# Real-Time Water Quality Deployment Report

## Voisey's Bay Network

**August 5 to September 8, 2018**

Newfoundland Labrador


**Government of Newfoundland & Labrador**

**Department of Municipal Affairs and Environment**

**Water Resources Management Division**

# Contents



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## Real Time Water Quality Monitoring

Staff with the Department of Municipal Affairs and Environment monitors 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 of Reid Pond; Camp Pond Brook below Camp Pond; Tributary to Reid Brook; and Reid Brook below Tributary.

On August 5, 2018, 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 and Water Resources Management Staff on September 8, 2018. This was the second deployment for the 2018 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 alongside 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 | August 5 | Deployment | Good | Marginal | Marginal | Not Ranked | Excellent |
| | September 8 | Removal | Good | Marginal | Marginal | Good | Excellent |
| Camp Pond Brook | August 5 | Deployment | Excellent | Excellent | Excellent | Excellent | Excellent |
| | September 8 | Removal | Excellent | Good | Excellent | Excellent | Good |
| Reid Brook below Tributary | August 5 | Deployment | Excellent | Excellent | Excellent | Excellent | Excellent |
| | September 8 | Removal | Excellent | Fair | Excellent | Fair | Excellent |
| Tributary to Reid Brook | August 5 | Deployment | Excellent | Excellent | Good | Good | Excellent |
| | September 8 | Removal | Excellent | Excellent | Excellent | Excellent | Excellent |

### Reid Brook at Outlet of Reid Pond

- At deployment, turbidity was 'excellent', temperature was 'good', while conductivity and pH were 'marginal. Dissolved oxygen could not be ranked because a QA/QC reading was not recorded. The discrepancy in pH and conductivity values may be attributable to the instrument not having sufficient time to acclimate, or to the QA/QC instrument not being placed close enough to the field sonde. This is supported by comparisons between the field sonde and grab sample, which ranked as 'good'.
- At removal, turbidity was 'excellent', temperature and dissolved oxygen were 'good', while pH and conductivity were 'marginal'.

### Camp Pond Brook below Camp Pond

- At deployment, all parameters ranked as 'excellent'.
- At removal, pH and turbidity were 'good', while all other parameters were 'excellent'.

### Reid Brook below Tributary

- At deployment, all parameters ranked as 'excellent'.
- At removal, temperature, conductivity, and turbidity were 'excellent', while pH and dissolved oxygen were 'fair'. This discrepancy may be attributable to the instrument not having sufficient time to acclimate, or to the QA/QC instrument not being placed close enough to the field sonde.

### Tributary to Reid Brook

- At deployment, temperature, pH, and turbidity were 'excellent', while conductivity and dissolved oxygen were 'good'.
- At removal, all parameters ranked as 'excellent'.

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 5$^{th}$ to September 8$^{th}$, 2018 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.

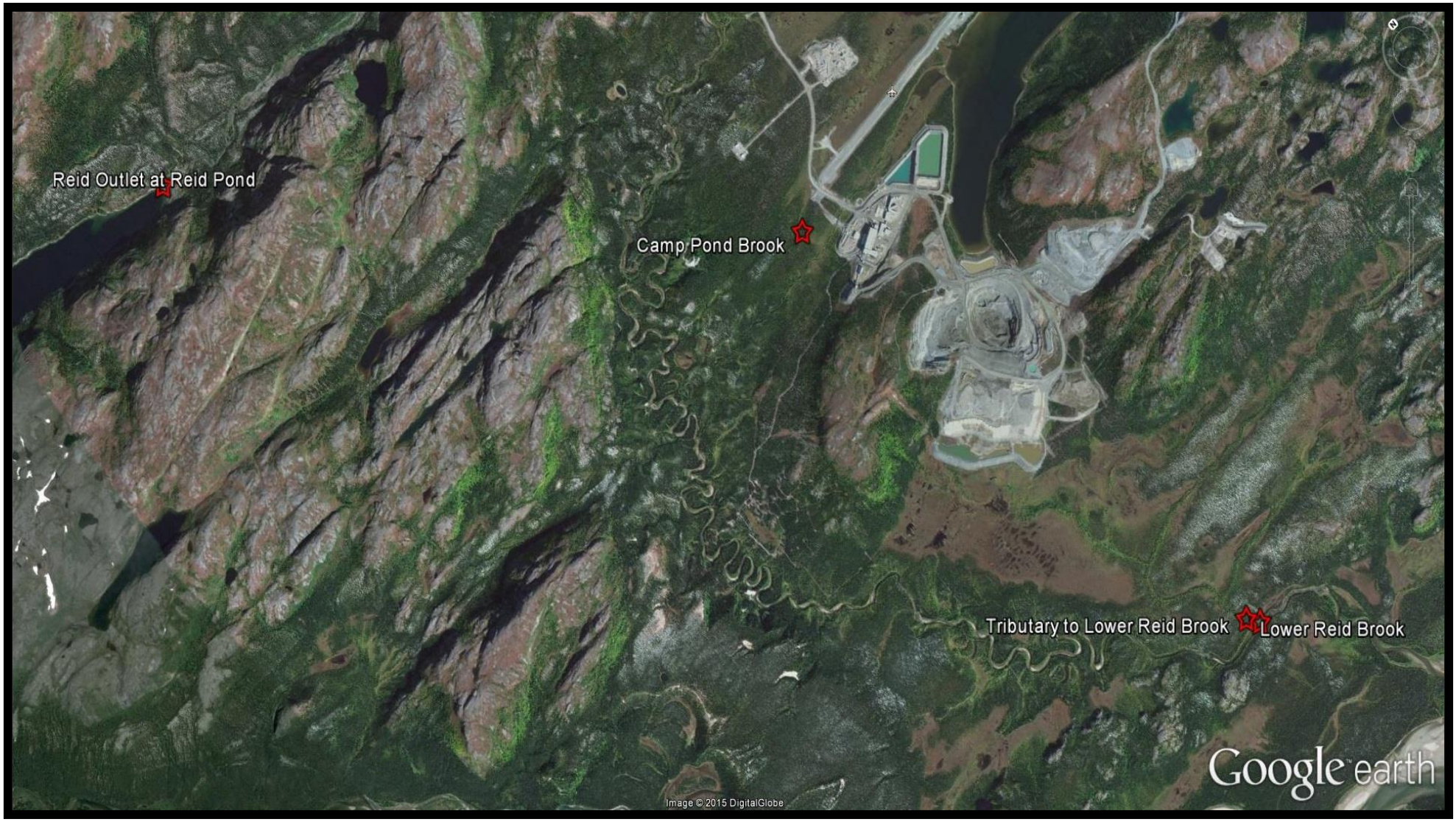


**Figure 1: Voisey's Bay Network Station Locations**

## Reid Brook at Outlet of Reid Pond

### Water Temperature

Over the deployment period, water temperature ranged from 9.36°C to 15.97°C, with a median value of 12.18°C (Figure 2). Water temperature was relatively stable at the start of the deployment period and then started to decrease steadily from mid-August onwards. This is to be expected as ambient air temperatures were also decreasing during this time (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.

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.

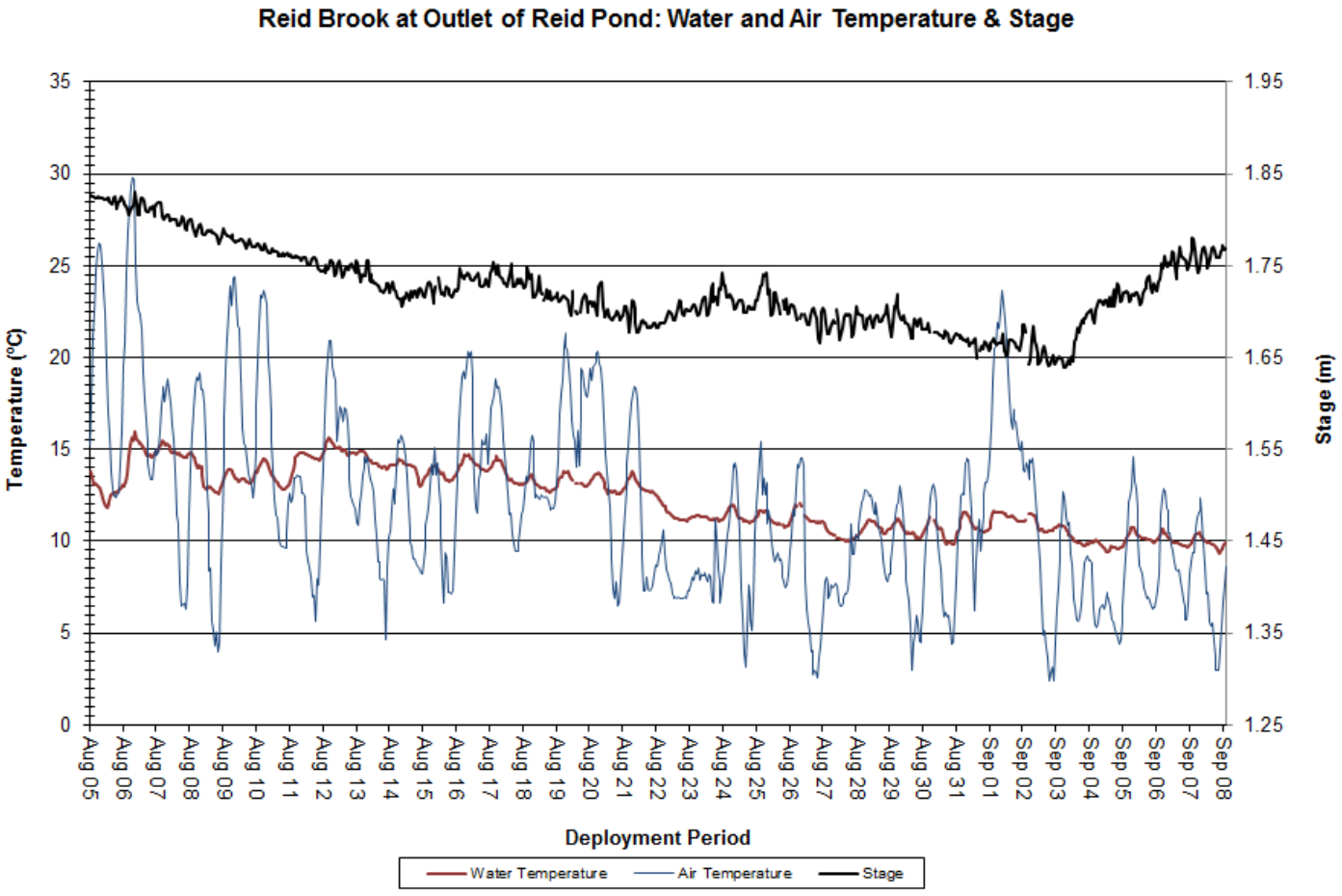


**Figure 2: Water and Air Temperature & Stage at Reid Brook at Outlet of Reid Pond**

**pH**

Over the deployment period, pH values ranged from 6.69 pH units to 7.60 pH units, with a median value of 7.08 pH units (Figure 3).

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

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.

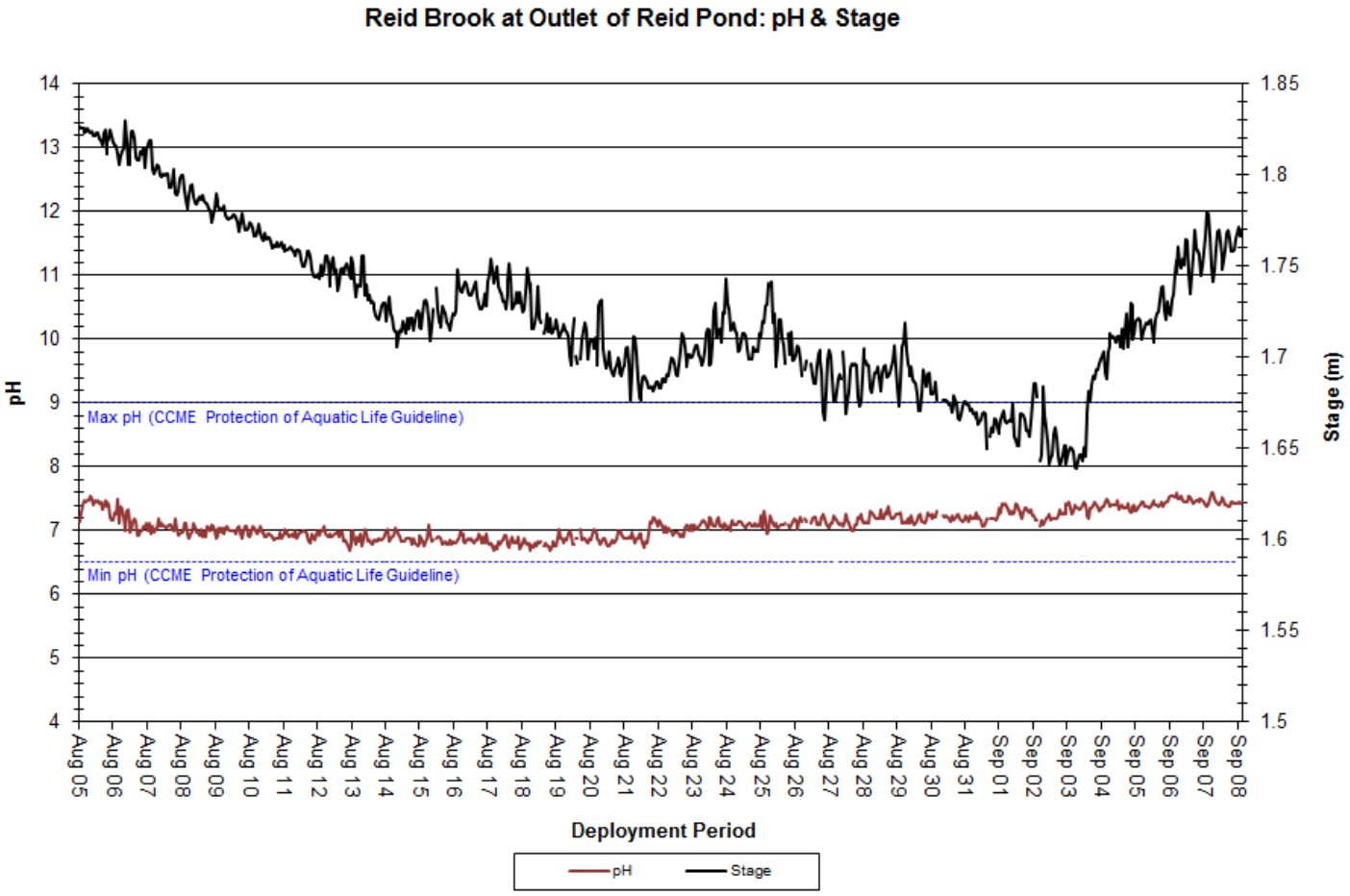


**Figure 3: pH & Stage at Reid Brook at Outlet of Reid Pond**

## Specific Conductivity

Over the deployment period, specific conductivity levels ranged from 26.1µS/cm to 27.5µS/cm, with a median value of 26.8µS/cm (Figure 4). Conductivity at Reid Brook remained very stable; 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.

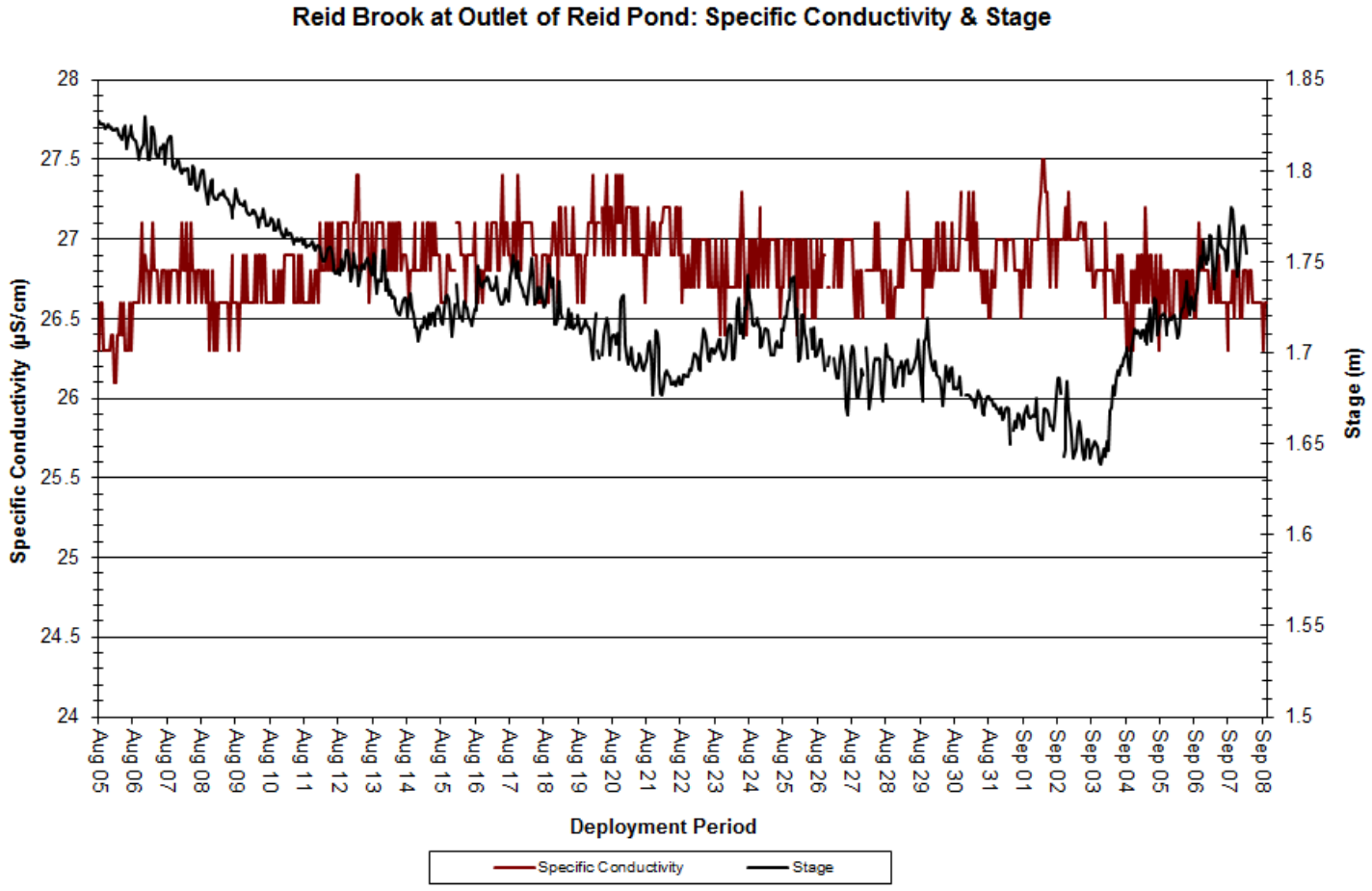


**Figure 4: Specific Conductivity & Stage at Reid Brook at Outlet of Reid Pond**

## Dissolved Oxygen

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.

Over the deployment period, dissolved oxygen concentrations ranged from 9.63mg/L to 10.81mg/L, with a median value of 10.37mg/L. Percent saturation levels for dissolved oxygen ranged from 93.5% saturation to 104.8% saturation, with a median value of 96.7% saturation (Figure 5).

Dissolved oxygen concentration remained above the CCME's Guideline for the Protection of Early Life Stages (9.5 mg/L) for the duration of deployment. As summer changed to fall, there was a natural decrease in water temperature, which in turn resulted in a slight increase in dissolved oxygen concentrations (Figure 5).

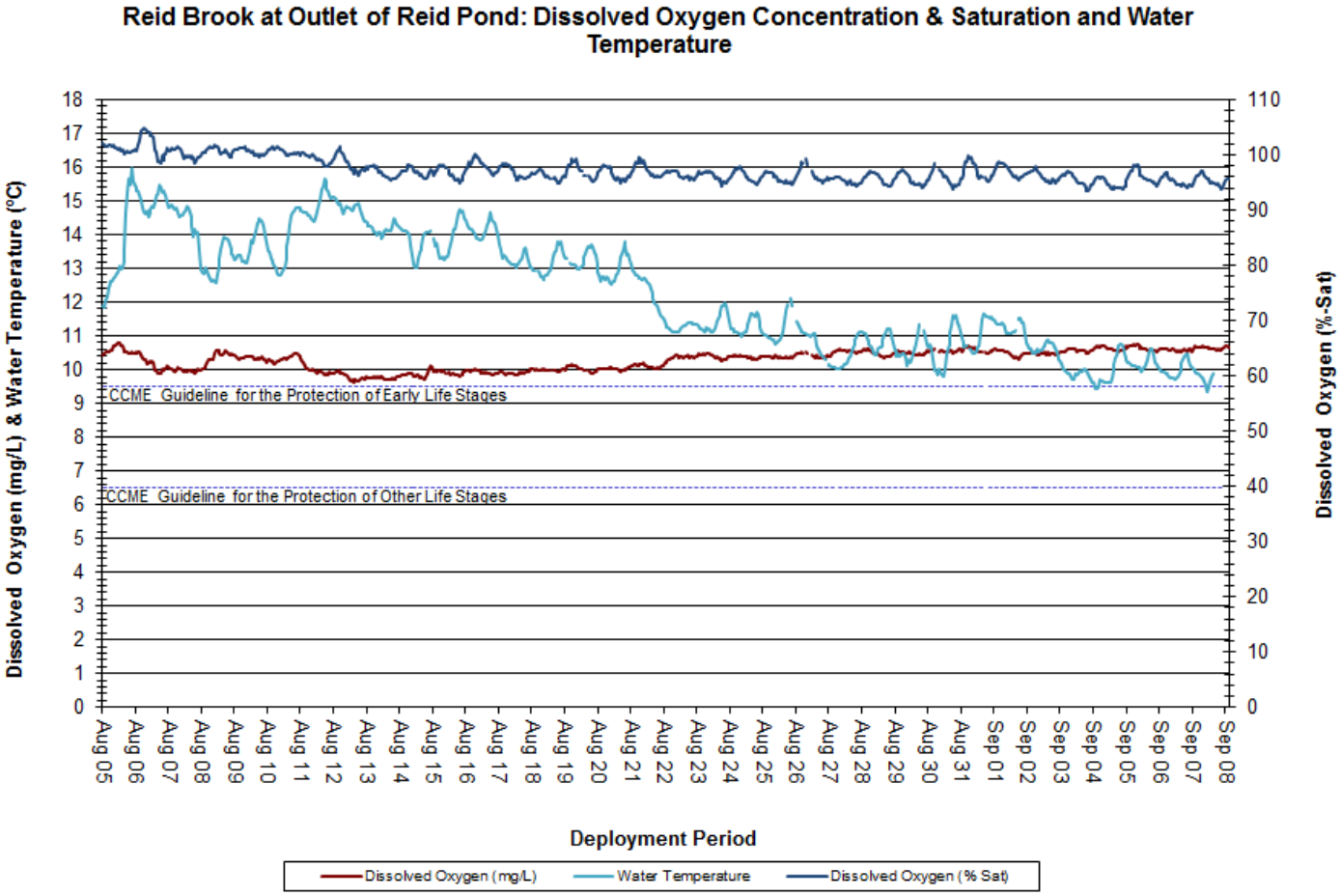


**Figure 5: Dissolved Oxygen Concentration and Saturation & Water Temperature at Reid Brook at Outlet of Reid Pond**

**Turbidity**

Over the deployment period, turbidity levels ranged from 0.7NTU to 15.3NTU, with a median value of 1.2NTU (Figure 6). A median value of 1.2NTU indicates that there was a small amount of natural 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 levels observed during deployment were very stable with only slight increases, which were often associated with precipitation events (Figure 6).

Turbidity values can also increase when there is a decrease in water level, which causes natural material in the water body to become concentrated.

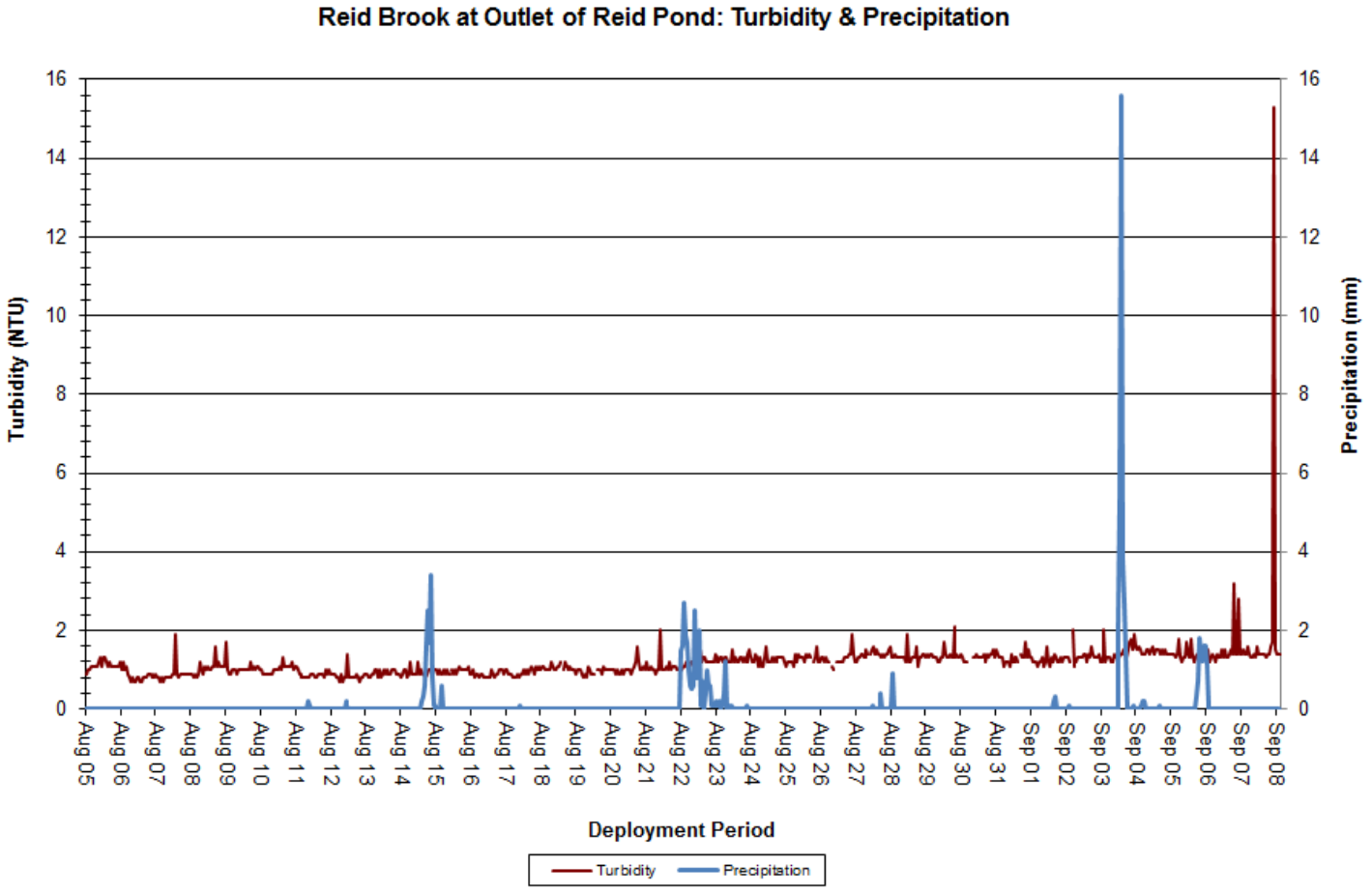


**Figure 6: Turbidity & Precipitation at Reid Brook at Outlet of Reid Pond**

### 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). Both stage and flow 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 and flow.

Over the deployment period, stage ranged from 1.64m to 1.83m, with a median value of 1.72m. Flow values ranged from 0.62m$^3$/s to 1.70m$^3$/s, with a median value of 0.99m$^3$/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.

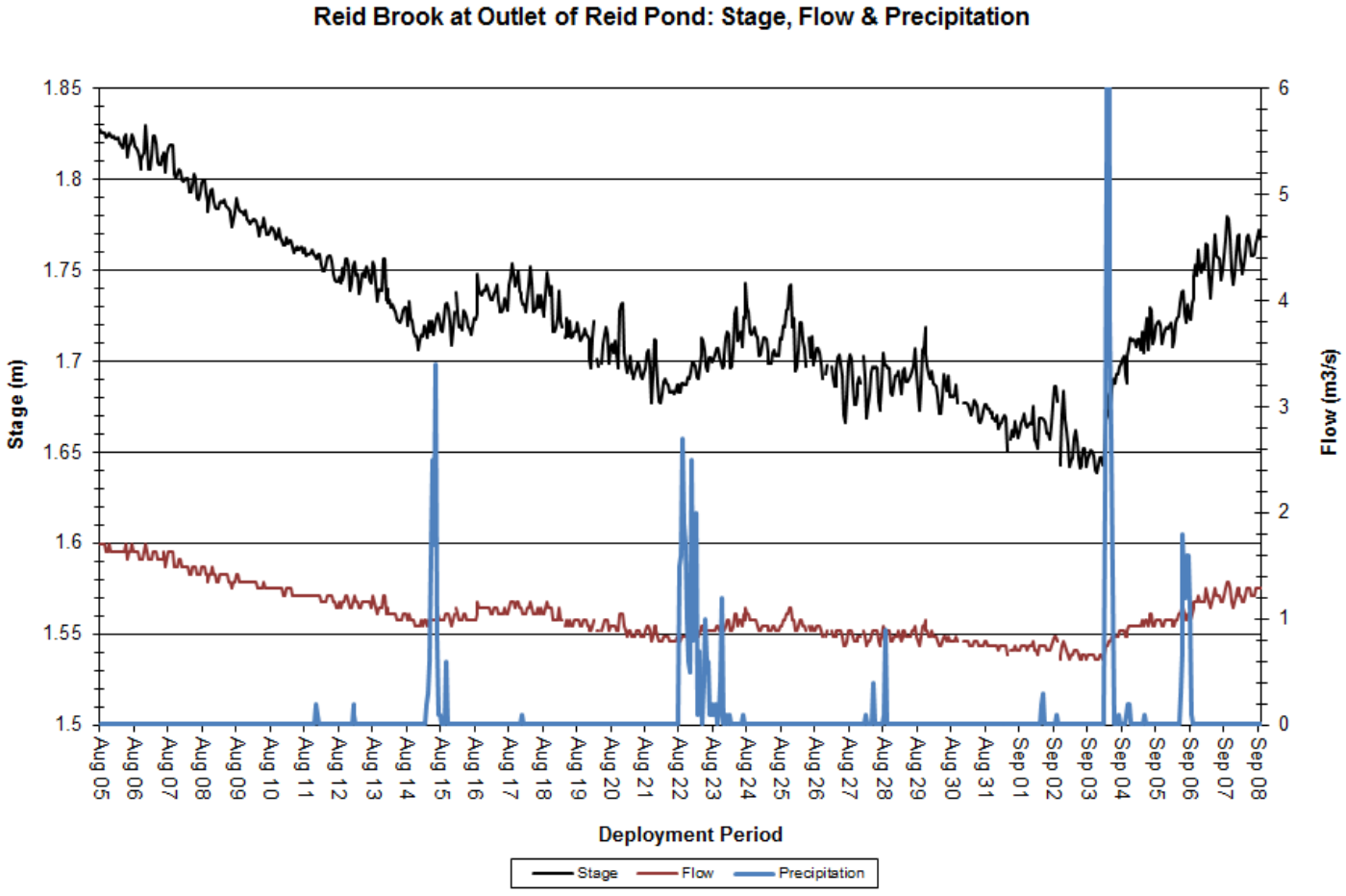


**Figure 7: Stage, Flow & Precipitation at Reid Brook at Outlet of Reid Pond**

## Camp Pond Brook below Camp Pond

### Water Temperature

Over the deployment period, water temperature ranged from 7.58°C to 21.42°C, with a median value of 13.12°C (Figure 8).

Water temperature at this station displays diurnal variations. There was a gradual decrease in water temperature over the course of deployment. This is to be expected as air temperatures decreased with the change from summer to fall (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.

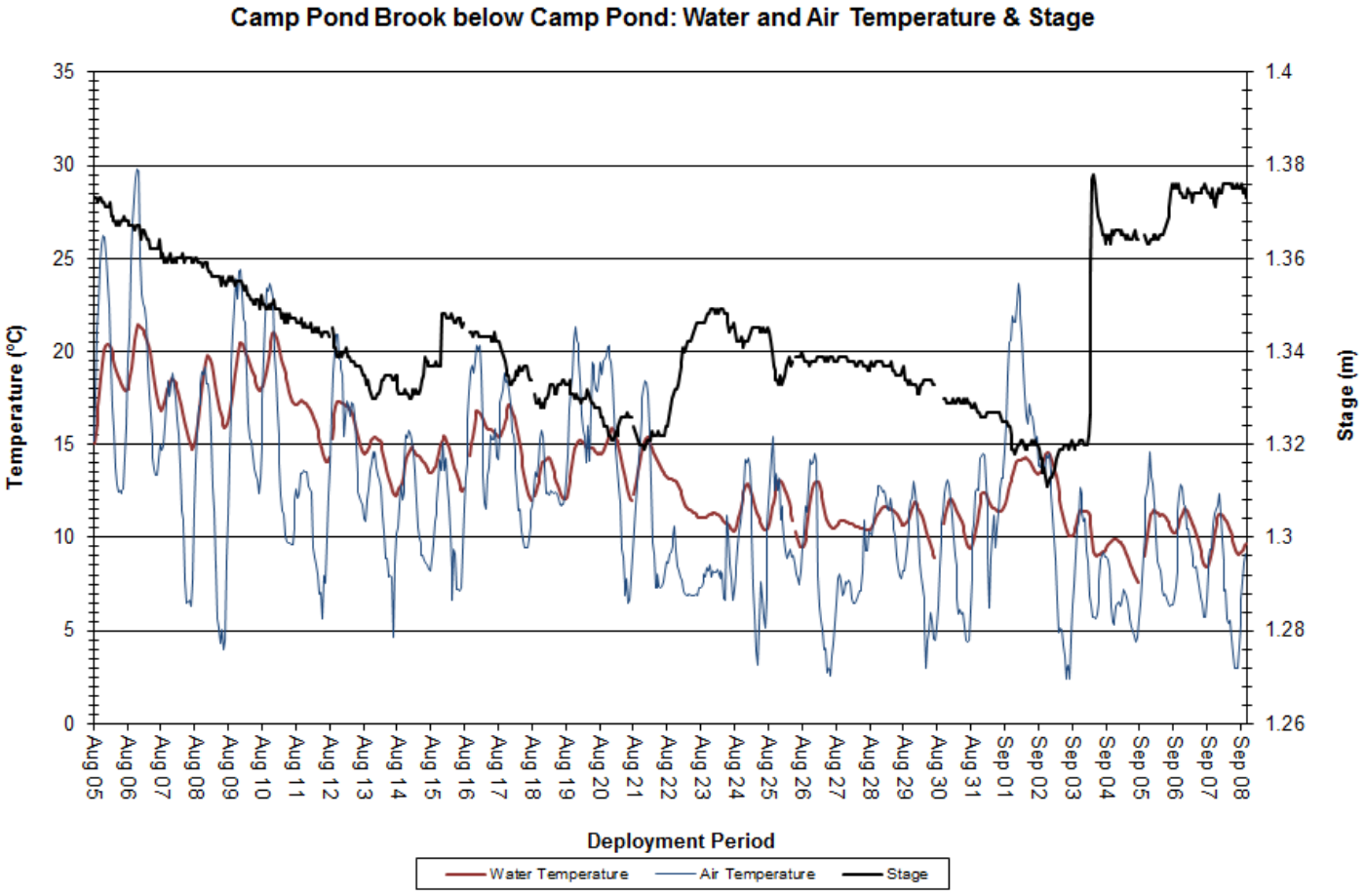


**Figure 8: Water and Air Temperature & Stage at Camp Pond Brook below Camp Pond**

**pH**

Over the deployment period, pH values ranged from 6.42 pH units to 6.98 pH units, with a median value of 6.73 pH units (Figure 9).

pH levels were quite consistent for the duration of deployment. pH levels remained within the CCME's Guidelines for Protection of Aquatic Life for the majority of deployment, with one exception being closely associated with an increase in stage due to significant rainfall (Figure 13).

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.

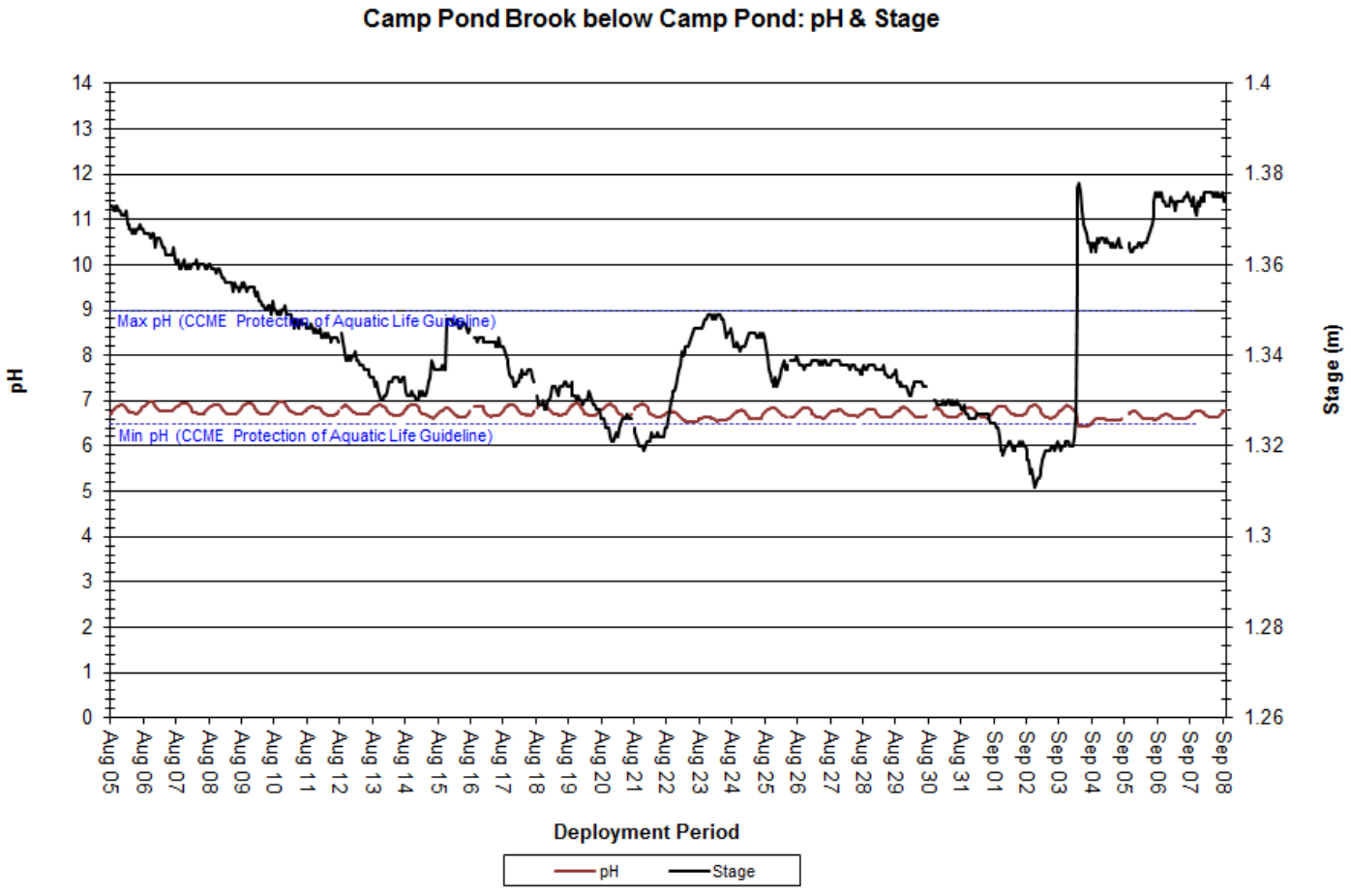


**Figure 9: pH & Stage at Camp Pond Brook below Camp Pond**

### Specific Conductivity

Over the deployment period, specific conductivity ranged from 34.5µS/cm to 111.0µS/cm, with a median value of 40.8µS/cm (Figure 10).

Over the course of deployment, conductivity levels slowly increased while stage decreased. This is a common association, since a decrease in water level serves to concentrate suspended materials in the water column, in turn increasing specific conductivity (Figure 10). Significant increases in conductivity occurred on August 15th, August 23rd, September 4th and September 6th. These increases all correlate closely with both increases in stage (Figure 10) and precipitation events (Figure 13).

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.

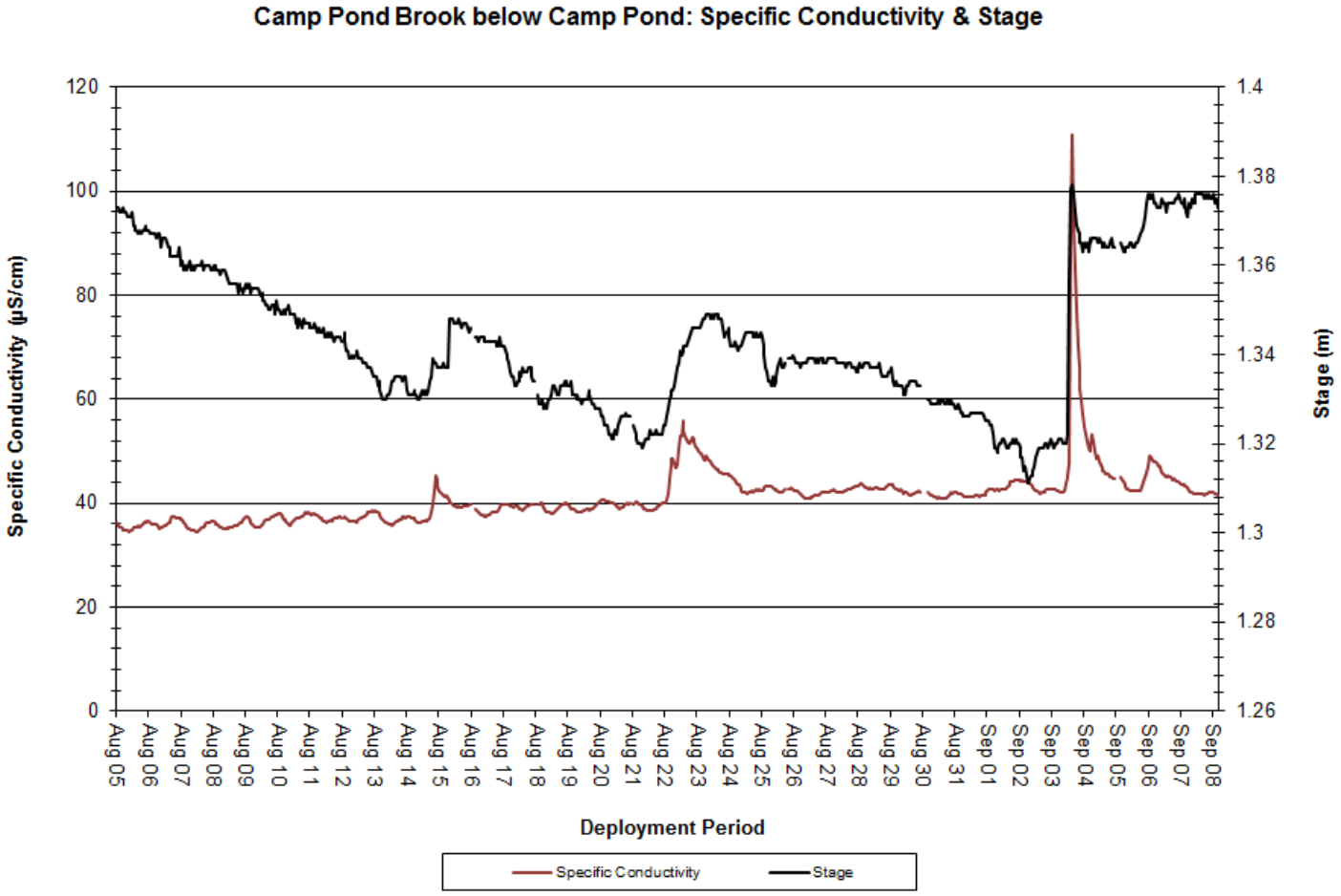


**Figure 10: Specific Conductivity & Stage at Camp Pond Brook below Camp Pond**

## Dissolved Oxygen

Over the deployment period, dissolved oxygen concentration ranged from 8.27mg/L to 11.26mg/L, with a median value of 9.93mg/L. Saturation of dissolved oxygen ranged from 89.9% saturation to 102.2% saturation, with a median of 95.0% (Figure 11).

Dissolved oxygen concentrations were below or around the CCME's Guideline for the Protection of Early Life Stages from the beginning of deployment until August 21st. Occurrences where dissolved oxygen concentrations were below the CCME's guidelines correspond closely with warmer water temperatures (Figure 11). This 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.

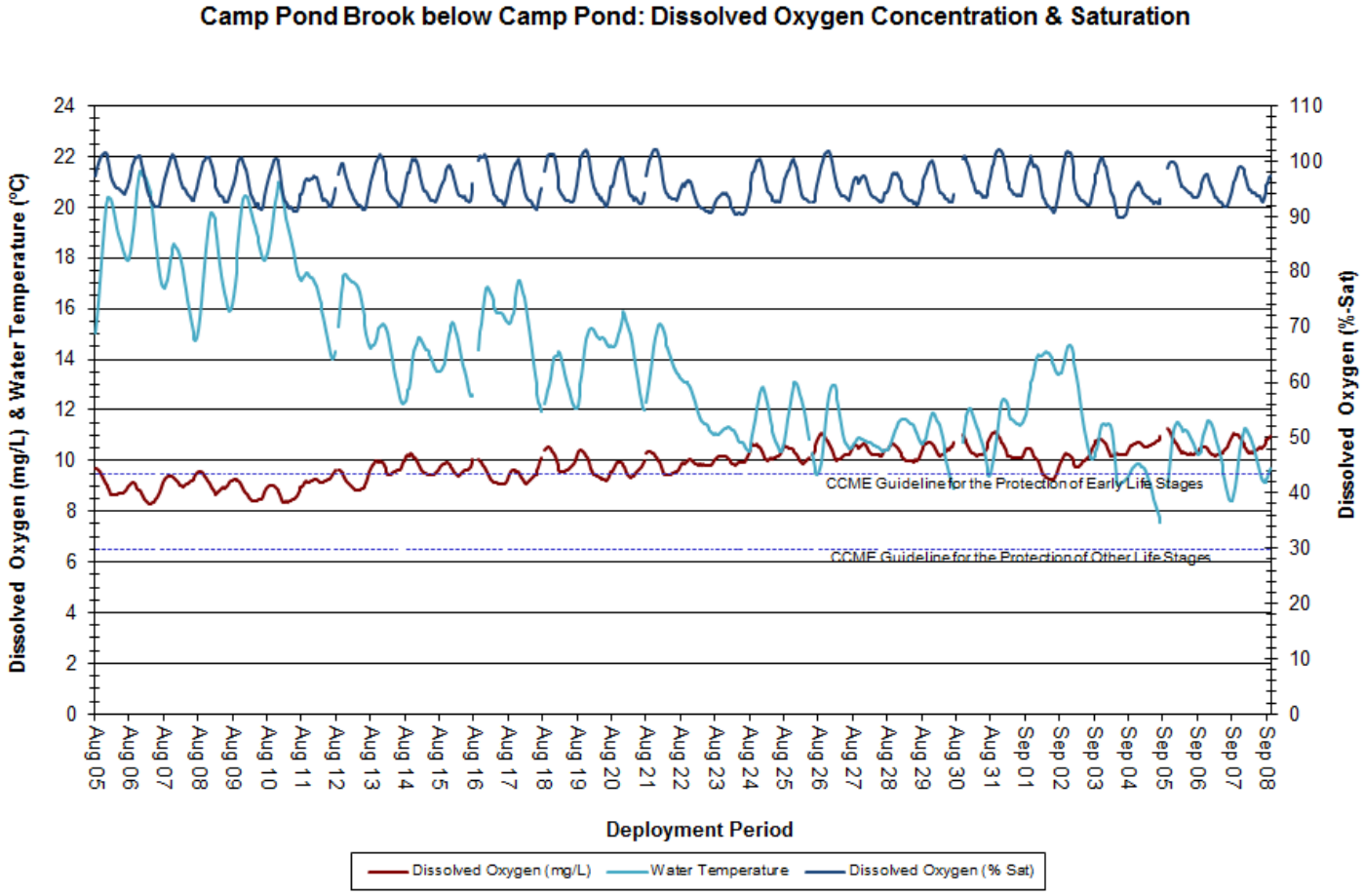


**Figure 11: Dissolved Oxygen & Water Temperature at Camp Pond Brook below Camp Pond**

**Turbidity**

Over the deployment period, turbidity ranged from 0.0NTU to 446.0NTU, with a median value of 0.0NTU (Figure 12). A median value of 0.0NTU indicates there was very little natural background turbidity at this station.

Spikes in turbidity levels observed throughout the deployment period correlate closely with precipitation events (Figure 12). This is to be expected since precipitation and subsequent runoff can increase the amount of suspended materials in the water column.

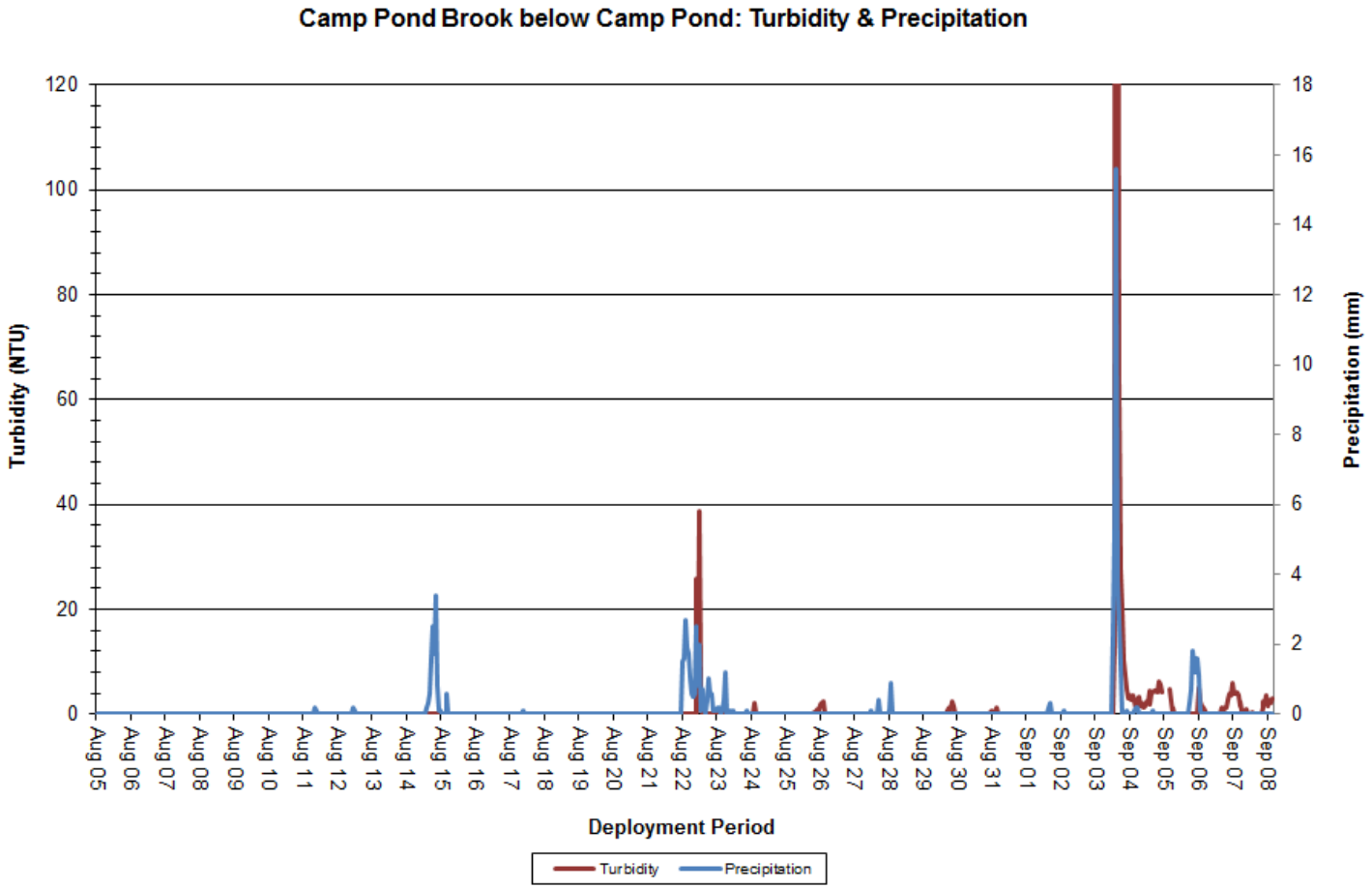


**Figure 12: Turbidity & Precipitation at Camp Pond Brook below Camp Pond**

### Stage, Flow and Precipitation

Over the deployment period, stage values ranged from 1.31m to 1.38m, with a median value of 1.34m. Stream flow values ranged from 0.18m$^3$/s to 0.38m$^3$/s, with a median value of 0.25m$^3$/s. Precipitation data was obtained from the Voisey's Bay airstrip weather station (Figure 13).

Increases in stage and flow are often associated with rainfall events; this was particularly evident on August 15$^{th}$, August 23$^{rd}$, September 4$^{th}$ and September 6$^{th}$ (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.

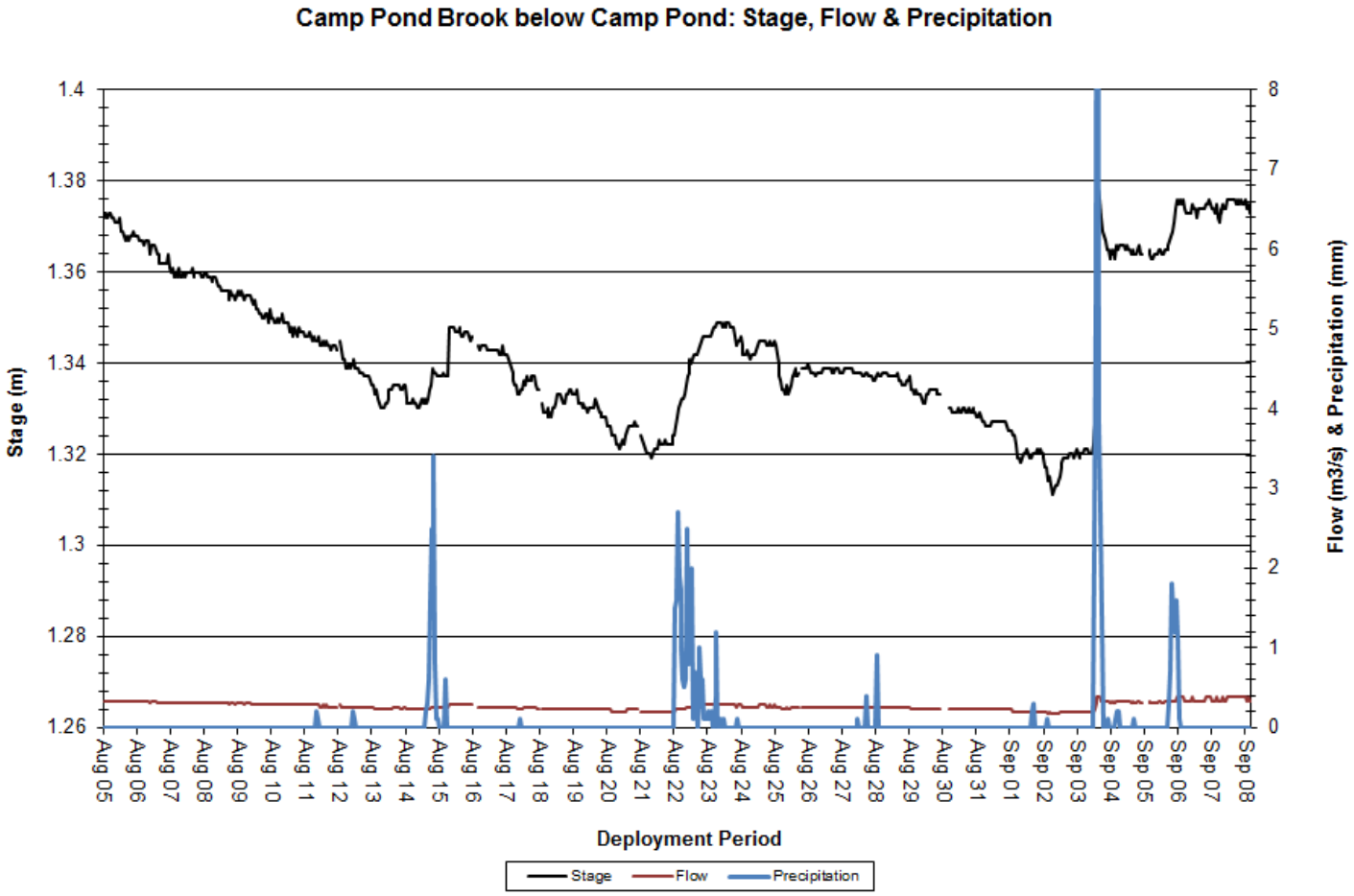


**Figure 13: Stage, Flow & Precipitation at Camp Pond Brook below Camp Pond**

## Reid Brook below Tributary

### Water Temperature

Over the deployment period, water temperature ranged from 7.03°C to 18.02°C, with a median value of 10.97°C (Figure 14).

Water temperature at this station displays diurnal variations, and there was a gradual decrease in water temperature throughout the deployment period as summer changed to fall. This is to be expected as air temperatures also decreased (Figure 14). Air temperature data was obtained from the Voisey's Bay airstrip weather 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.

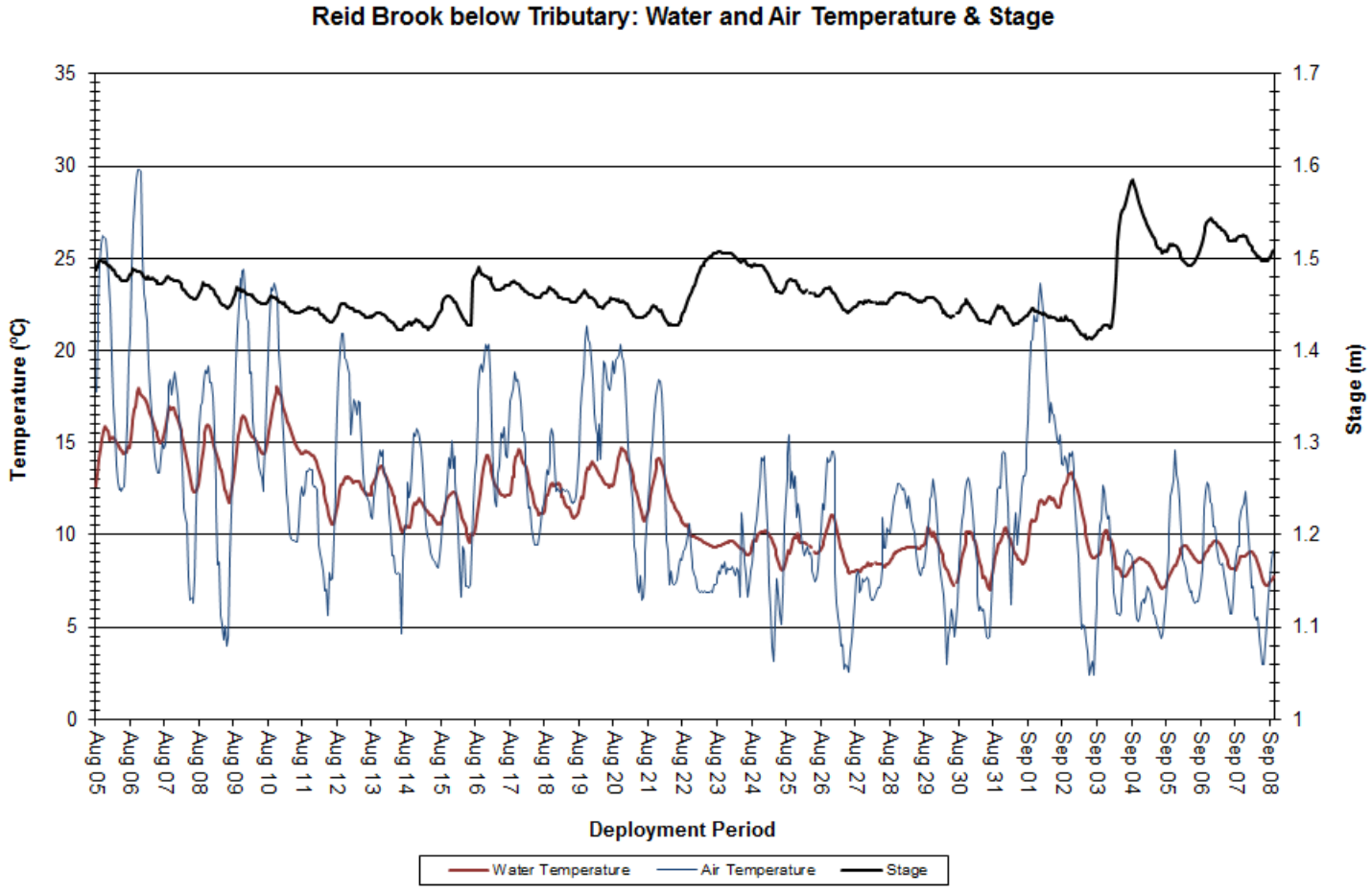


**Figure 14: Water and Air Temperature & Stage at Reid Brook below Tributary**

**pH**

Over the deployment period, pH ranged from 6.90 pH units to 7.78 pH units, with a median value of 7.47 (Figure 15).

pH remained within the CCME Guidelines for the Protection of Aquatic Life for the duration of deployment. The decrease in pH level observed on September 4th is closely associated with an increased stage level (Figure 15) and significant rainfall event (Figure 19).

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.

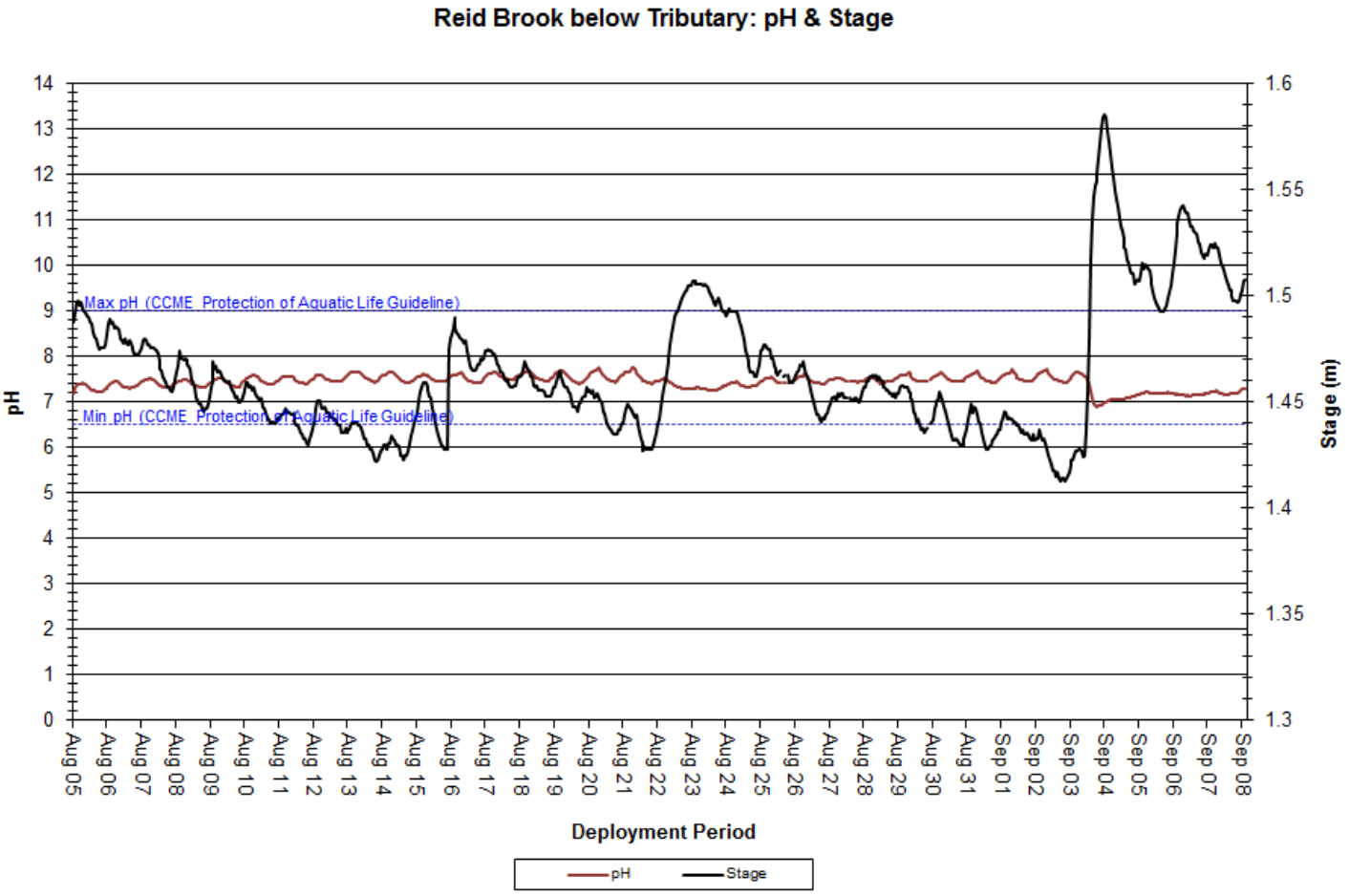


**Figure 15: pH & Stage at Reid Brook below Tributary**

**Specific Conductivity**

Over the deployment period, specific conductivity ranged from 25.7µS/cm to 38.1µS/cm, with a median value of 32.6µS/cm (Figure 16).

Stage and specific conductivity exhibit an inverse relationship in the graph below: as one parameter increases, the other decreases. As water levels decrease, suspended materials in the water body become more concentrated, in turn increasing specific conductivity (Figure 16).

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.

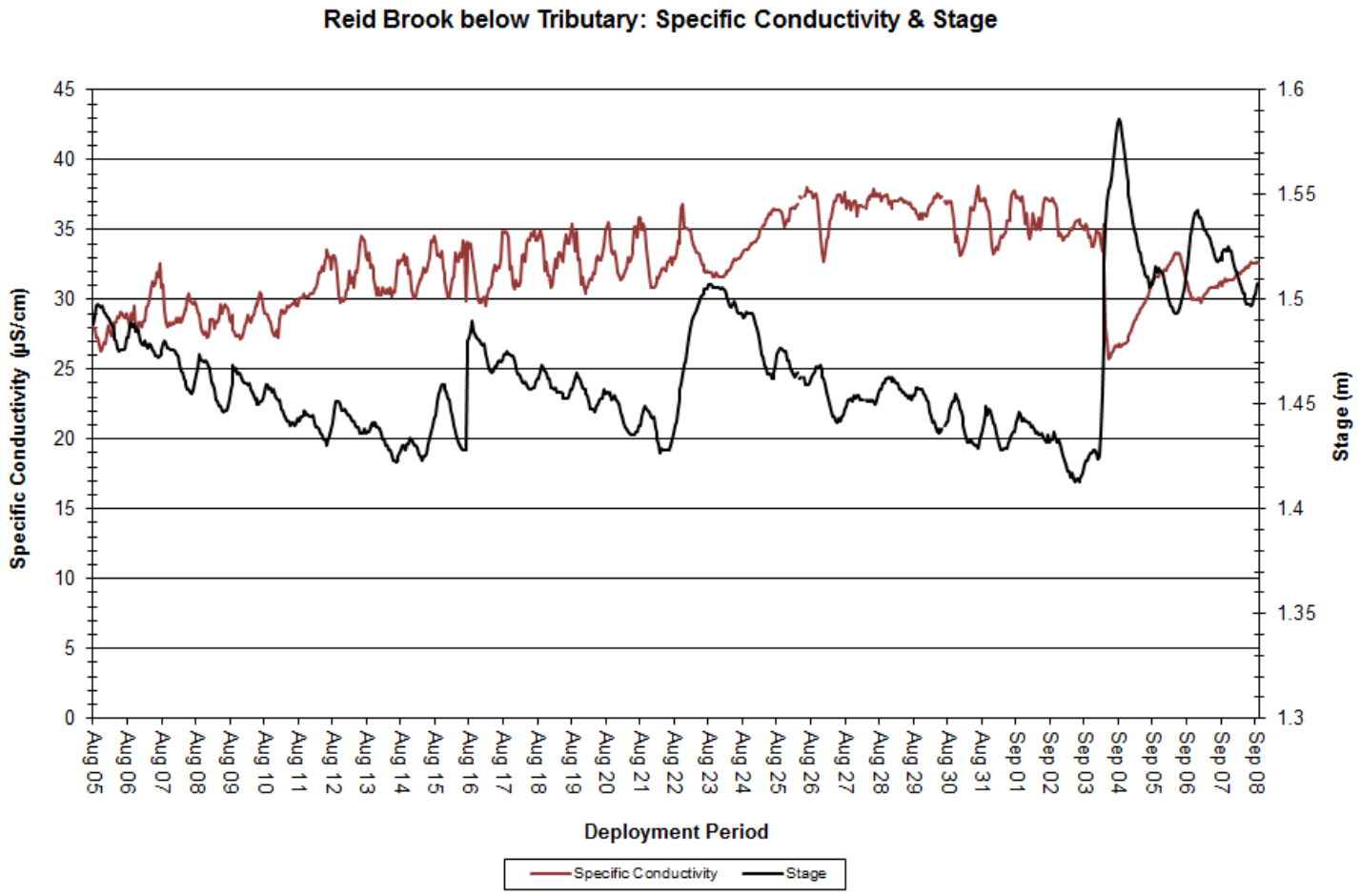


**Figure 16: Specific Conductivity & Stage at Reid Brook below Tributary**

## Dissolved Oxygen

Over the deployment period, dissolved oxygen concentration ranged from 9.03mg/L to 11.51mg/L, with a median value of 10.48mg/L. Saturation of dissolved oxygen ranged from 92.0% saturation to 103.9% saturation, with a median value of 94.9% (Figure 17).

Dissolved oxygen concentrations hovered around the CCME's Guideline for the Protection of Early Life Stages (9.5mg/L) until August 11th, after which concentrations remained above the CCME's guideline for the remainder of deployment. Increasing dissolved oxygen concentrations correlated closely with decreasing water temperatures, which is to be expected as these parameters generally exhibit an inverse relationship.

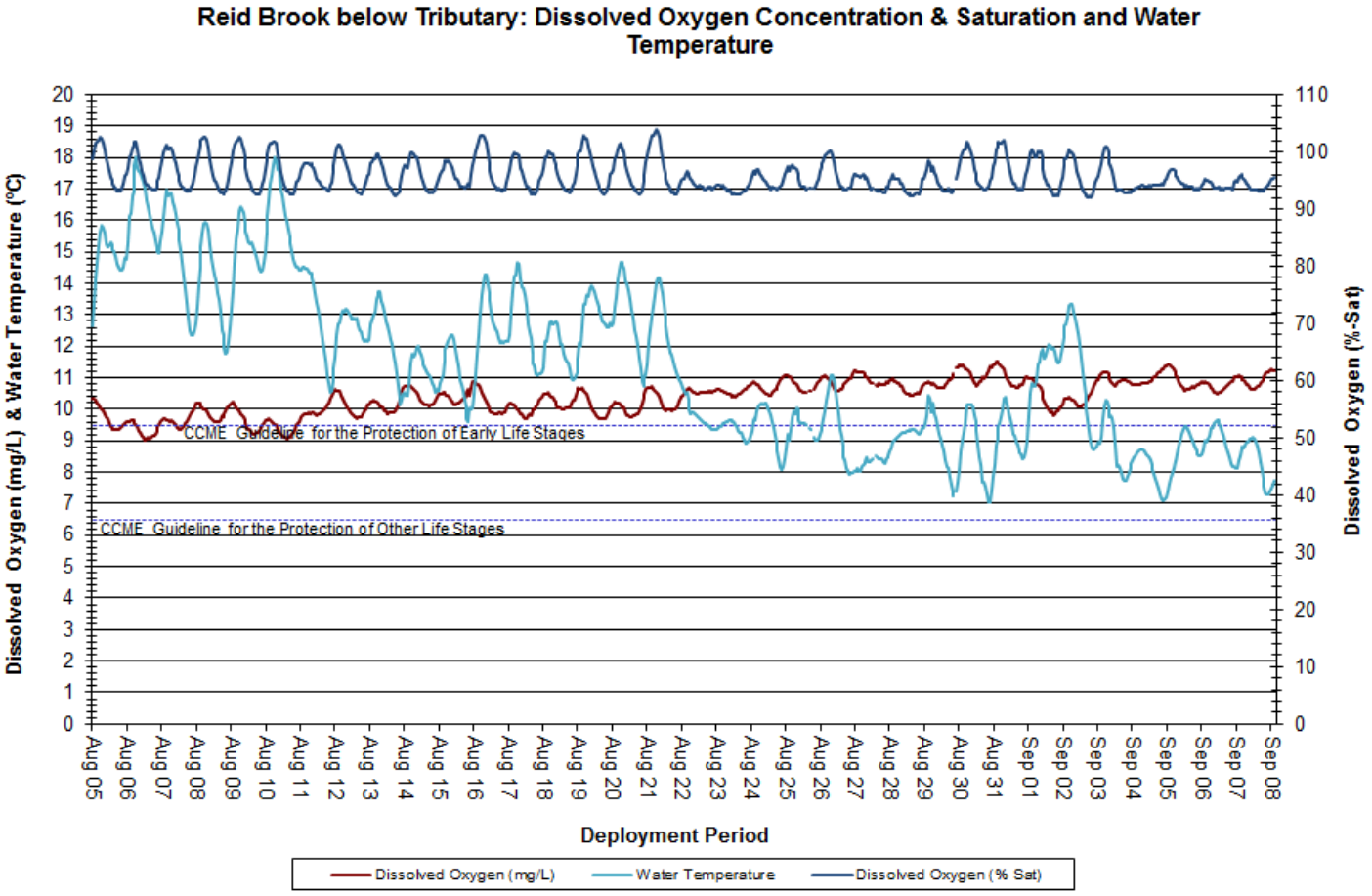


**Figure 17: Dissolved Oxygen & Water Temperature at Reid Brook below Tributary**

**Turbidity**

Over the deployment period, turbidity ranged from 0.0 NTU to 366.1 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.

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.

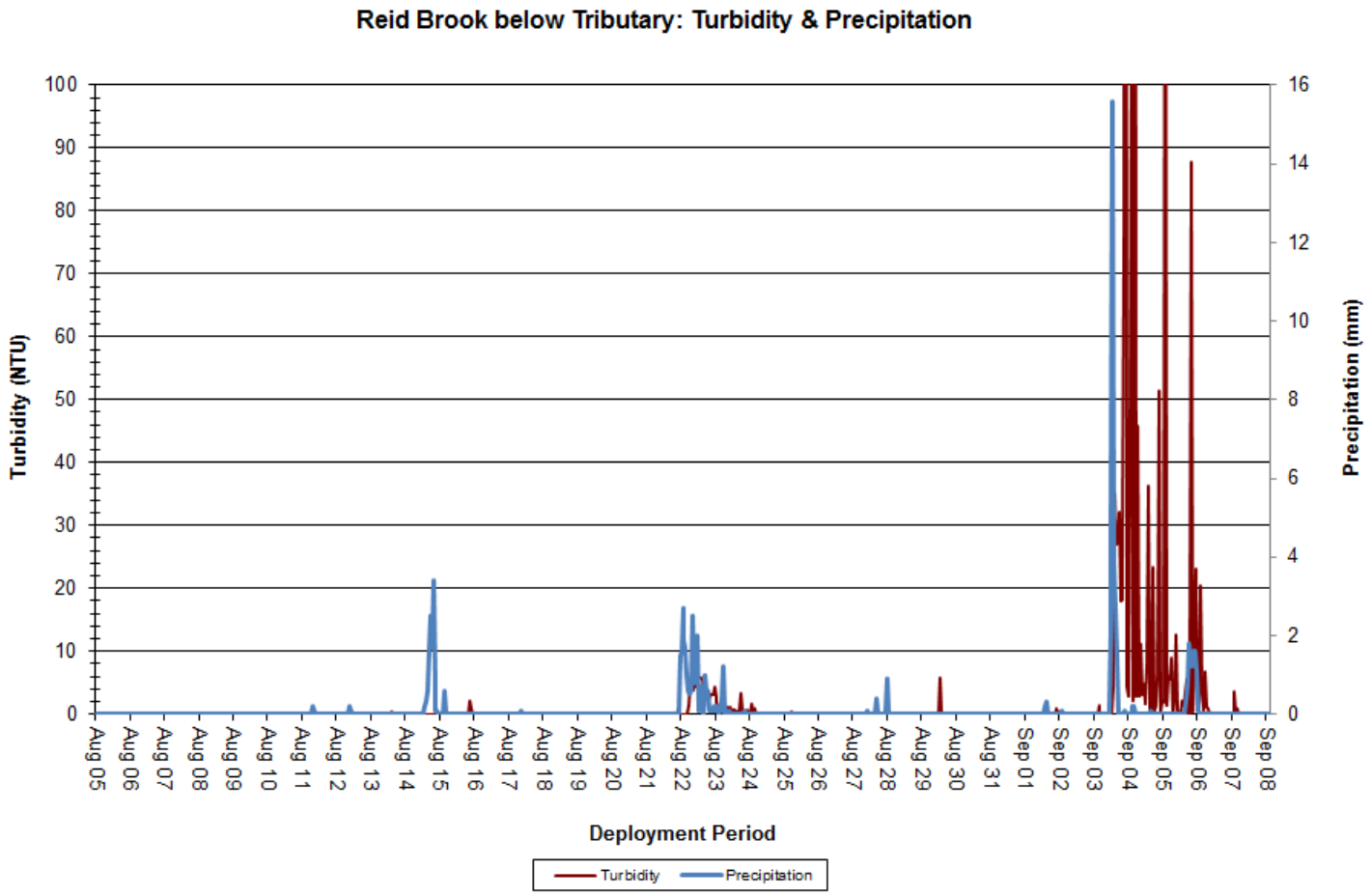


**Figure 18: Turbidity & Precipitation at Reid Brook below Tributary**

### Stage, Flow and Precipitation

Over the deployment period, stage values ranged from 1.41m to 1.59m, with a median value of 1.46m. Flow ranged from 1.21m$^3$/s to 4.22m$^3$/s, with a median value of 1.84m$^3$/s. Precipitation data was obtained from the Voisey's Bay airstrip weather station (Figure 19).

Stage, flow and precipitation are graphed below to show the relationship between rainfall and water level. It is evident that many peaks in stage (m) and flow (m³/s) are closely linked to precipitation events.

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.

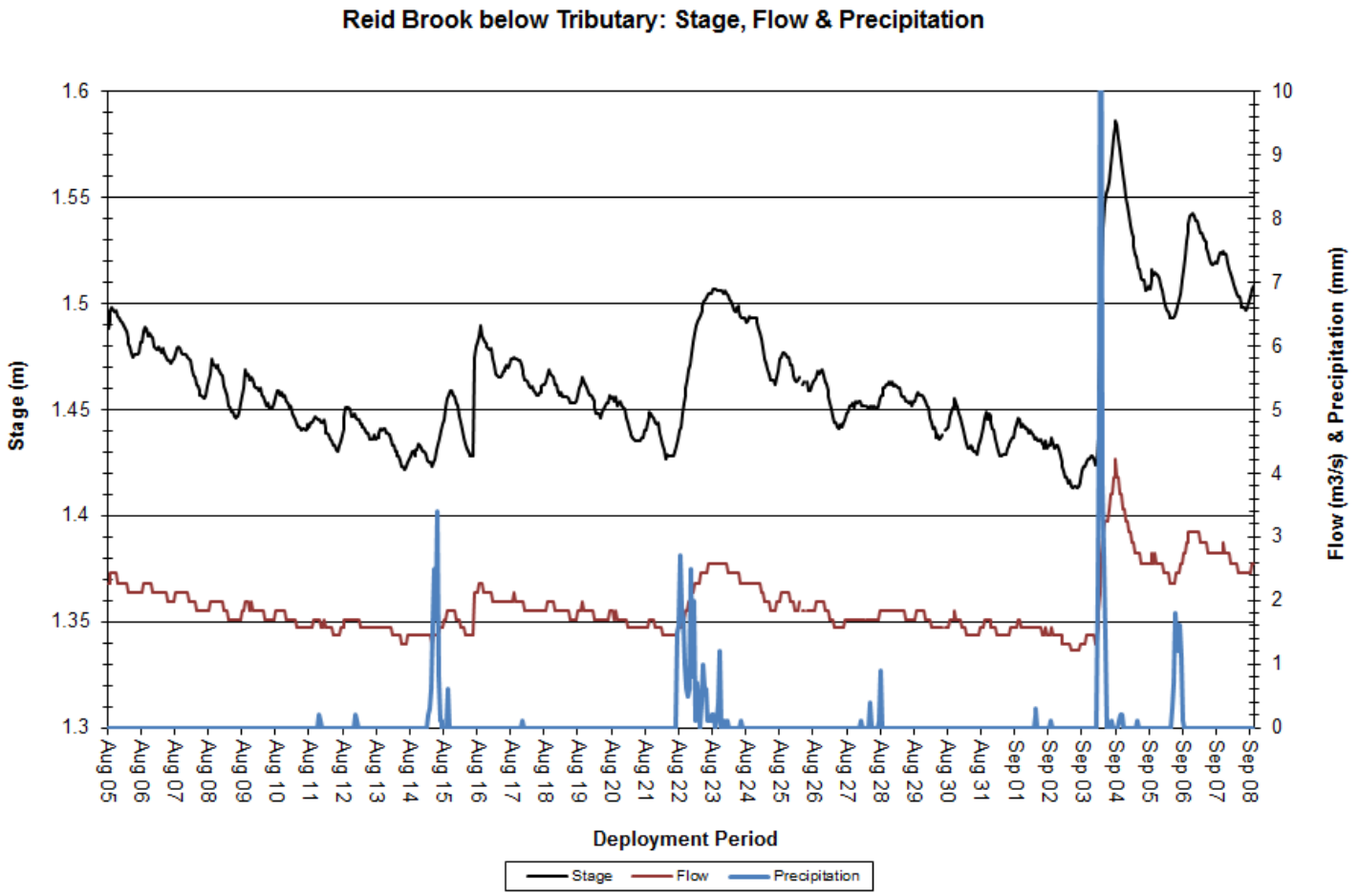


**Figure 19: Stage, Flow & Precipitation at Reid Brook below Tributary**

## Tributary to Reid Brook

### Water Temperature

Over the deployment period, water temperature ranged from 6.90°C to 15.60°C, with a median value of 10.10°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. As expected, water temperatures decreased gradually over the course of deployment with the change from summer to fall, and correlated closely with ambient air temperatures.

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.

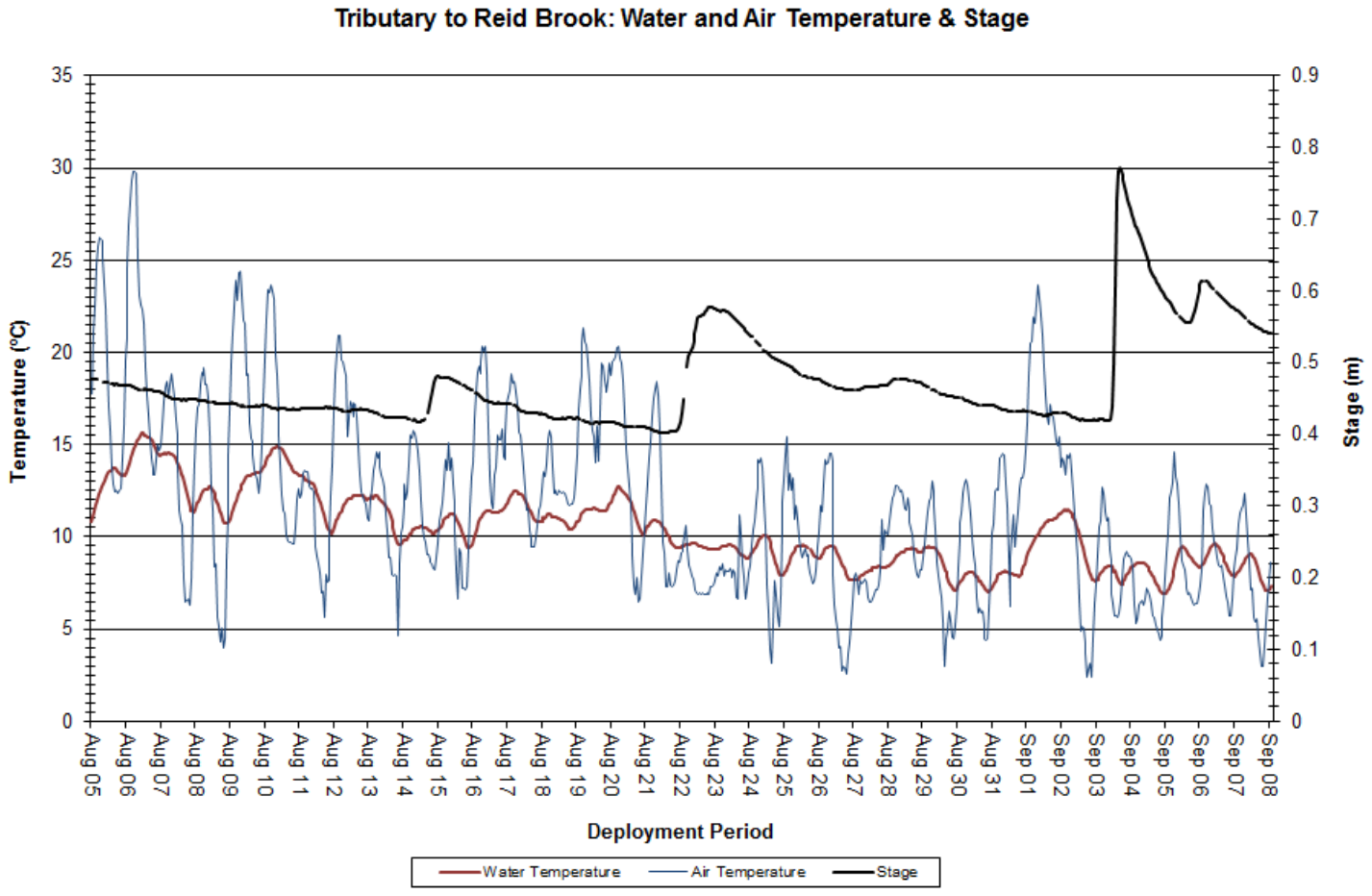


**Figure 20: Water and Air Temperature & Stage at Tributary to Reid Brook**

**pH**

Over the deployment period, pH ranged from 6.41 pH units to 7.28 pH units, with a median value of 7.11 (Figure 21).

Stage increases often indicate a rainfall event; rainfall will cause pH values to decrease for a short period of time (Figure 21). This is evidenced by an obvious increase in stage and associated decrease in pH on both August 23rd and September 4th.

pH levels remained within the CCME's Guidelines for the Protection of Aquatic Life for the duration of deployment, with a single exception on September 4th associated with a rainfall event and subsequent increased stage level.

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.

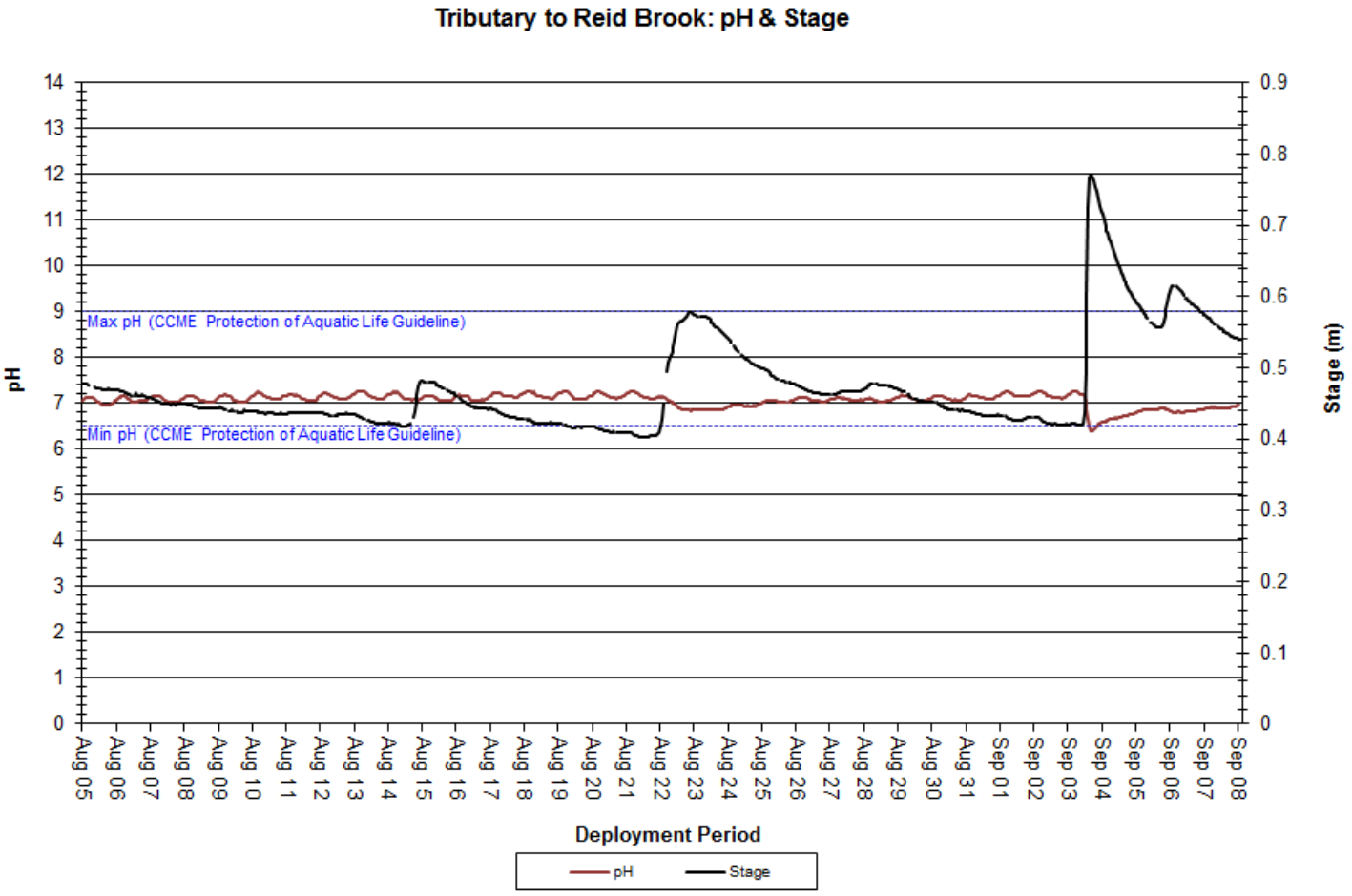


**Figure 21: pH & Stage at Tributary to Reid Brook**

**Specific Conductivity**

Over the deployment period, specific conductivity ranged from 23.9µS/cm to 40.3µS/cm, with a median value of 36.3µS/cm (Figure 22).

Specific conductance and stage generally exhibit an inverse relationship: as one parameter increases, the other decreases. An increased amount of water in the river system dilutes solids causing a decrease in conductivity, and vice versa. Rainfall events over the course of deployment (Figure 24) likely influenced the observed decrease in specific conductivity on the same dates.

There was also a gradual increase in conductivity across the deployment period. This is to be expected; as air temperatures increased and evaporation occurred in the brook, dissolved particulate matter became more concentrated.

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.

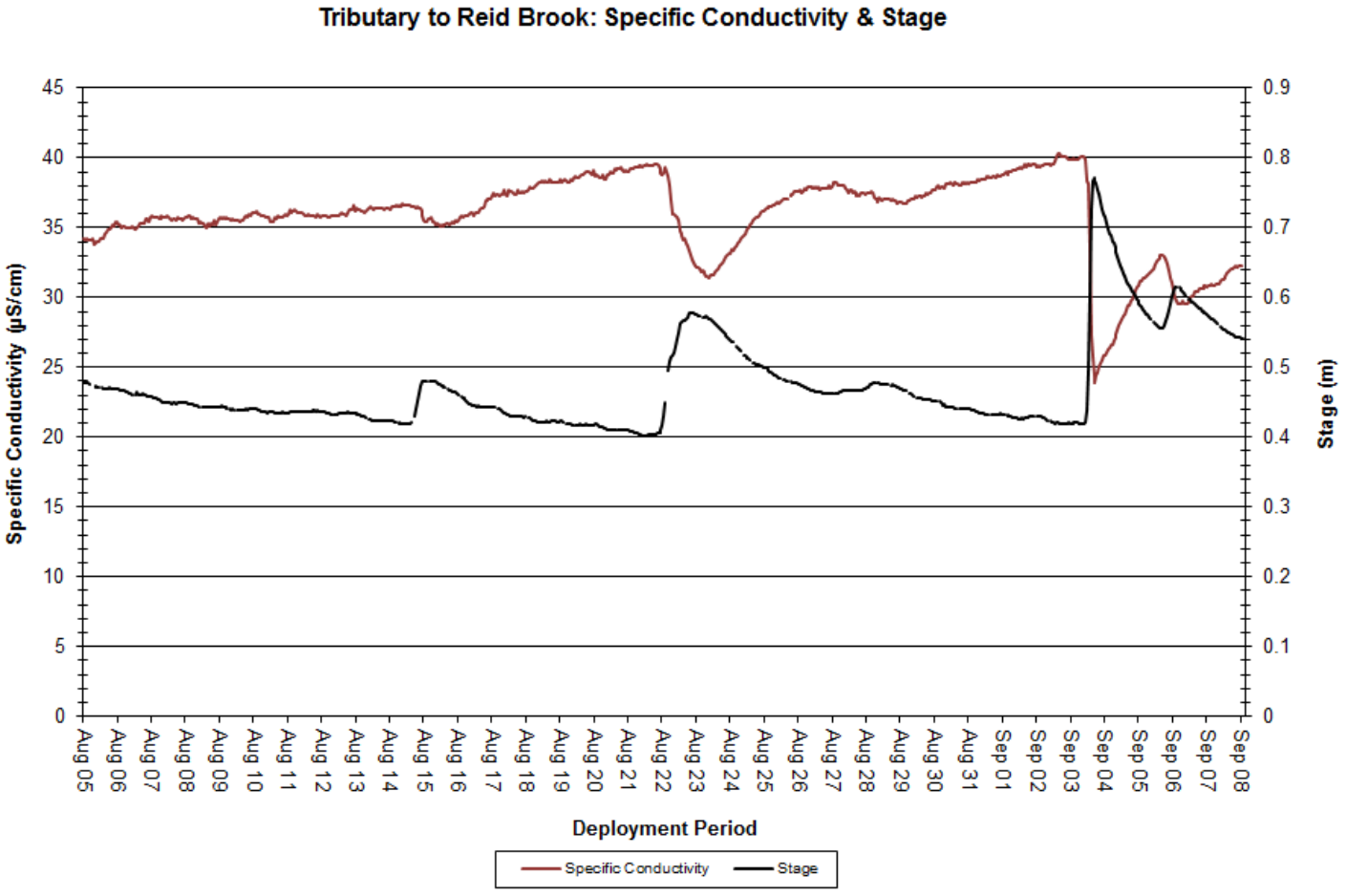


**Figure 22: Specific Conductivity & Stage at Tributary to Reid Brook**

### Dissolved Oxygen

Over the deployment period, dissolved oxygen concentration ranged from 9.45mg/L to 11.76mg/L, with a median value of 10.73mg/L. The saturation of dissolved oxygen ranged from 92.1% saturation to 102.6% saturation, with a median value of 94.9% (Figure 23).

Dissolved oxygen levels remained above the CCME's Guideline for the Protection of Early Life Stages for the duration of deployment, with one exception on August 6th. This decrease in dissolved oxygen concentration was short-lived and corresponded closely with a significant increase in water temperature.

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.

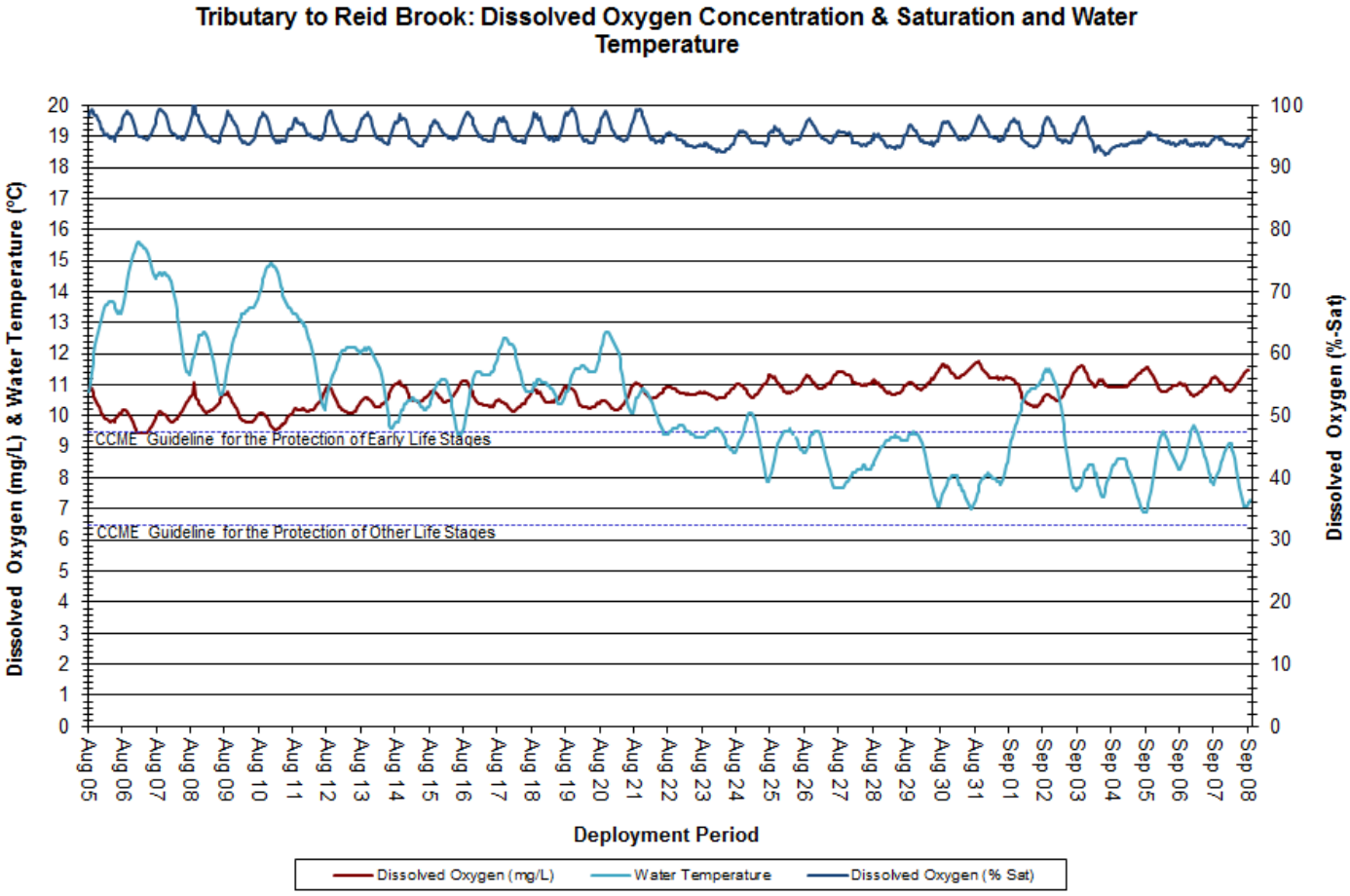


**Figure 23: Dissolved Oxygen & Water Temperature at Tributary to Reid Brook**

**Turbidity**

Over the deployment period, turbidity ranged from 0.0 NTU to 52.8 NTU, with a median value of 0.2 NTU (Figure 24). A median value of 0.2 NTU indicates that there was very little natural background turbidity at this station.

There were a number of turbidity events at this station, with many of the larger turbidity events correlating with rainfall events (Figure 24). Rainfall generally causes an increase in water volume, which serves to stir up solid materials in the water column, in turn increasing turbidity. This site is particularly prone to variable turbidity, as it has a sandy-clay bottom that is easily disturbed by precipitation events.

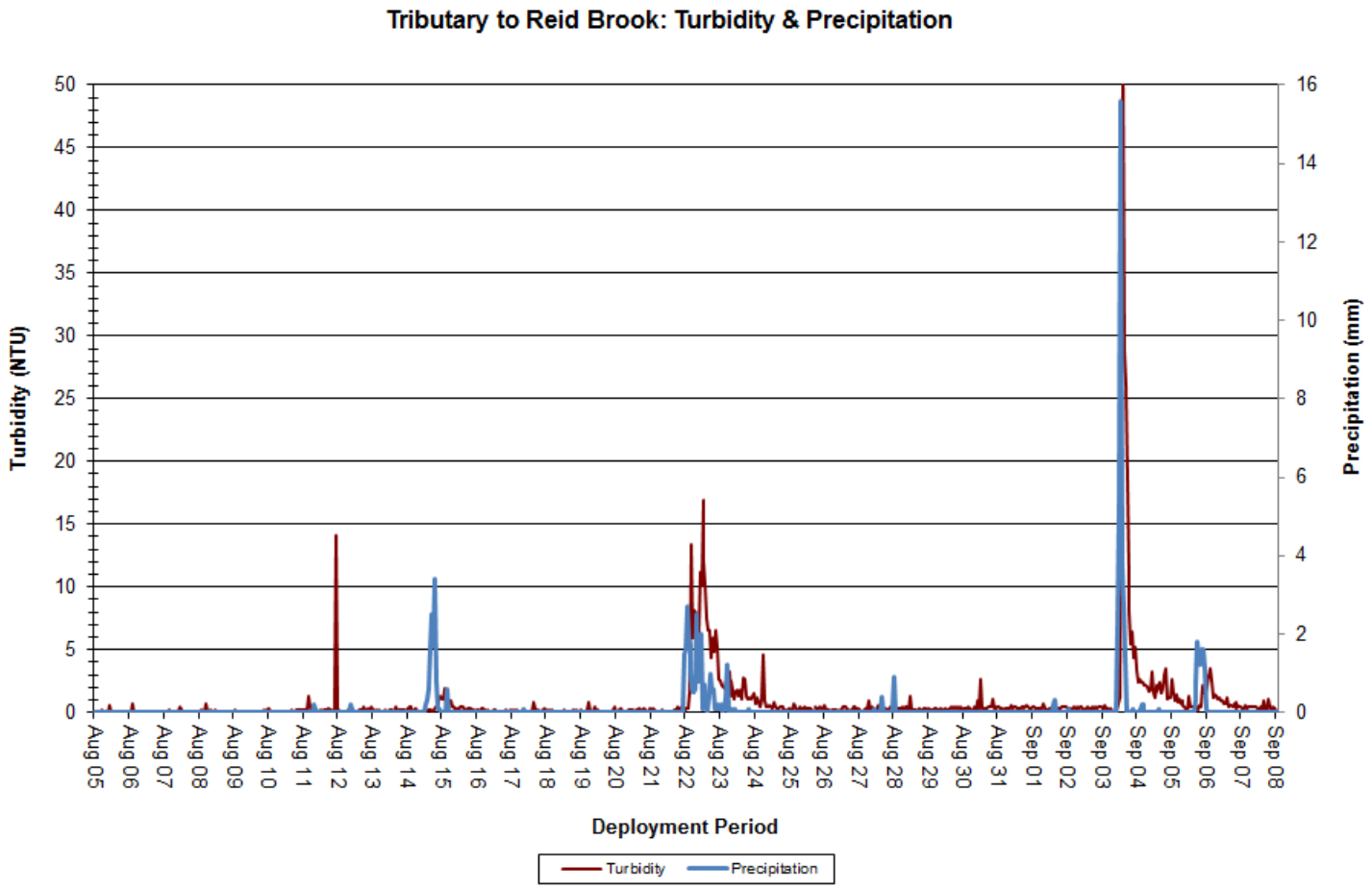


**Figure 24: Turbidity & Stage at Tributary to Reid Brook**

### Stage, Flow and Precipitation

Over the deployment period, stage ranged from 0.40m to 0.77m, with a median value of 0.44m. Flow ranged from 0.07$m^3$/s to 1.22$m^3$/s, with a median value of 0.11$m^3$/s. Precipitation data was obtained from the Voisey's Bay airstrip weather station (Figure 25).

Stage, flow and precipitation are graphed below to show the relationship between rainfall and water level. It is evident that the peaks in stage and flow data are closely related to precipitation.

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.

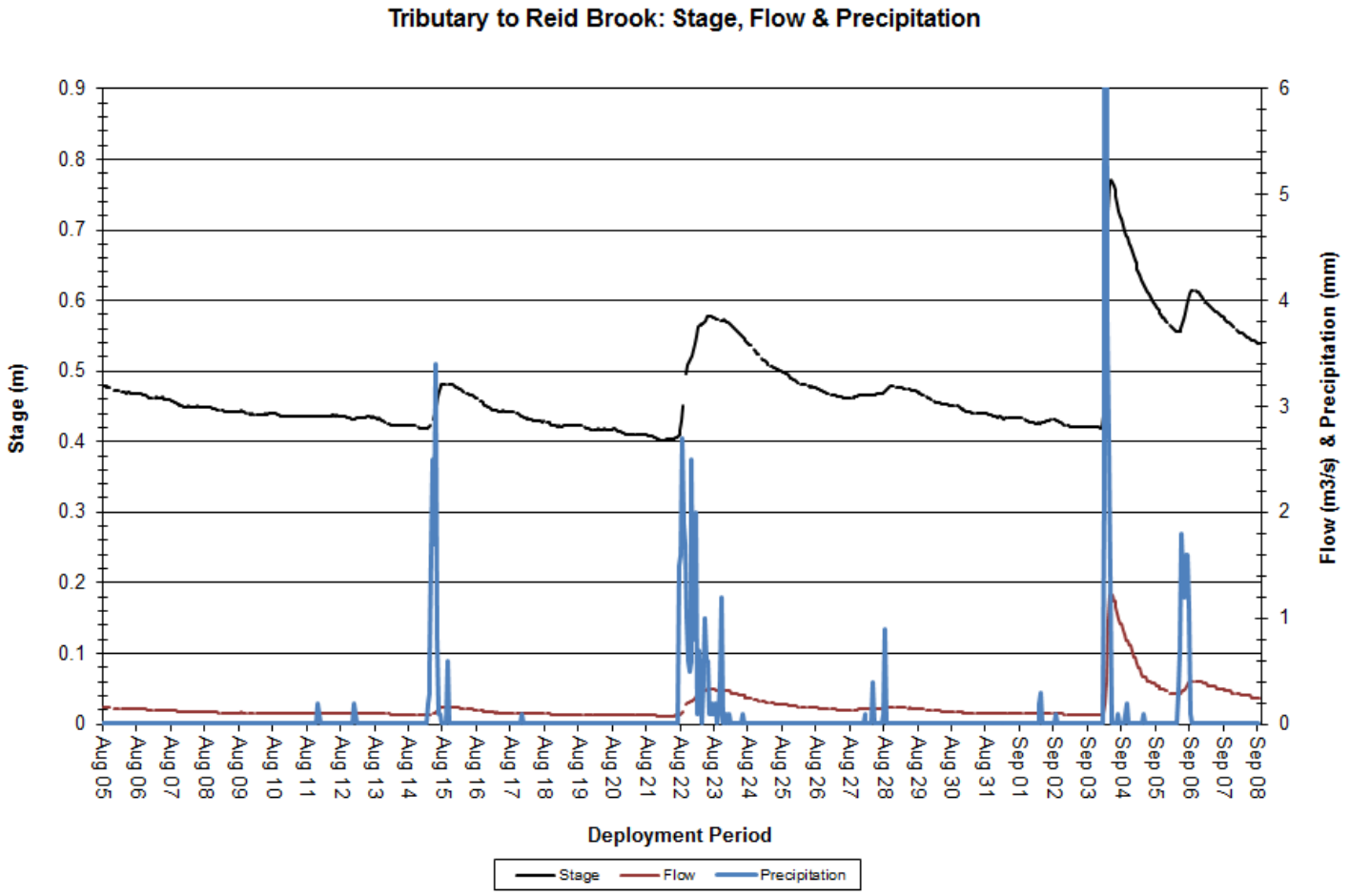


**Figure 25: Stage, Flow & Precipitation at Tributary to Reid Brook**

## Conclusions

Water temperatures across all stations ranged from a minimum of 6.90°C at Tributary to Reid Brook to a maximum of 21.42°C at Camp Pond Brook below Camp Pond. Overall, water temperature was 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 6.41pH units at Tributary to Reid Brook to a maximum of 7.78pH units at Reid Brook below Tributary. pH values at all stations were relatively consistent.

Specific conductivity across all stations ranged from a minimum of 23.9µS/cm at Tributary to Reid Brook to a maximum of 111.0µS/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 40.8µS/cm, which is to be expected given the station's proximity to the Voisey's Bay mine site and increased potential for roadway runoff and other anthropogenic influences.

Dissolved oxygen levels across all stations ranged from a minimum of 8.27mg/L at Camp Pond Brook below Camp Pond to a maximum of 11.76mg/L at Tributary to Reid Brook. Dissolved oxygen gradually increased over the deployment period and varied diurnally as water temperature is greatly affected by ambient air temperature. Dissolved oxygen levels remained above the CCME's Guideline for the Protection of Early Life Stages at the Reid Brook at Outlet of Reid Pond station. At the other stations, dissolved oxygen levels remained above the CCME's guideline for the majority of deployment, with exceptions correlating closely with higher water temperatures.

Turbidity levels across all stations ranged from a minimum of 0.0 NTU at three stations to a maximum of 446.0 NTU at Camp Pond Brook below Camp Pond. Turbidity levels showed natural increases and decreases corresponding to changes in stage and 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 very accurate and no data was removed.

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.

# APPENDIX A: Comparison Graphs

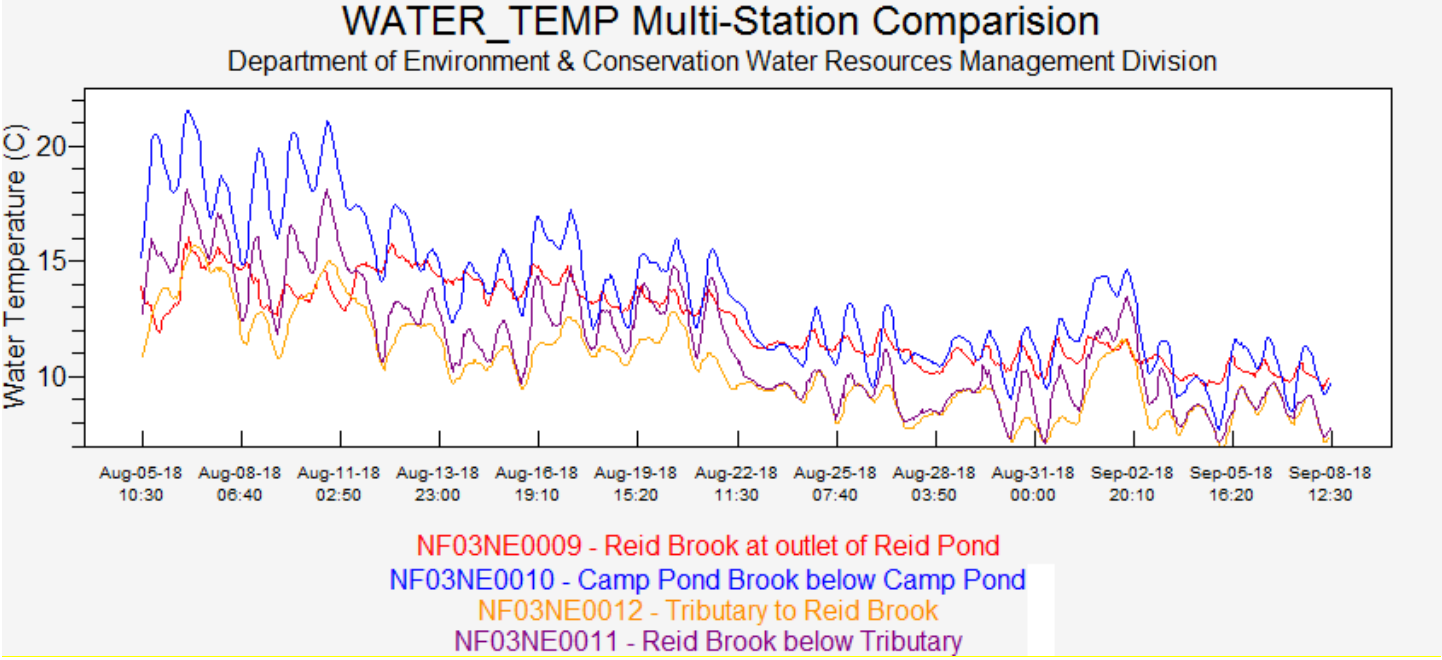


**Figure A1: Comparison of Water Temperature ($^0$C) between all Real-Time Stations in Voisey's Bay.**

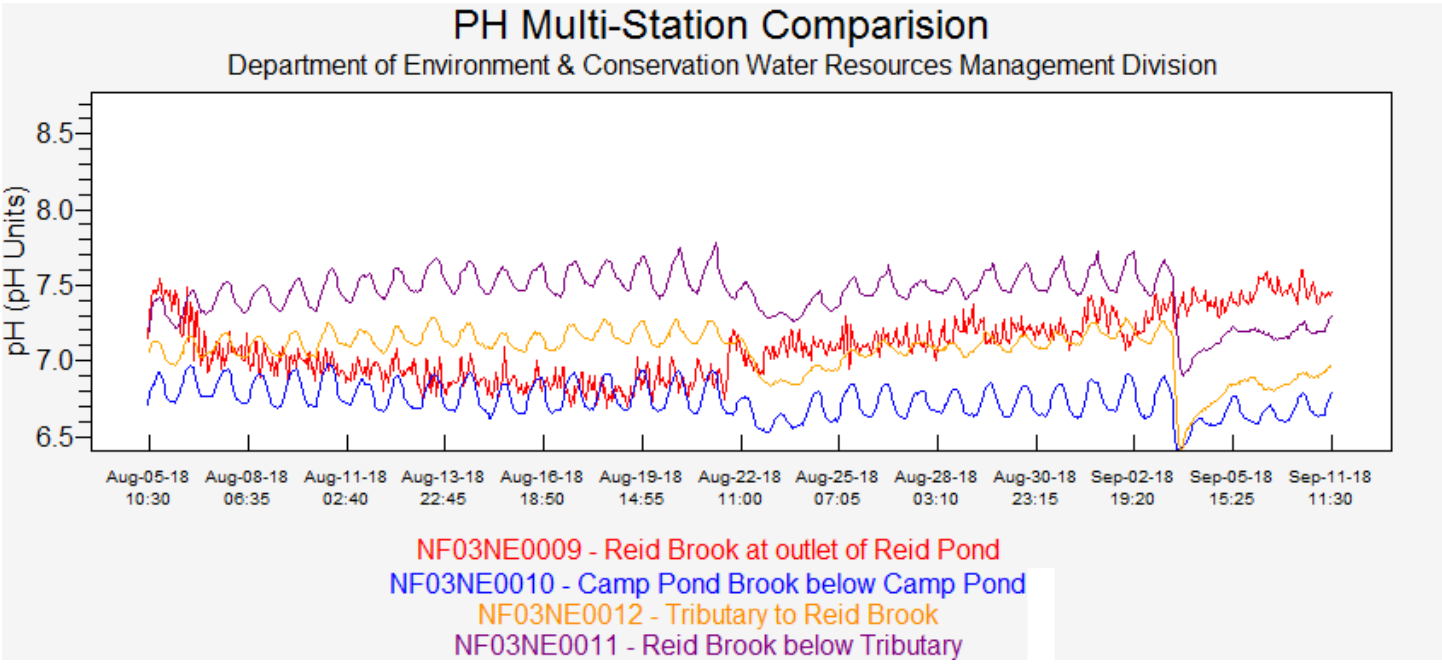


**Figure A2: Comparison of pH between all Real-Time Stations in Voisey's Bay.**

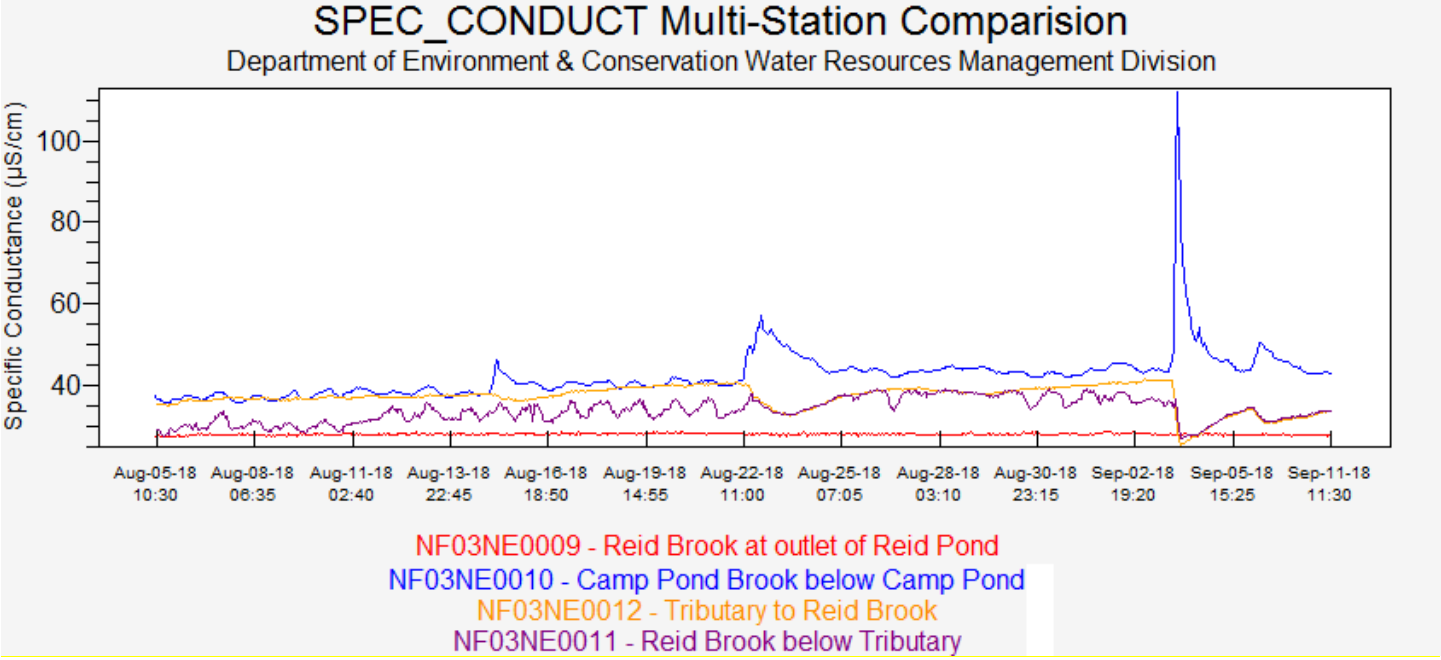


**Figure A3: Comparison of Specific Conductivity (µS/cm) between all Real-Time Stations in Voisey's Bay.**

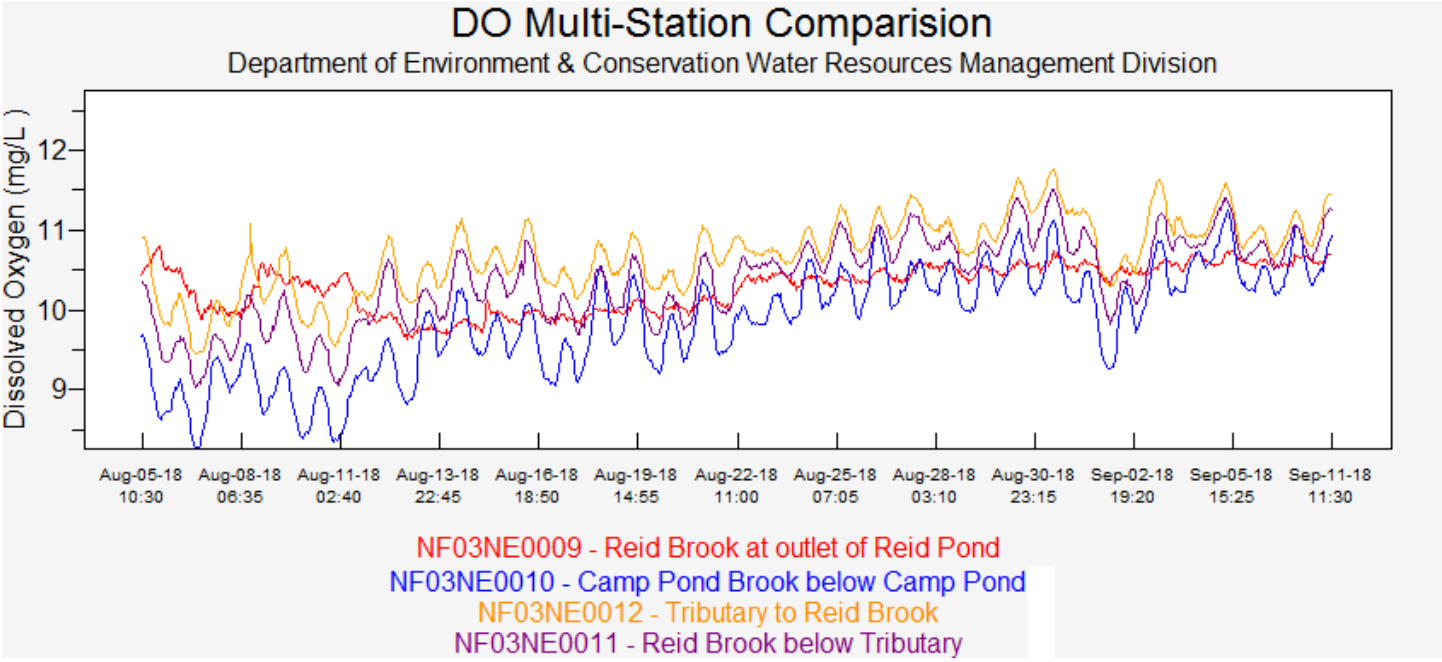


**Figure A4: Comparison of Dissolved Oxygen (mg/L) between all Real-Time Stations in Voisey's Bay.**

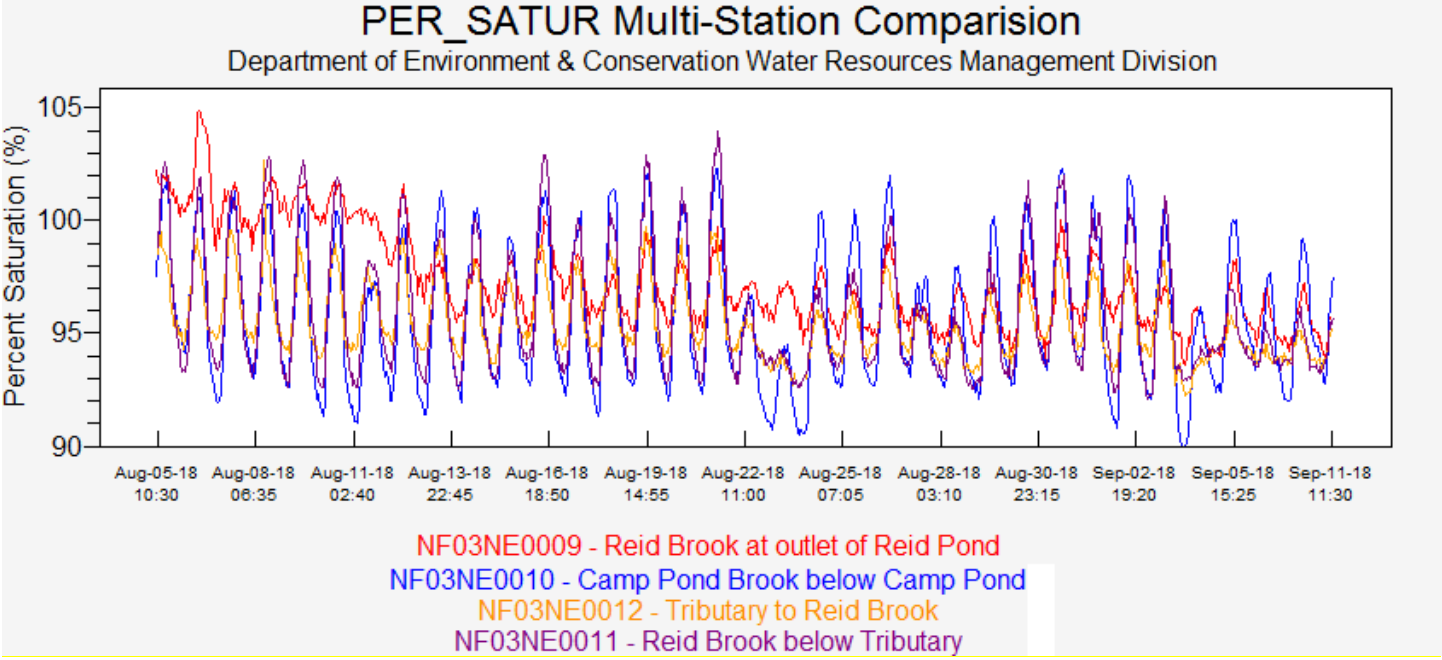


**Figure A5: Comparison of Dissolved Oxygen (% Sat) between all Real-Time Stations in Voisey's Bay.**

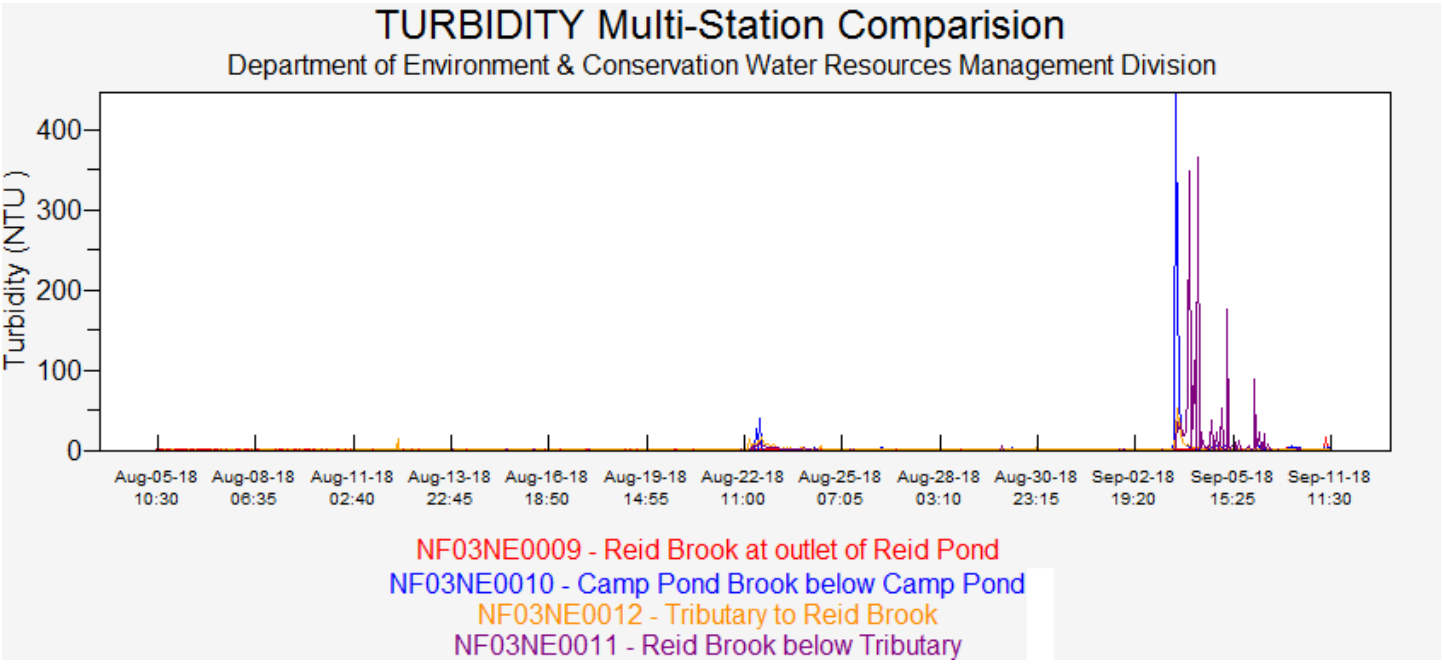


**Figure A6: Comparison of Turbidity (NTU) between all Real-Time Stations in Voisey's Bay. There may have been an error during calibration that resulted in the higher-than-expected background turbidity level observed at Tributary to Reid Brook.**

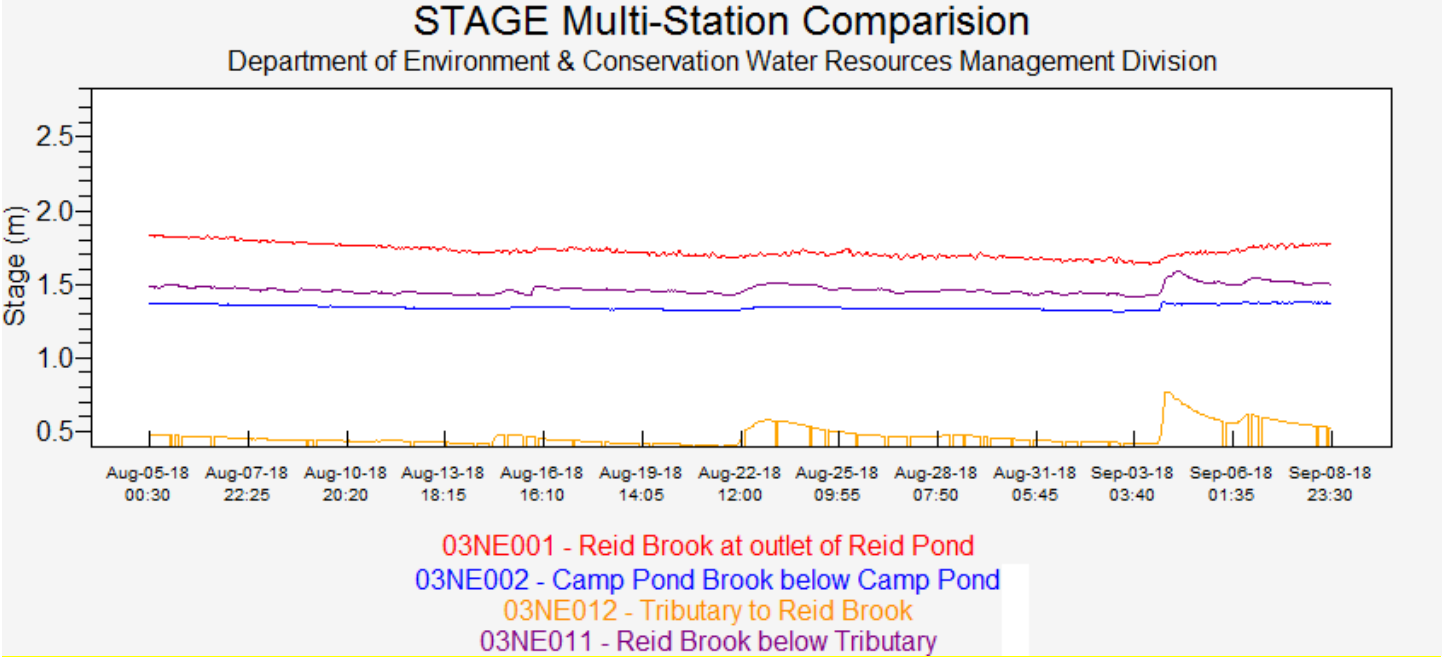


**Figure A7: Comparison of Stage (m) between all Real-Time Stations in Voisey's Bay. Please note that stage data is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data.**

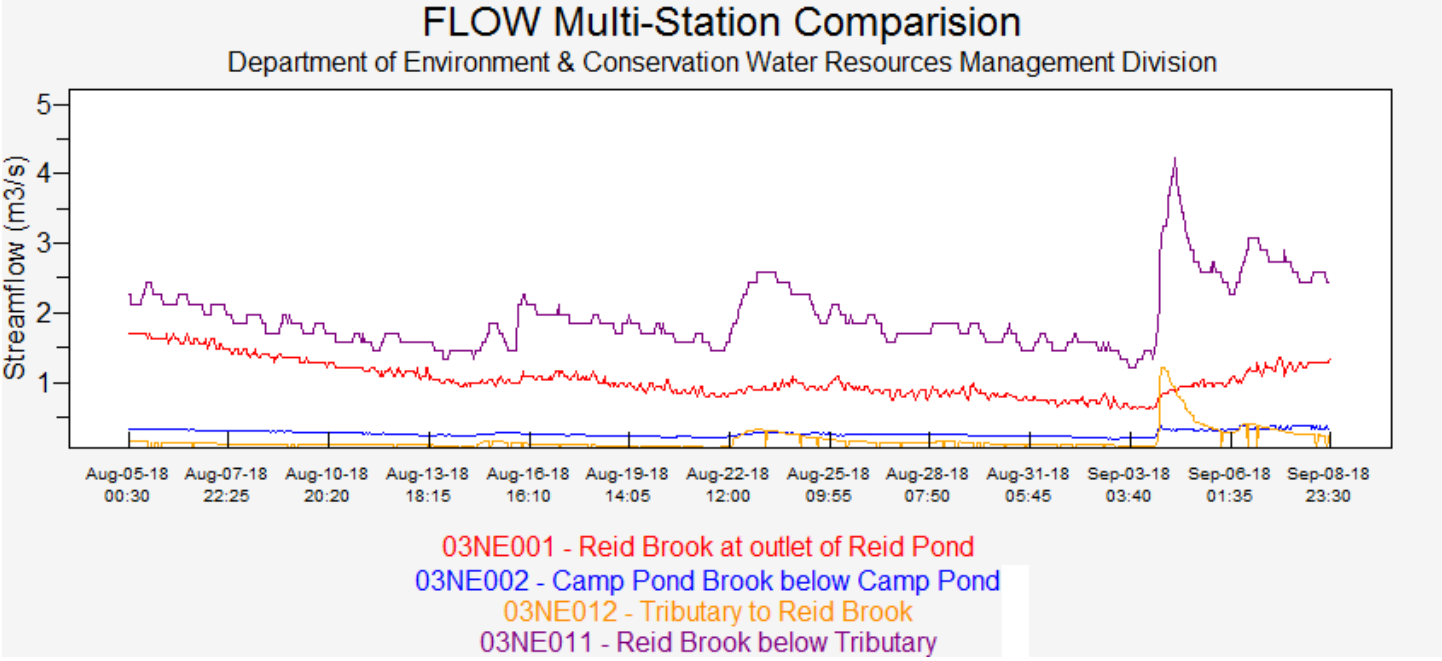


**Figure A8: Comparison of Flow ($m^3/s$) between all Real-Time Stations in Voisey's Bay. Please note that flow data is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data.**

# 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

# REPORT OF ANALYSIS

**Lab Report Number:** **1813979**

| | | | |
|---|---|---|---|
| **Cient:** | Department of Environment | **COC Number:** | 834482 |
| **Attention:** | Ms. Tara Clinton | **Date Reported:** | 2018-08-16 |
| **Client Project:** | | **Date Submitted:** | 2018-08-08 |
| **Purchase Order:** | 2180014302 | **Sample Matrix:** | Water |

| LAB ID | Supply / Description | Client Sample ID | Sample Date |
|---|---|---|---|
| 1379137 | WS-S-0000<br>Reid Brook at Outlet Reid Pond | 2018-1861-00-SI-SP | 2018-08-05 |

Sample comment:

Holding time for turbidity analysis was exceeded for entire report.

Report comment:

| ANALYTE | UNIT | MRL | RESULT |
|---|---|---|---|
| Alkalinity as CaCO3 | mg/L | 5 | 6 |
| Bromide | mg/L | 0.25 | <0.25 |
| Chloride | mg/L | 1 | <1 |
| Colour | TCU | 2 | 9 |
| Conductivity | uS/cm | 5 | 19 |
| Dissolved Organic Carbon | mg/L | 0.5 | 1.5 |
| Fluoride | mg/L | 0.10 | <0.10 |
| Hardness as CaCO3 | mg/L | 1 | 2 |
| N-NH3 (Ammonia) | mg/L | 0.05 | <0.05 |
| N-NO2 (Nitrite) | mg/L | 0.10 | <0.10 |
| N-NO3 (Nitrate) | mg/L | 0.10 | <0.10 |
| pH | | 1.00 | 7.16 |
| Sulphate | mg/L | 1 | <1 |
| Total Dissolved Solids (COND - CALC) | mg/L | 1 | 12 |
| Total Kjeldahl Nitrogen | mg/L | 0.1 | <0.1 |
| Total Organic Carbon | mg/L | 0.5 | 2.5 |
| Turbidity | NTU | 0.1 | 0.1 |
| Aluminum | mg/L | 0.01 | 0.04 |

Eurofins (Ottawa) is accredited for specific parameters by CALA. The scope can be viewed at http://www.cala.ca/scopes/2602.pdf.
Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

APPROVAL: 

Sarah Horner

# REPORT OF ANALYSIS

**Lab Report Number:** **1813979**

| | | | |
|---|---|---|---|
| **Cient:** | Department of Environment | **COC Number:** | 834482 |
| **Attention:** | Ms. Tara Clinton | **Date Reported:** | 2018-08-16 |
| **Client Project:** | | **Date Submitted:** | 2018-08-08 |
| **Purchase Order:** | 2180014302 | **Sample Matrix:** | Water |

| LAB ID | Supply / Description | Client Sample ID | Sample Date | ANALYTE | UNIT | MRL | RESULT |
|---|---|---|---|---|---|---|---|
| 1379137 | WS-S-0000 | 2018-1861-00-SI-SP | 2018-08-05 | Antimony | mg/L | 0.0005 | <0.0005 |
| | Reid Brook at Outlet Reid Pond | | | Arsenic | mg/L | 0.001 | <0.001 |
| | | | | Barium | mg/L | 0.01 | <0.01 |
| | | | | Boron | mg/L | 0.01 | <0.01 |
| | | | | Calcium | mg/L | 1 | 1 |
| | | | | Cadmium | mg/L | 0.0001 | <0.0001 |
| | | | | Chromium | mg/L | 0.001 | <0.001 |
| | | | | Copper | mg/L | 0.001 | <0.001 |
| | | | | Iron | mg/L | 0.03 | <0.03 |
| | | | | Lead | mg/L | 0.001 | <0.001 |
| | | | | Magnesium | mg/L | 1 | <1 |
| | | | | Manganese | mg/L | 0.01 | <0.01 |
| | | | | Mercury | mg/L | 0.0001 | <0.0001 |
| | | | | Nickel | mg/L | 0.005 | <0.005 |
| | | | | Potassium | mg/L | 1 | <1 |
| | | | | Selenium | mg/L | 0.001 | <0.001 |
| | | | | Sodium | mg/L | 2 | <2 |
| | | | | Strontium | mg/L | 0.001 | 0.005 |

Sample comment:

Holding time for turbidity analysis was exceeded for entire report.

Report comment:

Eurofins (Ottawa) is accredited for specific parameters by CALA. The scope can be viewed at http://www.cala.ca/scopes/2602.pdf.
Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

APPROVAL: Sarah Horner

# REPORT OF ANALYSIS

**Lab Report Number:** **1813979**

| | | | |
|---|---|---|---|
| **Cient:** | Department of Environment | **COC Number:** | 834482 |
| **Attention:** | Ms. Tara Clinton | **Date Reported:** | 2018-08-16 |
| **Client Project:** | | **Date Submitted:** | 2018-08-08 |
| **Purchase Order:** | 2180014302 | **Sample Matrix:** | Water |

| LAB ID | Supply / Description | Client Sample ID | Sample Date | ANALYTE | UNIT | MRL | RESULT |
|---|---|---|---|---|---|---|---|
| 1379137 | WS-S-0000 | 2018-1861-00-SI-SP | 2018-08-05 | Uranium | mg/L | 0.001 | <0.001 |
| | Reid Brook at Outlet Reid Pond | | | Zinc | mg/L | 0.01 | <0.01 |
| | | | | Phosphorus | mg/L | 0.002 | <0.002 |
| | | | | Total Suspended Solids | mg/L | 2 | <2 |

Sample comment:

Holding time for turbidity analysis was exceeded for entire report.

Report comment:

Eurofins (Ottawa) is accredited for specific parameters by CALA. The scope can be viewed at http://www.cala.ca/scopes/2602.pdf.
Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

APPROVAL: Sarah Horner

# REPORT OF ANALYSIS

**Lab Report Number:** **1813979**

| | | | |
|---|---|---|---|
| **Cient:** | Department of Environment | **COC Number:** | 834482 |
| **Attention:** | Ms. Tara Clinton | **Date Reported:** | 2018-08-16 |
| **Client Project:** | | **Date Submitted:** | 2018-08-08 |
| **Purchase Order:** | 2180014302 | **Sample Matrix:** | Water |

| LAB ID | Supply / Description | Client Sample ID | Sample Date | ANALYTE | UNIT | MRL | RESULT |
|---|---|---|---|---|---|---|---|
| 1379140 | WS-S-0000<br>Camp Pond Brook below Camp Pond | 2018-1864-00-SI-SP | 2018-08-05 | Alkalinity as CaCO3 | mg/L | 5 | 9 |
| | | | | Bromide | mg/L | 0.25 | <0.25 |
| | | | | Chloride | mg/L | 1 | 2 |
| Sample comment: | | | | Colour | TCU | 2 | 26 |
| | | | | Conductivity | uS/cm | 5 | 40 |
| | | | | Dissolved Organic Carbon | mg/L | 0.5 | 3.2 |
| Report comment: | | | | Fluoride | mg/L | 0.10 | <0.10 |
| | | | | Hardness as CaCO3 | mg/L | 1 | 14 |
| | | | | N-NH3 (Ammonia) | mg/L | 0.05 | <0.05 |
| | | | | N-NO2 (Nitrite) | mg/L | 0.10 | <0.10 |
| | | | | N-NO3 (Nitrate) | mg/L | 0.10 | <0.10 |
| | | | | pH | | 1.00 | 7.15 |
| | | | | Sulphate | mg/L | 1 | 4 |
| | | | | Total Dissolved Solids (COND - CALC) | mg/L | 1 | 26 |
| | | | | Total Kjeldahl Nitrogen | mg/L | 0.1 | <0.1 |
| | | | | Total Organic Carbon | mg/L | 0.5 | 3.9 |
| | | | | Turbidity | NTU | 0.1 | 0.9 |
| | | | | Aluminum | mg/L | 0.01 | 0.05 |

Eurofins (Ottawa) is accredited for specific parameters by CALA. The scope can be viewed at http://www.cala.ca/scopes/2602.pdf.
Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

APPROVAL: 

Sarah Horner

# REPORT OF ANALYSIS

**Lab Report Number:** **1813979**

| | | | |
|---|---|---|---|
| **Cient:** | Department of Environment | **COC Number:** | 834482 |
| **Attention:** | Ms. Tara Clinton | **Date Reported:** | 2018-08-16 |
| **Client Project:** | | **Date Submitted:** | 2018-08-08 |
| **Purchase Order:** | 2180014302 | **Sample Matrix:** | Water |

| LAB ID | Supply / Description | Client Sample ID | Sample Date | ANALYTE | UNIT | MRL | RESULT |
|---|---|---|---|---|---|---|---|
| 1379140 | WS-S-0000 | 2018-1864-00-SI-SP | 2018-08-05 | Antimony | mg/L | 0.0005 | <0.0005 |
| | Camp Pond Brook below Camp Pond | | | Arsenic | mg/L | 0.001 | <0.001 |
| | | | | Barium | mg/L | 0.01 | <0.01 |
| Sample comment: | | | | Boron | mg/L | 0.01 | <0.01 |
| | | | | Calcium | mg/L | 1 | 4 |
| | | | | Cadmium | mg/L | 0.0001 | <0.0001 |
| Report comment: | | | | Chromium | mg/L | 0.001 | <0.001 |
| | | | | Copper | mg/L | 0.001 | 0.003 |
| | | | | Iron | mg/L | 0.03 | 0.12 |
| | | | | Lead | mg/L | 0.001 | <0.001 |
| | | | | Magnesium | mg/L | 1 | 1 |
| | | | | Manganese | mg/L | 0.01 | <0.01 |
| | | | | Mercury | mg/L | 0.0001 | <0.0001 |
| | | | | Nickel | mg/L | 0.005 | 0.027 |
| | | | | Potassium | mg/L | 1 | <1 |
| | | | | Selenium | mg/L | 0.001 | <0.001 |
| | | | | Sodium | mg/L | 2 | 2 |
| | | | | Strontium | mg/L | 0.001 | 0.018 |

Eurofins (Ottawa) is accredited for specific parameters by CALA. The scope can be viewed at http://www.cala.ca/scopes/2602.pdf.
Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

APPROVAL: Sarah Horner

# REPORT OF ANALYSIS

**Lab Report Number:** **1813979**

| | | | |
|---|---|---|---|
| **Cient:** | Department of Environment | **COC Number:** | 834482 |
| **Attention:** | Ms. Tara Clinton | **Date Reported:** | 2018-08-16 |
| **Client Project:** | | **Date Submitted:** | 2018-08-08 |
| **Purchase Order:** | 2180014302 | **Sample Matrix:** | Water |

| LAB ID | Supply / Description | Client Sample ID | Sample Date | ANALYTE | UNIT | MRL | RESULT |
|---|---|---|---|---|---|---|---|
| 1379140 | WS-S-0000 | 2018-1864-00-SI-SP | 2018-08-05 | Uranium | mg/L | 0.001 | <0.001 |
| | Camp Pond Brook below Camp Pond | | | Zinc | mg/L | 0.01 | <0.01 |
| | | | | Phosphorus | mg/L | 0.002 | 0.003 |
| Sample comment: | | | | Total Suspended Solids | mg/L | 2 | <2 |

Report comment:

Eurofins (Ottawa) is accredited for specific parameters by CALA. The scope can be viewed at http://www.cala.ca/scopes/2602.pdf.
Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

APPROVAL: Sarah Horner

# REPORT OF ANALYSIS

**Lab Report Number:** 1813979

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|---|---|---|---|
| **Cient:** | Department of Environment | **COC Number:** | 834482 |
| **Attention:** | Ms. Tara Clinton | **Date Reported:** | 2018-08-16 |
| **Client Project:** | | **Date Submitted:** | 2018-08-08 |
| **Purchase Order:** | 2180014302 | **Sample Matrix:** | Water |

| LAB ID | Supply / Description | Client Sample ID | Sample Date | ANALYTE | UNIT | MRL | RESULT |
|---|---|---|---|---|---|---|---|
| 1379139 | WS-S-0000 | 2018-1863-00-SI-SP | 2018-08-05 | Alkalinity as CaCO3 | mg/L | 5 | 9 |
| | Redi Brook below Tributary | | | Bromide | mg/L | 0.25 | <0.25 |
| | | | | Chloride | mg/L | 1 | 2 |
| Sample comment: | | | | Colour | TCU | 2 | 28 |
| | | | | Conductivity | uS/cm | 5 | 33 |
| | | | | Dissolved Organic Carbon | mg/L | 0.5 | 3.0 |
| Report comment: | | | | Fluoride | mg/L | 0.10 | <0.10 |
| | | | | Hardness as CaCO3 | mg/L | 1 | 7 |
| | | | | N-NH3 (Ammonia) | mg/L | 0.05 | <0.05 |
| | | | | N-NO2 (Nitrite) | mg/L | 0.10 | <0.10 |
| | | | | N-NO3 (Nitrate) | mg/L | 0.10 | <0.10 |
| | | | | pH | | 1.00 | 7.14 |
| | | | | Sulphate | mg/L | 1 | 2 |
| | | | | Total Dissolved Solids (COND - CALC) | mg/L | 1 | 21 |
| | | | | Total Kjeldahl Nitrogen | mg/L | 0.1 | 0.1 |
| | | | | Total Organic Carbon | mg/L | 0.5 | 3.4 |
| | | | | Turbidity | NTU | 0.1 | 0.9 |
| | | | | Aluminum | mg/L | 0.01 | 0.05 |

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Methods references and/or additional QA/QC information available on request.

APPROVAL: 

Sarah Horner

# REPORT OF ANALYSIS

**Lab Report Number:** 1813979

| | | | |
|---|---|---|---|
| **Cient:** | Department of Environment | **COC Number:** | 834482 |
| **Attention:** | Ms. Tara Clinton | **Date Reported:** | 2018-08-16 |
| **Client Project:** | | **Date Submitted:** | 2018-08-08 |
| **Purchase Order:** | 2180014302 | **Sample Matrix:** | Water |

| LAB ID | Supply / Description | Client Sample ID | Sample Date | ANALYTE | UNIT | MRL | RESULT |
|---|---|---|---|---|---|---|---|
| 1379139 | WS-S-0000 | 2018-1863-00-SI-SP | 2018-08-05 | Antimony | mg/L | 0.0005 | <0.0005 |
| | Redi Brook below Tributary | | | Arsenic | mg/L | 0.001 | <0.001 |
| | | | | Barium | mg/L | 0.01 | <0.01 |
| Sample comment: | | | | Boron | mg/L | 0.01 | <0.01 |
| | | | | Calcium | mg/L | 1 | 3 |
| | | | | Cadmium | mg/L | 0.0001 | <0.0001 |
| Report comment: | | | | Chromium | mg/L | 0.001 | <0.001 |
| | | | | Copper | mg/L | 0.001 | 0.001 |
| | | | | Iron | mg/L | 0.03 | 0.34 |
| | | | | Lead | mg/L | 0.001 | <0.001 |
| | | | | Magnesium | mg/L | 1 | <1 |
| | | | | Manganese | mg/L | 0.01 | <0.01 |
| | | | | Mercury | mg/L | 0.0001 | <0.0001 |
| | | | | Nickel | mg/L | 0.005 | 0.006 |
| | | | | Potassium | mg/L | 1 | <1 |
| | | | | Selenium | mg/L | 0.001 | <0.001 |
| | | | | Sodium | mg/L | 2 | 2 |
| | | | | Strontium | mg/L | 0.001 | 0.014 |

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**Lab Report Number:** **1813979**

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| **Cient:** | Department of Environment | **COC Number:** | 834482 |
| **Attention:** | Ms. Tara Clinton | **Date Reported:** | 2018-08-16 |
| **Client Project:** | | **Date Submitted:** | 2018-08-08 |
| **Purchase Order:** | 2180014302 | **Sample Matrix:** | Water |

| LAB ID | Supply / Description | Client Sample ID | Sample Date | ANALYTE | UNIT | MRL | RESULT |
|---|---|---|---|---|---|---|---|
| 1379139 | WS-S-0000 | 2018-1863-00-SI-SP | 2018-08-05 | Uranium | mg/L | 0.001 | <0.001 |
| | Redi Brook below Tributary | | | Zinc | mg/L | 0.01 | <0.01 |
| | | | | Phosphorus | mg/L | 0.002 | 0.002 |
| Sample comment: | | | | Total Suspended Solids | mg/L | 2 | 3 |

Report comment:

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# REPORT OF ANALYSIS

**Lab Report Number:** **1813979**

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| **Cient:** | Department of Environment | **COC Number:** | 834482 |
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| **Client Project:** | | **Date Submitted:** | 2018-08-08 |
| **Purchase Order:** | 2180014302 | **Sample Matrix:** | Water |

| LAB ID | Supply / Description | Client Sample ID | Sample Date | ANALYTE | UNIT | MRL | RESULT |
|---|---|---|---|---|---|---|---|
| 1379138 | WS-S-0000<br>Tributary to Reid Brook | 2018-1862-00-SI-SP | 2018-08-05 | Alkalinity as CaCO3 | mg/L | 5 | 11 |
| | | | | Bromide | mg/L | 0.25 | <0.25 |
| | | | | Chloride | mg/L | 1 | 2 |
| | | | | Colour | TCU | 2 | 40 |
| | | | | Conductivity | uS/cm | 5 | 41 |
| | | | | Dissolved Organic Carbon | mg/L | 0.5 | 4.0 |
| | | | | Fluoride | mg/L | 0.10 | 0.12 |
| | | | | Hardness as CaCO3 | mg/L | 1 | 12 |
| | | | | N-NH3 (Ammonia) | mg/L | 0.05 | <0.05 |
| | | | | N-NO2 (Nitrite) | mg/L | 0.10 | <0.10 |
| | | | | N-NO3 (Nitrate) | mg/L | 0.10 | <0.10 |
| | | | | pH | | 1.00 | 7.33 |
| | | | | Sulphate | mg/L | 1 | 3 |
| | | | | Total Dissolved Solids (COND - CALC) | mg/L | 1 | 27 |
| | | | | Total Kjeldahl Nitrogen | mg/L | 0.1 | 0.1 |
| | | | | Total Organic Carbon | mg/L | 0.5 | 4.7 |
| | | | | Turbidity | NTU | 0.1 | 0.9 |
| | | | | Aluminum | mg/L | 0.01 | 0.06 |

Sample comment:

Report comment:

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| **Purchase Order:** | 2180014302 | **Sample Matrix:** | Water |

| LAB ID | Supply / Description | Client Sample ID | Sample Date | ANALYTE | UNIT | MRL | RESULT |
|---|---|---|---|---|---|---|---|
| 1379138 | WS-S-0000<br>Tributary to Reid Brook | 2018-1862-00-SI-SP | 2018-08-05 | Antimony | mg/L | 0.0005 | <0.0005 |
| | | | | Arsenic | mg/L | 0.001 | <0.001 |
| | | | | Barium | mg/L | 0.01 | <0.01 |
| | | | | Boron | mg/L | 0.01 | <0.01 |
| | | | | Calcium | mg/L | 1 | 3 |
| | | | | Cadmium | mg/L | 0.0001 | <0.0001 |
| | | | | Chromium | mg/L | 0.001 | <0.001 |
| | | | | Copper | mg/L | 0.001 | 0.001 |
| | | | | Iron | mg/L | 0.03 | 0.37 |
| | | | | Lead | mg/L | 0.001 | <0.001 |
| | | | | Magnesium | mg/L | 1 | 1 |
| | | | | Manganese | mg/L | 0.01 | <0.01 |
| | | | | Mercury | mg/L | 0.0001 | <0.0001 |
| | | | | Nickel | mg/L | 0.005 | 0.008 |
| | | | | Potassium | mg/L | 1 | <1 |
| | | | | Selenium | mg/L | 0.001 | <0.001 |
| | | | | Sodium | mg/L | 2 | 2 |
| | | | | Strontium | mg/L | 0.001 | 0.018 |

Sample comment:

Report comment:

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| LAB ID | Supply / Description | Client Sample ID | Sample Date | ANALYTE | UNIT | MRL | RESULT |
|---|---|---|---|---|---|---|---|
| 1379138 | WS-S-0000 | 2018-1862-00-SI-SP | 2018-08-05 | Uranium | mg/L | 0.001 | <0.001 |
| | Tributary to Reid Brook | | | Zinc | mg/L | 0.01 | <0.01 |
| | | | | Phosphorus | mg/L | 0.002 | 0.003 |
| Sample comment: | | | | Total Suspended Solids | mg/L | 2 | <2 |

Report comment:

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## References

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