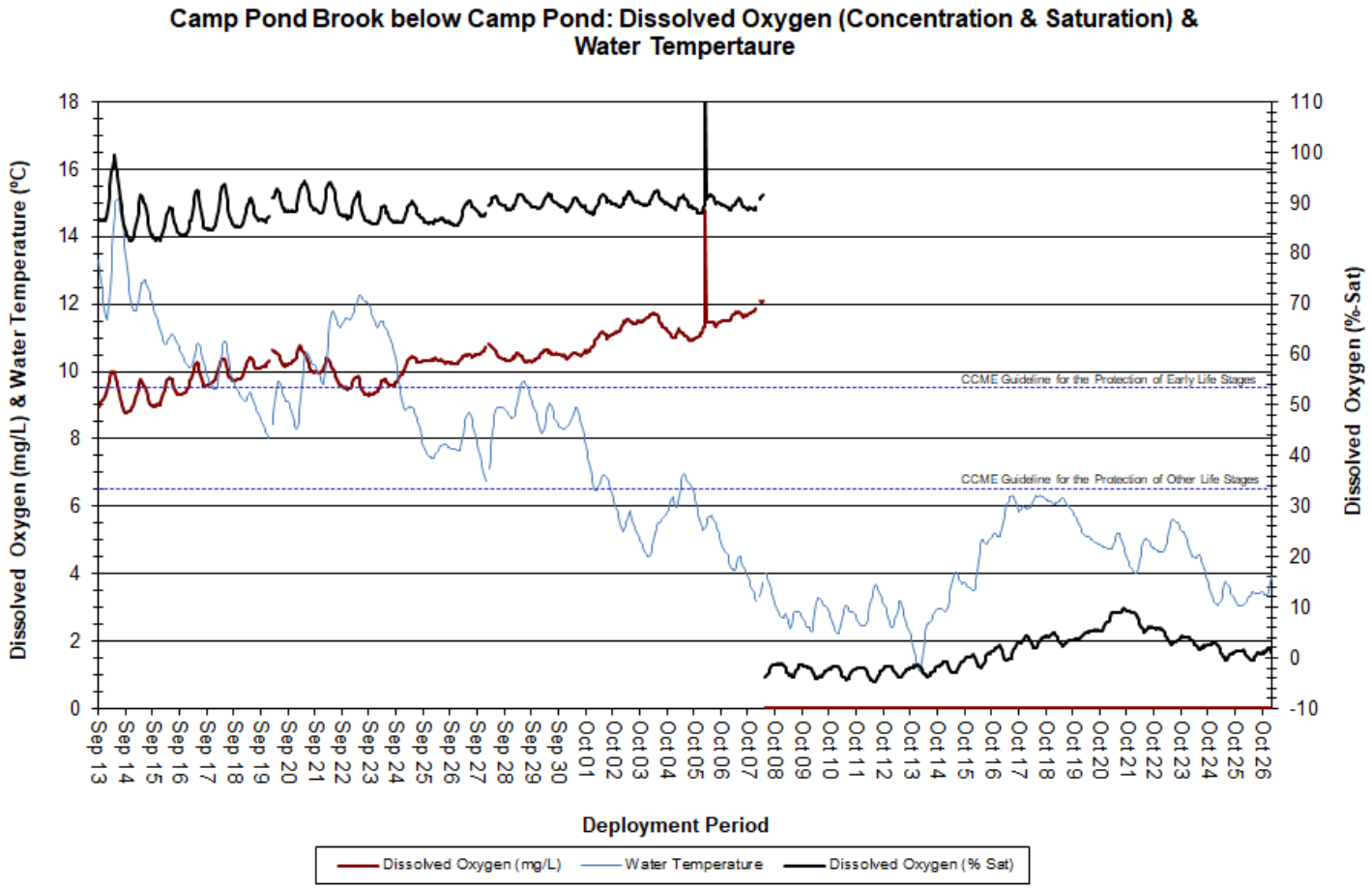

Figure 11: Dissolved Oxygen & Water Temperature at Camp Pond Brook below Camp Pond

Turbidity

Over the deployment period, turbidity ranged from 0 NTU to 27 NTU, with a median value of 0 NTU (Figure 12). A median value of 0 NTU indicates that there was a very low level of natural background turbidity at this station.

Turbidity spikes are common at this station and often correlate with precipitation events and subsequent runoff entering Camp Pond Brook (Figure 12). Precipitation data was obtained from the Voisey's Bay airstrip weather station.

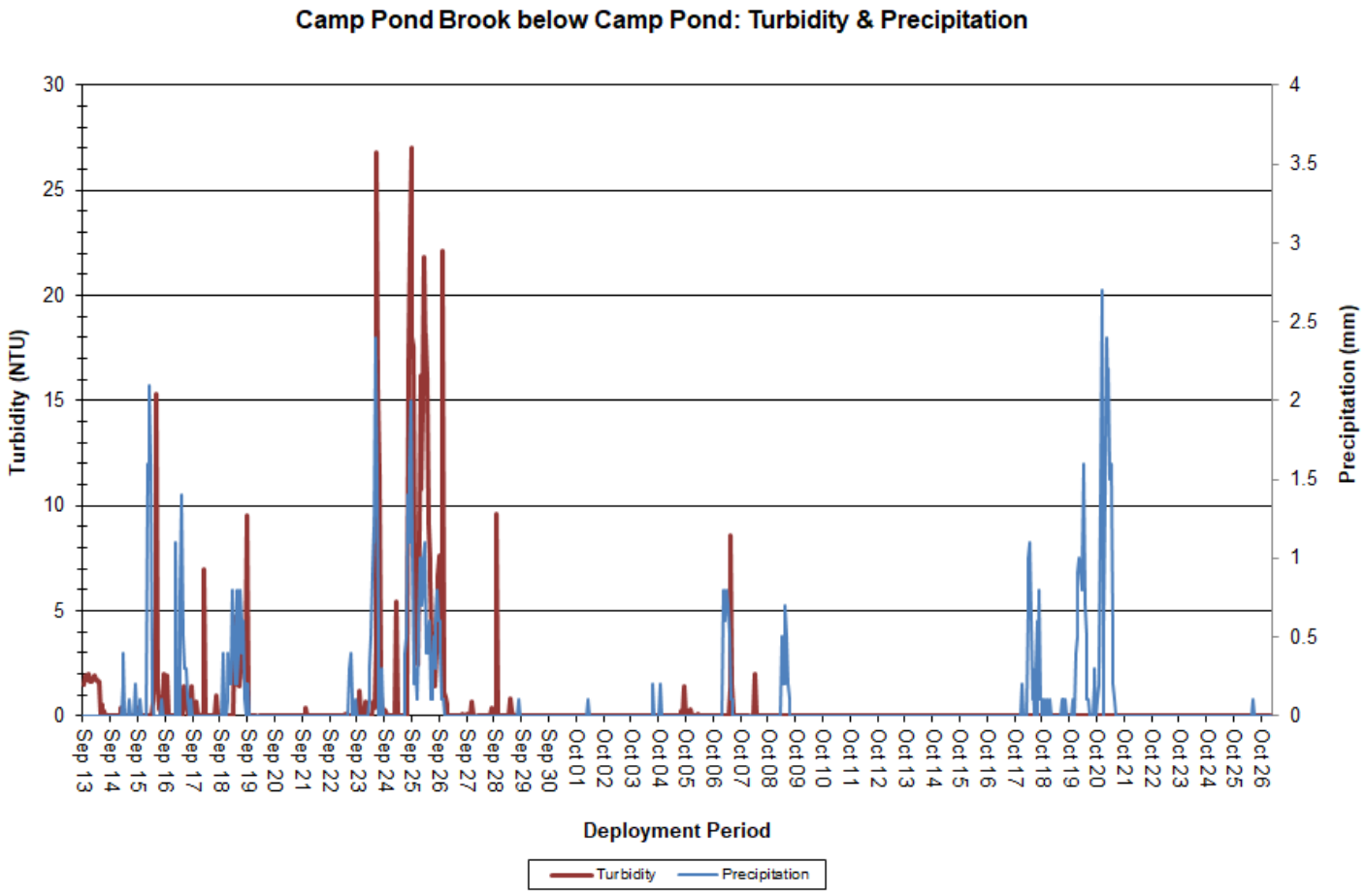

Figure 12: Turbidity & Precipitation at Camp Pond Brook below Camp Pond

Stage and Flow

Over the deployment period, stage values ranged from 1.25m to 1.43m, with a median value of 1.35m. Stream flow values ranged from 0.066m^3/s to 0.563m^3/s, with a median value of 0.235m^3/s. Precipitation data was obtained from the Voisey's Bay airstrip weather station (Figure 13).

Stage and flow were variable across the deployment period, and most increases in both stage and flow can be attributed to observed rainfall events (Figure 13).

Please note the stage and flow data used below is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request to WSC.

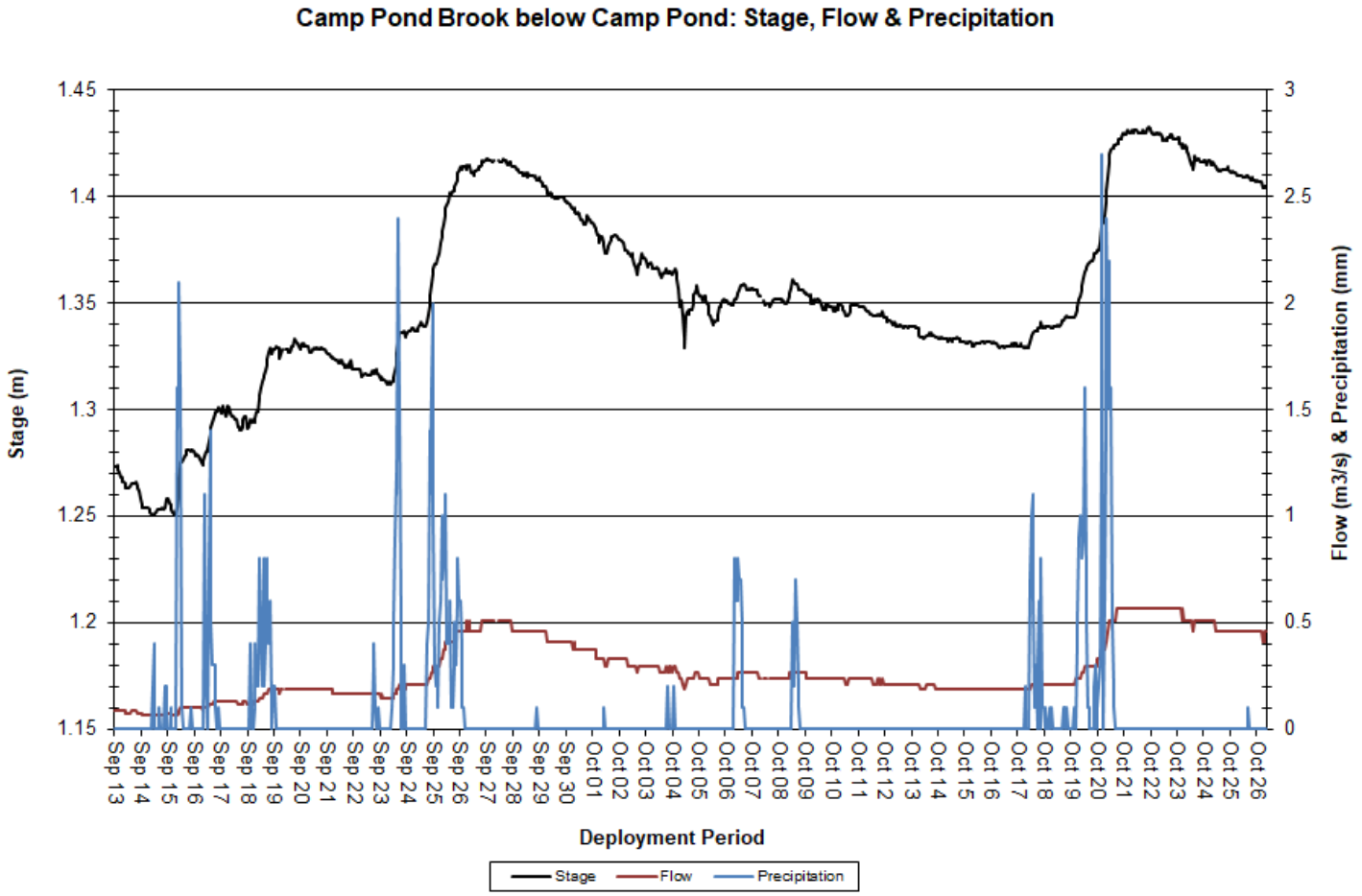

Figure 13: Stage, Flow & Precipitation at Camp Pond Brook below Camp Pond

Reid Brook below Tributary

Water Temperature

Over the deployment period, water temperature ranged from 0.01°C to 13.92°C, with a median value of 5.32°C (Figure 14).

Water temperature at this station displays diurnal variations, and was variable but generally decreasing across the deployment period. This is to be expected as air temperatures exhibited a similar trend (Figure 14). Air temperature data was obtained from the Voisey's Bay airstrip weather station.

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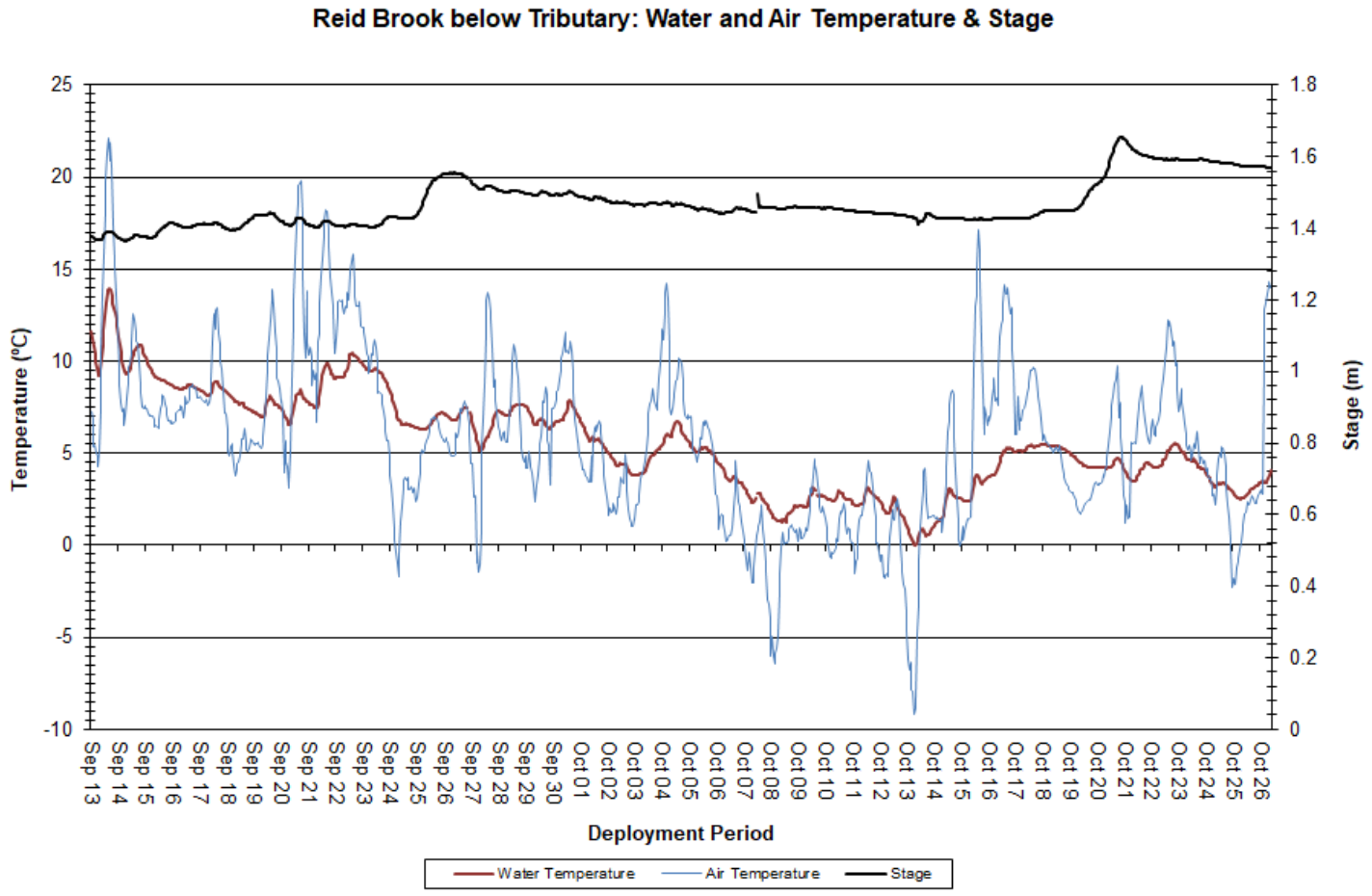

Figure 14: Water and Air Temperature & Stage at Reid Brook below Tributary

pH

Over the deployment period, pH ranged from 6.43 pH units to 7.70 pH units, with a median value of 6.96 (Figure 15).

pH was within the CCME's Guidelines for the Protection of Aquatic Life for the majority of the deployment period. The brief period on October 20th where pH values fell below the CCME's Minimum Guideline correlated closely with a sharp increase in stage, which is to be expected.

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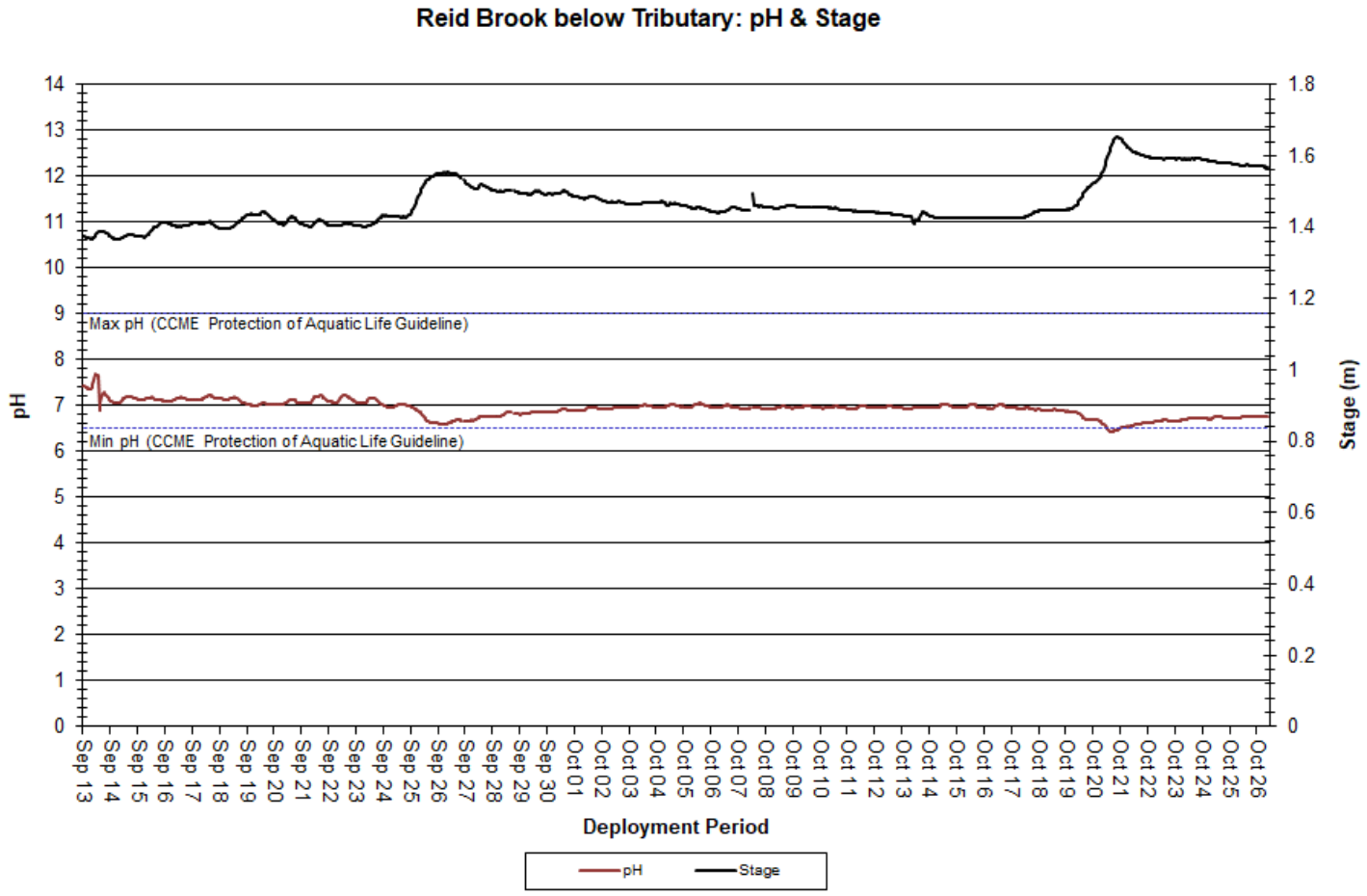

Figure 15: pH & Stage at Reid Brook below Tributary

Specific Conductivity

Over the deployment period, specific conductivity ranged from 35.3µS/cm to 53.0µS/cm, with a median value of 45.5µS/cm (Figure 16).

Specific conductivity was variable over the course of the deployment period (Figure 16).

Specific conductivity and stage generally exhibit an inverse relationship: as one parameter increases, the other decreases. This relationship is quite evident in the graph below.

Please note the stage and flow data used below is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request to WSC.

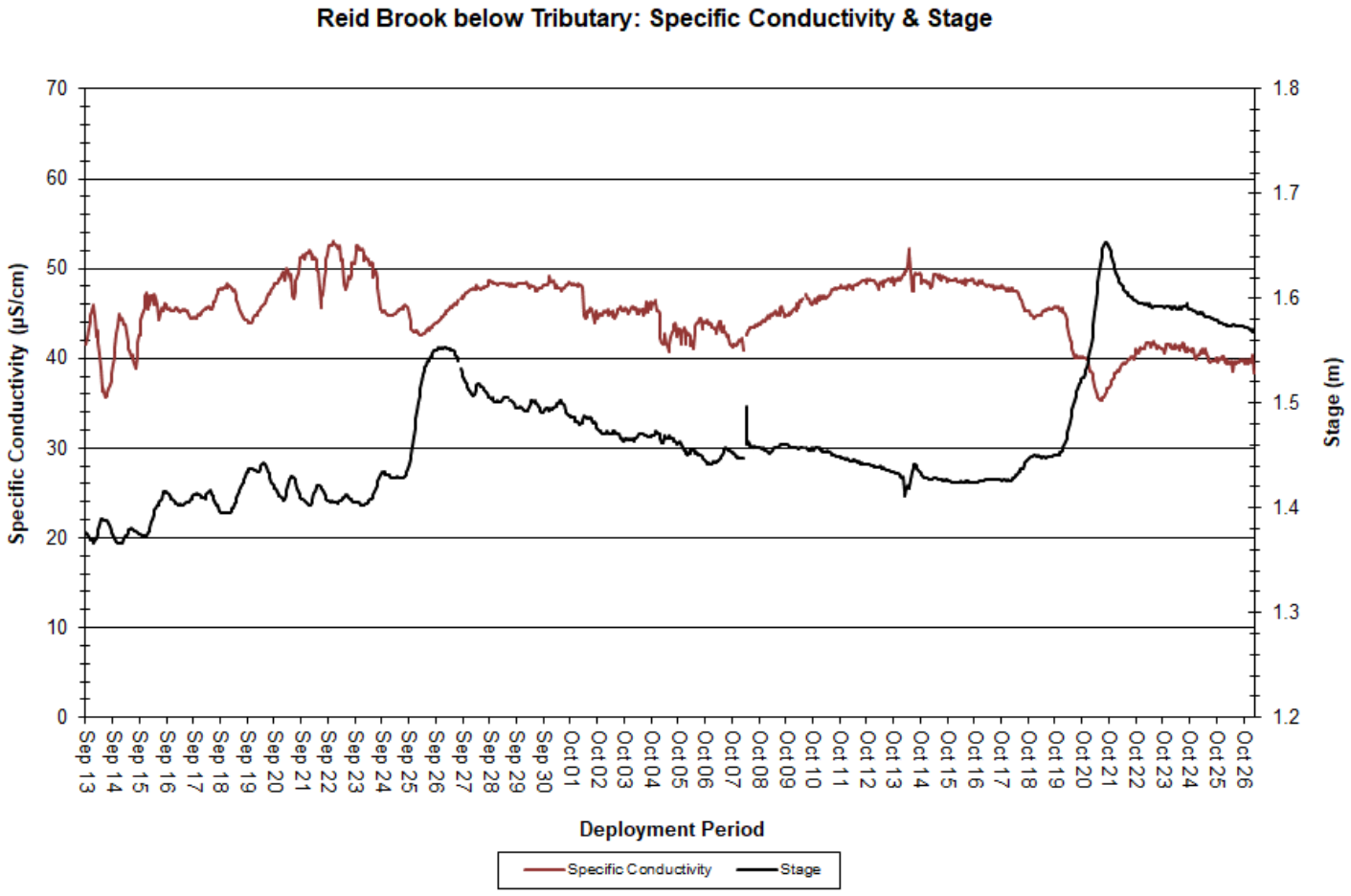

Figure 16: Specific Conductivity & Stage at Reid Brook below Tributary

Dissolved Oxygen

Over the deployment period, dissolved oxygen concentration ranged from 10.29mg/L to 14.09mg/L, with a median value of 11.96mg/L. The saturation of dissolved oxygen ranged from 91.6% saturation to 106.4% saturation, with a median value of 94.6% (Figure 17).

Dissolved oxygen concentrations remained above the CCME's Guidelines for the Protection of Early and Other Life Stages for the duration of deployment. Dissolved oxygen concentrations steadily increased over the course of deployment, which is to be expected as water temperatures steadily decreased across the same period.

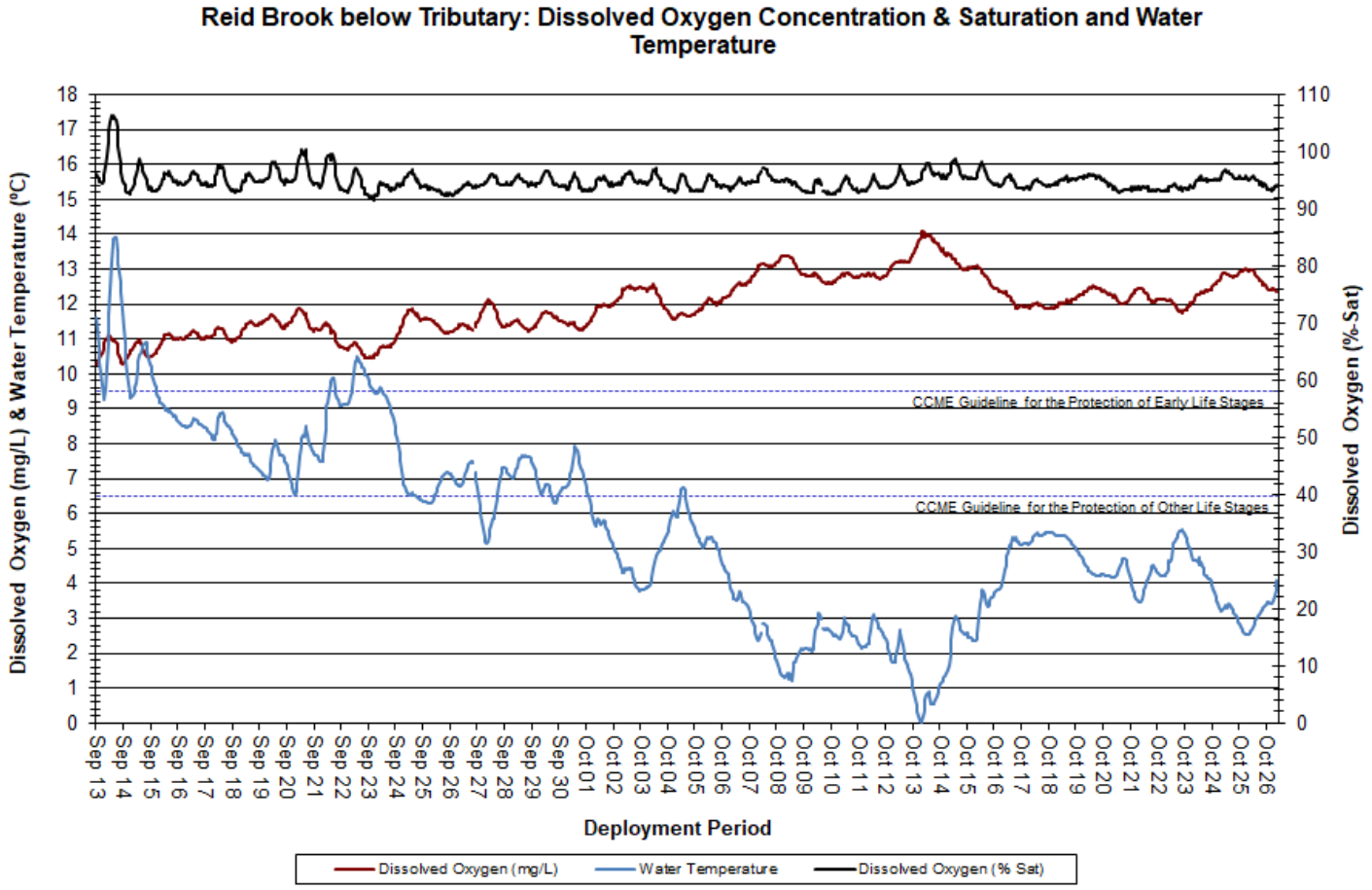

Figure 17: Dissolved Oxygen & Water Temperature at Reid Brook below Tributary

Turbidity

Over the deployment period, turbidity ranged from 0.3 NTU to 3000 NTU, with a median value of 869.5 NTU (Figure 18). A median turbidity value of 869.5 NTU indicates a high level of background turbidity at this station.

The majority of the turbidity events observed at this station closely correlated with rainfall events (Figure 18), which can cause mixing of solids in the water column. While it is not uncommon to see high turbidity levels at this station, the sustained high turbidity levels across the deployment period indicate potential sediment build-up around the sensor.

Precipitation data was obtained from the Voisey's Bay airstrip weather station.

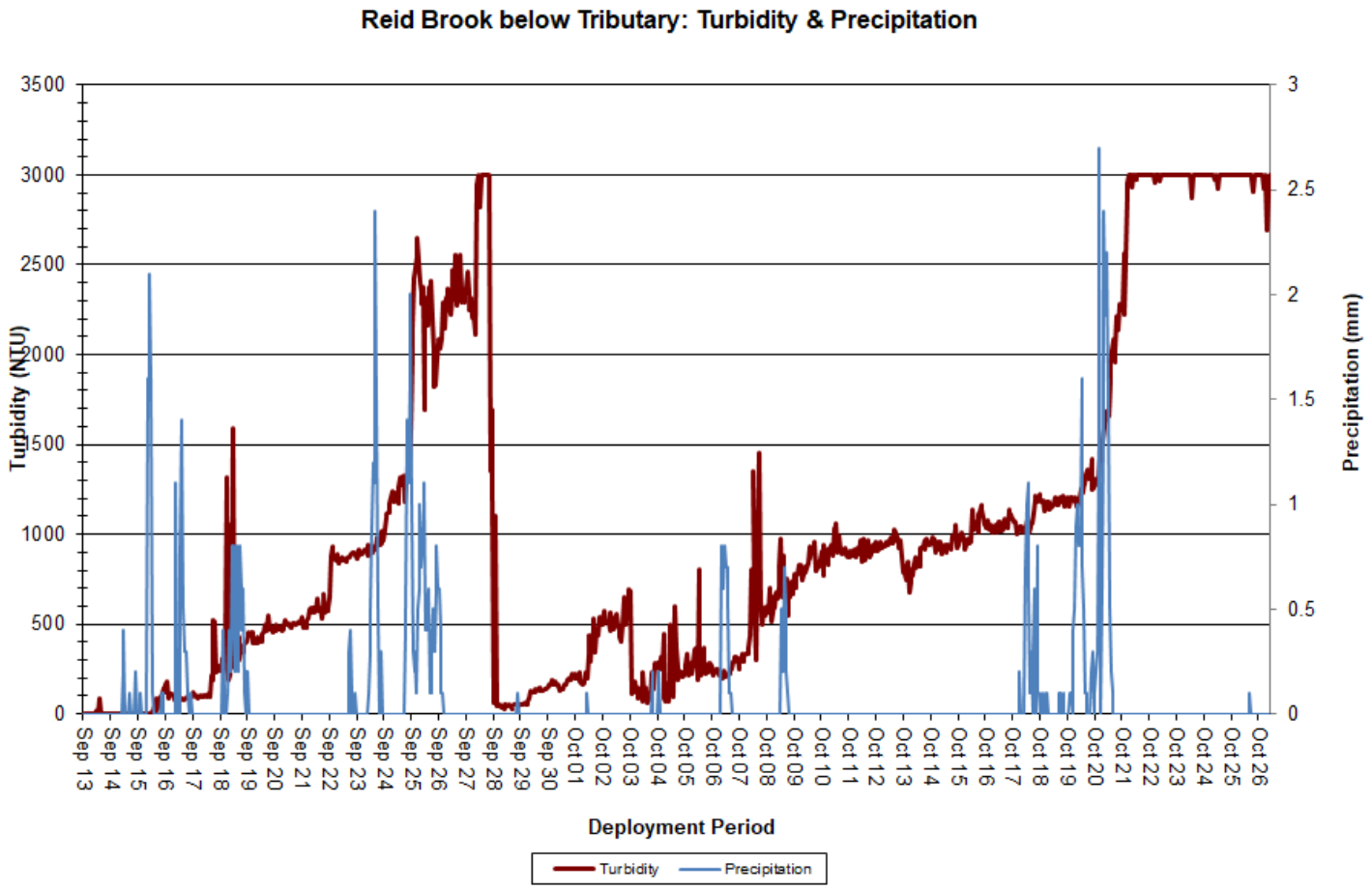

Figure 18: Turbidity & Precipitation at Reid Brook below Tributary

Stage and Flow

Over the deployment period, stage values ranged from 1.366m to 1.653m, with a median value of 1.451m. Stream flow values ranged from 0.749m^3/s to 6.101m^3/s, with a median value of 1.516m^3/s. Precipitation data was obtained from the Voisey's Bay airstrip weather station (Figure 19).

Stage and flow were variable across the deployment period, with increases in both stage and flow being generally attributable to observed rainfall events (Figure 19).

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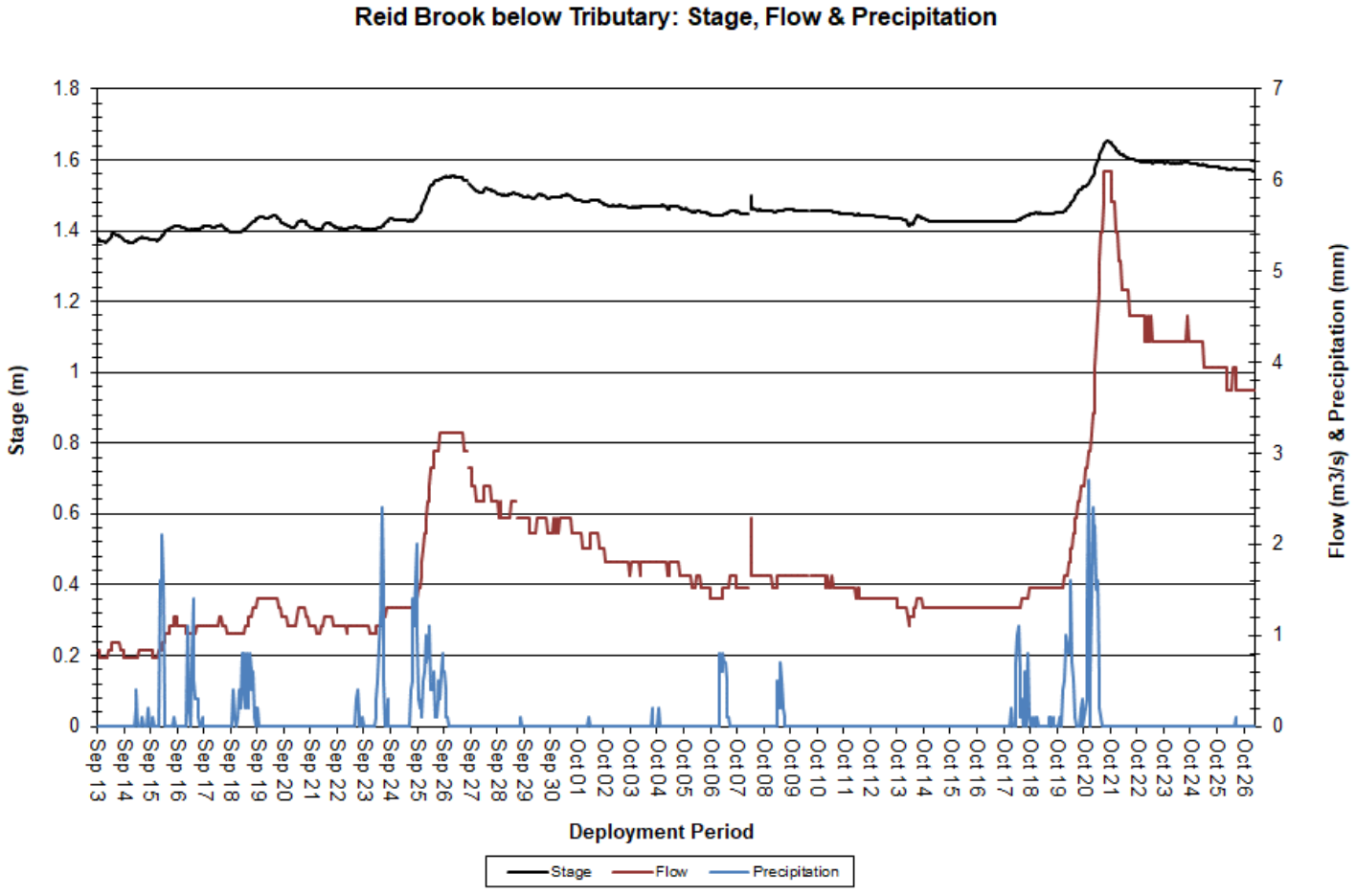

Figure 19: Stage, Flow & Precipitation at Reid Brook below Tributary

Tributary to Reid Brook

Water Temperature

Over the deployment period, water temperature ranged from 0.04ºC to 10.6ºC, with a median value of 5.31ºC (Figure 20). Streams and brooks are sensitive to changes in the ambient air temperature, thus water temperature will fluctuate considerably depending on the weather and the time of day. Air temperature fluctuates to a greater extent compared to water temperature. Air temperature data was obtained from the Voisey's Bay airstrip weather station.

Water temperature data displays a natural diurnal pattern. Water temperatures were variable but generally decreasing over the course of deployment, and correlated closely with ambient air temperatures.

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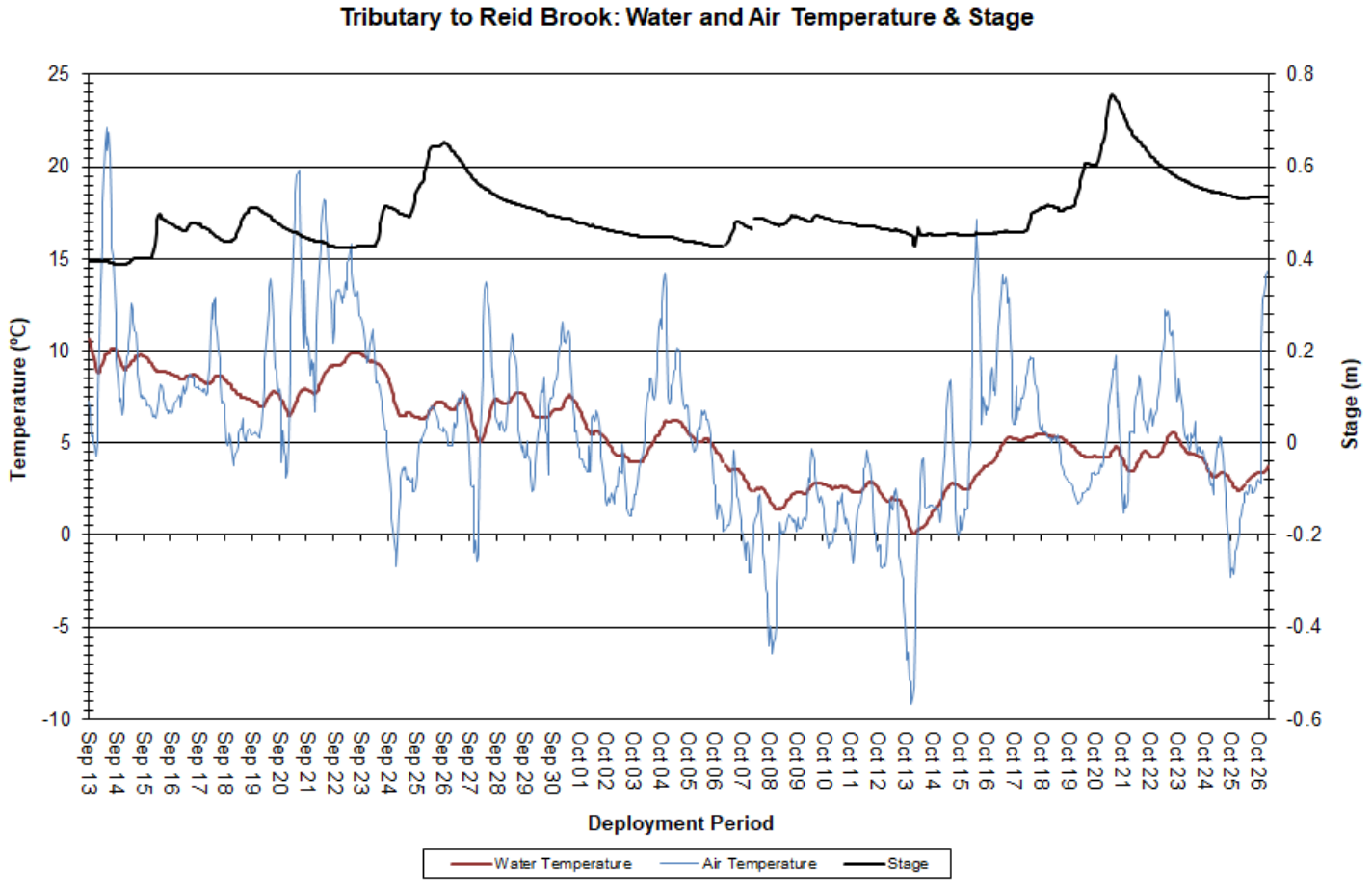

Figure 20: Water and Air Temperature & Stage at Tributary to Reid Brook

pH

Over the deployment period, pH ranged from 6.30 pH units to 7.09 pH units, with a median value of 6.78 (Figure 21).

pH values were quite stable and remained within the CCME's Guidelines for the Protection of Aquatic Life for the majority of the deployment period. There were two brief periods where pH levels dropped below the CCME's Minimum Guideline, both of which correlated closely with a significant increase in stage.

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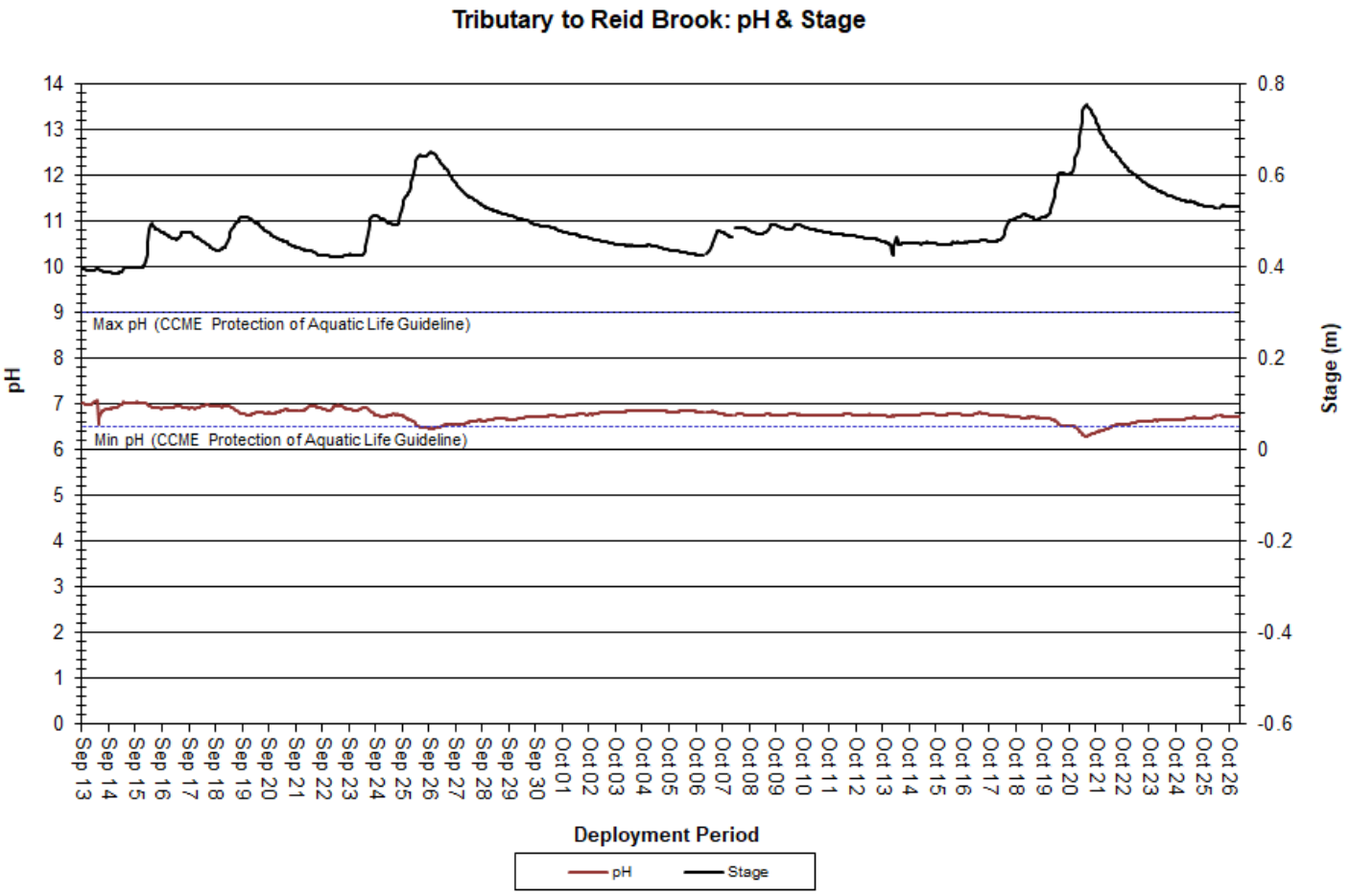

Figure 21: pH & Stage at Tributary to Reid Brook

Specific Conductivity

Over the deployment period, specific conductivity ranged from 34.0µS/cm to 54.7µS/cm, with a median value of 46.5µS/cm (Figure 22).

Specific conductivity and stage generally exhibit an inverse relationship: as one parameter increases, the other decreases. This relationship is clearly evident in the graph below.

Please note the stage and flow data used below is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request to WSC.

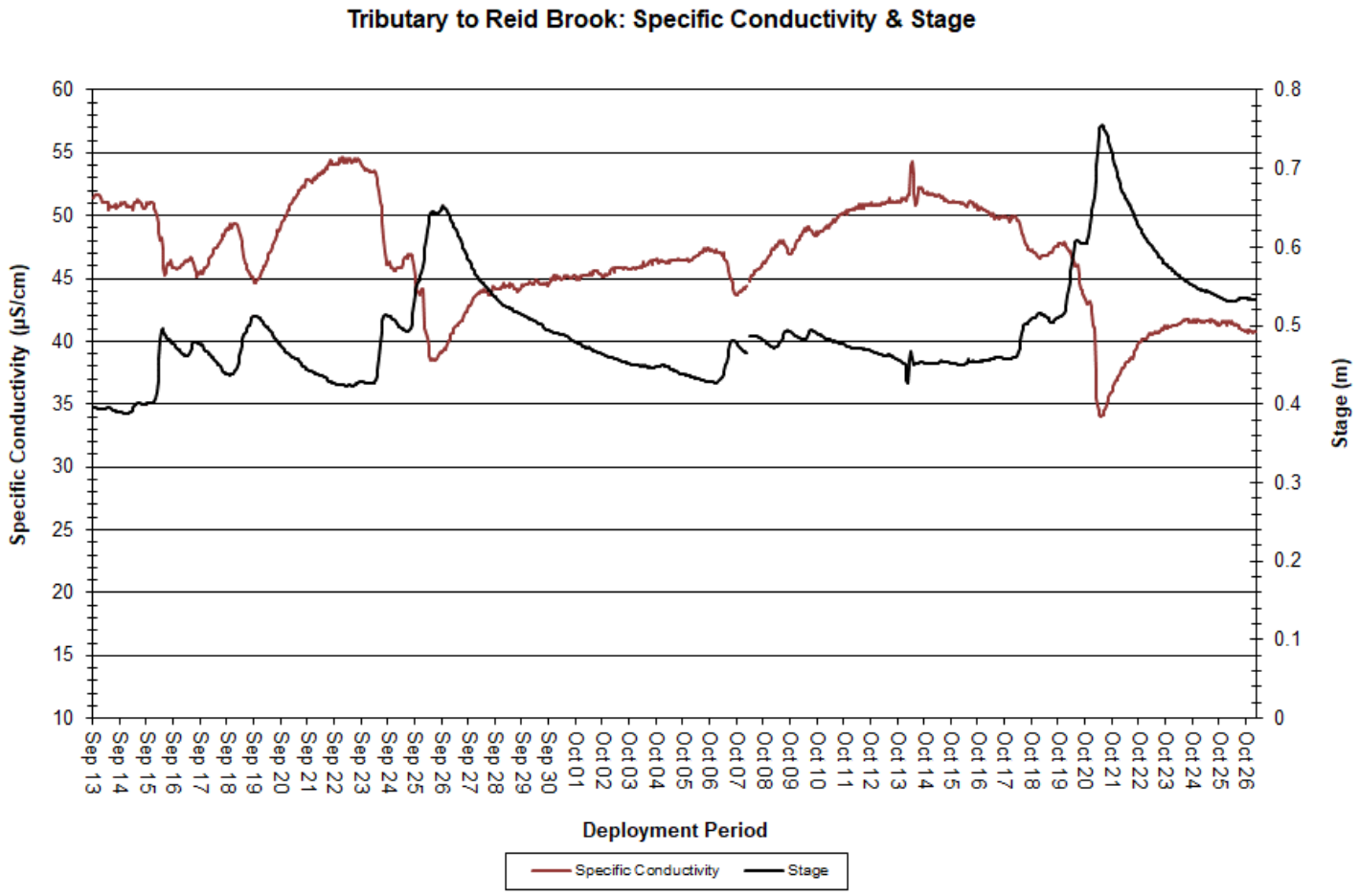

Figure 22: Specific Conductivity & Stage at Tributary to Reid Brook

Dissolved Oxygen

Over the deployment period, dissolved oxygen concentration ranged from 9.81mg/L to 14.1mg/L, with a median value of 12.12mg/L. The saturation of dissolved oxygen ranged from 89.5% saturation to 99.7% saturation, with a median value of 95.6% (Figure 23).

Dissolved oxygen levels were gradually increasing across the deployment period, which is to be expected given that water temperatures were decreasing across the same period. Dissolved oxygen levels remained above the CCME's Guidelines for the Protection of Early and Other Life Stages for the duration of the deployment period.

Dissolved oxygen concentration displays a diurnal pattern. During nightfall, dissolved oxygen levels are higher as cooler temperatures allow for more DO to be stored in the water column. During the day, dissolved oxygen levels are lower. This is a result of warmer water temperatures and photosynthesis by aquatic plants, which decrease dissolved oxygen levels in the water column.

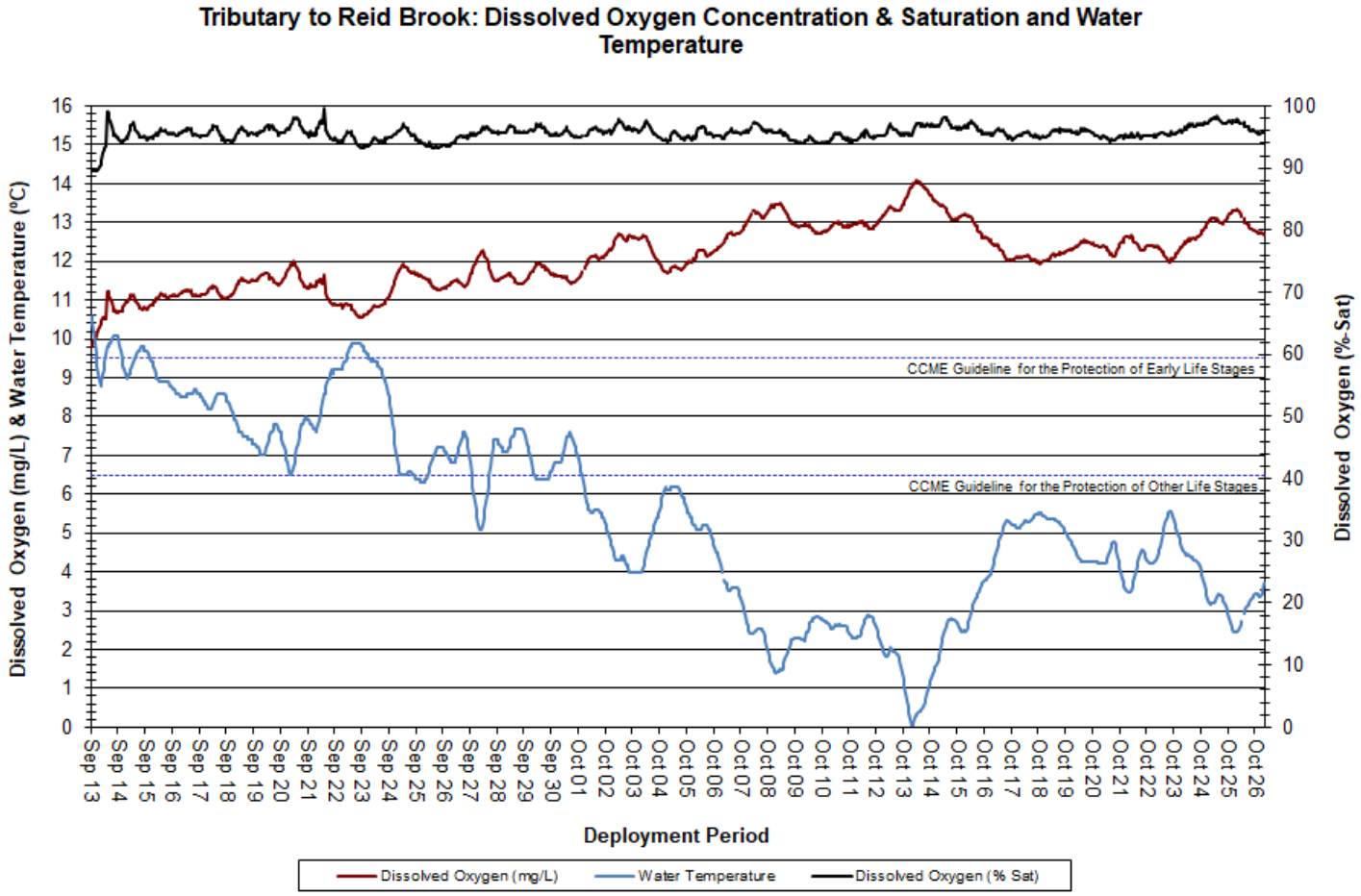

Figure 23: Dissolved Oxygen & Water Temperature at Tributary to Reid Brook

Turbidity

Over the deployment period, turbidity ranged from 0 NTU to 68.2 NTU, with a median value of 0.1 NTU (Figure 24). A median value of 0.1 NTU indicates that there was a very low level of background turbidity at this station.

This site is particularly prone to variable turbidity as it has a sandy-clay bottom that is easily disturbed by precipitation events. Turbidity events correlated closely with observed rainfall events, and turbidity returned to baseline levels following each temporary increase (Figure 24).

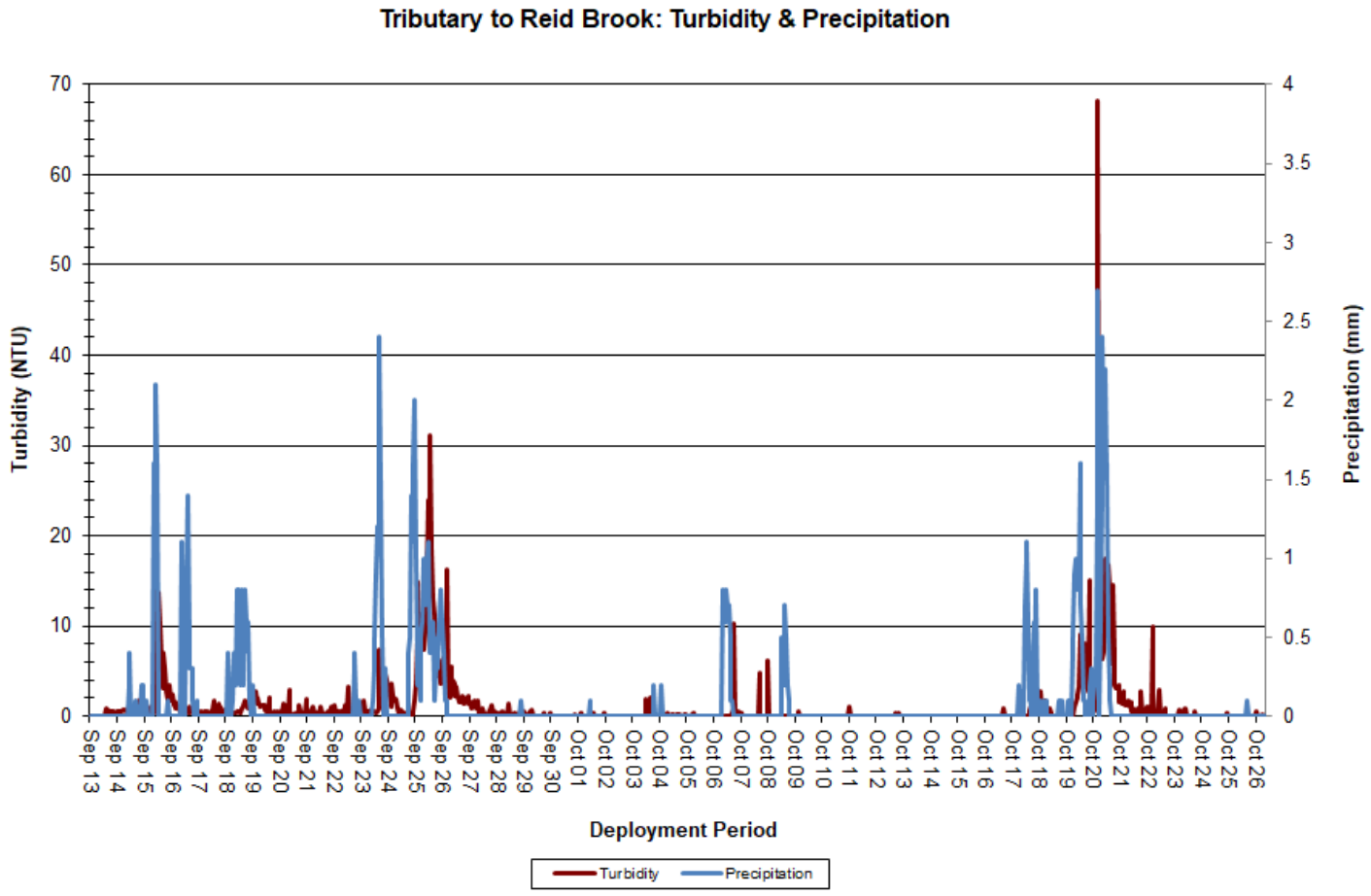

Figure 24: Turbidity & Precipitation at Tributary to Reid Brook

Stage and Flow

Over the deployment period, stage values ranged from 0.388m to 0.756m, with a median value of 0.476m. Stream flow values ranged from 0.062m^3/s to 1.093m^3/s, with a median value of 0.12m^3/s. Precipitation data was obtained from the Voisey's Bay airstrip weather station (Figure 25).

Stage and flow were variable across the deployment period, with increases in both stage and flow closely correlating with observed rainfall events (Figure 19).

Please note the stage and flow data used below is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request to WSC.

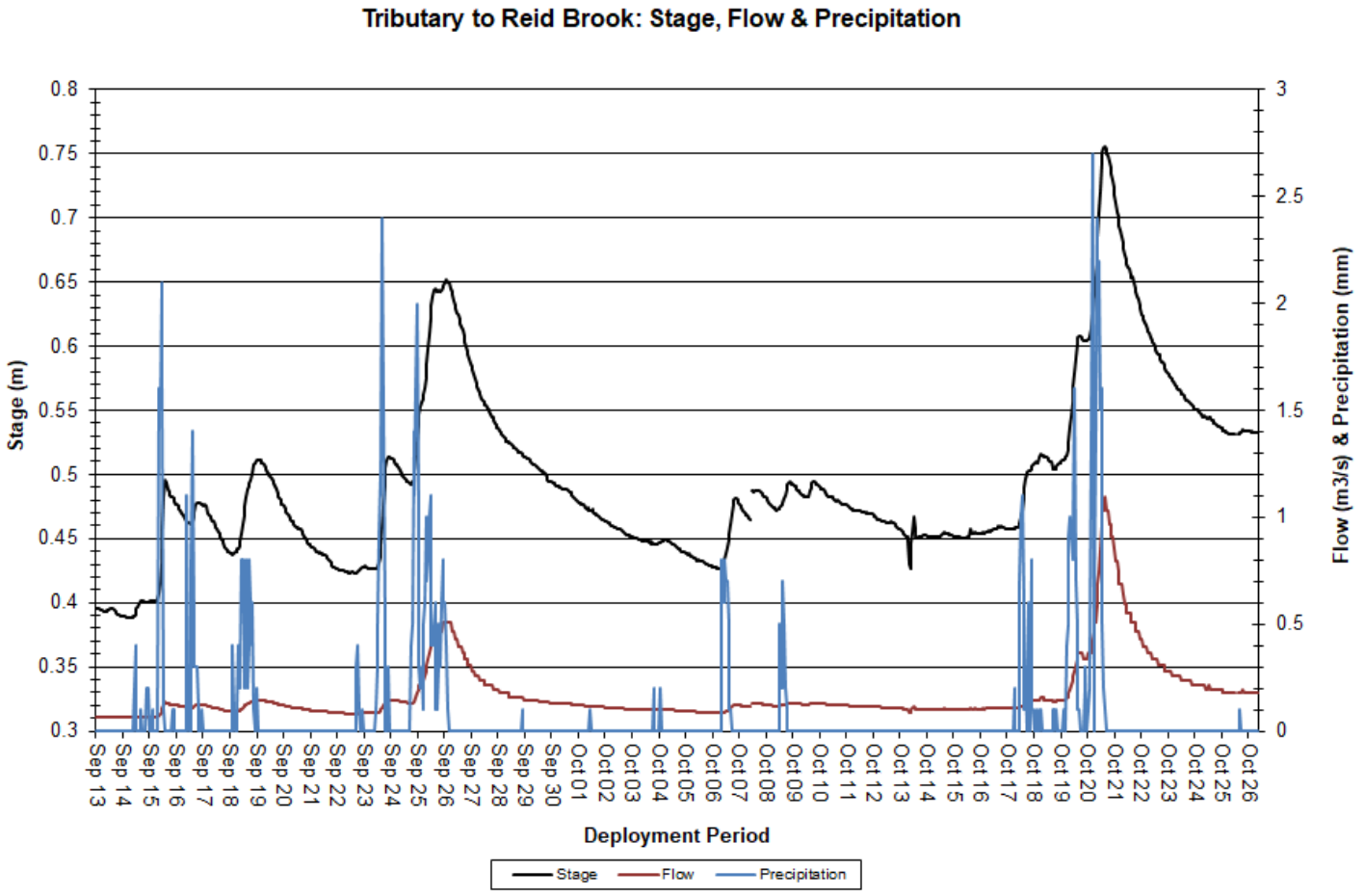

Figure 25: Stage, Flow & Precipitation at Tributary to Reid Brook

Conclusions

Water temperatures across all stations ranged from a minimum of 0.01°C at Reid Brook below Tributary to a maximum of 16.65°C at Reid Brook at Outlet of Reid Pond. Overall, water temperatures were decreasing across the network. Stations at Camp Pond Brook, Tributary to Reid Brook, and Reid Brook below Tributary are more sensitive to changes in ambient air temperatures as these sites are brooks with continuously moving water. In contrast, Reid Brook at Outlet of Reid Pond is a large pond with a high surface area and deeper, slower-moving water.

pH values across all stations ranged from a minimum of 4.53pH units at Reid Brook at Outlet of Reid Pond to a maximum of 7.70pH units at Reid Brook below Tributary. pH values at all stations were relatively consistent across the deployment period.

Specific conductivity across all stations ranged from a minimum of 11.0µS/cm at Reid Brook at Outlet of Reid Pond to a maximum of 93.1µS/cm at Camp Pond Brook below Camp Pond. Conductivity values at Reid Brook at Outlet of Reid Pond were the lowest across the network.

Dissolved oxygen levels across all stations ranged from a minimum of 0mg/L to a maximum of 14.81mg/L, both at Camp Pond Brook below Camp Pond. Dissolved oxygen is generally increasing at this time of year and varies diurnally as water temperature is greatly affected by ambient air temperature. Dissolved oxygen levels remained above the CCME's Guidelines for the Protection of Early and Other Life Stages at all stations for the duration of deployment, with the exception of Camp Pond Brook below Camp Pond.

Turbidity levels across all stations ranged from a minimum of 0 NTU at three stations to a maximum of 3000NTU at Reid Brook below Tributary. Turbidity levels generally showed natural increases and decreases generally corresponding to precipitation events.

Air temperature and precipitation data were obtained from the Voisey's Bay weather station, which is located at the airstrip. This data appears to be quite accurate and no modifications were made.

Overall, the changes in water quality parameters over the course of this deployment can be explained by natural events. Camp Pond Brook below Camp Pond does have the potential for anthropogenic influences as the site is the closest to the inhabited area. It is important to note that during a change (a decrease or increase) in water quality, change only occurs for a short period of time and then water quality parameters return to baseline.

References

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APPENDIX A: Comparison Graphs

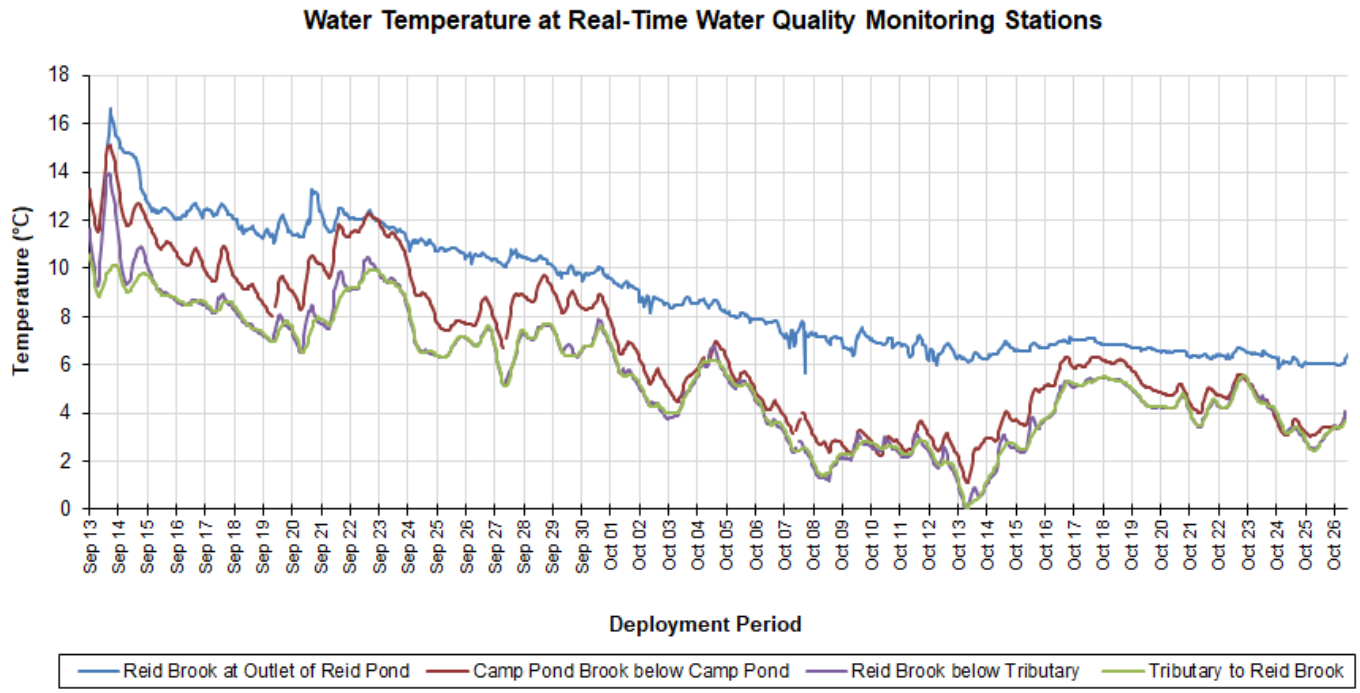

Figure A1: Comparison of Water Temperature (^{0}C) between all Real-Time Stations in Voisey's Bay.

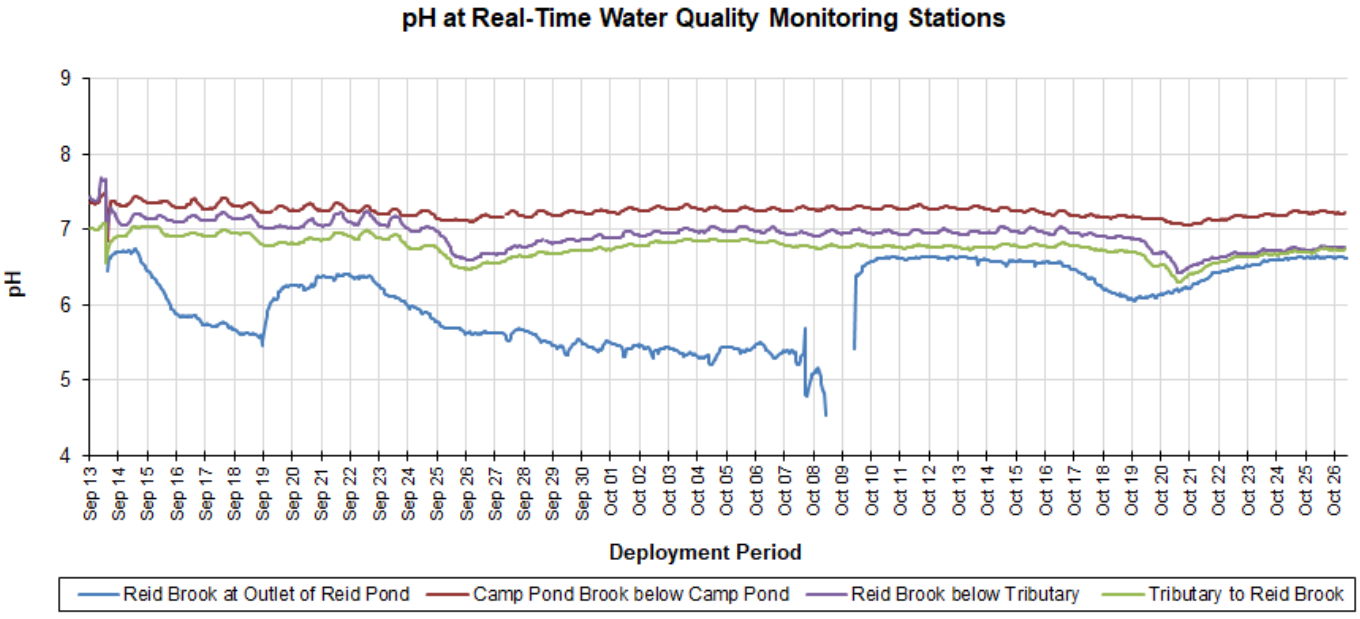

Figure A2: Comparison of pH between all Real-Time Stations in Voisey's Bay.

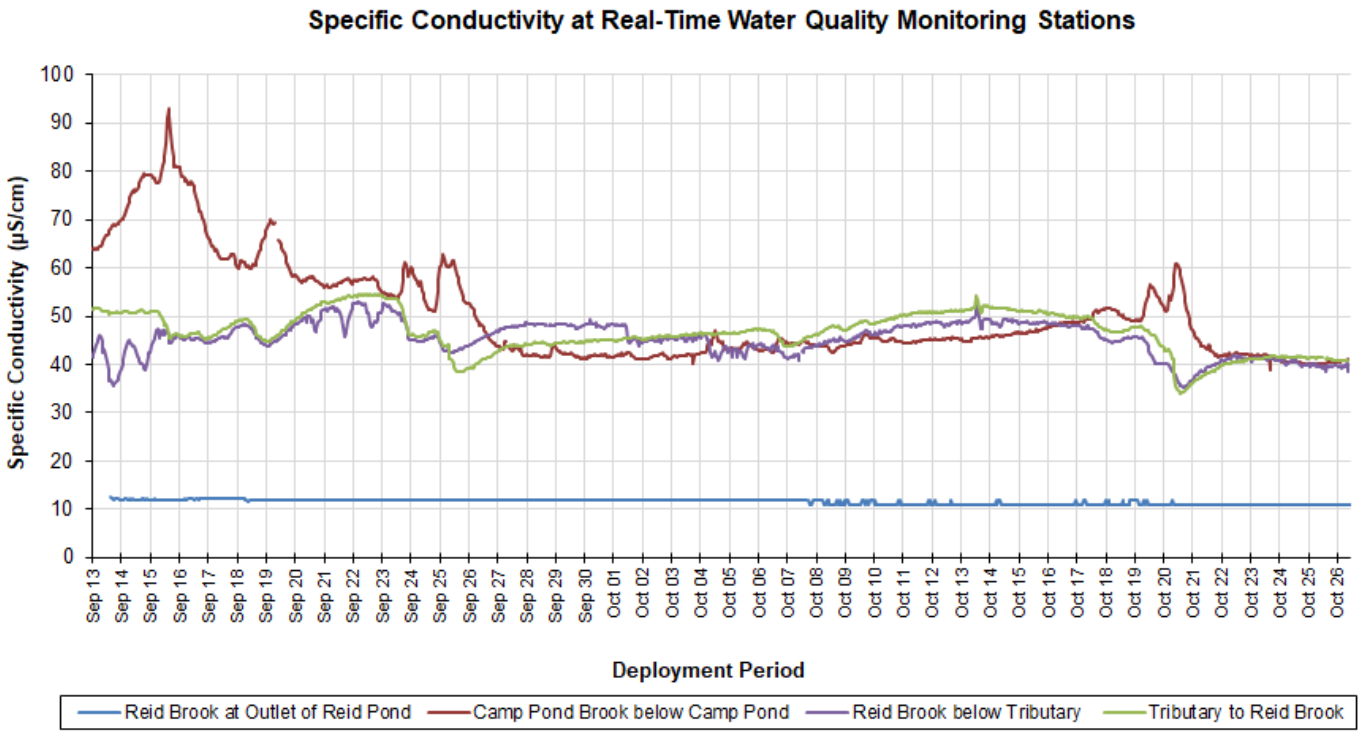

Figure A3: Comparison of Specific Conductivity (µS/cm) between all Real-Time Stations in Voisey's Bay.

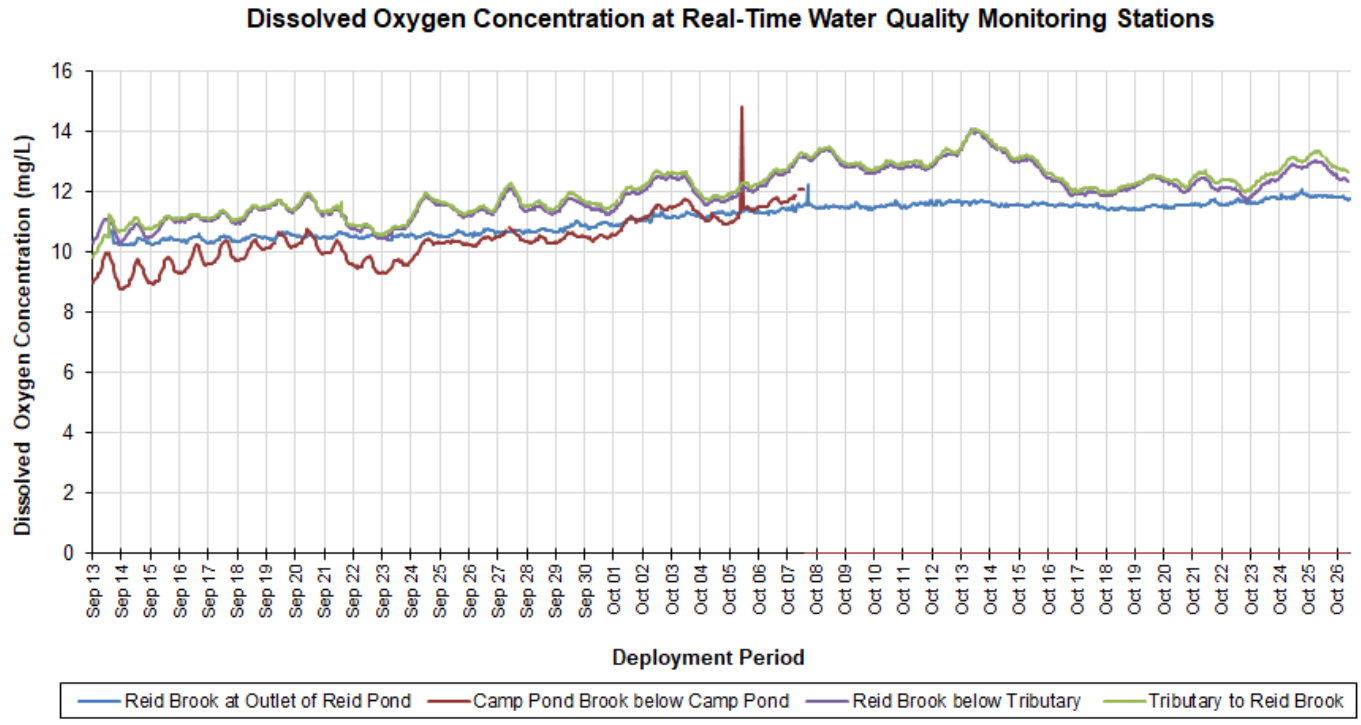

Figure A4: Comparison of Dissolved Oxygen (mg/L) between all Real-Time Stations in Voisey's Bay.

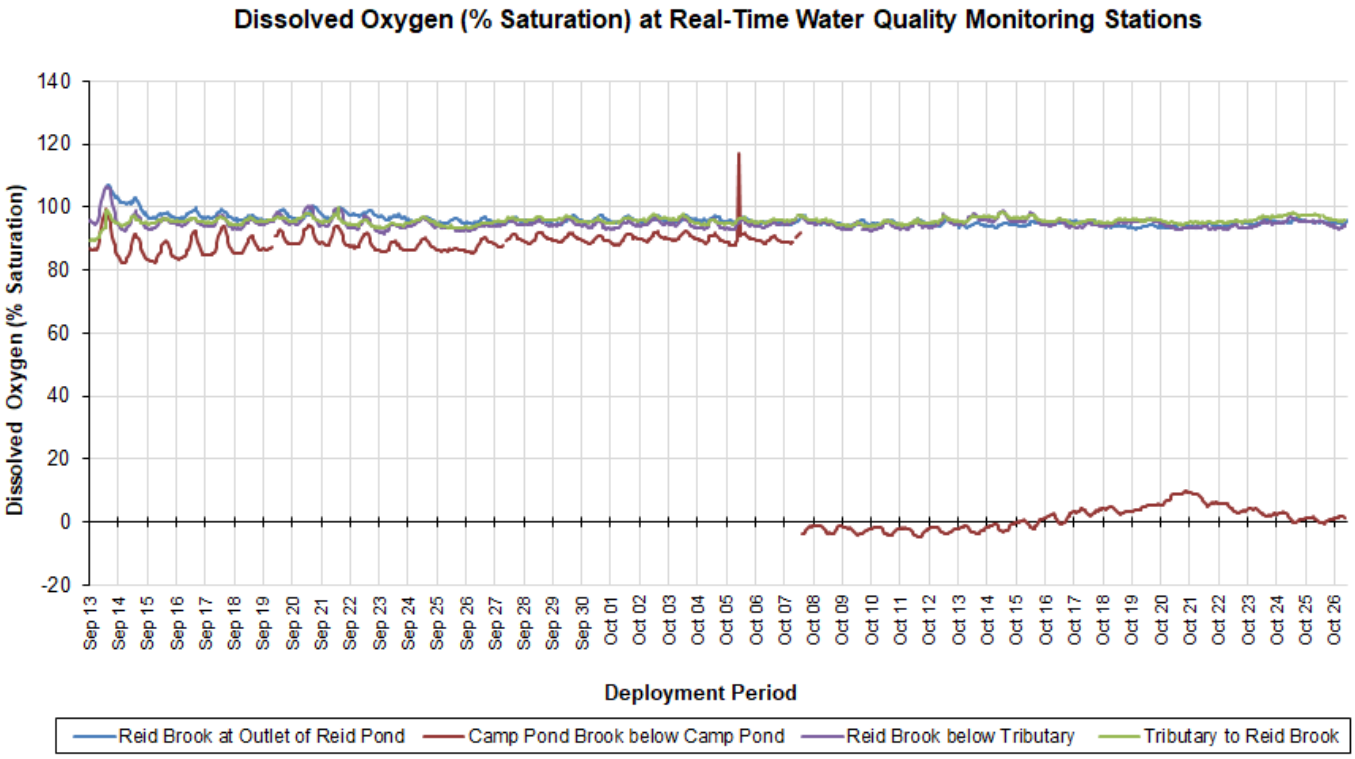

Figure A5: Comparison of Dissolved Oxygen (% Sat) between all Real-Time Stations in Voisey's Bay.

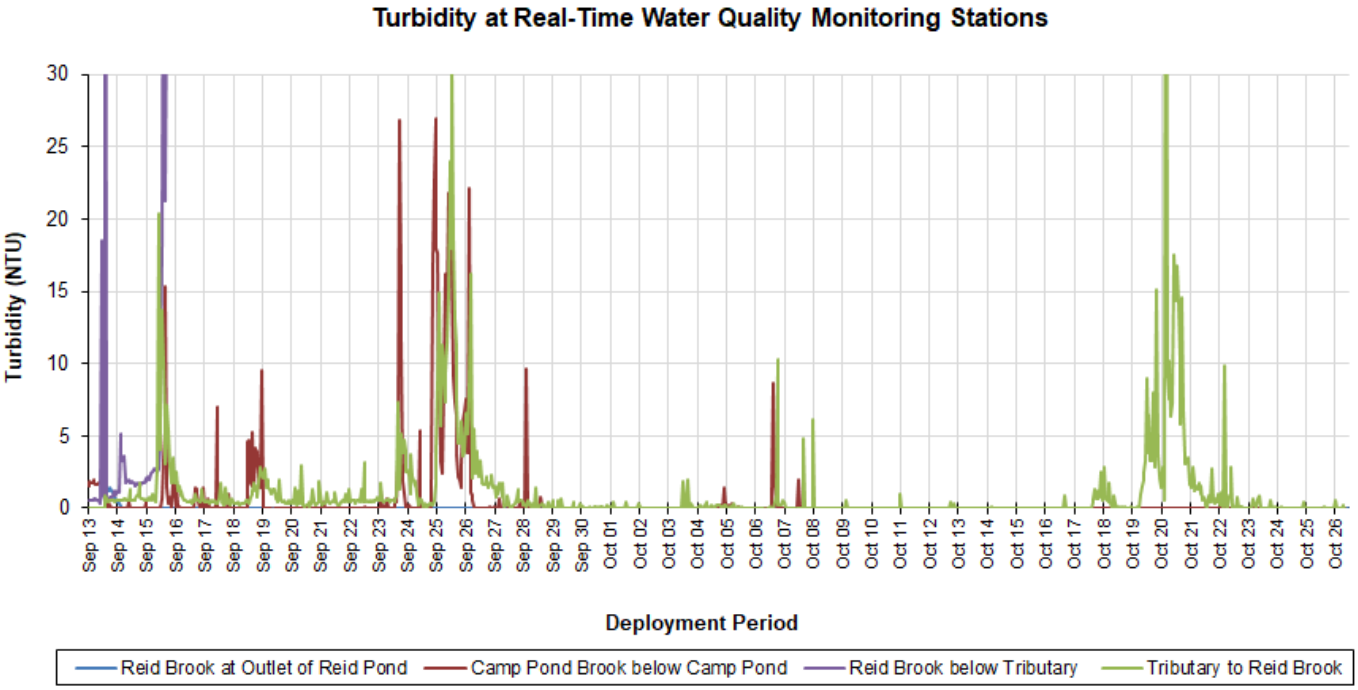

Figure A6: Comparison of Turbidity (NTU) between all Real-Time Stations in Voisey's Bay.

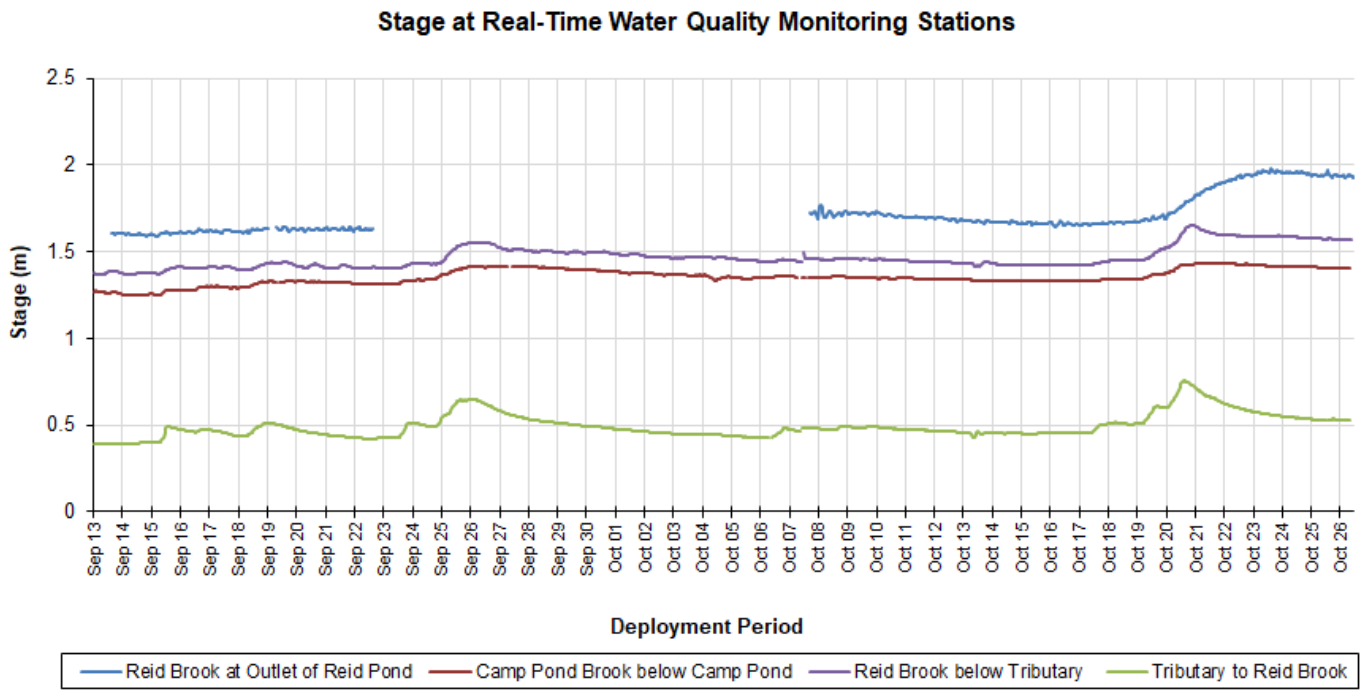

Figure A7: Comparison of Stage (m) between all Real-Time Stations in Voisey's Bay. Please note that stage data is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data.

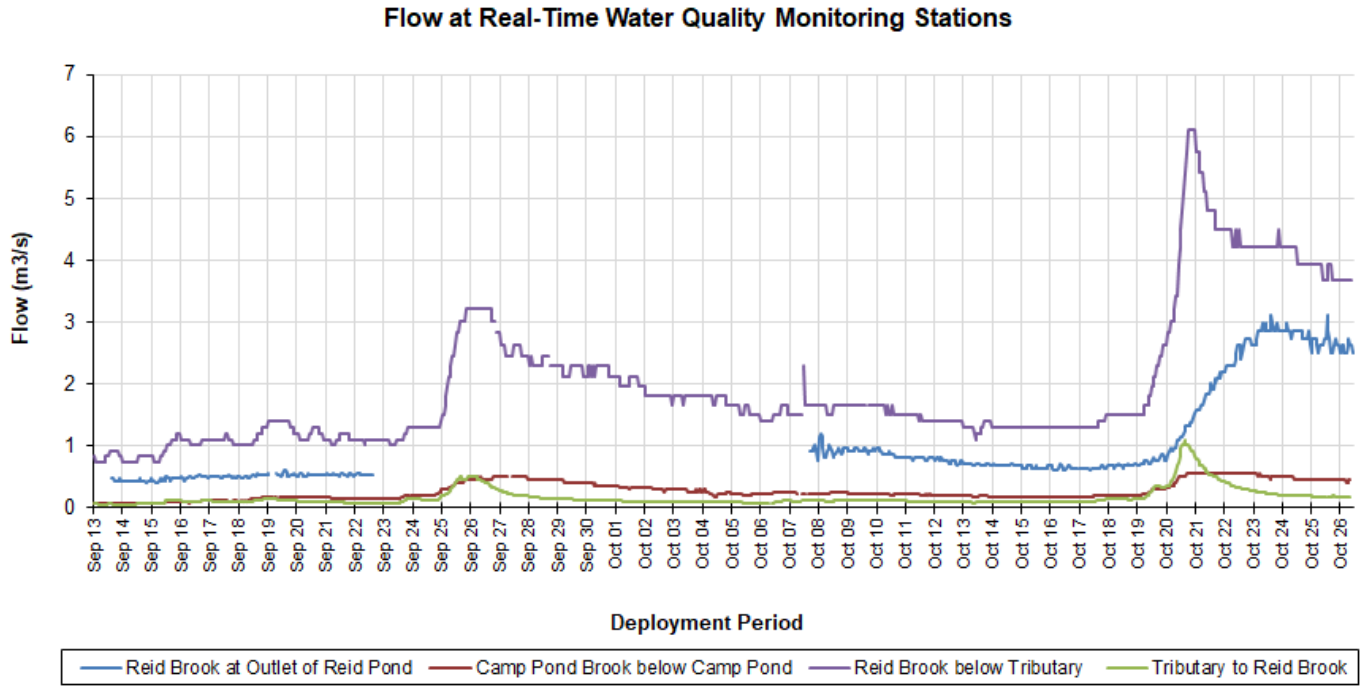

Figure A8: Comparison of Flow (m^3/s) between all Real-Time Stations in Voisey's Bay. Please note that flow data is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data.

APPENDIX B: Water Parameter Description

Dissolved Oxygen: The amount of Dissolved Oxygen (DO) (mg/L or % saturation) in the water is vital to the survival of aquatic organisms. The concentration of DO is affected by such things as water temperature, water depth and flow (e.g., aeration by rapids, riffles etc.), consumption by aerobic organisms, consumption by inorganic chemical reactions, consumption by plants during darkness, and production by plants during the daylight (CCME 2014).

Flow: Flow (m3/s) is a measure of how quickly a volume of water is displaced in streams, rivers, and other channels.

pH: pH is the measure of hydrogen ion activity and affects: (i) the availability of nutrients to aquatic life; (ii) the concentration of biochemical substances dissolved in water; (iii) the efficiency of hemoglobin in the blood of vertebrates; and (iv) the toxicity of pollutants. Changes in pH can be attributed to industrial effluence, saline inflows or aquatic organisms involved in the photosynthetic cycling of CO_2 (CCME 2014).

Specific conductivity: Specific conductivity (µS/cm) is a measure of water's ability to conduct electricity, with values normalized to a water temperature of 25°C. Specific conductance indicates the concentration of dissolved solids (such as salts) in the water, which can affect the growth and reproduction of aquatic life. Specific conductivity is affected by rainfall events, the composition of inflowing tributaries and their associated geology, saline inflow (e.g., road salt), agricultural run-off and industrial inputs (Swanson and Baldwin 1965).

Stage: Stage (m) is the elevation of the water surface and is often used as a surrogate for the more difficult to measure flow.

Temperature: Essential to the measurement of most water quality parameters, temperature (°C) controls most processes and dynamics of limnology. Water temperature is influenced by such things as ambient air temperature, solar radiation, meteorological events, industrial effluence, wastewater, inflowing tributaries, as well as water body size and depth (OTT Hydromet 2017).

Total Dissolved Solids: Total Dissolved Solids (TDS) (g/l) is a measure of alkaline salts dissolved in water or in fine suspension and can affect the growth and reproduction of aquatic life. It is affected by rainfall events, the composition of inflowing tributaries and their associated geology, saline inflow (e.g., road salt), agricultural run-off and industrial inputs (CCME 2014; Swanson and Baldwin 1965).

Turbidity: Turbidity (NTU) is a measure of the translucence of water and indicates the amount of suspended material in the water. Turbidity is caused by any substance that makes water cloudy (e.g., soil erosion, micro-organisms, vegetation, chemicals, etc.) and can correspond to precipitation events, high stage, and floating debris near the sensor (Sadar, 2017).

APPENDIX C: Grab Sample Results

Bureau Veritas Job #: C2Q7736
Report Date: 2022/10/07

NL Department of Environment, Climate Change and Municipalities
Your P.O. #: 220028978-6

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
TTI084 REID BROOK BELOW REID POND								
Sampling Date 2022/09/13 15:10								
Matrix W								
Sample # 2022-1925-00-SI-SP								
Registration # WS-S-0000								
RESULTS OF ANALYSES OF WATER								
Calculated Parameters								
Hardness (CaCO3)	-	4.2	1.0	mg/L	N/A	2022/09/21		8228878
Nitrate (N)	-	ND	0.050	mg/L	N/A	2022/10/04		8228883
Total dissolved solids (calc., EC)	-	7.6	1.0	mg/L	N/A	2022/09/27		8229891
Inorganics								
Conductivity	-	14	1.0	uS/cm	N/A	2022/09/27	AA0	8246637
Chloride (Cl-)	-	ND	1.0	mg/L	N/A	2022/09/23	LKH	8239063
Bromide (Br-)	-	ND	1.0	mg/L	N/A	2022/09/23	LKH	8239063
Sulphate (SO4)	-	ND	1.0	mg/L	N/A	2022/09/23	LKH	8239063
Total Alkalinity (Total as CaCO3)	-	3.8	2.0	mg/L	N/A	2022/09/27	AA0	8246648
Colour	-	8.0	5.0	TCU	N/A	2022/09/29	TGO	8251397
Dissolved Fluoride (F-)	-	ND	0.10	mg/L	N/A	2022/09/27	AA0	8246650
Total Kjeldahl Nitrogen (TKN)	-	0.17	0.10	mg/L	2022/09/21	2022/09/23	RTY	8239216
Nitrate + Nitrite (N)	-	ND	0.050	mg/L	N/A	2022/09/30	TGO	8251399
Nitrite (N)	-	0.013	0.010	mg/L	N/A	2022/09/28	TGO	8251400
Nitrogen (Ammonia Nitrogen)	-	ND	0.050	mg/L	N/A	2022/09/27	TGO	8249504
Dissolved Organic Carbon (C)	-	1.4	0.50	mg/L	N/A	2022/09/26	RSL	8243866
Total Organic Carbon (C)	-	1.8	0.50	mg/L	N/A	2022/09/26	RSL	8246759
pH	-	7.08		pH	N/A	2022/09/27	AA0	8246646
Total Phosphorus	-	ND	0.004	mg/L	2022/09/21	2022/09/22	SSV	8239191
Total Suspended Solids	-	ND	1.0	mg/L	2022/09/20	2022/09/21	RMK	8234498
Turbidity	-	1.2	0.10	NTU	N/A	2022/09/28	NGI	8251754
MERCURY BY COLD VAPOUR AA (WATER)								
Metals								
Total Mercury (Hg)	-	ND	0.000013	mg/L	2022/09/22	2022/09/22	FJO	8238060
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Aluminum (Al)	-	0.049	0.0050	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Antimony (Sb)	-	ND	0.0010	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Arsenic (As)	-	ND	0.0010	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Barium (Ba)	-	0.0020	0.0010	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Boron (B)	-	ND	0.050	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Cadmium (Cd)	-	ND	0.000010	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Calcium (Ca)	-	1.3	0.10	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Chromium (Cr)	-	ND	0.0010	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Copper (Cu)	-	ND	0.00050	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Iron (Fe)	-	ND	0.050	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Lead (Pb)	-	ND	0.00050	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Magnesium (Mg)	-	0.25	0.10	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Manganese (Mn)	-	ND	0.0020	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Nickel (Ni)	-	ND	0.0020	mg/L	2022/09/20	2022/09/21	JHY	8234609

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Bureau Veritas Job #: C2Q7736
Report Date: 2022/10/07

NL Department of Environment, Climate Change and Municipalities
Your P.O. #: 220028978-6

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
TTI084 REID BROOK BELOW REID POND Sampling Date 2022/09/13 15:10 Matrix W Sample # 2022-1925-00-SI-SP Registration # WS-S-0000								
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Phosphorus (P)	-	ND	0.10	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Potassium (K)	-	0.12	0.10	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Selenium (Se)	-	ND	0.00050	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Sodium (Na)	-	0.77	0.10	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Strontium (Sr)	-	0.0047	0.0020	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Uranium (U)	-	ND	0.00010	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Zinc (Zn)	-	ND	0.0050	mg/L	2022/09/20	2022/09/21	JHY	8234609

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Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
TTI087 CAMP PD BK BELOW CAMP PD Sampling Date 2022/09/13 15:45 Matrix W Sample # 2022-1928-00-SI-SP Registration # WS-S-0000								
RESULTS OF ANALYSES OF WATER								
Calculated Parameters								
Hardness (CaCO3)	-	24	1.0	mg/L	N/A	2022/09/21		8228878
Nitrate (N)	-	0.062	0.050	mg/L	N/A	2022/10/04		8228883
Total dissolved solids (calc., EC)	-	38	1.0	mg/L	N/A	2022/09/27		8229891
Inorganics								
Conductivity	-	68	1.0	uS/cm	N/A	2022/09/27	AA0	8246637
Chloride (Cl-)	-	4.8	1.0	mg/L	N/A	2022/09/23	LKH	8239063
Bromide (Br-)	-	ND	1.0	mg/L	N/A	2022/09/23	LKH	8239063
Sulphate (SO4)	-	7.9	1.0	mg/L	N/A	2022/09/23	LKH	8239063
Total Alkalinity (Total as CaCO3)	-	15	2.0	mg/L	N/A	2022/09/27	AA0	8246648
Colour	-	37	5.0	TCU	N/A	2022/09/29	TGO	8251397
Dissolved Fluoride (F-)	-	ND	0.10	mg/L	N/A	2022/09/27	AA0	8246650
Total Kjeldahl Nitrogen (TKN)	-	0.26	0.10	mg/L	2022/09/21	2022/09/23	RTY	8239216
Nitrate + Nitrite (N)	-	0.062	0.050	mg/L	N/A	2022/09/30	TGO	8251399
Nitrite (N)	-	ND	0.010	mg/L	N/A	2022/09/28	TGO	8251400
Nitrogen (Ammonia Nitrogen)	-	ND	0.050	mg/L	N/A	2022/09/27	TGO	8249504
Dissolved Organic Carbon (C)	-	3.6	0.50	mg/L	N/A	2022/09/26	RSL	8243866
Total Organic Carbon (C)	-	4.0	0.50	mg/L	N/A	2022/09/26	RSL	8243888
pH	-	7.35		pH	N/A	2022/09/27	AA0	8246646
Total Phosphorus	-	0.012	0.004	mg/L	2022/09/21	2022/09/22	SSV	8239191
Total Suspended Solids	-	4.0	1.0	mg/L	2022/09/20	2022/09/21	RMK	8234498
Turbidity	-	2.0	0.10	NTU	N/A	2022/09/28	NGI	8251754
MERCURY BY COLD VAPOUR AA (WATER)								
Metals								
Total Mercury (Hg)	-	ND	0.000013	mg/L	2022/09/22	2022/09/22	FJO	8238060
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Aluminum (Al)	-	0.050	0.0050	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Antimony (Sb)	-	ND	0.0010	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Arsenic (As)	-	ND	0.0010	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Barium (Ba)	-	0.0082	0.0010	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Boron (B)	-	ND	0.050	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Cadmium (Cd)	-	0.000013	0.000010	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Calcium (Ca)	-	6.7	0.10	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Chromium (Cr)	-	ND	0.0010	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Copper (Cu)	-	0.0032	0.00050	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Iron (Fe)	-	0.97	0.050	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Lead (Pb)	-	ND	0.00050	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Magnesium (Mg)	-	1.8	0.10	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Manganese (Mn)	-	0.022	0.0020	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Nickel (Ni)	-	0.023	0.0020	mg/L	2022/09/20	2022/09/21	JHY	8234609

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Bureau Veritas Job #: C2Q7736
Report Date: 2022/10/07

NL Department of Environment, Climate Change and Municipalities
Your P.O. #: 220028978-6

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
TTI087 CAMP PD BK BELOW CAMP PD Sampling Date 2022/09/13 15:45 Matrix W Sample # 2022-1928-00-SI-SP Registration # WS-S-0000								
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Phosphorus (P)	-	ND	0.10	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Potassium (K)	-	0.99	0.10	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Selenium (Se)	-	ND	0.00050	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Sodium (Na)	-	2.9	0.10	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Strontium (Sr)	-	0.035	0.0020	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Uranium (U)	-	ND	0.00010	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Zinc (Zn)	-	ND	0.0050	mg/L	2022/09/20	2022/09/21	JHY	8234609

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Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
TTI086 REID BK BELOW TRIBUTARY								
Sampling Date 2022/09/13 14:45								
Matrix W								
Sample # 2022-1927-00-SI-SP								
Registration # WS-S-0000								
RESULTS OF ANALYSES OF WATER								
Calculated Parameters								
Hardness (CaCO3)	-	12	1.0	mg/L	N/A	2022/09/21		8228878
Nitrate (N)	-	0.066	0.050	mg/L	N/A	2022/09/28		8228883
Total dissolved solids (calc., EC)	-	22	1.0	mg/L	N/A	2022/09/28		8229891
Inorganics								
Conductivity	-	39	1.0	uS/cm	N/A	2022/09/27	NGI	8248999
Chloride (Cl-)	-	2.5	1.0	mg/L	N/A	2022/09/23	LKH	8239063
Bromide (Br-)	-	ND	1.0	mg/L	N/A	2022/09/23	LKH	8239063
Sulphate (SO4)	-	2.8	1.0	mg/L	N/A	2022/09/23	LKH	8239063
Total Alkalinity (Total as CaCO3)	-	11	2.0	mg/L	N/A	2022/09/27	NGI	8249006
Colour	-	19	5.0	TCU	N/A	2022/09/28	TGO	8248316
Dissolved Fluoride (F-)	-	0.12	0.10	mg/L	N/A	2022/09/27	NGI	8249007
Total Kjeldahl Nitrogen (TKN)	-	0.18	0.10	mg/L	2022/09/21	2022/09/23	RTY	8239216
Nitrate + Nitrite (N)	-	0.066	0.050	mg/L	N/A	2022/09/27	TGO	8248321
Nitrite (N)	-	ND	0.010	mg/L	N/A	2022/09/27	TGO	8248322
Nitrogen (Ammonia Nitrogen)	-	ND	0.050	mg/L	N/A	2022/09/27	TGO	8249504
Dissolved Organic Carbon (C)	-	2.1	0.50	mg/L	N/A	2022/09/26	RSL	8243621
Total Organic Carbon (C)	-	2.4	0.50	mg/L	N/A	2022/09/26	RSL	8246759
pH	-	7.28		pH	N/A	2022/09/27	NGI	8249005
Total Phosphorus	-	0.007	0.004	mg/L	2022/09/21	2022/09/22	SSV	8239191
Total Suspended Solids	-	1.0	1.0	mg/L	2022/09/20	2022/09/21	RMK	8234498
Turbidity	-	1.7	0.10	NTU	N/A	2022/09/27	AA0	8248877
MERCURY BY COLD VAPOUR AA (WATER)								
Metals								
Total Mercury (Hg)	-	ND	0.000013	mg/L	2022/09/22	2022/09/22	FJO	8238060
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Aluminum (Al)	-	0.055	0.0050	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Antimony (Sb)	-	ND	0.0010	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Arsenic (As)	-	ND	0.0010	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Barium (Ba)	-	0.0046	0.0010	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Boron (B)	-	ND	0.050	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Cadmium (Cd)	-	ND	0.000010	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Calcium (Ca)	-	3.3	0.10	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Chromium (Cr)	-	ND	0.0010	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Copper (Cu)	-	0.00087	0.00050	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Iron (Fe)	-	0.50	0.050	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Lead (Pb)	-	ND	0.00050	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Magnesium (Mg)	-	0.98	0.10	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Manganese (Mn)	-	0.0080	0.0020	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Nickel (Ni)	-	0.0033	0.0020	mg/L	2022/09/20	2022/09/21	JHY	8234609

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Bureau Veritas Job #: C2Q7736
Report Date: 2022/10/07

NL Department of Environment, Climate Change and Municipalities
Your P.O. #: 220028978-6

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
TTI086 REID BK BELOW TRIBUTARY Sampling Date 2022/09/13 14:45 Matrix W Sample # 2022-1927-00-SI-SP Registration # WS-S-0000								
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Phosphorus (P)	-	ND	0.10	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Potassium (K)	-	0.57	0.10	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Selenium (Se)	-	ND	0.00050	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Sodium (Na)	-	2.5	0.10	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Strontium (Sr)	-	0.017	0.0020	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Uranium (U)	-	ND	0.00010	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Zinc (Zn)	-	ND	0.0050	mg/L	2022/09/20	2022/09/21	JHY	8234609

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Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
TTI085 TRIB TO REID BROOK								
Sampling Date 2022/09/13 14:10								
Matrix W								
Sample # 2022-1926-00-SI-SP								
Registration # WS-S-0000								
RESULTS OF ANALYSES OF WATER								
Calculated Parameters								
Hardness (CaCO3)	-	17	1.0	mg/L	N/A	2022/09/21		8228878
Nitrate (N)	-	0.053	0.050	mg/L	N/A	2022/09/28		8228883
Total dissolved solids (calc., EC)	-	28	1.0	mg/L	N/A	2022/09/28		8229891
Inorganics								
Conductivity	-	51	1.0	uS/cm	N/A	2022/09/27	NGI	8249008
Chloride (Cl-)	-	3.5	1.0	mg/L	N/A	2022/09/23	LKH	8239063
Bromide (Br-)	-	ND	1.0	mg/L	N/A	2022/09/23	LKH	8239063
Sulphate (SO4)	-	3.9	1.0	mg/L	N/A	2022/09/23	LKH	8239063
Total Alkalinity (Total as CaCO3)	-	14	2.0	mg/L	N/A	2022/09/27	NGI	8249014
Colour	-	27	5.0	TCU	N/A	2022/09/28	TGO	8248316
Dissolved Fluoride (F-)	-	0.13	0.10	mg/L	N/A	2022/09/27	NGI	8249016
Total Kjeldahl Nitrogen (TKN)	-	0.25	0.10	mg/L	2022/09/21	2022/09/23	RTY	8239216
Nitrate + Nitrite (N)	-	0.053	0.050	mg/L	N/A	2022/09/27	TGO	8248321
Nitrite (N)	-	ND	0.010	mg/L	N/A	2022/09/27	TGO	8248322
Nitrogen (Ammonia Nitrogen)	-	ND	0.050	mg/L	N/A	2022/09/27	TGO	8249504
Dissolved Organic Carbon (C)	-	3.4	0.50	mg/L	N/A	2022/09/26	RSL	8243866
Total Organic Carbon (C)	-	3.7	0.50	mg/L	N/A	2022/09/27	RSL	8243901
pH	-	7.20		pH	N/A	2022/09/27	NGI	8249013
Total Phosphorus	-	0.009	0.004	mg/L	2022/09/21	2022/09/22	SSV	8239191
Total Suspended Solids	-	ND	1.0	mg/L	2022/09/20	2022/09/21	RMK	8234498
Turbidity	-	1.5	0.10	NTU	N/A	2022/09/27	AA0	8248877
MERCURY BY COLD VAPOUR AA (WATER)								
Metals								
Total Mercury (Hg)	-	ND	0.000013	mg/L	2022/09/22	2022/09/22	FJO	8238060
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Aluminum (Al)	-	0.047	0.0050	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Antimony (Sb)	-	ND	0.0010	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Arsenic (As)	-	ND	0.0010	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Barium (Ba)	-	0.0059	0.0010	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Boron (B)	-	ND	0.050	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Cadmium (Cd)	-	0.000011	0.000010	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Calcium (Ca)	-	4.4	0.10	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Chromium (Cr)	-	ND	0.0010	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Copper (Cu)	-	0.0012	0.00050	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Iron (Fe)	-	0.66	0.050	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Lead (Pb)	-	ND	0.00050	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Magnesium (Mg)	-	1.5	0.10	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Manganese (Mn)	-	0.010	0.0020	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Nickel (Ni)	-	0.0062	0.0020	mg/L	2022/09/20	2022/09/21	JHY	8234609

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Bureau Veritas Job #: C2Q7736
Report Date: 2022/10/07

NL Department of Environment, Climate Change and Municipalities
Your P.O. #: 220028978-6

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
TTI085 TRIB TO REID BROOK Sampling Date 2022/09/13 14:10 Matrix W Sample # 2022-1926-00-SI-SP Registration # WS-S-0000								
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Phosphorus (P)	-	ND	0.10	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Potassium (K)	-	0.70	0.10	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Selenium (Se)	-	ND	0.00050	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Sodium (Na)	-	3.4	0.10	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Strontium (Sr)	-	0.026	0.0020	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Uranium (U)	-	ND	0.00010	mg/L	2022/09/20	2022/09/21	JHY	8234609
Total Zinc (Zn)	-	ND	0.0050	mg/L	2022/09/20	2022/09/21	JHY	8234609

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