



# Real-Time Water Quality Deployment Report

## Voisey's Bay Network

August 16 to September 11, 2021



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

## **Contents**

<b>REAL TIME WATER QUALITY MONITORING</b>	<b>2</b>
<b>QUALITY ASSURANCE AND QUALITY CONTROL</b>	<b>2</b>
<b>DATA INTERPRETATION</b>	<b>4</b>
<b>REID BROOK AT OUTLET OF REID POND</b>	<b>6</b>
<b>CAMP POND BROOK BELOW CAMP POND</b>	<b>12</b>
<b>REID BROOK BELOW TRIBUTARY</b>	<b>18</b>
<b>TRIBUTARY TO REID BROOK</b>	<b>24</b>
<b>CONCLUSIONS</b>	<b>30</b>
<b>REFERENCES</b>	<b>31</b>
<b>APPENDIX A: COMPARISON GRAPHS</b>	<b>32</b>
<b>APPENDIX B: WATER PARAMETER DESCRIPTION</b>	<b>37</b>
<b>APPENDIX C: GRAB SAMPLE RESULTS</b>	<b>39</b>

Prepared by:  
Brenda Congram  
Environmental Scientist  
Water Resources Management Division  
Department of Environment and Climate Change  
[brendacongram@gov.nl.ca](mailto:brendacongram@gov.nl.ca)

## 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 August 16, 2021, 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 September 11, 2021. This was the third deployment for the 2021 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**

Parameter	Rank				
	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	August 16	Deployment	Good	Fair	Excellent	Excellent	Excellent
	September 11	Removal	Excellent	Fair	Excellent	Excellent	Excellent
Camp Pond Brook	August 16	Deployment	Excellent	Poor	Good	Excellent	Excellent
	September 11	Removal	Excellent	Fair	Good	Excellent	Excellent
Reid Brook below Tributary	August 16	Deployment	Excellent	Poor	Poor	Excellent	Excellent
	September 11	Removal	Good	Marginal	Poor	Excellent	Excellent
Tributary to Reid Brook	August 16	Deployment	Excellent	Excellent	Fair	Excellent	Excellent
	September 11	Removal	Excellent	Good	Good	Excellent	Good

**Reid Brook at Outlet of Reid Pond**

- At deployment, all parameters ranked as either 'excellent' or 'good' with the exception of pH, which ranked as 'fair'.
- At removal, all parameters ranked as 'excellent' with the exception of pH, which again ranked as 'fair'.

**Camp Pond Brook below Camp Pond**

- At deployment, all parameters ranked as either 'excellent' or 'good' with the exception of pH, which ranked as 'poor'. This discrepancy is likely due to the field sonde not being given sufficient time to acclimatize to its environment, which is supported by a much closer comparison ranking between the QA/QC sonde and the grab sample.
- At removal, all parameters ranked as 'excellent' or 'good' with the exception of pH, which ranked as 'fair'.

**Reid Brook below Tributary**

- At deployment, all parameters ranked as 'excellent' with the exception of pH and conductivity, which both ranked as 'poor'. The discrepancy in pH is likely due to the field sonde not being given sufficient time to acclimatize to its environment, which is supported by a much closer comparison ranking between the QA/QC sonde and the grab sample result. The discrepancy in conductivity is likely due to a slight calibration error with the field sonde, which is supported by a much closer comparison ranking between the QA/QC sonde and the grab sample result.
- At removal, dissolved oxygen and turbidity were 'excellent', temperature was 'good' and pH was 'marginal', while specific conductivity again ranked as 'poor'. This further indicates that there was likely a slight calibration error with the field sonde.

### **Tributary to Reid Brook**

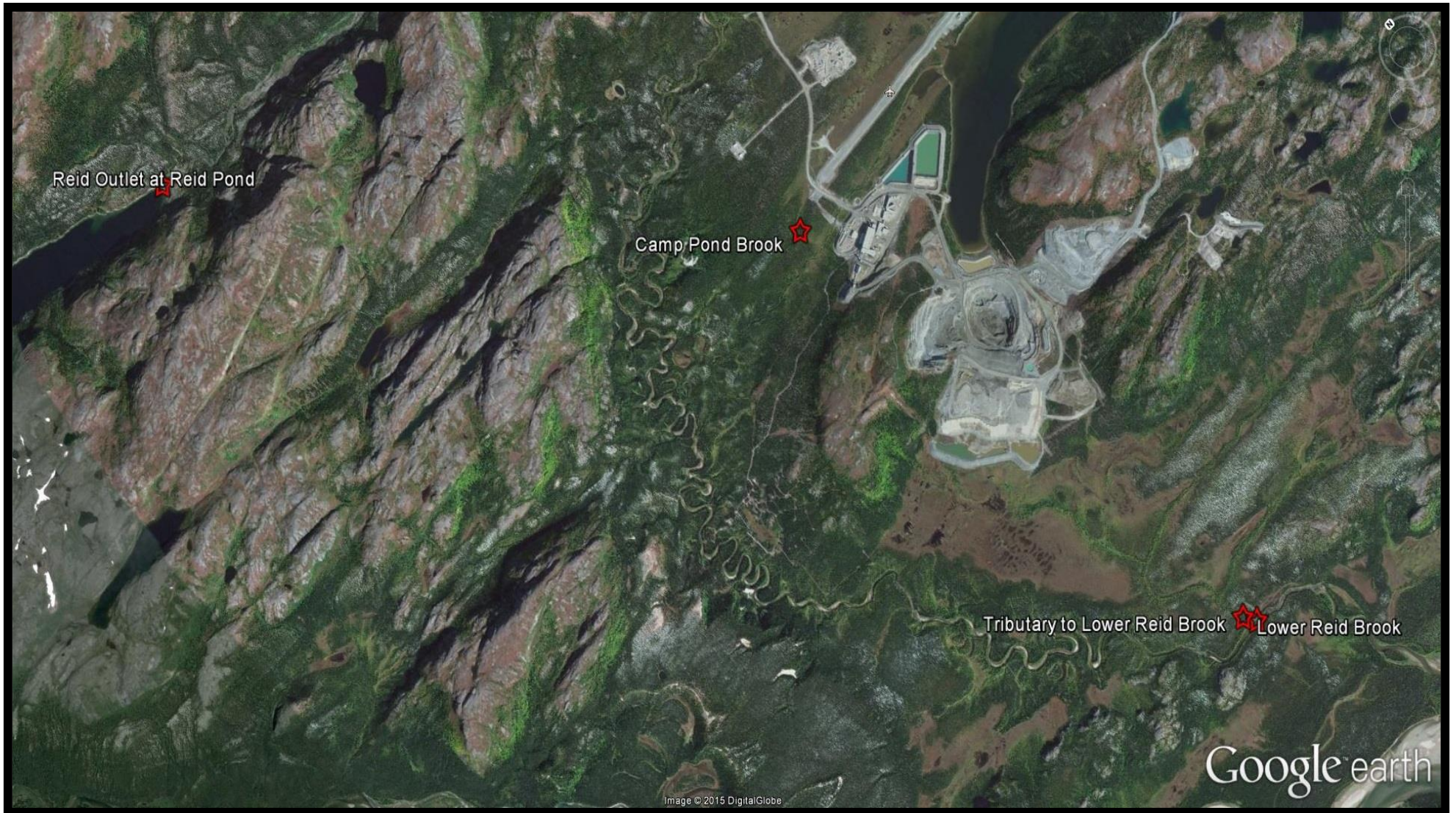
- At deployment, all parameters ranked as 'excellent' with the exception of conductivity, which ranked as 'fair'.
- At removal, all parameters ranked as either 'excellent' or 'good'.

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 August 16<sup>th</sup> to September 11<sup>th</sup>, 2021 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 12.03°C to 16.37°C, with a median value of 13.87°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.

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



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

### pH

Over the deployment period, pH values ranged from 6.21 pH units to 6.74 pH units, with a median value of 6.54 pH units (Figure 3).

pH levels hovered above and below the CCME's Minimum Guideline for the Protection of Aquatic Life for the duration 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.

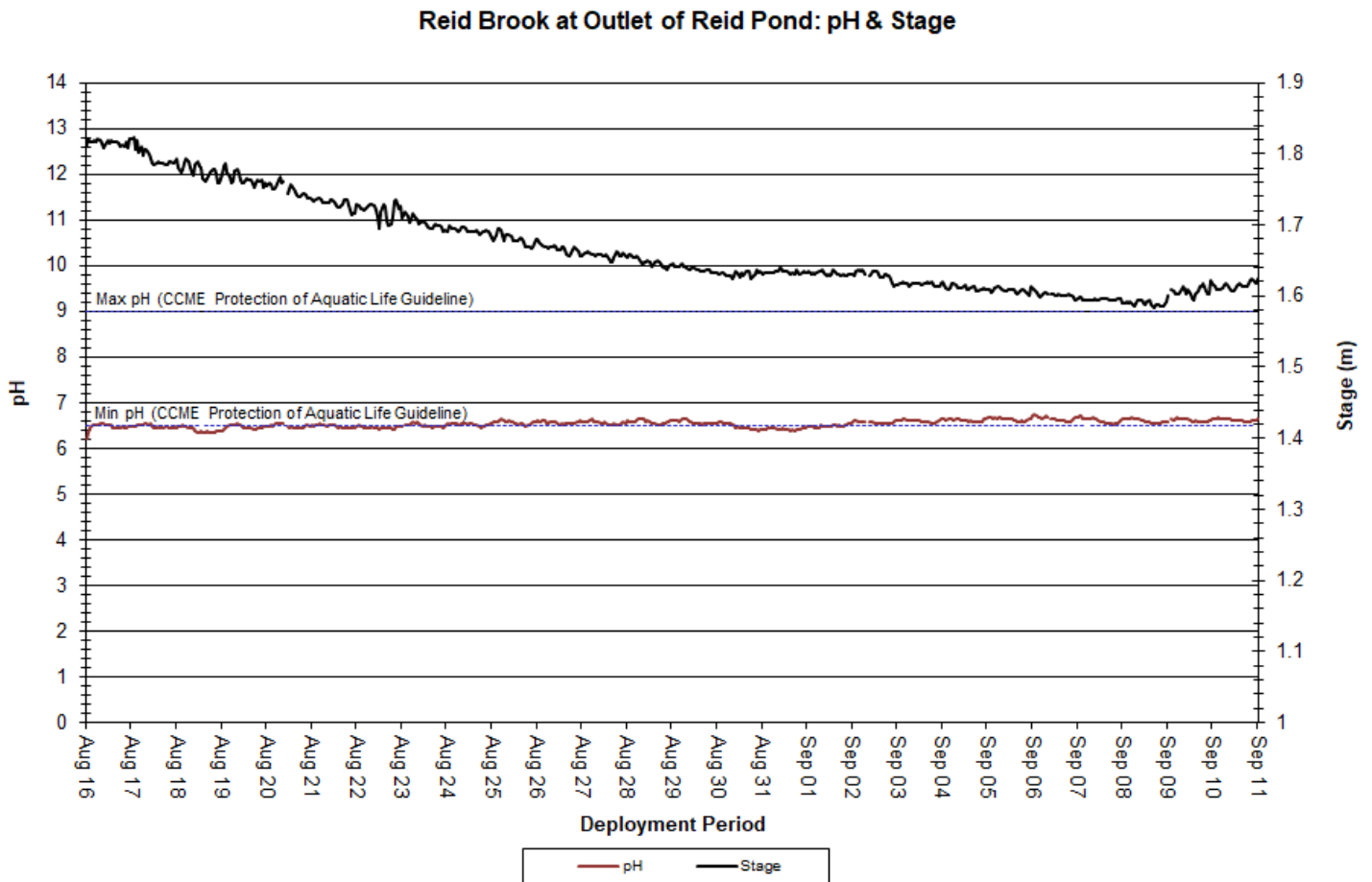


Figure 3: pH & Stage at Reid Brook at Outlet of Reid Pond



### Specific Conductivity

Over the deployment period, specific conductivity levels ranged from 9.3 $\mu$ S/cm to 10.0 $\mu$ S/cm, with a median value of 9.6 $\mu$ S/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.

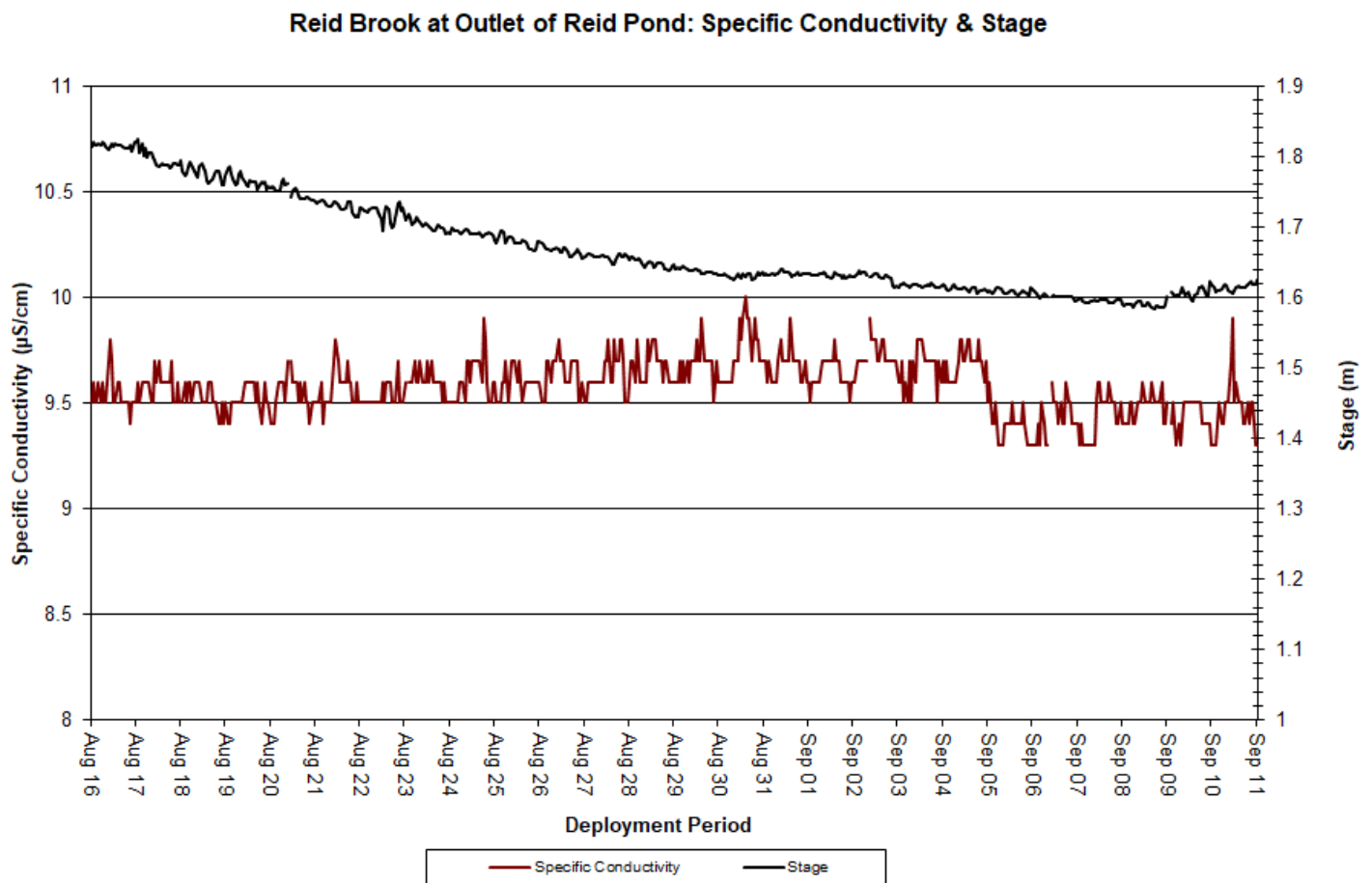


Figure 4: Specific Conductivity & Stage at Reid Brook at Outlet of Reid Pond

### Dissolved Oxygen

Over the deployment period, dissolved oxygen concentration levels ranged from 9.87mg/L to 10.65mg/L, with a median value of 10.35mg/L. Percent saturation levels for dissolved oxygen ranged from 96.2% saturation to 104.2% saturation, with a median value of 99.8% 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.

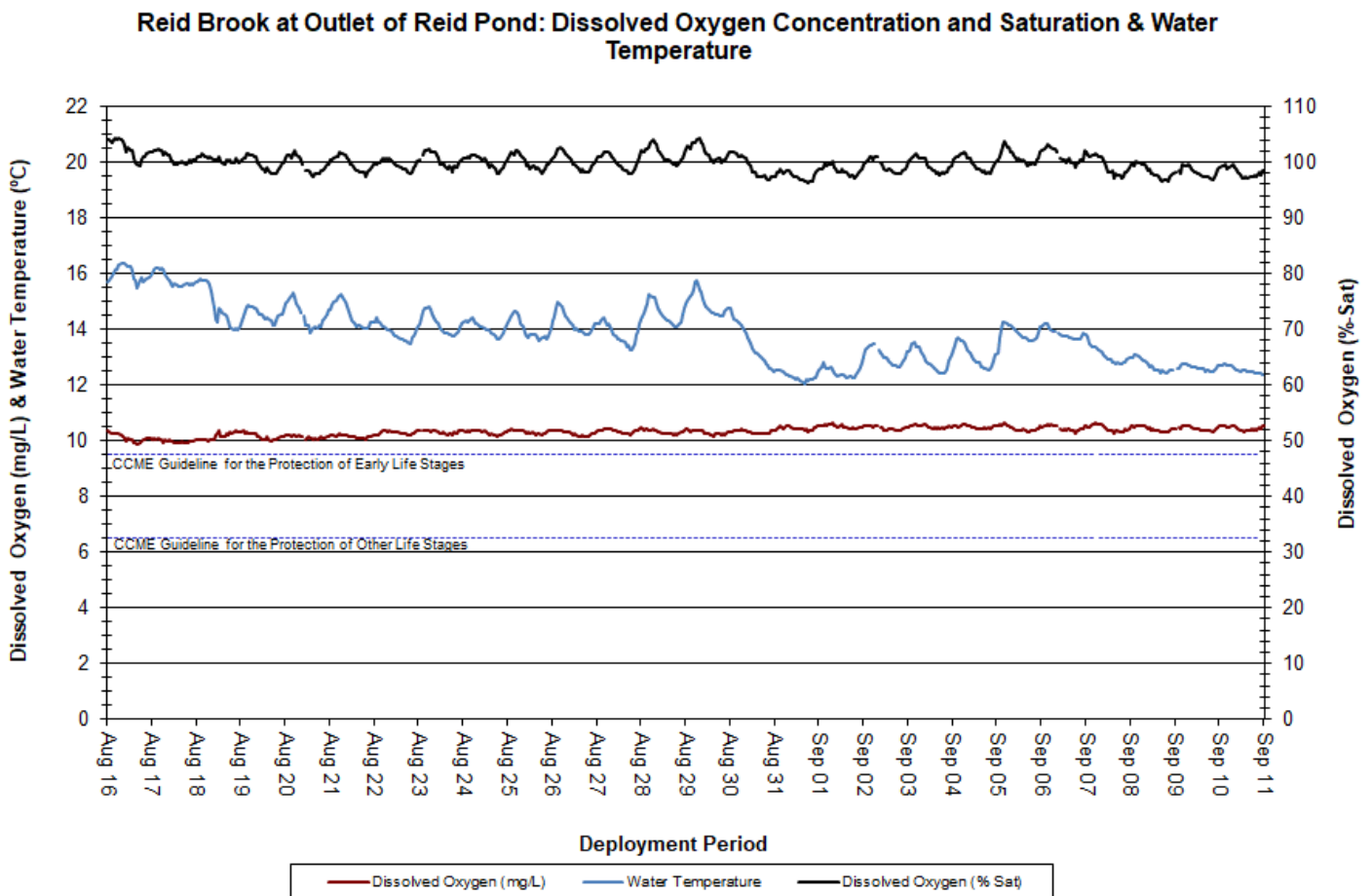


Figure 5: Dissolved Oxygen Concentration and Saturation & Water Temperature at Reid Brook at Outlet of Reid Pond

## Turbidity

Over the deployment period, turbidity levels ranged from 0.0NTU to 4.7NTU, 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.

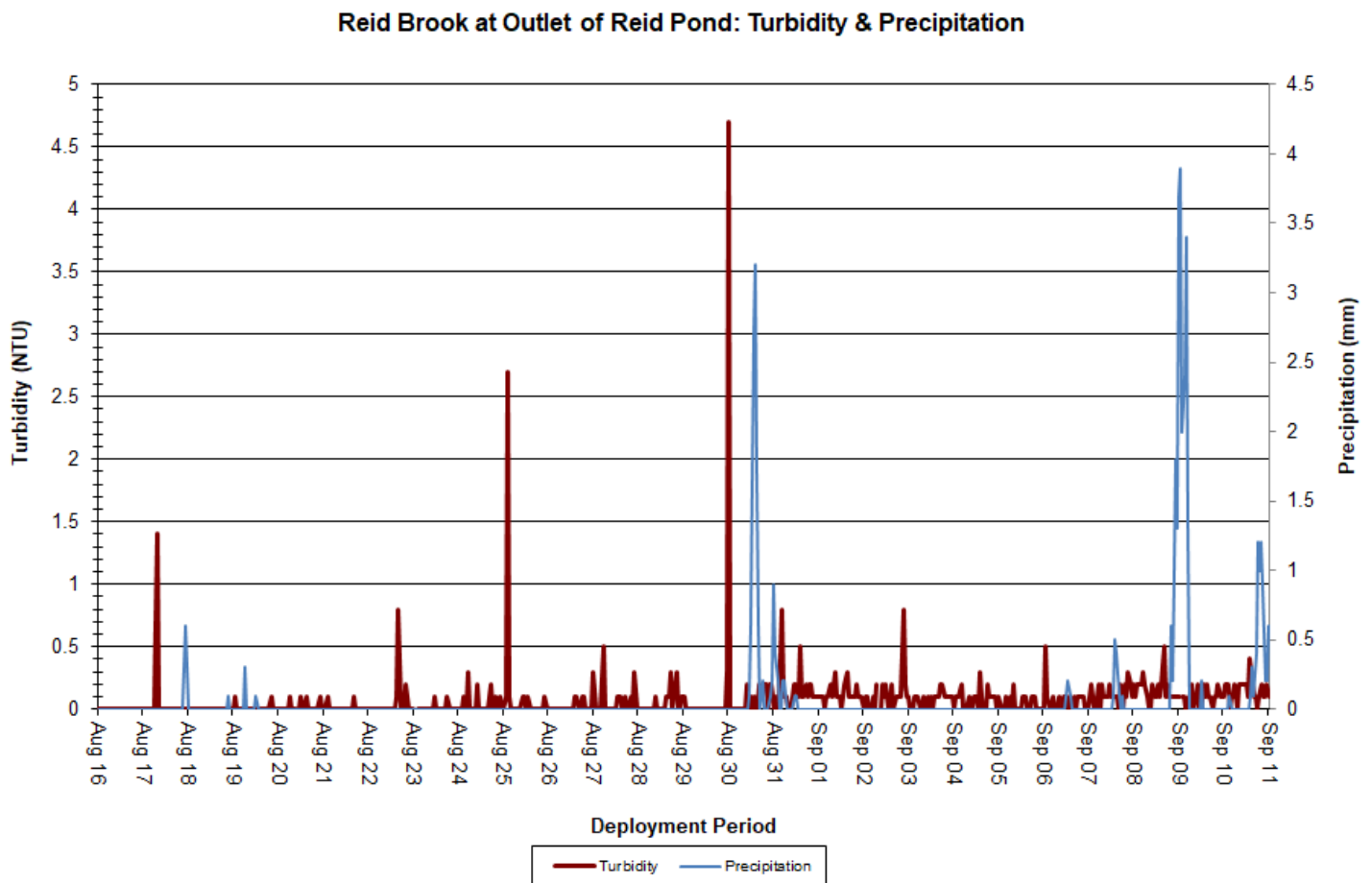


Figure 6: Turbidity & Precipitation at Reid Brook at Outlet of Reid Pond

### Stage, Flow & Precipitation

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 1.584m to 1.824m, with a median value of 1.642m. Flow values ranged from 0.398m<sup>3</sup>/s to 1.548m<sup>3</sup>/s, with a median value of 0.598m<sup>3</sup>/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.

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

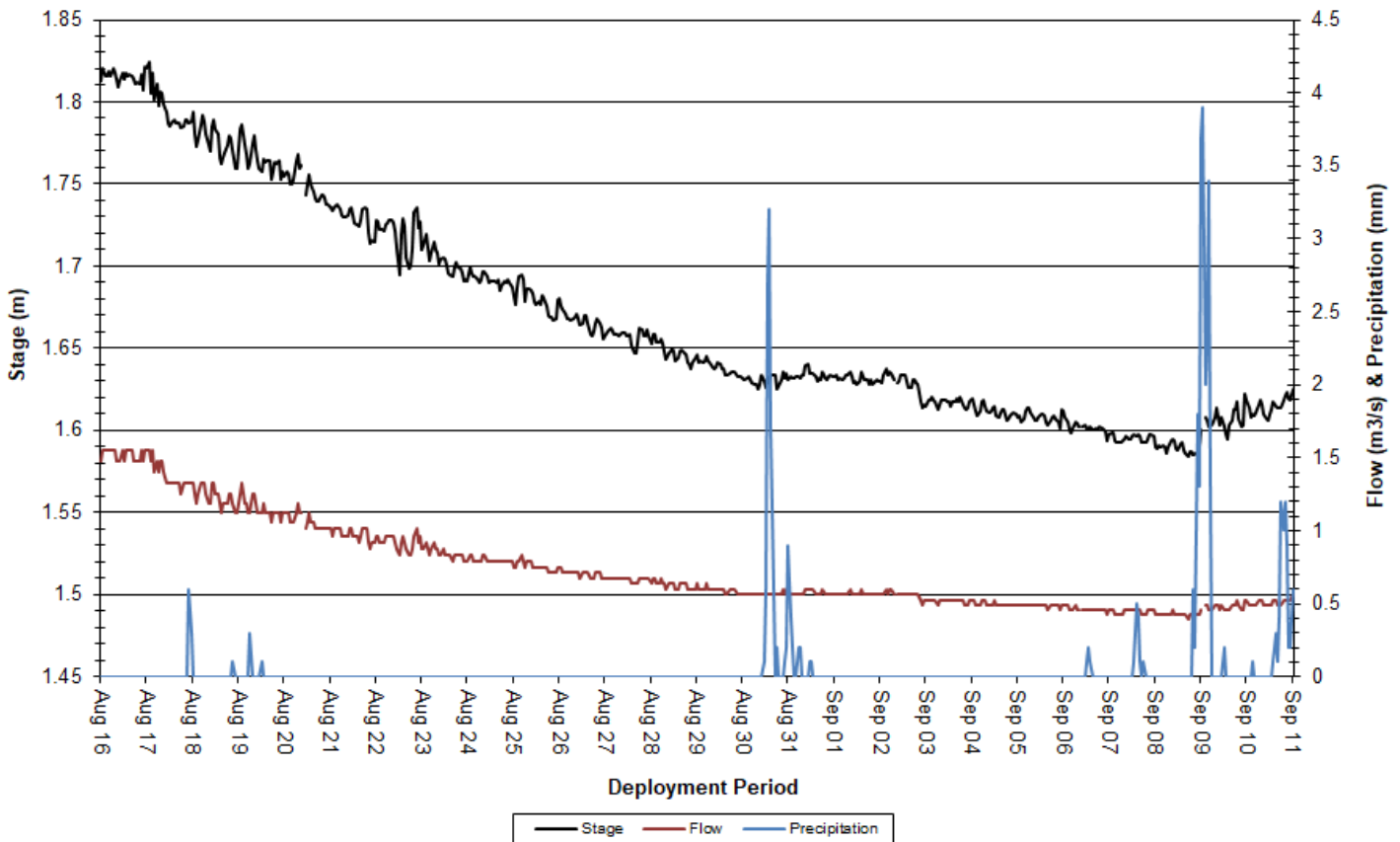


Figure 7: Stage, Flow & Precipitation at Reid Brook at Outlet of Reid Pond

## Camp Pond Brook below Camp Pond

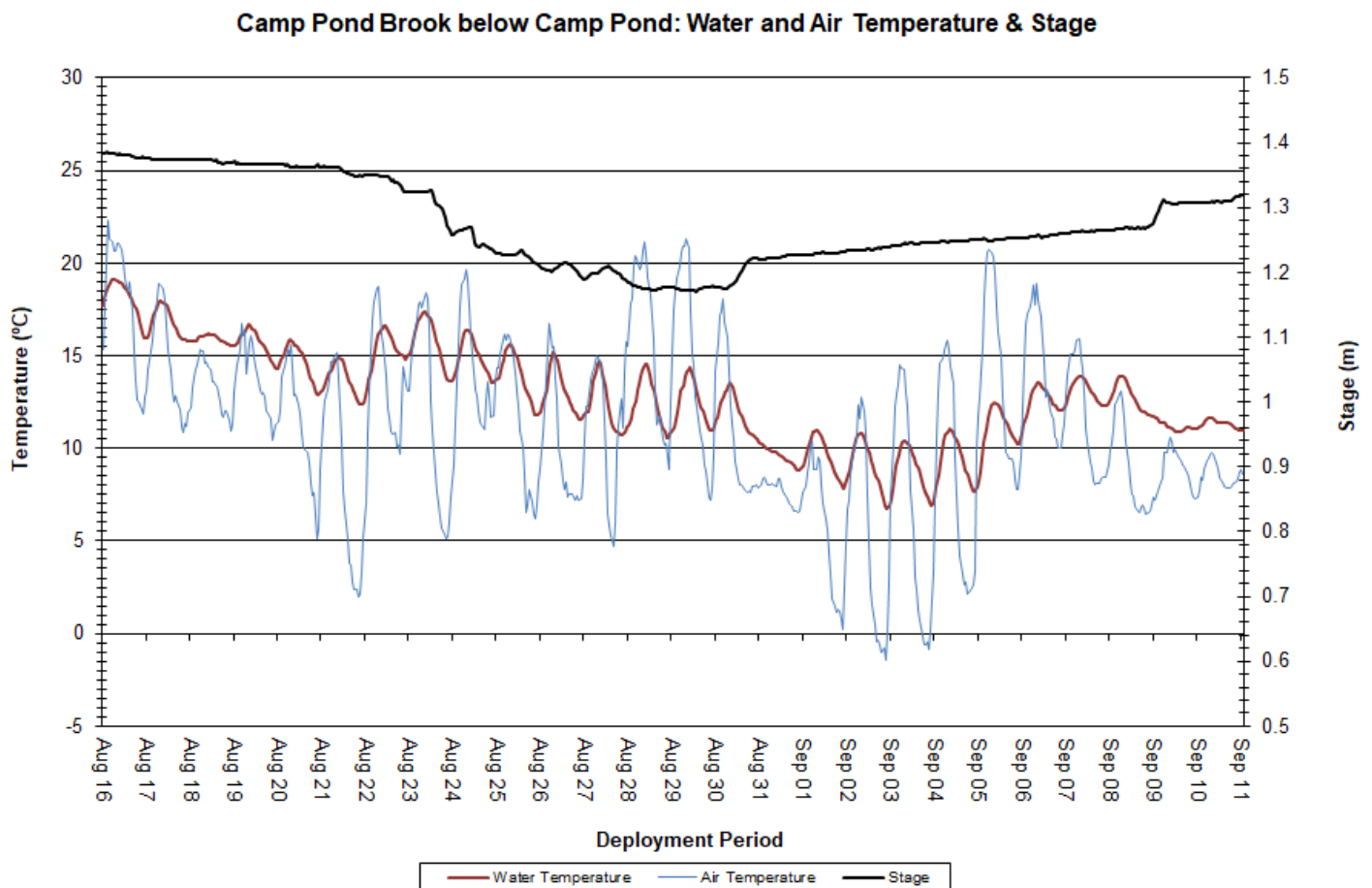
### Water Temperature

Over the deployment period, water temperature ranged from 6.77°C to 19.12°C, with a median value of 12.76°C (Figure 8).

Water temperature at this station displays diurnal variations. Water temperature was variable 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 6.52 pH units to 7.18 pH units, with a median value of 6.84 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.

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.

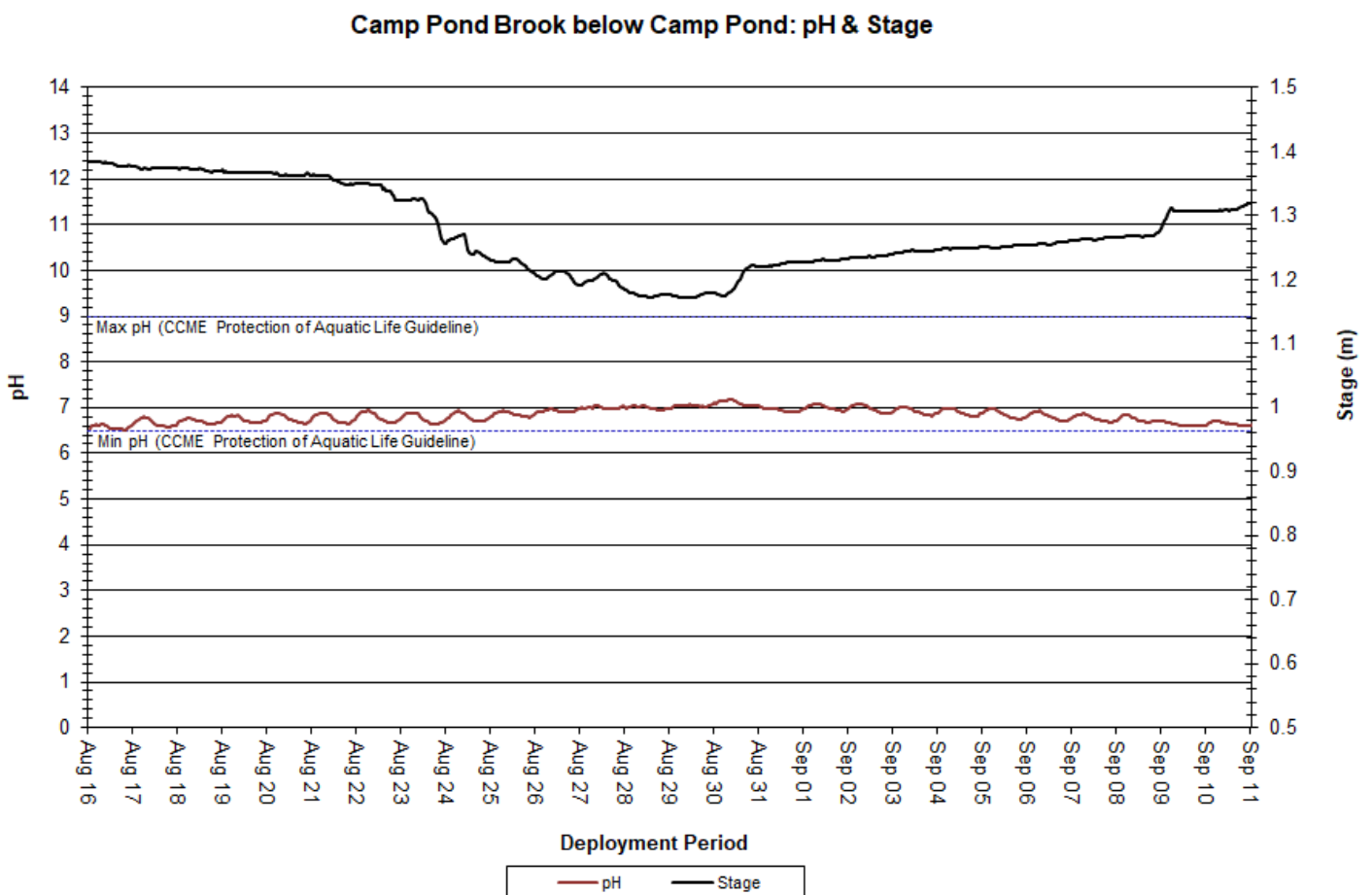


Figure 9: pH & Stage at Camp Pond Brook below Camp Pond

### Specific Conductivity

Over the deployment period, specific conductivity ranged from 35.2 $\mu$ S/cm to 222.0 $\mu$ S/cm, with a median value of 67.7 $\mu$ S/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.

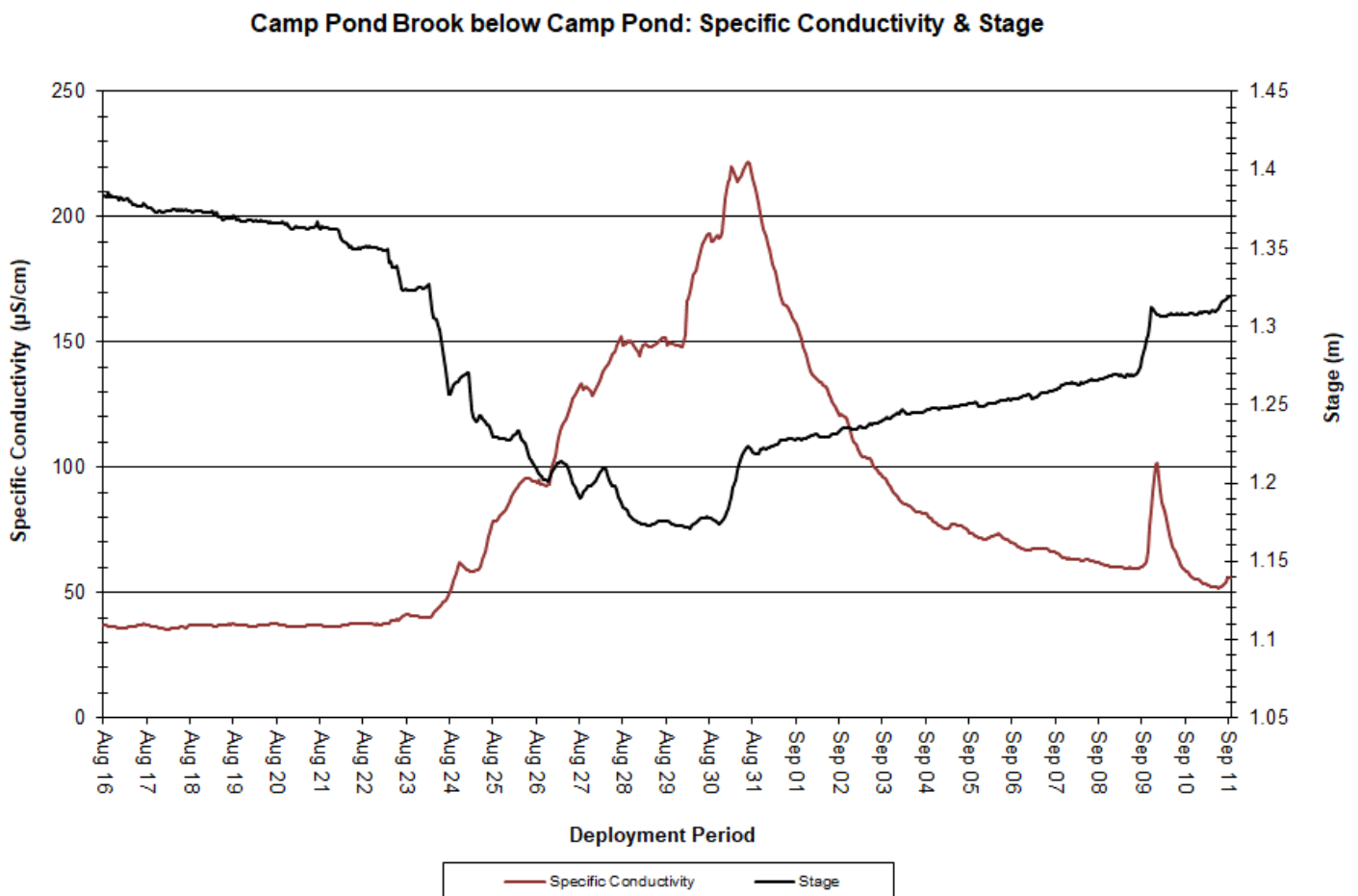


Figure 10: Specific Conductivity & Stage at Camp Pond Brook below Camp Pond

### Dissolved Oxygen

Over the deployment period, dissolved oxygen concentration ranged from 8.65mg/L to 11.17mg/L, with a median value of 9.61mg/L. Saturation of dissolved oxygen ranged from 80.8% saturation to 100.8% saturation, with a median value of 91.9% (Figure 11).

Dissolved oxygen concentrations were variable but slowly increasing across the deployment period, as water temperatures were variable but slowly 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.

Dissolved oxygen concentrations hovered above and below the CCME's Guideline for the Protection of Early Life Stages for the majority of deployment. Instances where dissolved oxygen concentrations rose above the Guideline correlated closely with periods of cooler water temperatures, which is to be expected. Dissolved oxygen concentrations remained above the CCME's Guideline for the Protection of Other Life Stages for the duration of deployment (Figure 11).

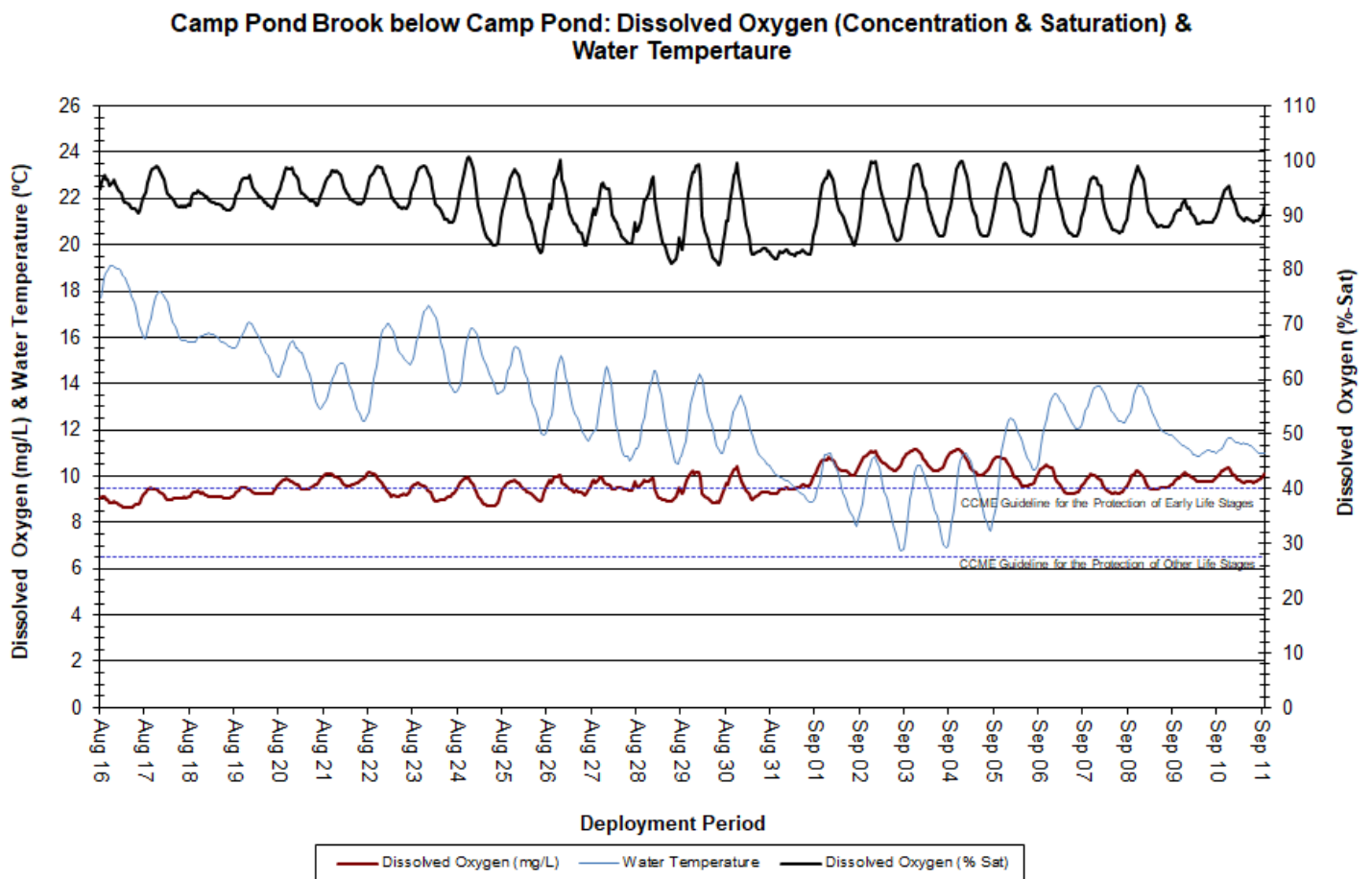


Figure 11: Dissolved Oxygen & Water Temperature at Camp Pond Brook below Camp Pond

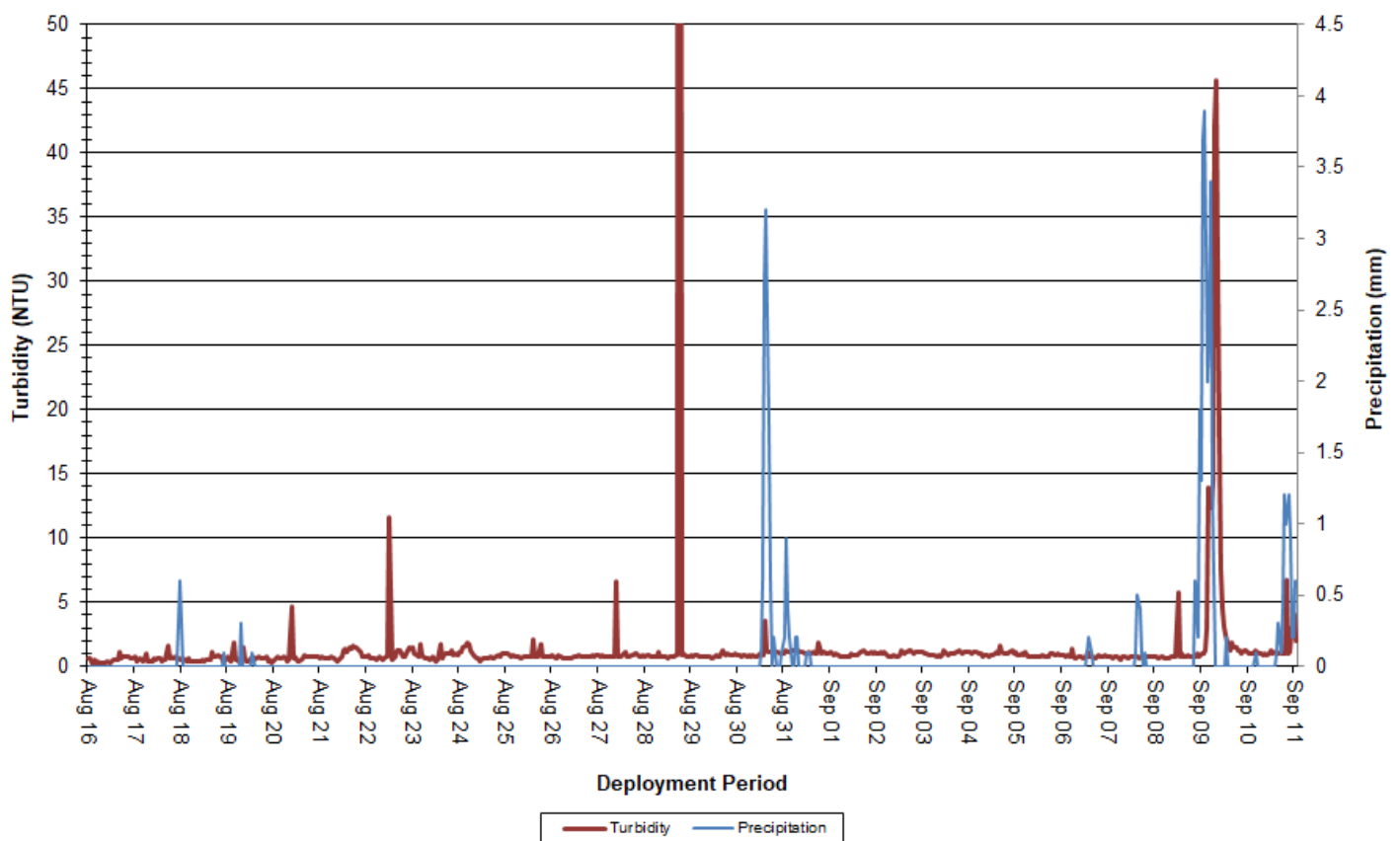


## Turbidity

Over the deployment period, turbidity ranged from 0.2NTU to 226.6NTU, with a median value of 0.8NTU (Figure 12). A median value of 0.8NTU indicates that there was a very low level of natural background turbidity at this station.

Higher turbidity levels are commonly observed 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.

**Camp Pond Brook below Camp Pond: Turbidity & Precipitation**



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

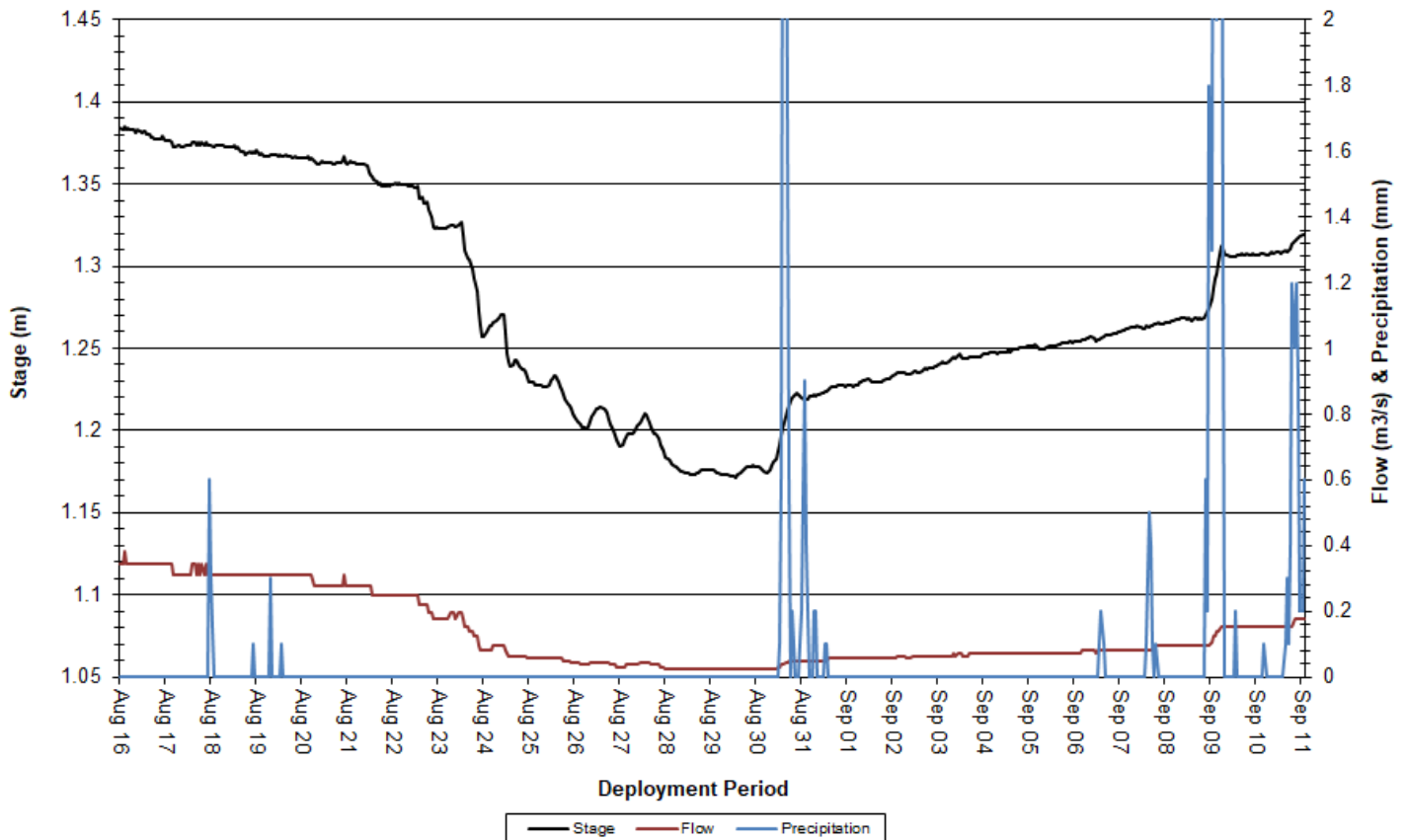
### Stage, Flow and Precipitation

Over the deployment period, stage values ranged from 1.171m to 1.385m, with a median value of 1.257m. Stream flow values ranged from 0.022m<sup>3</sup>/s to 0.381m<sup>3</sup>/s, with a median value of 0.083m<sup>3</sup>/s. Precipitation data was obtained from the Voisey's Bay airstrip weather station (Figure 13).

Stage and flow were variable across the deployment period. Significant increases in both stage and flow were observed on August 31<sup>st</sup> and September 9<sup>th</sup>, which 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.

**Camp Pond Brook below Camp Pond: Stage, Flow & Precipitation**



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

## Reid Brook below Tributary

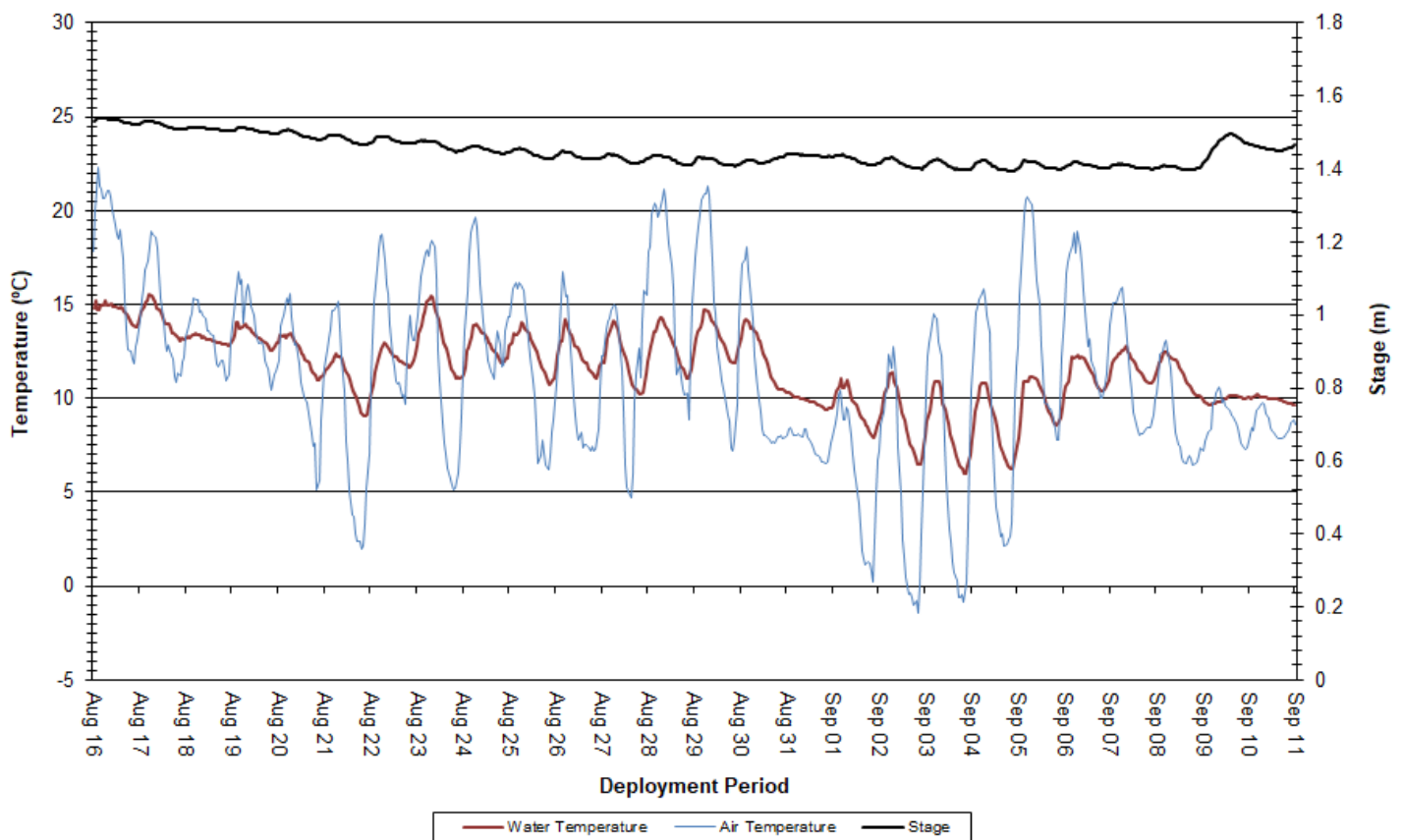
### Water Temperature

Over the deployment period, water temperature ranged from 5.99°C to 15.5°C, with a median value of 11.78°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.

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.

**Reid Brook below Tributary: Water and Air Temperature & Stage**



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

## pH

Over the deployment period, pH ranged from 6.48 pH units to 6.94 pH units, with a median value of 6.77 (Figure 15).

pH was within the CCME's Guidelines for the Protection of Aquatic Life for the majority of the deployment period. Instances where pH values fell below the CCME's Minimum Guideline correlated closely with sharp increases in stage, which is to be expected.

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.

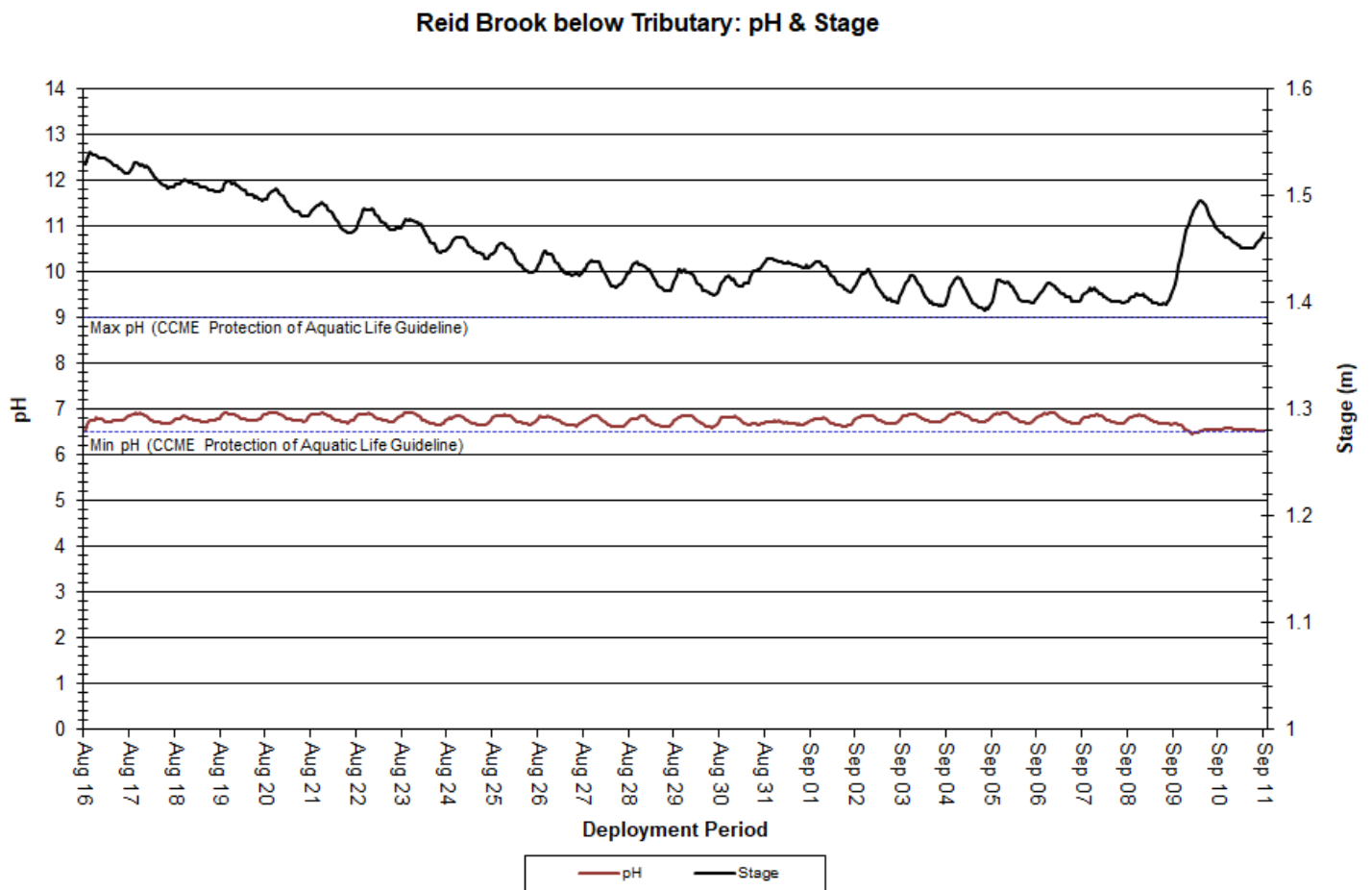


Figure 15: pH & Stage at Reid Brook below Tributary

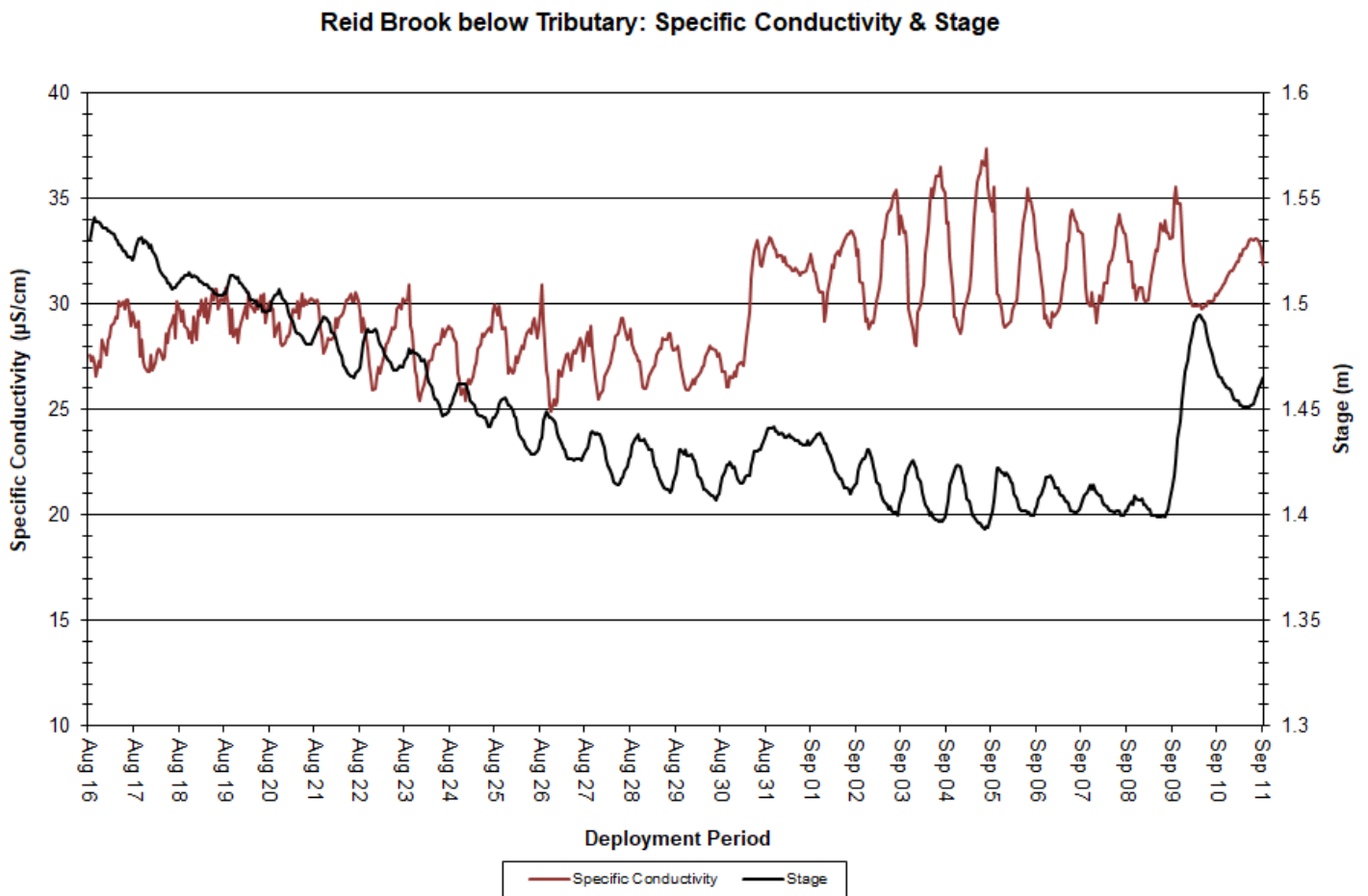
### Specific Conductivity

Over the deployment period, specific conductivity ranged from 24.9 $\mu$ S/cm to 37.4 $\mu$ S/cm, with a median value of 29.6 $\mu$ S/cm (Figure 16).

Specific conductivity slowly increased 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. Increasing specific conductivity levels and corresponding decreasing water levels are characteristic of this station at this time of year.

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 9.74mg/L to 13.65mg/L, with a median value of 10.81mg/L. The saturation of dissolved oxygen ranged from 95.1% saturation to 131.1% saturation, with a median value of 98.2% (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 slowly increased over the course of deployment, which is to be expected as water temperatures slowly decreased across the same period.

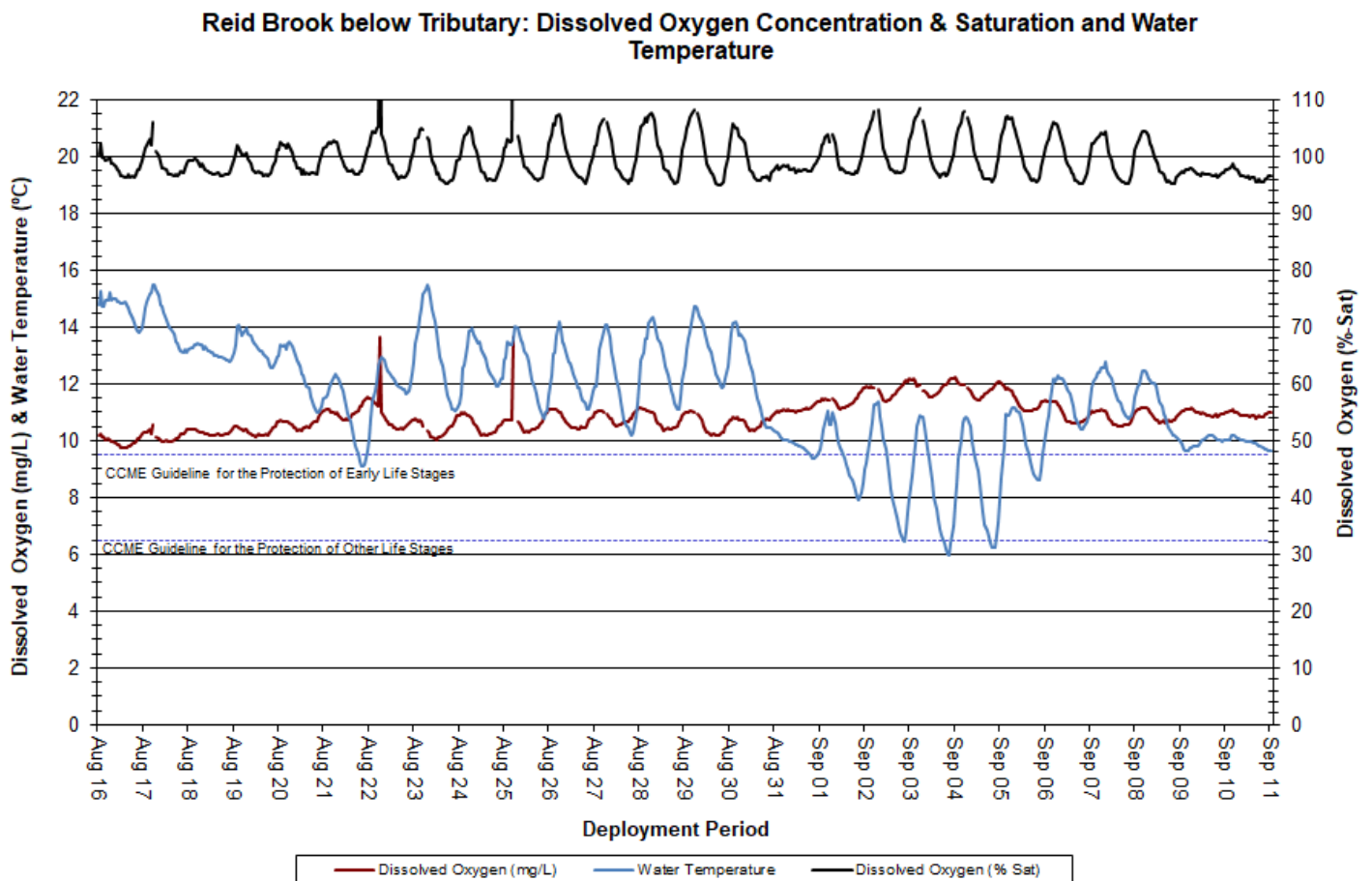


Figure 17: Dissolved Oxygen & Water Temperature at Reid Brook below Tributary

## Turbidity

Over the deployment period, turbidity ranged from 0.0 NTU to 10.7 NTU, with a median value of 0.0 NTU (Figure 18). A median turbidity value of 0.0 NTU indicates that there was very little 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. Precipitation data was obtained from the Voisey's Bay airstrip weather station.

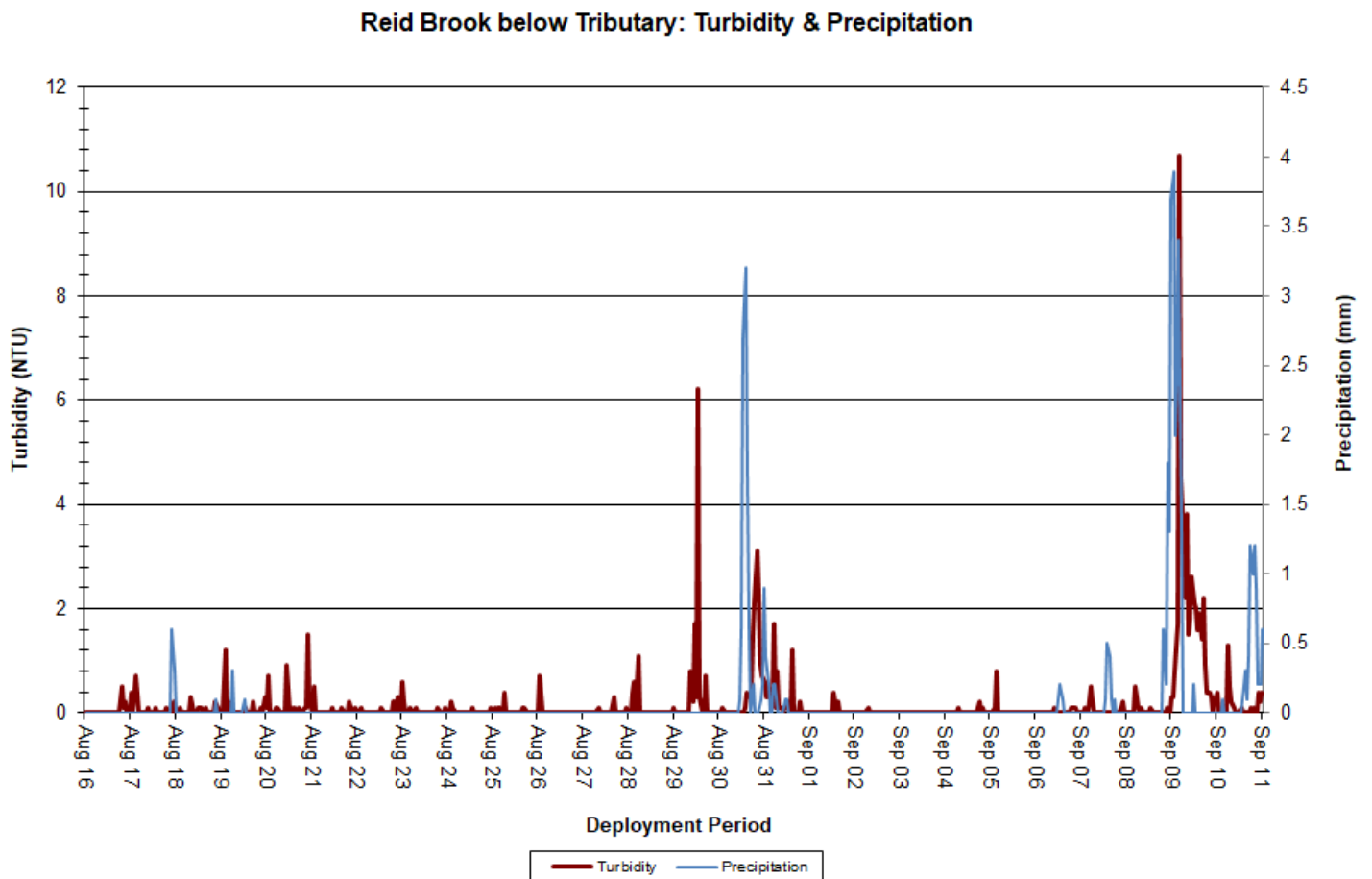


Figure 18: Turbidity & Precipitation at Reid Brook below Tributary

### Stage and Flow

Over the deployment period, stage values ranged from 1.393m to 1.541m, with a median value of 1.437m. Stream flow values ranged from 0.921m<sup>3</sup>/s to 3.025m<sup>3</sup>/s, with a median value of 1.401m<sup>3</sup>/s. Precipitation data was obtained from the Voisey's Bay airstrip weather station (Figure 19).

Stage and flow were variable, but steadily decreasing, across the deployment period. Increases in both stage and flow were generally attributable to 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.

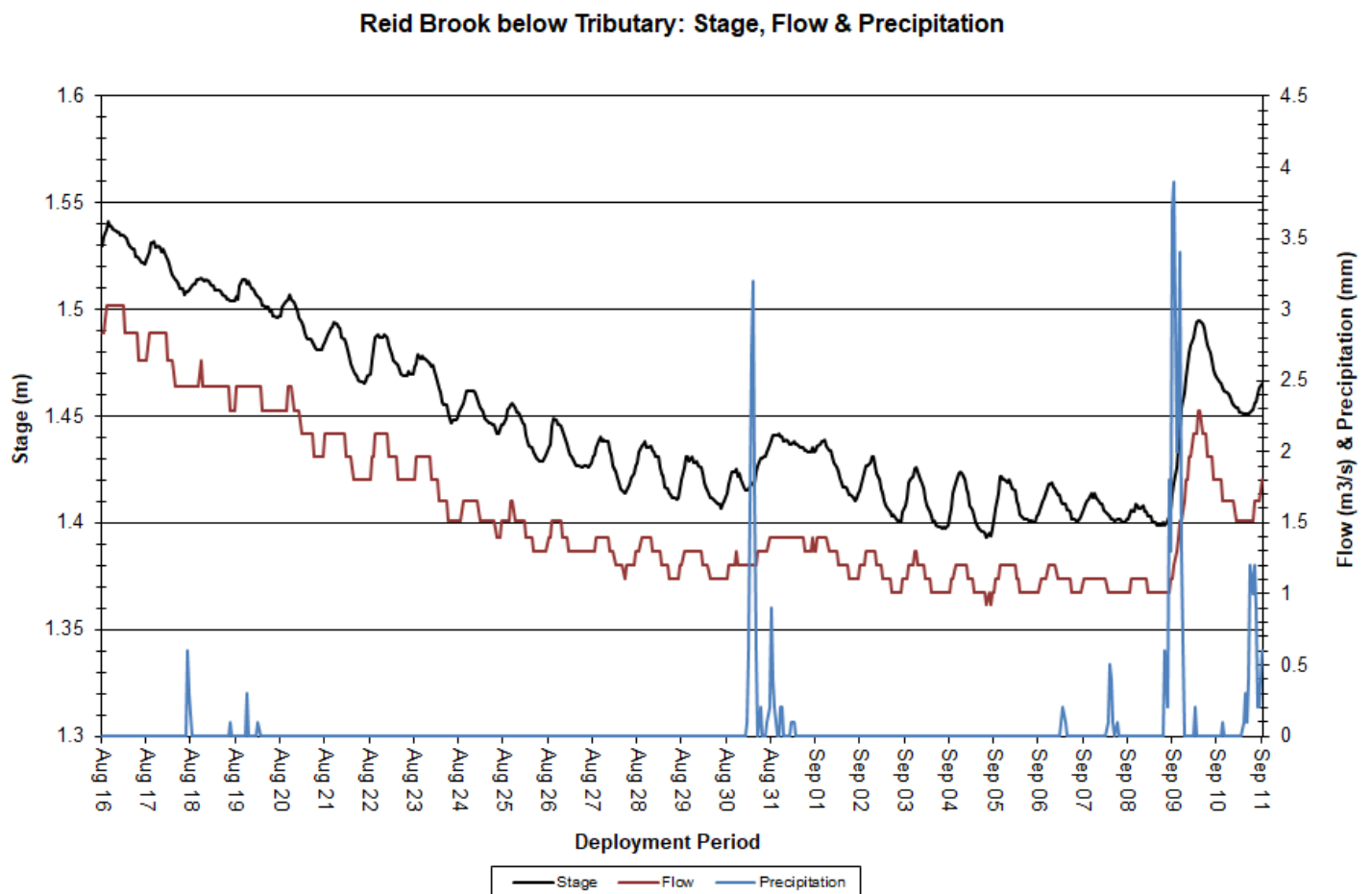


Figure 19: Stage, Flow & Precipitation at Reid Brook below Tributary



## Tributary to Reid Brook

### Water Temperature

Over the deployment period, water temperature ranged from 6.0°C to 14.8°C, with a median value of 10.5°C (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.

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.

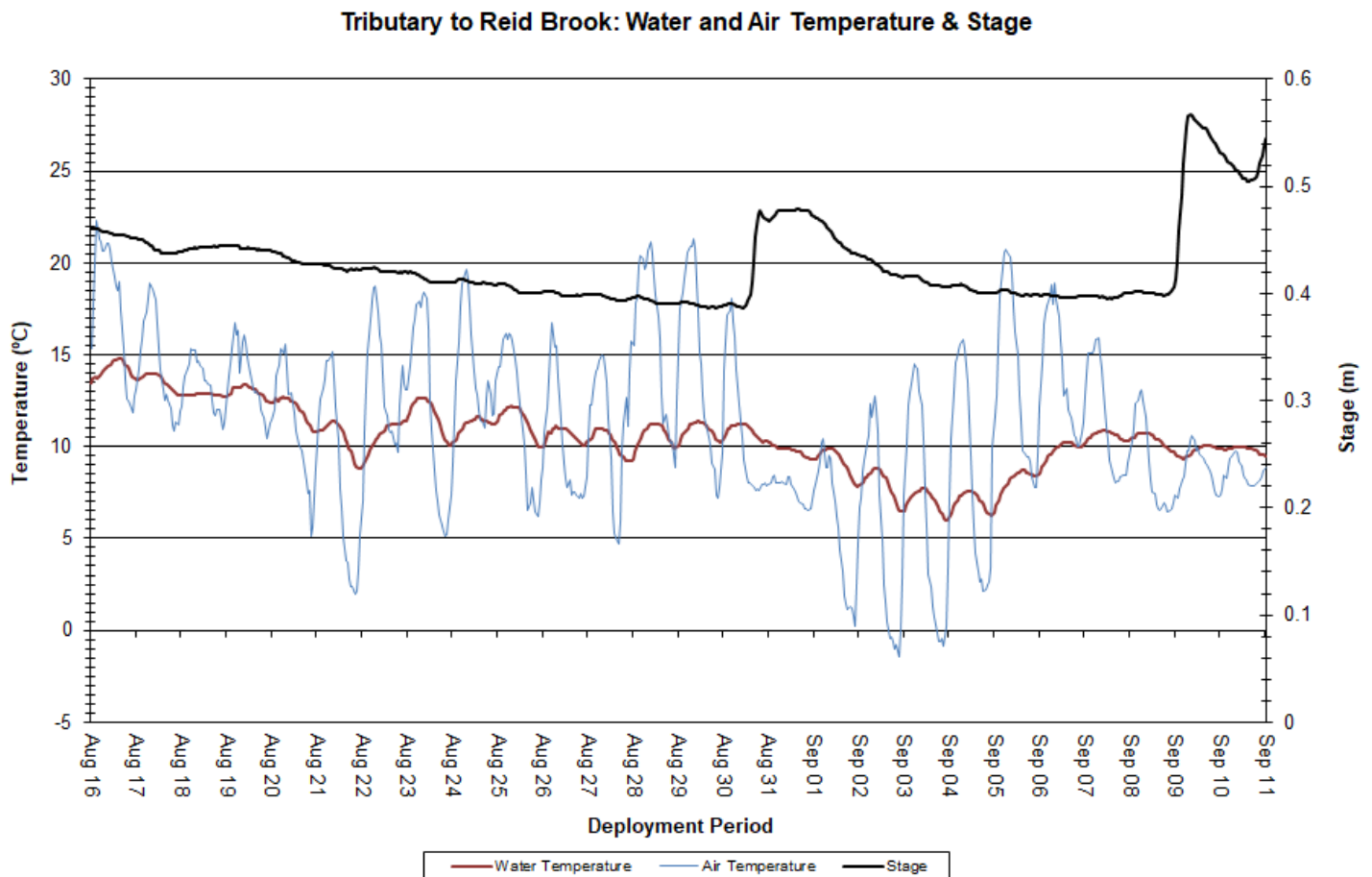


Figure 20: Water and Air Temperature & Stage at Tributary to Reid Brook

## pH

Over the deployment period, pH ranged from 6.60 pH units to 7.15 pH units, with a median value of 7.02 (Figure 21).

pH values were quite stable and remained within the CCME's Guidelines for the Protection of Aquatic Life for the duration of the deployment period.

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.

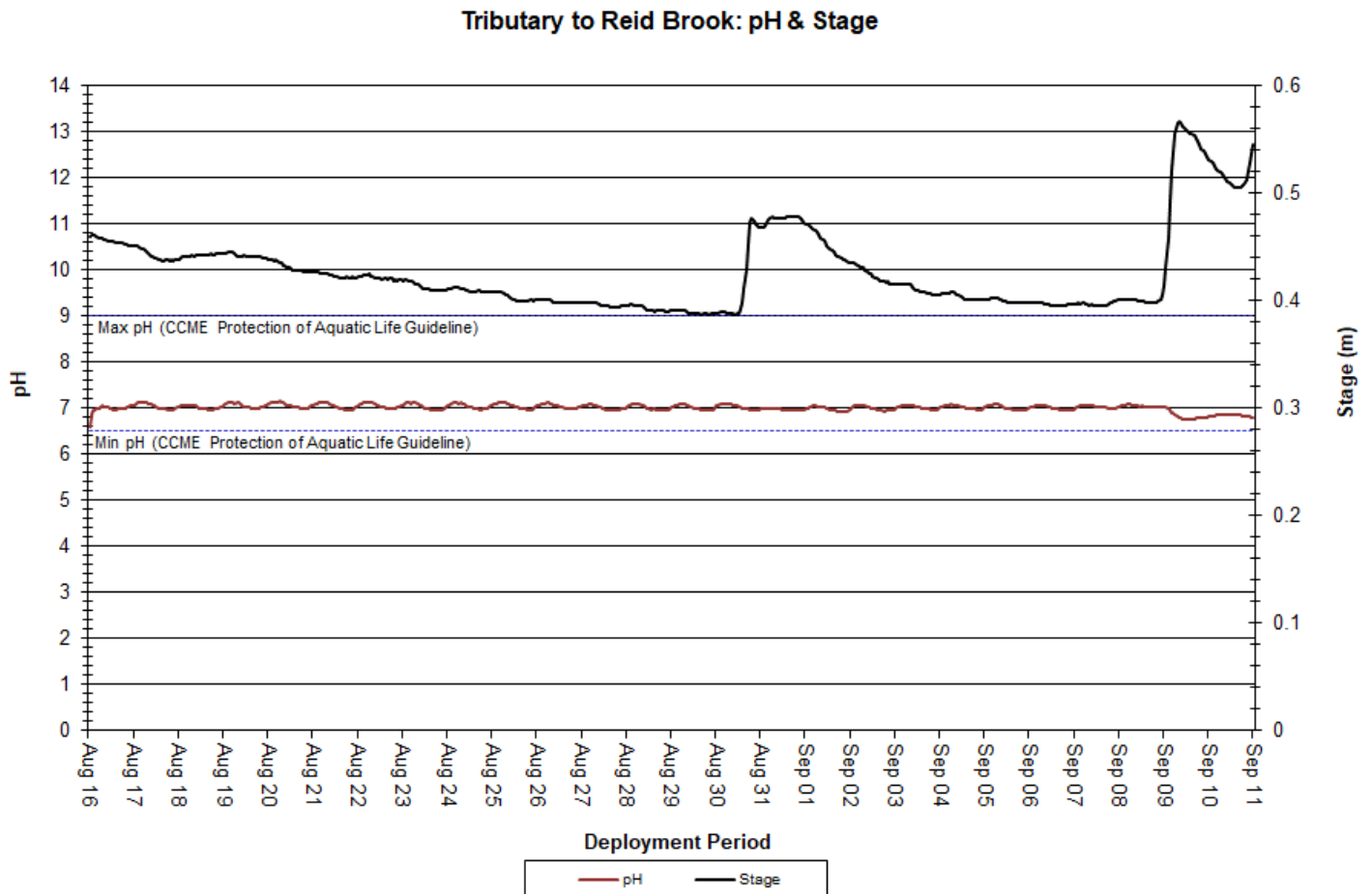


Figure 21: pH & Stage at Tributary to Reid Brook

### Specific Conductivity

Over the deployment period, specific conductivity ranged from 33.2 $\mu$ S/cm to 42.4 $\mu$ S/cm, with a median value of 37.1 $\mu$ S/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.

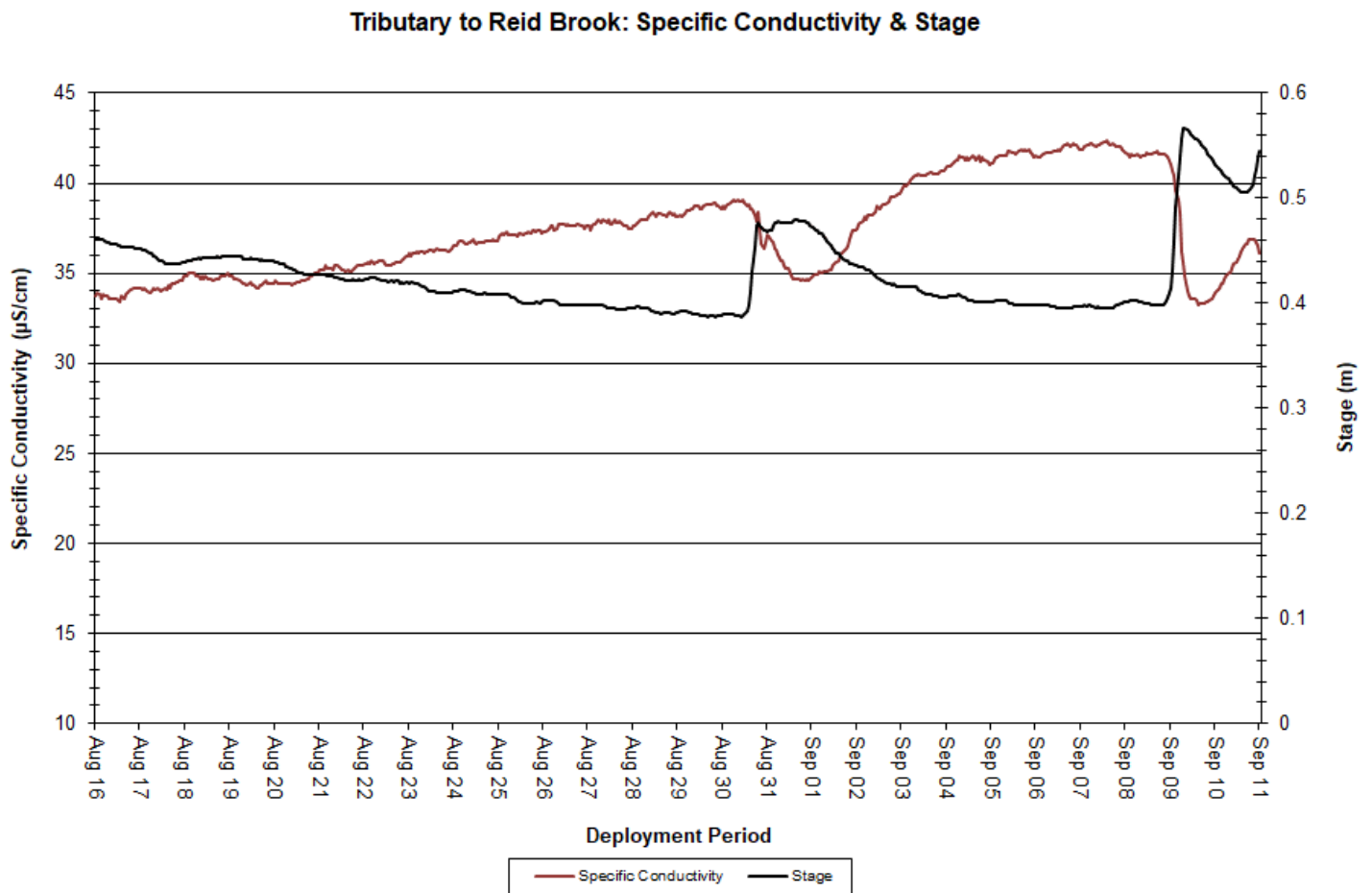


Figure 22: Specific Conductivity & Stage at Tributary to Reid Brook

### Dissolved Oxygen

Over the deployment period, dissolved oxygen concentration ranged from 9.6mg/L to 12.1mg/L, with a median value of 10.7mg/L. The saturation of dissolved oxygen ranged from 93.8% saturation to 99.9% saturation, with a median value of 96.0% (Figure 23).

Dissolved oxygen levels were steadily increasing across the deployment period, which is to be expected given that water temperatures were steadily 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.

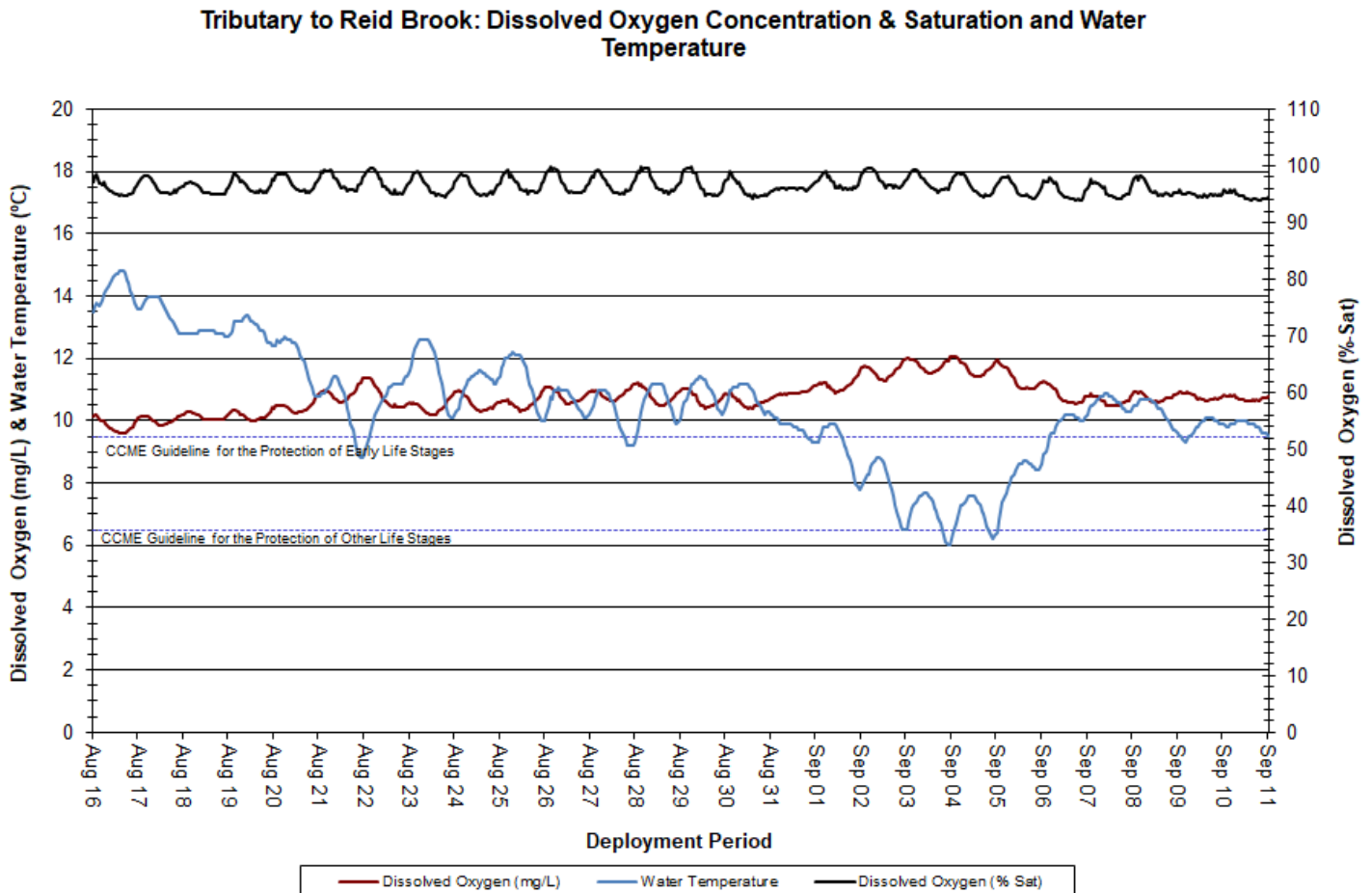


Figure 23: Dissolved Oxygen & Water Temperature at Tributary to Reid Brook

### Turbidity

Over the deployment period, turbidity ranged from 0 NTU to 1455 NTU, with a median value of 0 NTU (Figure 24). A median value of 0 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 somewhat correlated with observed rainfall events, and turbidity returned to baseline levels following each temporary increase (Figure 24).

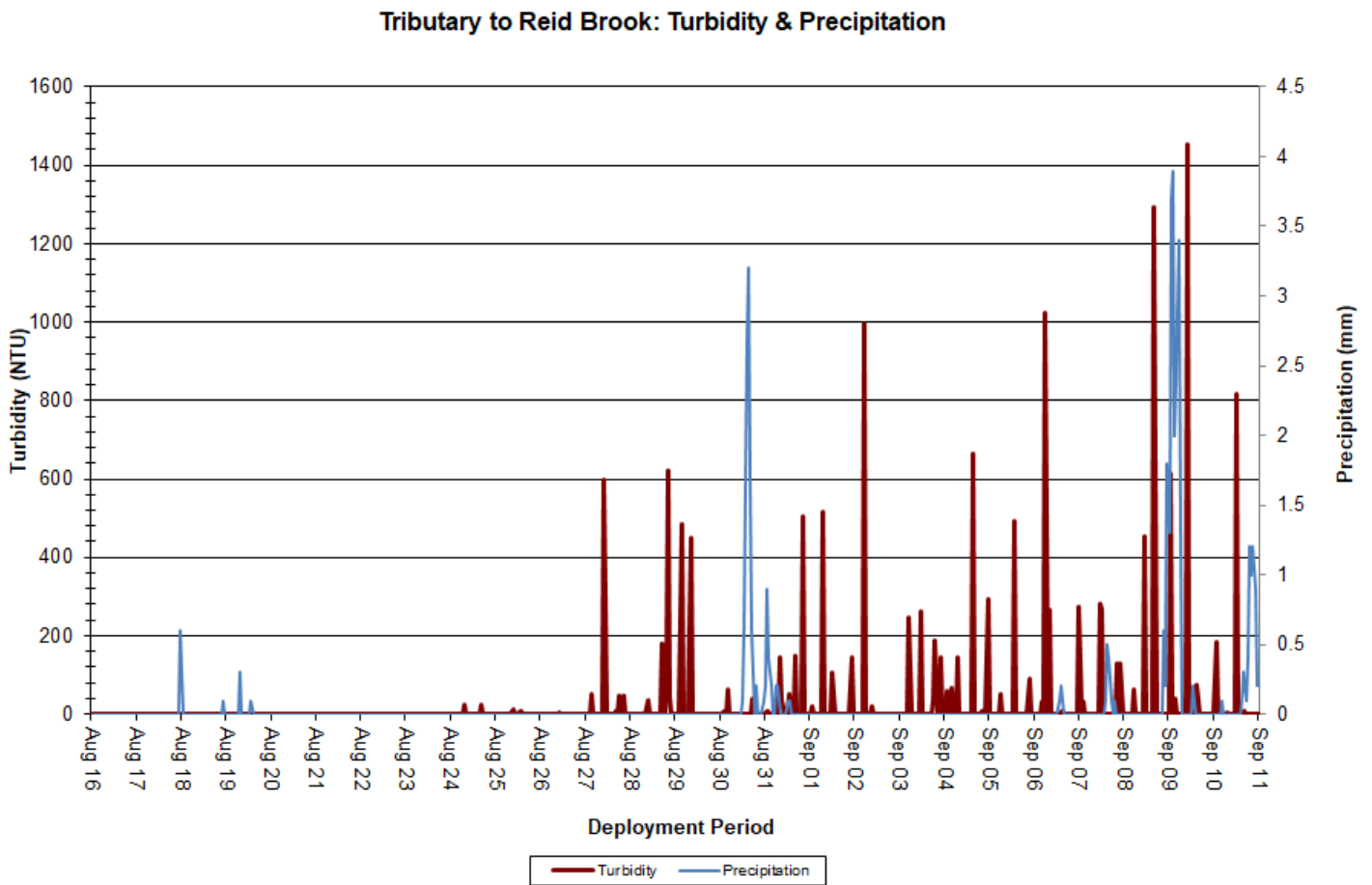


Figure 24: Turbidity & Precipitation at Tributary to Reid Brook

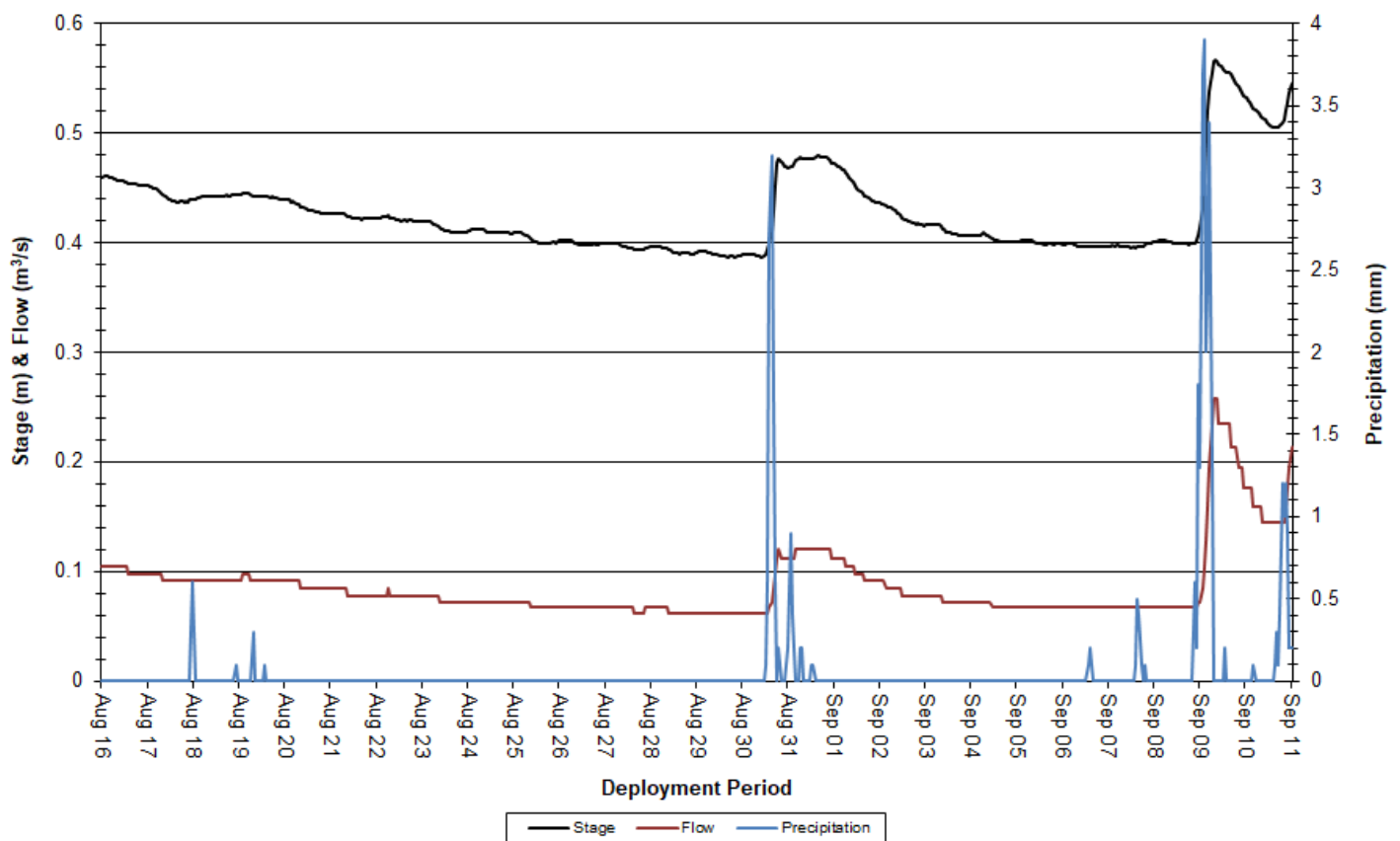
### Stage and Flow

Over the deployment period, stage values ranged from 0.387m to 0.567m, with a median value of 0.415m. Stream flow values ranged from 0.062m<sup>3</sup>/s to 0.257m<sup>3</sup>/s, with a median value of 0.078m<sup>3</sup>/s. Precipitation data was obtained from the Voisey's Bay airstrip weather station (Figure 25).

Stage and flow were generally decreasing across the deployment period. Increases in both stage and flow closely correlated to 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.

**Tributary to Reid Brook: Stage, Flow & Precipitation**



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

## **Conclusions**

Water temperatures across all stations ranged from a minimum of 5.99°C at Reid Brook below Tributary to a maximum of 19.12°C at Camp Pond Brook below Camp 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 6.21pH units at Reid Brook at Outlet of Reid Pond to a maximum of 7.18pH units at Camp Pond Brook below Camp Pond. pH values at all stations were relatively consistent across the deployment period.

Specific conductivity across all stations ranged from a minimum of 9.3µS/cm at Reid Brook at Outlet of Reid Pond to a maximum of 222µS/cm at Camp Pond Brook below Camp Pond. Conductivity values at Reid Brook at Outlet of Reid Pond were the lowest across the network. Camp Pond Brook below Camp Pond had the highest median value at 67.7µS/cm.

Dissolved oxygen levels across all stations ranged from a minimum of 8.65mg/L at Camp Pond Brook below Camp Pond to a maximum of 13.65mg/L at Reid Brook below Tributary. 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 Other Life Stages at all stations for the duration of deployment, but occasionally fell below the CCME's Guidelines for the Protection of Early Life Stages at Camp Pond Brook below Camp Pond, correlating closely with warmer water temperatures.

Turbidity levels across all stations ranged from a minimum of 0.0 NTU at three stations to a maximum of 1455NTU at Tributary to Reid Brook. Turbidity levels 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

- Canadian Council of Ministers of the Environment. (2014) "Canadian water quality guidelines for the protection of aquatic life" Canadian Council of Ministers of the Environment. Retrieved from: [http://www.ccme.ca/en/resources/canadian\\_environmental\\_quality\\_guidelines/index.html](http://www.ccme.ca/en/resources/canadian_environmental_quality_guidelines/index.html)
- Canadian Council of Ministers of the Environment. (2014) "Water Quality Guidelines for the Protection of Aquatic Life" Canadian Council of Ministers of the Environment. Retrieved from: <http://sts.ccme.ca/en/index.html?chems=162&chapters=1>
- OTT Hydromet (2017) "Hydrolab" Retrieved from: <http://www.ott.com/en-us/products/water-quality-2/hydrolab-ds5x-multiparameter-data-sonde-855/>
- Mike Sader (2017) "Turbidity Measurement: A Simple, Effective Indicator of Water Quality Change". OTT Hydromet. Retrieved from <http://www.ott.com/en-us/products/download/turbidity-white-paper/>
- Swanson, H.A., and Baldwin, H.L., (1965) "A Primer on Water Quality" U.S. Geological Survey. Retrieved from: <http://ga.water.usgs.gov/edu/characteristics.html>



## **APPENDIX A: Comparison Graphs**

### Water Temperature at Real-Time Water Quality Monitoring Stations

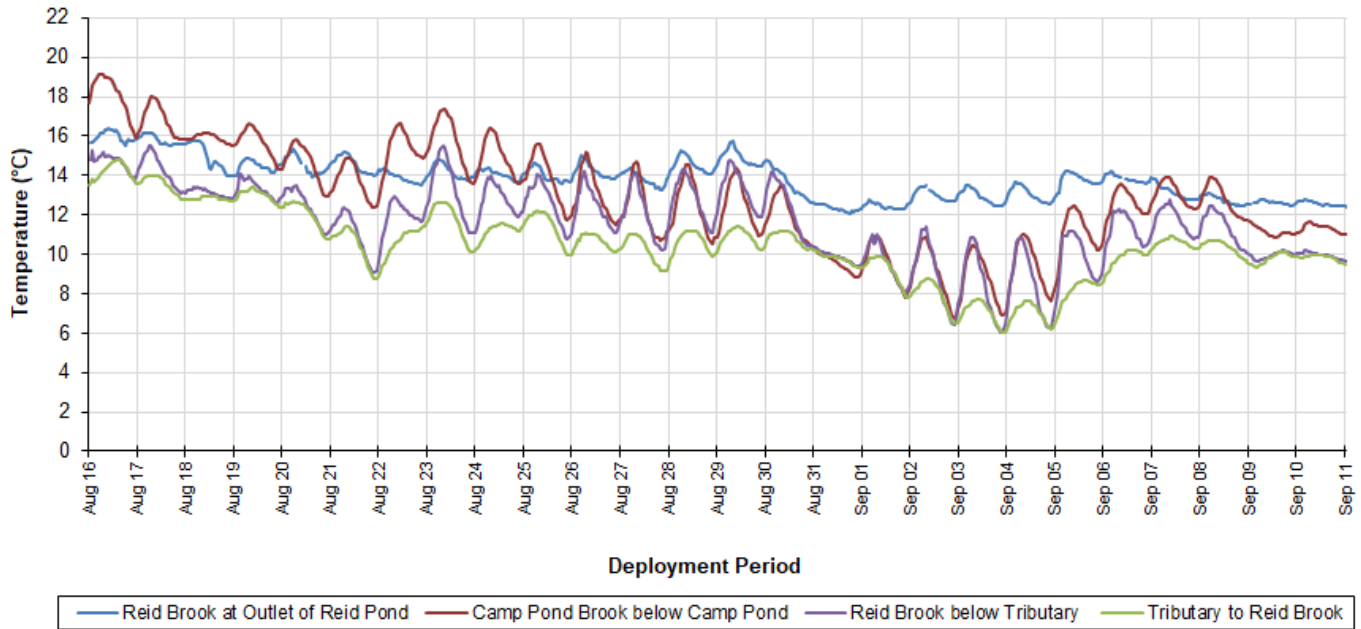


Figure A1: Comparison of Water Temperature (°C) between all Real-Time Stations in Voisey's Bay.

### pH at Real-Time Water Quality Monitoring Stations

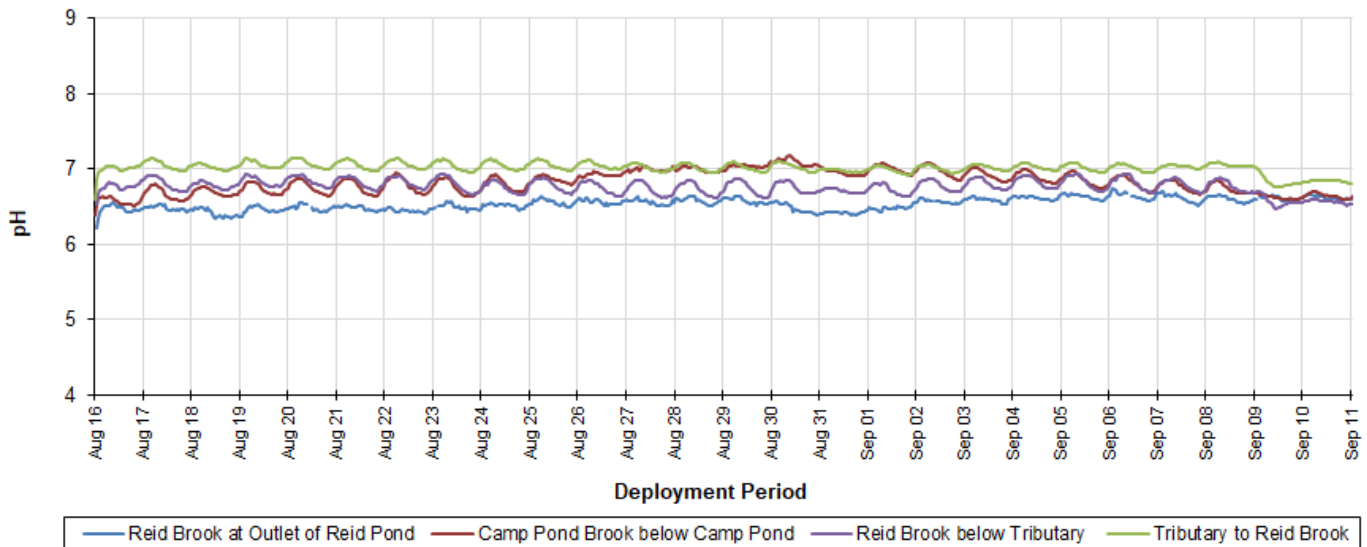


Figure A2: Comparison of pH between all Real-Time Stations in Voisey's Bay.

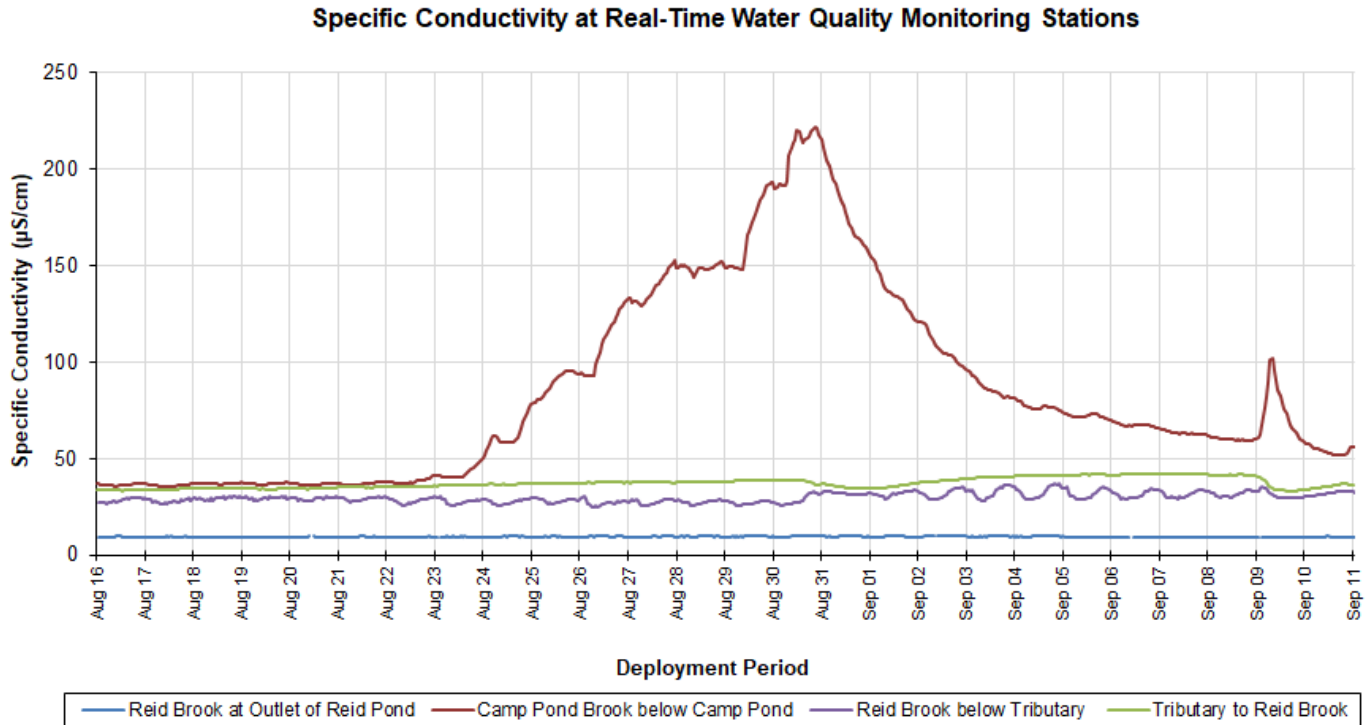


Figure A3: Comparison of Specific Conductivity ( $\mu\text{S}/\text{cm}$ ) between all Real-Time Stations in Voisey's Bay.

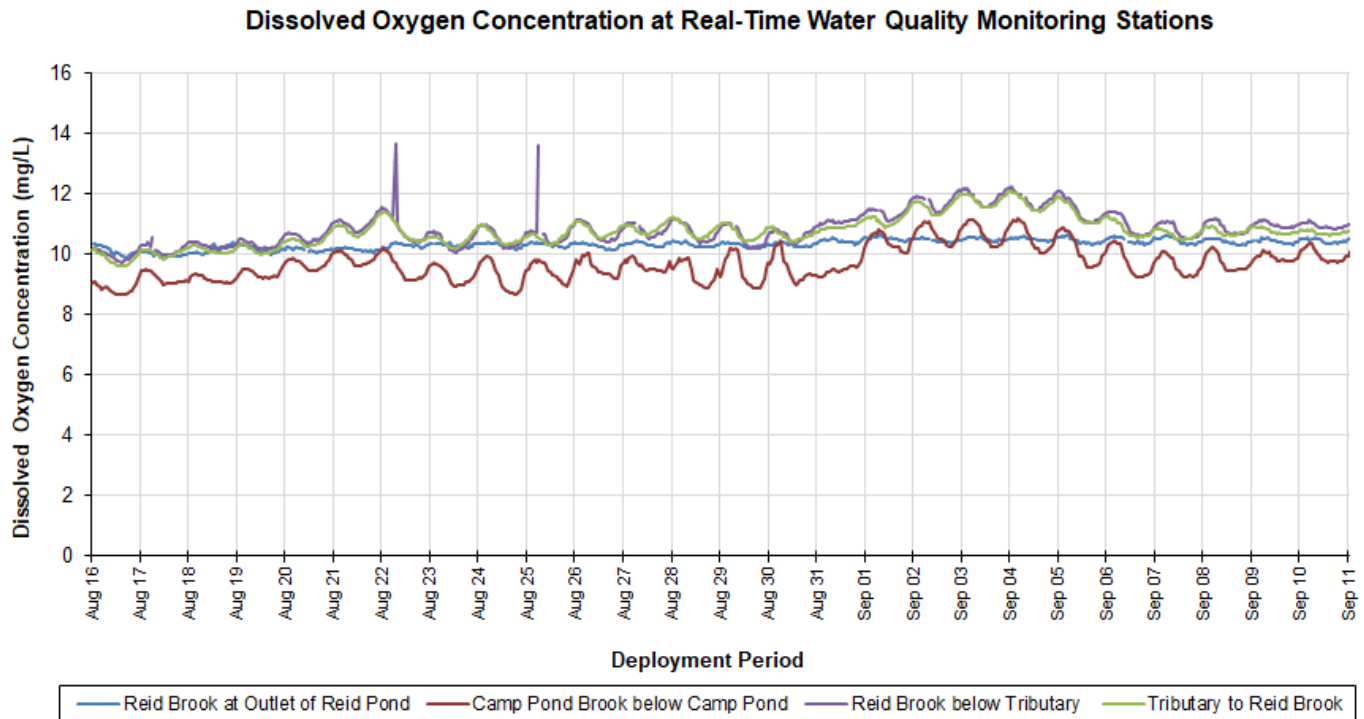


Figure A4: Comparison of Dissolved Oxygen (mg/L) between all Real-Time Stations in Voisey's Bay.

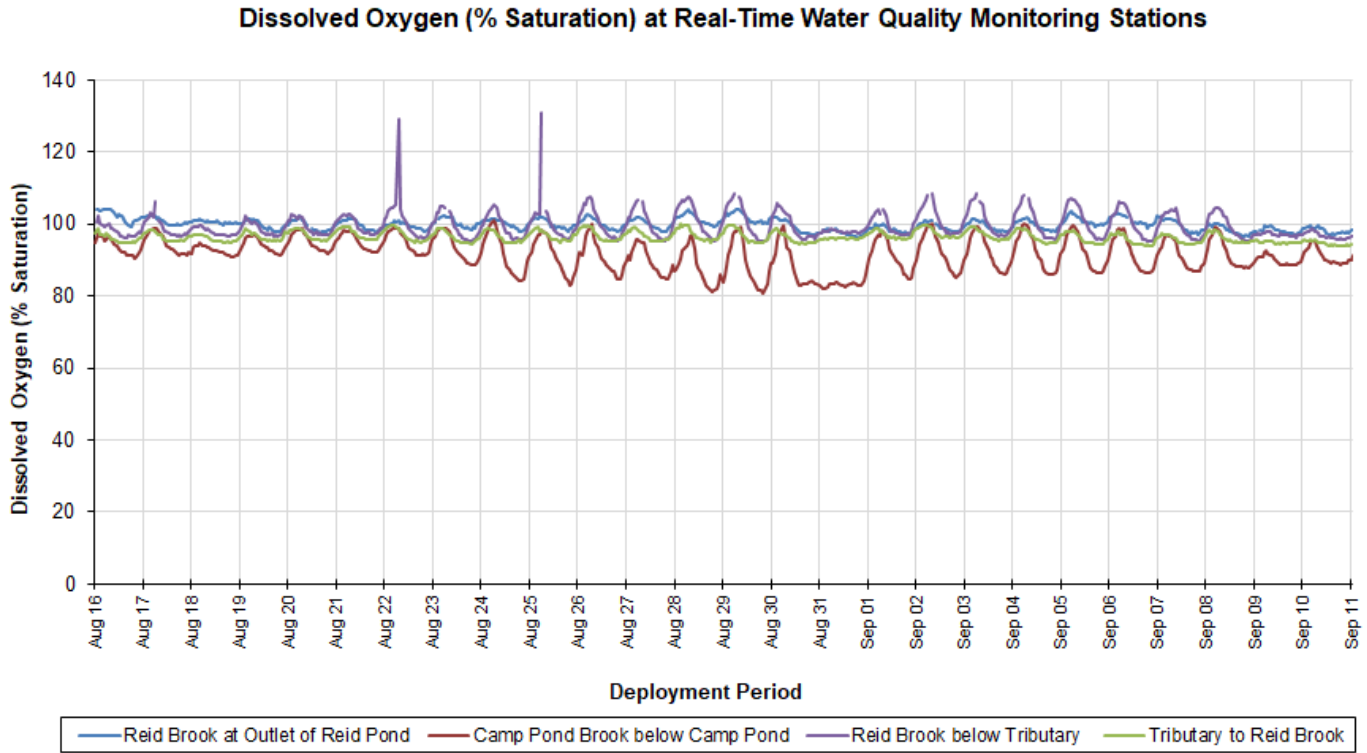


Figure A5: Comparison of Dissolved Oxygen (% Sat) between all Real-Time Stations in Voisey's Bay.

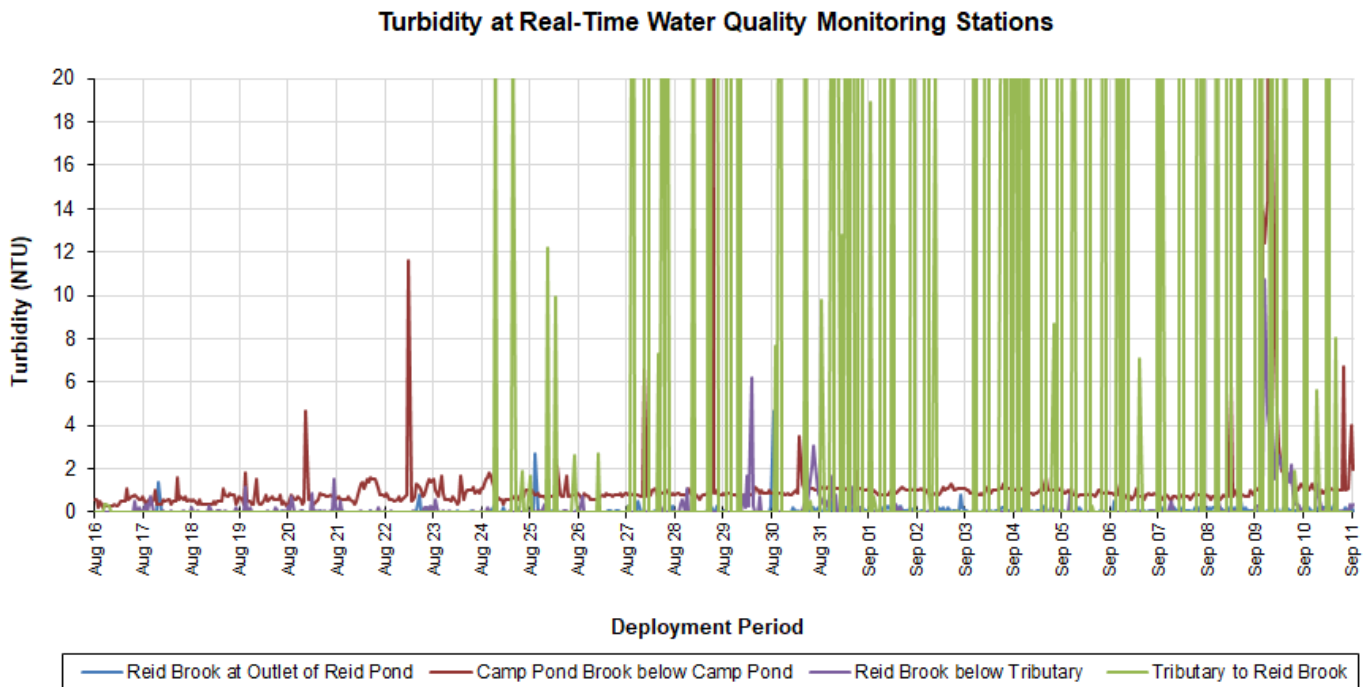


Figure A6: Comparison of Turbidity (NTU) between all Real-Time Stations in Voisey's Bay.

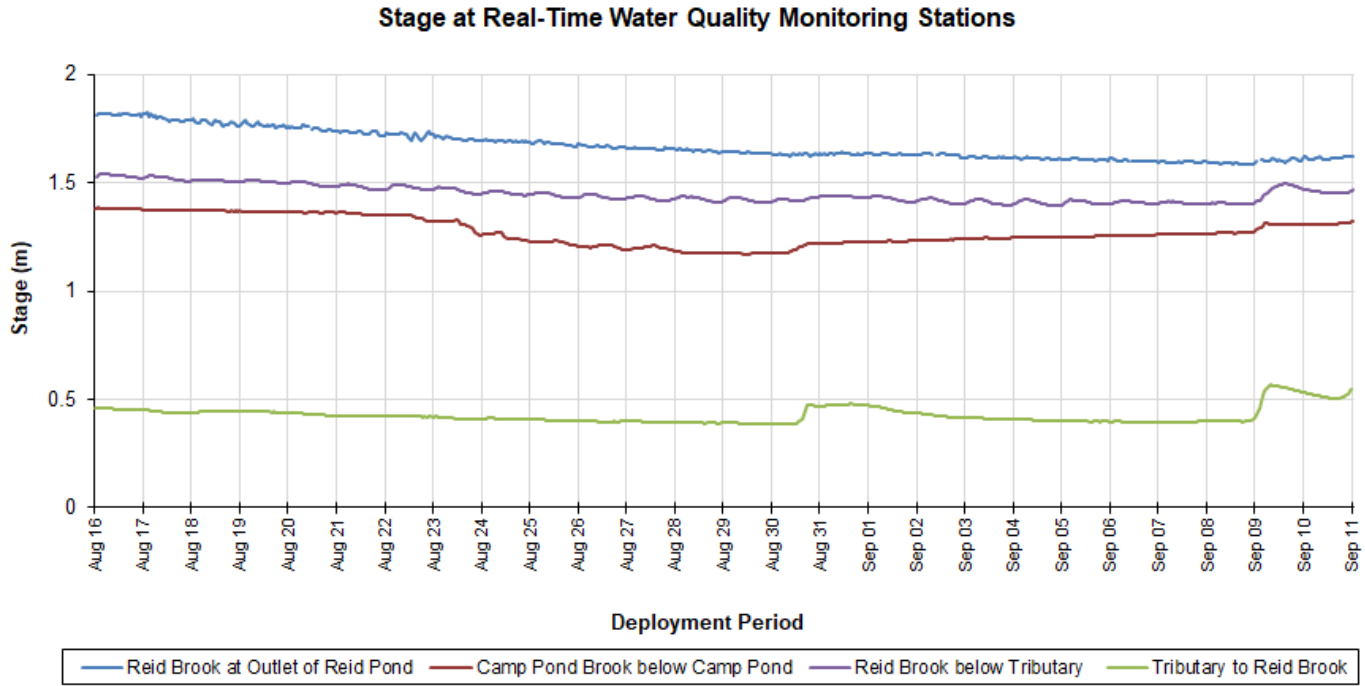


Figure A7: Comparison of Stage (m) between all Real-Time Stations in Voisey's Bay. Please note that stage data is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data.

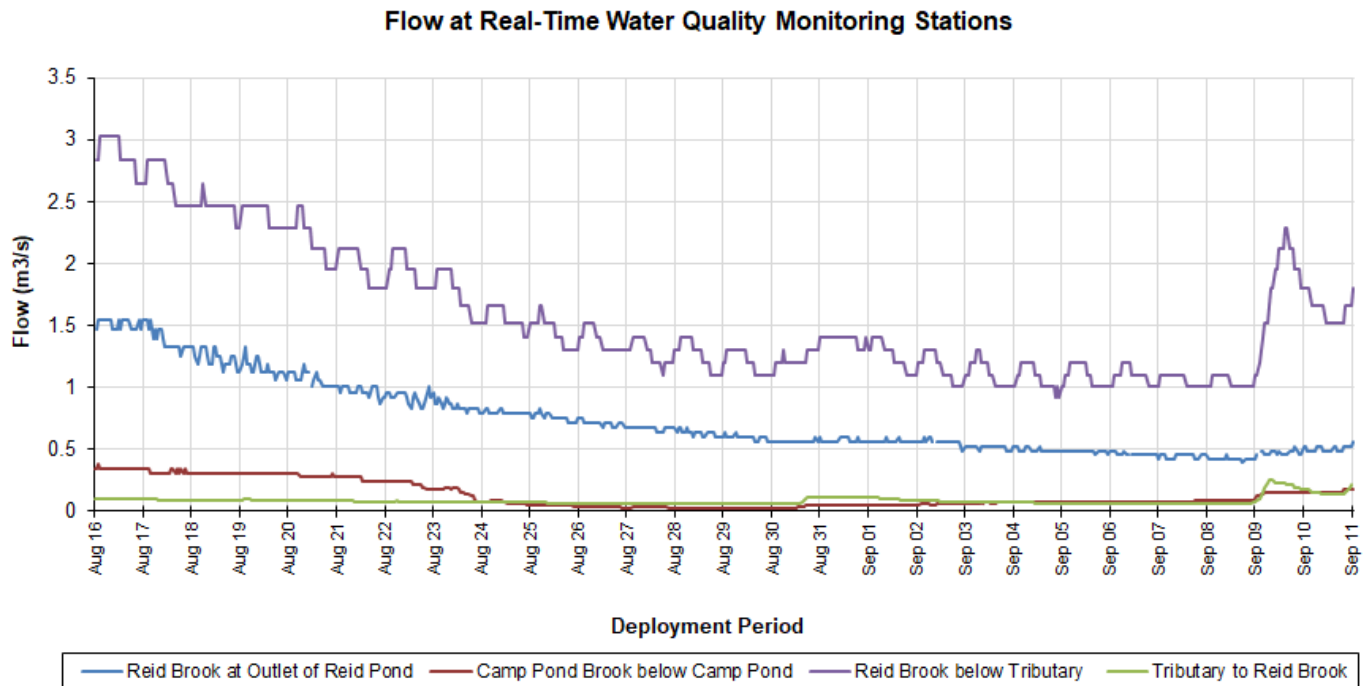


Figure A8: Comparison of Flow (m³/s) between all Real-Time Stations in Voisey's Bay. Please note that flow data is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data.

## **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 (m<sup>3</sup>/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<sub>2</sub> (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

BV Labs Job #: C1N6189  
Report Date: 2021/08/30

NL Department of Environment, Climate Change and  
Municipalities  
Your P.O. #: 220028978-5

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
QKR170 CAMP POND BROOK BELOW CAMP POND Sampling Date 2021/08/16 09:20 Matrix W Sample # 2021-1995-00-SI-SP Registration # WS-S-0000								
<b>RESULTS OF ANALYSES OF WATER</b>								
<b>Calculated Parameters</b>								
Hardness (CaCO3)	-	13	1.0	mg/L	N/A	2021/08/24		7529325
Nitrate (N)	-	ND	0.050	mg/L	N/A	2021/08/26		7529299
Total dissolved solids (calc., EC)	-	21	1.0	mg/L	N/A	2021/08/24		7529301
<b>Inorganics</b>								
Conductivity	-	38	1.0	uS/cm	N/A	2021/08/24	SHW	7537343
Chloride (Cl-)	-	2.7	1.0	mg/L	N/A	2021/08/25	FD	7536557
Bromide (Br-)	-	ND	1.0	mg/L	N/A	2021/08/25	FD	7536557
Sulphate (SO4)	-	5.4	1.0	mg/L	N/A	2021/08/25	FD	7536557
Total Alkalinity (Total as CaCO3)	-	11	5.0	mg/L	N/A	2021/08/25	MCN	7539854
Colour	-	25	5.0	TCU	N/A	2021/08/25	MCN	7539855
Dissolved Fluoride (F-)	-	ND	0.10	mg/L	N/A	2021/08/24	SHW	7537346
Total Kjeldahl Nitrogen (TKN)	-	0.28	0.20	mg/L	2021/08/25	2021/08/26	RTY	7541158
Nitrate + Nitrite (N)	-	ND	0.050	mg/L	N/A	2021/08/25	MCN	7539857
Nitrite (N)	-	ND	0.010	mg/L	N/A	2021/08/25	MCN	7539858
Nitrogen (Ammonia Nitrogen)	-	ND	0.75	mg/L	N/A	2021/08/26	EMT	7539948
Dissolved Organic Carbon (C)	-	3.6	0.50	mg/L	N/A	2021/08/24	NGI	7535083
Total Organic Carbon (C)	-	3.9	0.50	mg/L	N/A	2021/08/24	NGI	7535094
pH	-	6.98		pH	N/A	2021/08/24	SHW	7537345
Total Phosphorus	-	0.006	0.004	mg/L	2021/08/26	2021/08/26	SSV	7542746
Total Suspended Solids	-	4.0	1.4	mg/L	2021/08/23	2021/08/24	KLE	7535156
Turbidity	-	1.1	0.10	NTU	N/A	2021/08/23	SHW	7535290
<b>MERCURY BY COLD VAPOUR AA (WATER)</b>								
<b>Metals</b>								
Total Mercury (Hg)	-	ND	0.000013	mg/L	2021/08/24	2021/08/24	NHU	7535415
<b>ELEMENTS BY ICP/MS (WATER)</b>								
<b>Metals</b>								
Total Aluminum (Al)	-	0.065	0.0050	mg/L	2021/08/23	2021/08/23	MLB	7535027
Total Antimony (Sb)	-	ND	0.0010	mg/L	2021/08/23	2021/08/23	MLB	7535027
Total Arsenic (As)	-	ND	0.0010	mg/L	2021/08/23	2021/08/23	MLB	7535027
Total Barium (Ba)	-	0.0059	0.0010	mg/L	2021/08/23	2021/08/23	MLB	7535027
Total Boron (B)	-	ND	0.050	mg/L	2021/08/23	2021/08/23	MLB	7535027
Total Cadmium (Cd)	-	ND	0.000010	mg/L	2021/08/23	2021/08/23	MLB	7535027
Total Calcium (Ca)	-	3.6	0.10	mg/L	2021/08/23	2021/08/23	MLB	7535027
Total Chromium (Cr)	-	ND	0.0010	mg/L	2021/08/23	2021/08/23	MLB	7535027
Total Copper (Cu)	-	0.0033	0.00050	mg/L	2021/08/23	2021/08/23	MLB	7535027
Total Iron (Fe)	-	0.20	0.050	mg/L	2021/08/23	2021/08/23	MLB	7535027
Total Lead (Pb)	-	ND	0.00050	mg/L	2021/08/23	2021/08/23	MLB	7535027
Total Magnesium (Mg)	-	1.0	0.10	mg/L	2021/08/23	2021/08/23	MLB	7535027
Total Manganese (Mn)	-	0.0091	0.0020	mg/L	2021/08/23	2021/08/23	MLB	7535027



BUREAU  
VERITAS

BV Labs Job #: C1N6189  
Report Date: 2021/08/30

NL Department of Environment, Climate Change and  
Municipalities  
Your P.O. #: 220028978-5

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
QKR170 CAMP POND BROOK BELOW CAMP POND Sampling Date 2021/08/16 09:20 Matrix W Sample # 2021-1995-00-SI-SP Registration # WS-S-0000								
<b>ELEMENTS BY ICP/MS (WATER)</b>								
<b>Metals</b>								
Total Nickel (Ni)	-	0.022	0.0020	mg/L	2021/08/23	2021/08/23	MLB	7535027
Total Phosphorus (P)	-	ND	0.10	mg/L	2021/08/23	2021/08/23	MLB	7535027
Total Selenium (Se)	-	ND	0.00050	mg/L	2021/08/23	2021/08/23	MLB	7535027
Total Sodium (Na)	-	2.1	0.10	mg/L	2021/08/23	2021/08/23	MLB	7535027
Total Strontium (Sr)	-	0.019	0.0020	mg/L	2021/08/23	2021/08/23	MLB	7535027
Total Uranium (U)	-	ND	0.00010	mg/L	2021/08/23	2021/08/23	MLB	7535027
Total Zinc (Zn)	-	ND	0.0050	mg/L	2021/08/23	2021/08/23	MLB	7535027



BUREAU  
VERITAS

BV Labs Job #: C1N6189  
Report Date: 2021/08/30

NL Department of Environment, Climate Change and  
Municipalities  
Your P.O. #: 220028978-5

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
QKR171 REID BROOK BELOW TRIBUTARY								
Sampling Date		2021/08/16 10:06						
Matrix		W						
Sample #		2021-1996-00-SI-SP						
Registration #		WS-S-0000						
<b>RESULTS OF ANALYSES OF WATER</b>								
<b>Calculated Parameters</b>								
Hardness (CaCO3)	-	12	1.0	mg/L	N/A	2021/08/24		7529325
Nitrate (N)	-	ND	0.050	mg/L	N/A	2021/08/26		7529299
Total dissolved solids (calc., EC)	-	19	1.0	mg/L	N/A	2021/08/24		7529301
<b>Inorganics</b>								
Conductivity	-	35	1.0	uS/cm	N/A	2021/08/24	SHW	7537343
Chloride (Cl-)	-	2.6	1.0	mg/L	N/A	2021/08/25	FD	7536557
Bromide (Br-)	-	ND	1.0	mg/L	N/A	2021/08/25	FD	7536557
Sulphate (SO4)	-	3.0	1.0	mg/L	N/A	2021/08/25	FD	7536557
Total Alkalinity (Total as CaCO3)	-	12	5.0	mg/L	N/A	2021/08/25	MCN	7539854
Colour	-	28	5.0	TCU	N/A	2021/08/25	MCN	7539855
Dissolved Fluoride (F-)	-	ND	0.10	mg/L	N/A	2021/08/24	SHW	7537346
Total Kjeldahl Nitrogen (TKN)	-	0.19	0.10	mg/L	2021/08/25	2021/08/26	RTY	7541158
Nitrate + Nitrite (N)	-	ND	0.050	mg/L	N/A	2021/08/25	MCN	7539857
Nitrite (N)	-	0.010	0.010	mg/L	N/A	2021/08/25	MCN	7539858
Nitrogen (Ammonia Nitrogen)	-	ND	0.050	mg/L	N/A	2021/08/26	EMT	7539948
Dissolved Organic Carbon (C)	-	3.6	0.50	mg/L	N/A	2021/08/24	NGI	7535083
Total Organic Carbon (C)	-	3.6	0.50	mg/L	N/A	2021/08/24	NGI	7535094
pH	-	7.09		pH	N/A	2021/08/24	SHW	7537345
Total Phosphorus	-	0.004	0.004	mg/L	2021/08/26	2021/08/26	SSV	7542746
Total Suspended Solids	-	3.0	1.0	mg/L	2021/08/23	2021/08/24	KLE	7535156
Turbidity	-	1.6	0.10	NTU	N/A	2021/08/23	SHW	7535290
<b>MERCURY BY COLD VAPOUR AA (WATER)</b>								
<b>Metals</b>								
Total Mercury (Hg)	-	ND	0.000013	mg/L	2021/08/24	2021/08/24	NHU	7535415
<b>ELEMENTS BY ICP/MS (WATER)</b>								
<b>Metals</b>								
Total Aluminum (Al)	-	0.072	0.0050	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Antimony (Sb)	-	ND	0.0010	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Arsenic (As)	-	ND	0.0010	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Barium (Ba)	-	0.0052	0.0010	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Boron (B)	-	ND	0.050	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Cadmium (Cd)	-	ND	0.000010	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Calcium (Ca)	-	3.1	0.10	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Chromium (Cr)	-	ND	0.0010	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Copper (Cu)	-	0.00099	0.00050	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Iron (Fe)	-	0.48	0.050	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Lead (Pb)	-	ND	0.00050	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Magnesium (Mg)	-	0.90	0.10	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Manganese (Mn)	-	0.0075	0.0020	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Nickel (Ni)	-	0.0055	0.0020	mg/L	2021/08/23	2021/08/23	MLB	7535032



BUREAU  
VERITAS

BV Labs Job #: C1N6189  
Report Date: 2021/08/30

NL Department of Environment, Climate Change and  
Municipalities  
Your P.O. #: 220028978-5

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
QKR171 REID BROOK BELOW TRIBUTARY								
Sampling Date		2021/08/16 10:06						
Matrix		W						
Sample #		2021-1996-00-SI-SP						
Registration #		WS-S-0000						
<b>ELEMENTS BY ICP/MS (WATER)</b>								
<b>Metals</b>								
Total Phosphorus (P)	-	ND	0.10	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Selenium (Se)	-	ND	0.00050	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Sodium (Na)	-	2.2	0.10	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Strontium (Sr)	-	0.018	0.0020	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Uranium (U)	-	ND	0.00010	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Zinc (Zn)	-	ND	0.0050	mg/L	2021/08/23	2021/08/23	MLB	7535032



BUREAU  
VERITAS

BV Labs Job #: C1N6189  
Report Date: 2021/08/30

NL Department of Environment, Climate Change and  
Municipalities  
Your P.O. #: 220028978-5

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
QKR172 TRIBUTARY TO REID BROOK								
Sampling Date		2021/08/16 09:45						
Matrix		W						
Sample #		2021-1997-00-SI-SP						
Registration #		WS-S-0000						
<b>RESULTS OF ANALYSES OF WATER</b>								
<b>Calculated Parameters</b>								
Hardness (CaCO3)	-	13	1.0	mg/L	N/A	2021/08/24		7529325
Nitrate (N)	-	ND	0.050	mg/L	N/A	2021/08/26		7529299
Total dissolved solids (calc., EC)	-	21	1.0	mg/L	N/A	2021/08/24		7529301
<b>Inorganics</b>								
Conductivity	-	39	1.0	uS/cm	N/A	2021/08/24	SHW	7537343
Chloride (Cl-)	-	3.1	1.0	mg/L	N/A	2021/08/25	FD	7536557
Bromide (Br-)	-	ND	1.0	mg/L	N/A	2021/08/25	FD	7536557
Sulphate (SO4)	-	3.2	1.0	mg/L	N/A	2021/08/25	FD	7536557
Total Alkalinity (Total as CaCO3)	-	15	5.0	mg/L	N/A	2021/08/25	MCN	7539854
Colour	-	36	5.0	TCU	N/A	2021/08/25	MCN	7539855
Dissolved Fluoride (F-)	-	0.11	0.10	mg/L	N/A	2021/08/24	SHW	7537346
Total Kjeldahl Nitrogen (TKN)	-	0.17	0.10	mg/L	2021/08/25	2021/08/26	RTY	7541158
Nitrate + Nitrite (N)	-	ND	0.050	mg/L	N/A	2021/08/25	MCN	7539857
Nitrite (N)	-	ND	0.010	mg/L	N/A	2021/08/25	MCN	7539858
Nitrogen (Ammonia Nitrogen)	-	ND	0.050	mg/L	N/A	2021/08/25	EMT	7539948
Dissolved Organic Carbon (C)	-	4.0	0.50	mg/L	N/A	2021/08/24	NGI	7535083
Total Organic Carbon (C)	-	4.3	0.50	mg/L	N/A	2021/08/24	NGI	7535094
pH	-	7.09		pH	N/A	2021/08/24	SHW	7537345
Total Phosphorus	-	ND	0.004	mg/L	2021/08/26	2021/08/26	SSV	7542746
Total Suspended Solids	-	5.2	2.0	mg/L	2021/08/23	2021/08/24	KLE	7535156
Turbidity	-	1.9	0.10	NTU	N/A	2021/08/23	SHW	7535290
<b>MERCURY BY COLD VAPOUR AA (WATER)</b>								
<b>Metals</b>								
Total Mercury (Hg)	-	ND	0.000013	mg/L	2021/08/24	2021/08/24	NHU	7535415
<b>ELEMENTS BY ICP/MS (WATER)</b>								
<b>Metals</b>								
Total Aluminum (Al)	-	0.071	0.0050	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Antimony (Sb)	-	ND	0.0010	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Arsenic (As)	-	ND	0.0010	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Barium (Ba)	-	0.0055	0.0010	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Boron (B)	-	ND	0.050	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Cadmium (Cd)	-	ND	0.000010	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Calcium (Ca)	-	3.6	0.10	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Chromium (Cr)	-	ND	0.0010	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Copper (Cu)	-	0.00099	0.00050	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Iron (Fe)	-	0.51	0.050	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Lead (Pb)	-	ND	0.00050	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Magnesium (Mg)	-	1.1	0.10	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Manganese (Mn)	-	0.0062	0.0020	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Nickel (Ni)	-	0.0062	0.0020	mg/L	2021/08/23	2021/08/23	MLB	7535032



BUREAU  
VERITAS

BV Labs Job #: C1N6189  
Report Date: 2021/08/30

NL Department of Environment, Climate Change and  
Municipalities  
Your P.O. #: 220028978-5

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
QKR172 TRIBUTARY TO REID BROOK								
Sampling Date 2021/08/16 09:45								
Matrix W								
Sample # 2021-1997-00-SI-SP								
Registration # WS-S-0000								
<b>ELEMENTS BY ICP/MS (WATER)</b>								
<b>Metals</b>								
Total Phosphorus (P)	-	ND	0.10	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Selenium (Se)	-	ND	0.00050	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Sodium (Na)	-	2.5	0.10	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Strontium (Sr)	-	0.020	0.0020	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Uranium (U)	-	ND	0.00010	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Zinc (Zn)	-	ND	0.0050	mg/L	2021/08/23	2021/08/23	MLB	7535032



BUREAU  
VERITAS

BV Labs Job #: C1N6189  
Report Date: 2021/08/30

NL Department of Environment, Climate Change and  
Municipalities  
Your P.O. #: 220028978-5

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
QKR173 REID BROOK BELOW REID POND								
Sampling Date		2021/08/16 10:30						
Matrix		W						
Sample #		2021-1998-00-SI-SP						
Registration #		WS-S-0000						
<b>RESULTS OF ANALYSES OF WATER</b>								
<b>Calculated Parameters</b>								
Hardness (CaCO3)	-	4.1	1.0	mg/L	N/A	2021/08/24		7529325
Nitrate (N)	-	ND	0.050	mg/L	N/A	2021/08/26		7529299
Total dissolved solids (calc., EC)	-	6.6	1.0	mg/L	N/A	2021/08/25		7529301
<b>Inorganics</b>								
Conductivity	-	12	1.0	uS/cm	N/A	2021/08/25	SHW	7539877
Chloride (Cl-)	-	ND	1.0	mg/L	N/A	2021/08/25	FD	7536557
Bromide (Br-)	-	ND	1.0	mg/L	N/A	2021/08/25	FD	7536557
Sulphate (SO4)	-	1.2	1.0	mg/L	N/A	2021/08/25	FD	7536557
Total Alkalinity (Total as CaCO3)	-	7.5	5.0	mg/L	N/A	2021/08/25	MCN	7539854
Colour	-	9.7	5.0	TCU	N/A	2021/08/25	MCN	7539855
Dissolved Fluoride (F-)	-	ND	0.10	mg/L	N/A	2021/08/25	SHW	7539881
Total Kjeldahl Nitrogen (TKN)	-	ND	0.10	mg/L	2021/08/25	2021/08/26	RTY	7541158
Nitrate + Nitrite (N)	-	ND	0.050	mg/L	N/A	2021/08/25	MCN	7539857
Nitrite (N)	-	ND	0.010	mg/L	N/A	2021/08/25	MCN	7539858
Nitrogen (Ammonia Nitrogen)	-	0.078	0.050	mg/L	N/A	2021/08/25	EMT	7539948
Dissolved Organic Carbon (C)	-	1.7	0.50	mg/L	N/A	2021/08/24	NGI	7535083
Total Organic Carbon (C)	-	1.7	0.50	mg/L	N/A	2021/08/24	NGI	7535094
pH	-	6.70		pH	N/A	2021/08/25	SHW	7539880
Total Phosphorus	-	ND	0.004	mg/L	2021/08/26	2021/08/26	SSV	7542746
Total Suspended Solids	-	2.8	2.0	mg/L	2021/08/23	2021/08/24	KLE	7535156
Turbidity	-	0.26	0.10	NTU	N/A	2021/08/23	SHW	7535290
<b>MERCURY BY COLD VAPOUR AA (WATER)</b>								
<b>Metals</b>								
Total Mercury (Hg)	-	ND	0.000013	mg/L	2021/08/25	2021/08/25	NHU	7537662
<b>ELEMENTS BY ICP/MS (WATER)</b>								
<b>Metals</b>								
Total Aluminum (Al)	-	0.051	0.0050	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Antimony (Sb)	-	ND	0.0010	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Arsenic (As)	-	ND	0.0010	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Barium (Ba)	-	0.0020	0.0010	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Boron (B)	-	ND	0.050	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Cadmium (Cd)	-	ND	0.000010	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Calcium (Ca)	-	1.2	0.10	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Chromium (Cr)	-	ND	0.0010	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Copper (Cu)	-	ND	0.00050	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Iron (Fe)	-	ND	0.050	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Lead (Pb)	-	ND	0.00050	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Magnesium (Mg)	-	0.25	0.10	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Manganese (Mn)	-	ND	0.0020	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Nickel (Ni)	-	ND	0.0020	mg/L	2021/08/23	2021/08/23	MLB	7535032



BUREAU  
VERITAS

BV Labs Job #: C1N6189  
Report Date: 2021/08/30

NL Department of Environment, Climate Change and  
Municipalities  
Your P.O. #: 220028978-5

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
QKR173 REID BROOK BELOW REID POND								
Sampling Date		2021/08/16 10:30						
Matrix		W						
Sample #		2021-1998-00-SI-SP						
Registration #		WS-S-0000						
<b>ELEMENTS BY ICP/MS (WATER)</b>								
<b>Metals</b>								
Total Phosphorus (P)	-	ND	0.10	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Selenium (Se)	-	ND	0.00050	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Sodium (Na)	-	0.75	0.10	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Strontium (Sr)	-	0.0044	0.0020	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Uranium (U)	-	ND	0.00010	mg/L	2021/08/23	2021/08/23	MLB	7535032
Total Zinc (Zn)	-	ND	0.0050	mg/L	2021/08/23	2021/08/23	MLB	7535032