

Real-Time Water Quality Annual Report

Iron Ore Company of Canada
Labrador West Network

June 18 to
October 17, 2024



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

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Acknowledgements

The Real-Time Water Quality Monitoring Program (RTWQ) at Wabush Lake is fully funded by the Iron Ore Company of Canada (IOC). The program is made successful by a joint partnership between IOC, Environment and Climate Change Canada (ECCC), and the Newfoundland & Labrador Department of Environment & Climate Change (ECC).

Various individuals from each sector have been diligently involved to ensure this program is a successful operation including various WRMD staff (ECC), Jody Wentzell (IOC), Patrick Moran (IOC) and various WSC staff (ECCC). In addition to these managers, there have been a team of individuals who work together to ensure the day-to-day operations of these stations are providing quality data. Maria Murphy (ECC) was responsible for these water quality stations during 2024. Responsibilities included deployment and removal of instruments, maintenance and calibration of the instruments and preparation of monthly deployment reports. Brenda Congram (ECC) is acknowledged for her assistance during deployment and removal procedures in 2024.

ECCC staff are essential in the operation of the data logging/communication aspect of the network for most stations in this network. Staff of the Meteorological Service of Canada Division – Water Survey of Canada, visit the stations regularly to ensure that the data logging and data transmission equipment are working properly. ECCC is also the lead on dealing with stage and flow issues at certain stations. However, the station “Fraggle Rock” is exclusively managed by WRMD.

Introduction

- The real-time water quality-monitoring network on Wabush Lake was established during the summer of 2007 in a partnership between what was then the Newfoundland & Labrador Department of Environment and Conservation (DOEC) and the Iron Ore Company of Canada (IOC).
- This network consisted of two water quality/quantity stations, one located downstream of the IOC tailings disposal area and one located upstream of the same area.
- The official names of these two stations are *Wabush Lake at Dolomite Road* and *Wabush Lake at Lake Outlet*, hereafter referred to as the Dolomite Road station and the Julianne Narrows station, respectively.
- On June 8th, 2016, an additional station was commissioned under this agreement. This station is located at *Dumbell Stream above Dumbell Lake*, hereafter referred to as the Dumbell Stream station.
- On June 12th, 2017 a new station was commissioned under this agreement. This station is located at *Pumphouse Stream above Drum Lake*, hereafter referred to as the Pumphouse Stream station.
- On November 19, 2023 a new station was commissioned under this agreement. This station is located at *Unnamed Tributary above Fraggie Rock Lake*, hereafter referred to as the Fraggie Rock station.
- These stations measure water quality parameters including water temperature, pH, specific conductivity, dissolved oxygen and turbidity, as well as water quantity parameters, stage and flow. Measurements are recorded on an hourly basis during the deployment period.
- Due to several forest fires in Labrador during the spring and summer of 2024, transportation and access to some stations was not available or permitted at the beginning of the deployment season. These stations were not deployed until July 2024.

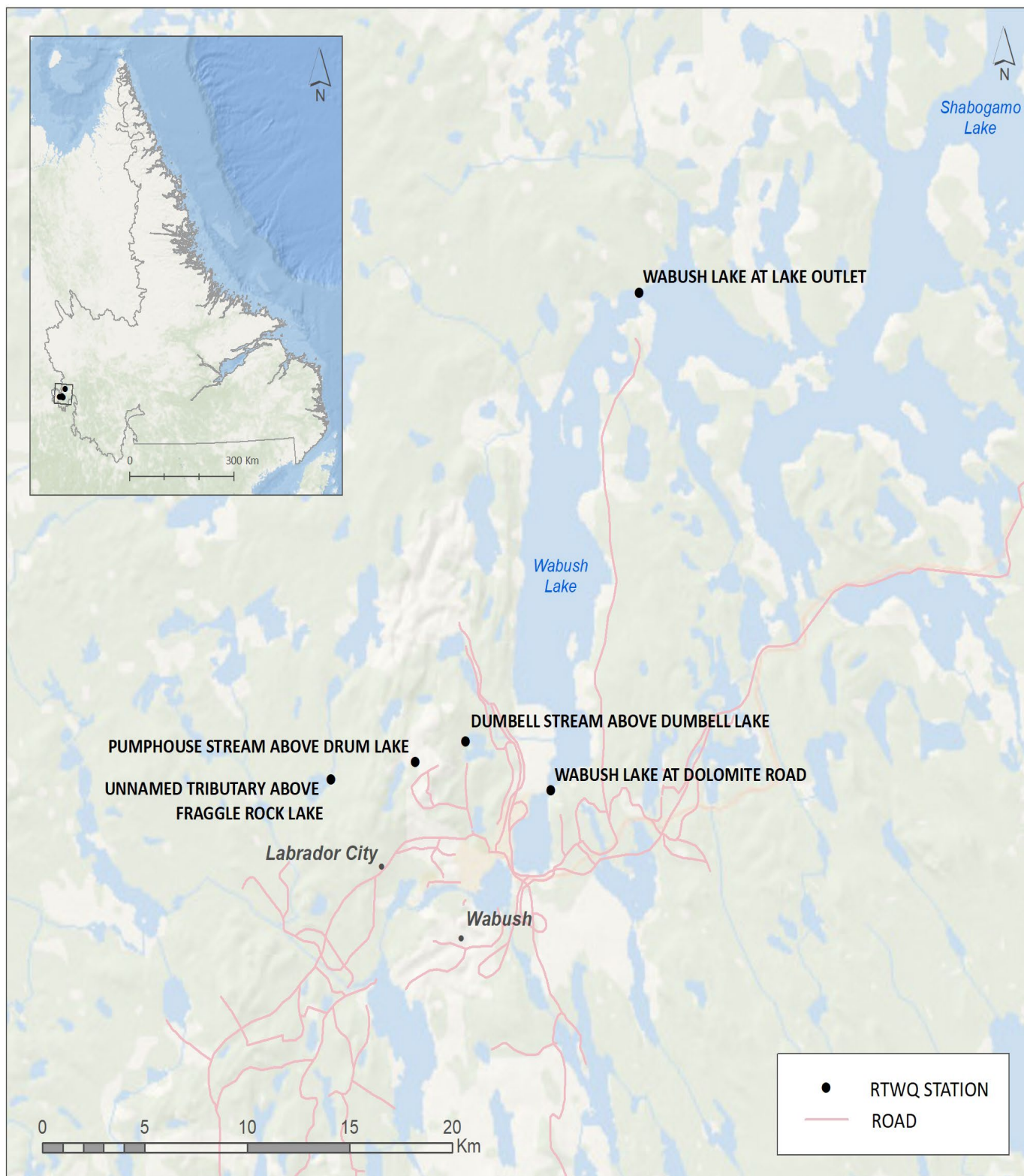


Figure 1: RTWQ Monitoring Stations in Labrador West

- Initial deployment in 2024 was June 18th at Dolomite Road and Dumbell Stream and June 19th at Pumphouse Stream. Delayed deployment at Julienne Narrows and Fraggie Rock was on July 24th. Instruments were removed for the winter season by October 16th and 17th. The following report depicts and discusses water quality events throughout this period.
- The purpose of this network is to monitor, process, and distribute water quality/quantity data to IOC, ECC and ECCC, for assessment and management of water resources, as well as to provide an early warning for any potential or emerging water issues. Any necessary mitigative measures can then be implemented in a timely manner.
- ECC provides IOC with monthly and annual deployment reports.
- It is important to note that unless otherwise stated, small gaps in data are due to the removal of the instrument for maintenance and calibration.

Maintenance and Calibration

- To ensure accurate data collection, maintenance and calibration of the water quality instrumentation are performed as per manufacturer recommended protocols and operating procedures.
- Maintenance includes a thorough cleaning of the instrument and replacement of any small sensor parts that are damaged or unsuitable for reuse. Once the instrument is cleaned, ECC staff carefully calibrate each sensor attachment for pH, specific conductivity, dissolved oxygen and turbidity.
- Installation and removal dates for the 2024 season are summarized in the table below.

Table 1: Water quality instrument deployment start and end dates for 2024

<i>Installation</i>	<i>Removal</i>	<i>Deployment duration (days)</i>
June 18-19	July 23-25	35-37
July 23-25	September 17-19	54-57
September 17-19	October 16-17	27-29

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. The procedure is based on the approach used by the United States Geological Survey.
- At deployment and removal, a QA/QC Sonde is temporarily deployed adjacent to the Field Sonde. Values for temperature, pH, conductivity, dissolved oxygen and turbidity are compared between the two instruments. Based on the degree of difference between parameters recorded by the Field Sonde

and QA/QC Sonde at deployment and at removal, a qualitative statement is made on the data quality (Table 2).

Table 2: Ranking classifications for deployment and removal

Parameter	Rank				
	Excellent	Good	Fair	Marginal	Poor
Temperature (°C)	<=+/-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 sonde is the most important. All other parameters can be broken down into three groups: temperature dependant, temperature compensated and temperature independent. As the temperature sensor is not isolated from the rest of the sonde, the entire sonde 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 IOC water quality stations for the 2024 deployment season are summarized in Table 3.
- For additional information and explanations of ranking, please refer to the monthly deployment reports.

Table 3: Comparison rankings for IOC RTWQ stations June 18 to October 17, 2024

Station	Date		Temperature	pH	Specific Conductivity	Dissolved Oxygen	Turbidity
Dolomite Road	18-Jun-24	Deployment	N/A	Excellent	Excellent	N/A	Excellent
	25-Jul-24	Removal	Excellent	Excellent	Excellent	Good	Excellent
	25-Jul-25	Deployment	Excellent	Excellent	Excellent	Excellent	Excellent
	17-Sep-25	Removal	Excellent	Good	Excellent	Excellent	Excellent
	17-Sep-25	Deployment	Excellent	Good	Excellent	Excellent	Excellent
	16-Oct-24	Removal	Good	Fair	Excellent	Good	Excellent
Julienne Narrows	24-Jul-24	Deployment	Excellent	Good	Excellent	Good	Excellent
	18-Sep-24	Removal	Excellent	Fair	Excellent	Good	Excellent
	18-Sep-24	Deployment	Excellent	Excellent	Excellent	Good	Excellent
	17-Oct-24	Removal	N/A	N/A	N/A	N/A	N/A
Dumbell Stream	18-Jun-24	Deployment	Excellent	Excellent	Excellent	Excellent	Excellent
	23-Jul-24	Removal	Excellent	Fair	Excellent	Excellent	Excellent
	23-Jul-24	Deployment	Excellent	Excellent	Excellent	Excellent	Excellent
	17-Sep-24	Removal	Excellent	Good	Excellent	Excellent	Excellent
	17-Sep-24	Deployment	Excellent	Excellent	Excellent	Excellent	Excellent
	16-Oct-24	Removal	Excellent	Good	Excellent	Good	Excellent
Pumphouse Stream	19-Jun-24	Deployment	Good	Excellent	Excellent	Excellent	Good
	24-Jul-24	Removal	Excellent	Good	Excellent	Excellent	Excellent
	24-Jul-24	Deployment	Excellent	Excellent	Excellent	Excellent	Excellent
	19-Sep-24	Removal	Excellent	Good	Excellent	Excellent	Good
	19-Sep-24	Deployment	Excellent	Excellent	Excellent	Excellent	Excellent
	16-Oct-24	Removal	Excellent	Excellent	Excellent	Fair	Good
Fraggle Rock	24-Jul-24	Deployment	Excellent	Excellent	Excellent	Good	Excellent
	18-Sep-24	Removal	Excellent	Good	Excellent	Excellent	Excellent
	18-Sep-24	Deployment	Excellent	Excellent	Excellent	Excellent	Excellent
	17-Oct-24	Removal	Excellent	Excellent	Excellent	Good	Excellent

Data Interpretation

- The following graphs and discussion illustrate water quality-related events from June 18th to October 17th, 2024 at the five IOC RTWQ stations.
- Water Survey Canada operates the hydrometric component of several stations in this network. Due to differences in protocols, Water Survey Canada hydrometric data is quality controlled on a less frequent basis than water quality data. The hydrometric data shown in this report is provisional and has not undergone quality control checks. Corrected hydrometric data can be obtained at <https://wateroffice.ec.gc.ca/> or upon request to Water Survey Canada.
- Water Resources Management Division hydrometric data is quality controlled on a less frequent basis than water quality data due to differences in protocols. The hydrometric data shown for Fraggie Rock is provisional and has not undergone quality control checks.
- Weather data is collected from a weather station near Moosehead Lake.
- Sudden decreases in stage at Dumbell Stream have occurred for unknown reasons and require further investigation.

Wabush Lake Network

- Water temperature ranged from 9.1 to 21.6°C at Julienne Narrows during the 2024 deployment season. The median value was 15.50 °C (Figure 2).
- Water temperature ranged from 4.9 to 22.2°C at Dolomite Road during the 2024 deployment season. The median value was 16.40 °C (Figure 2).
- Water temperature follows a seasonal trend. Warmest temperatures are recorded during the summer months and then temperature values decrease into the fall. Water temperature corresponds with increases/decreases in ambient air temperature.

**Water and Air Temperature: Wabush Lake Network
June 18 to October 17, 2024**

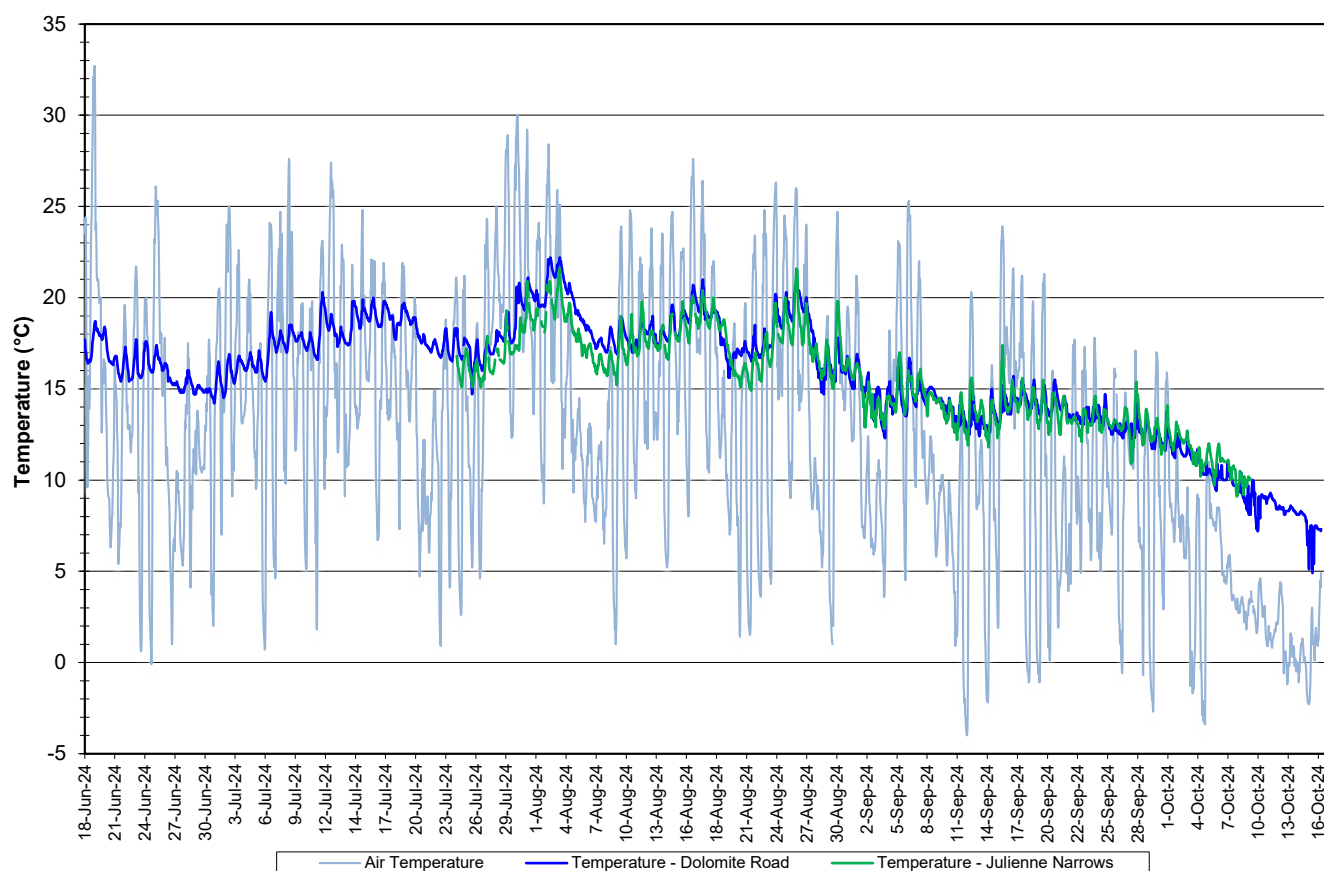


Figure 2: Water and Air Temperature – Wabush Lake Network

- pH ranged from 7.74 to 8.60 pH units at Julianne Narrows and from 7.28 to 8.69 pH units at Dolomite Road (Figure 3) during the 2024 deployment season. The median pH was 8.12 and 7.86 units, respectively.
- pH fluctuates daily at both stations. Peaks are observed during late afternoon and early evening. Some decreases in pH are noted when there are increases in stage.
- pH increased at Dolomite Road during the first month of the deployment season. It decreased at the end of the deployment season, when water levels were at their lowest.
- All the values during the deployment season are within the CCME Water Quality Guidelines for the Protection of Aquatic Life (between 6.5 and 9 pH units).
- Water Survey Canada operates the hydrometric component of this station. Due to differences in protocols, Water Survey Canada hydrometric data is quality controlled on a less frequent basis than water quality data. The hydrometric data shown for these stations is provisional and has not undergone quality control checks. Corrected hydrometric data can be obtained at <https://wateroffice.ec.gc.ca/> or upon request to Water Survey Canada.

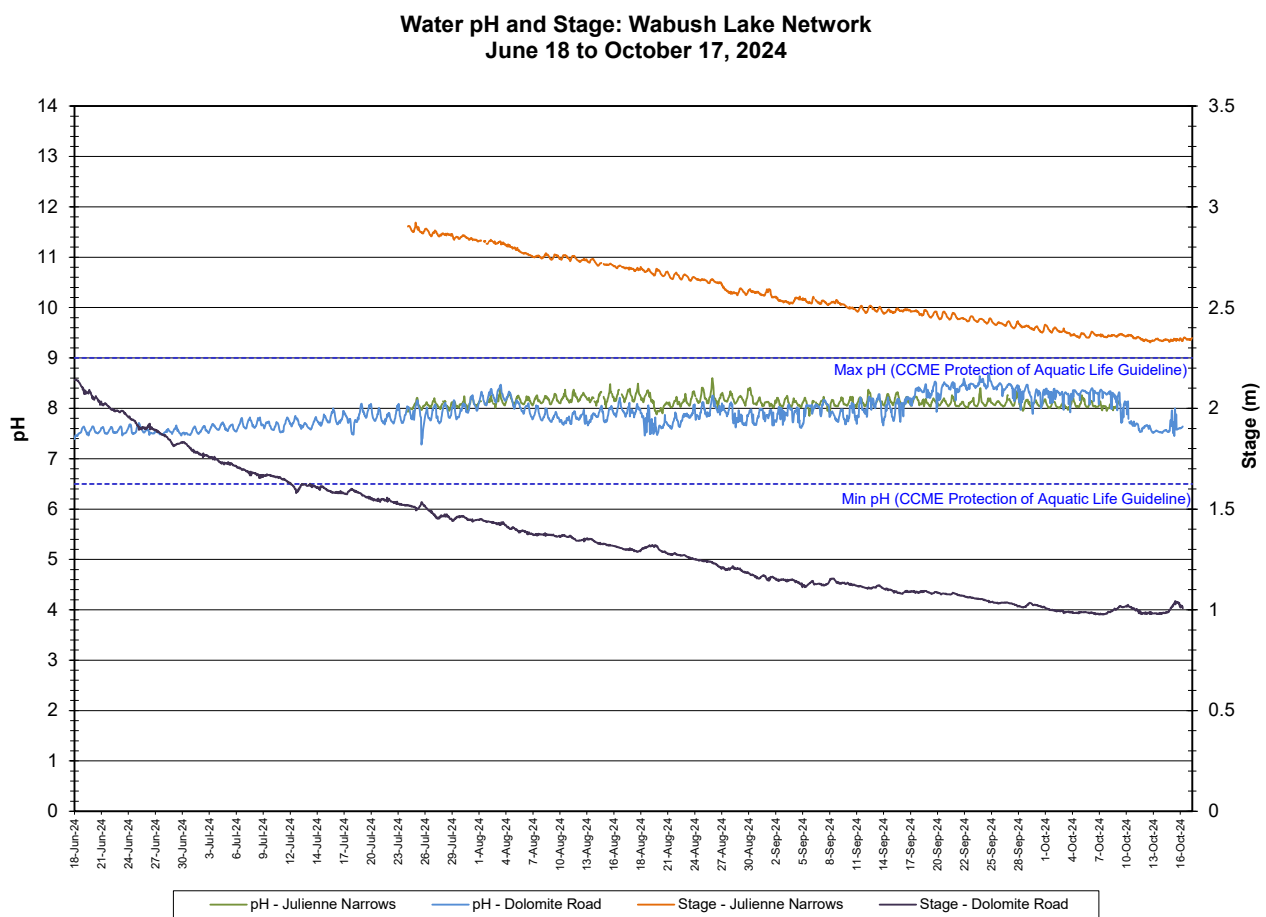


Figure 3: Water pH and Stage – Wabush Lake Network

- Throughout the 2024 deployment season, specific conductivity ranged from 94.1 to 121.8 $\mu\text{S}/\text{cm}$ at Julienne Narrows and from 46.1 to 156.3 $\mu\text{S}/\text{cm}$ at Dolomite Road (Figure 4).
- At Dolomite Road, conductivity increases during this deployment season. Fluctuations in conductivity increase greatly as water level decreases during the last month of deployment.
- At Julienne Narrows, conductivity increases slightly throughout this deployment season.
- Water Survey Canada operates the hydrometric component of this station. Due to differences in protocols, Water Survey Canada hydrometric data is quality controlled on a less frequent basis than water quality data. The hydrometric data shown for these stations is provisional and has not undergone quality control checks. Corrected hydrometric data can be obtained at <https://wateroffice.ec.gc.ca/> or upon request to Water Survey Canada.

**Specific Conductivity and Stage: Wabush Lake Network
June 18 to October 17, 2024**

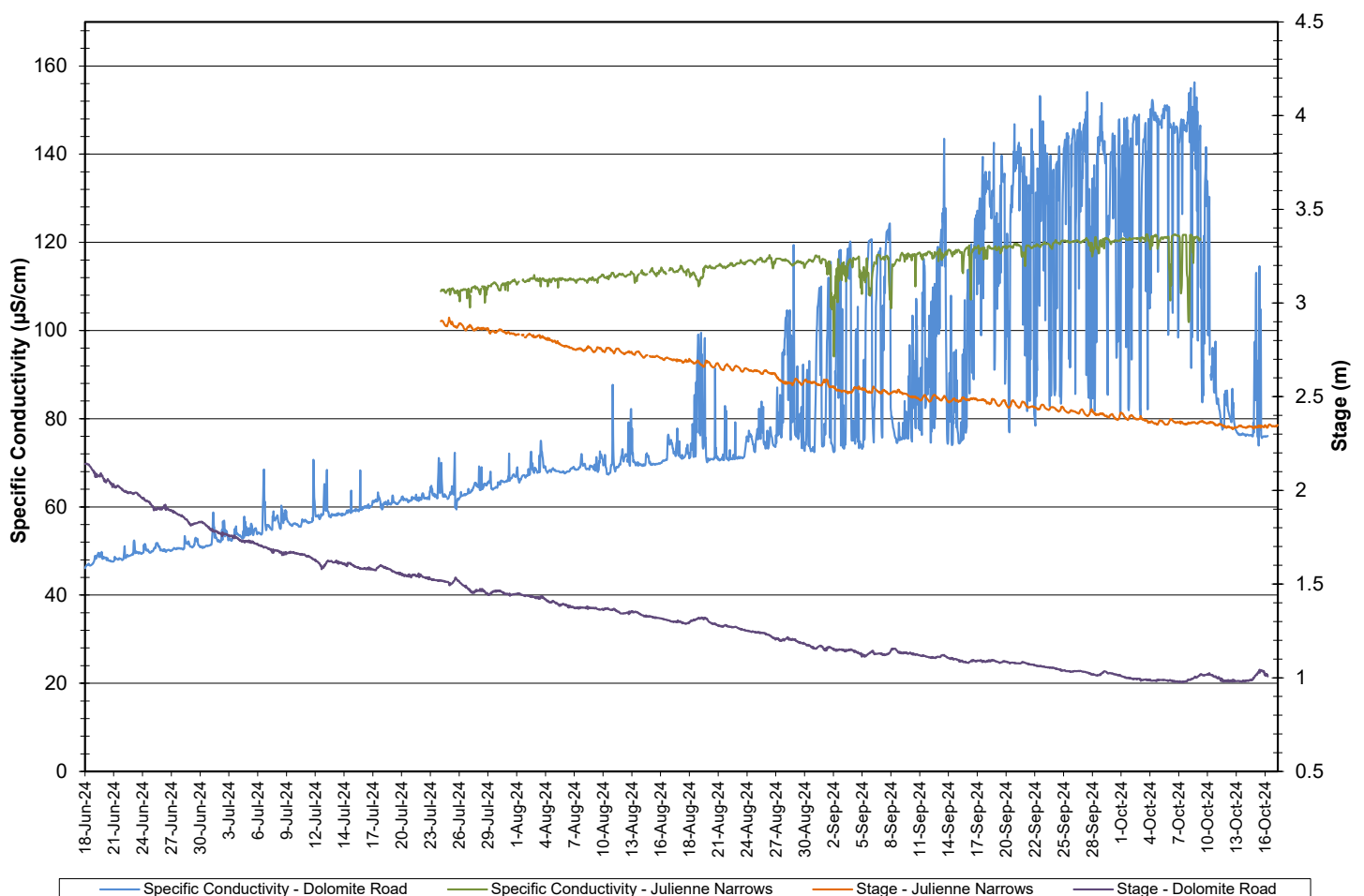


Figure 4: Specific Conductivity and Stage – Wabush Lake Network

- Dissolved oxygen ranged from 88.6 to 121.1% saturation and 8.65 to 11.42 mg/l with a median value of 9.86 mg/L at Julianne Narrows (Figure 5).
- Dissolved oxygen ranged from 81.3 to 111.1% saturation and 8.20 to 12.06 mg/l with a median value of 9.53 mg/L at Dolomite Road (Figure 5).
- Dissolved oxygen fluctuated daily at both stations with decreases observed at night.
- During the initial period of the deployment seasons DO levels are relatively stable with some variability. The fluctuations increase during the middle of the season, with a slight increase during the second half of the period. There is a noticeable decline at Dolomite Road in October.
- All values were above the CCME Water Quality Guideline for the Protection of Aquatic Life for Cold Water Biota at Other Life Stages of 6.5 mg/l. The majority of values recorded were above the minimum CCME Water Quality Guideline for the Protection of Aquatic Life for Cold Water Biota at Early Life Stages of 9.5 mg/l. The guidelines are indicated in blue on Figure 5.

**Dissolved Oxygen and Percent Saturation: Wabush Lake Network
June 18 to October 17, 2024**

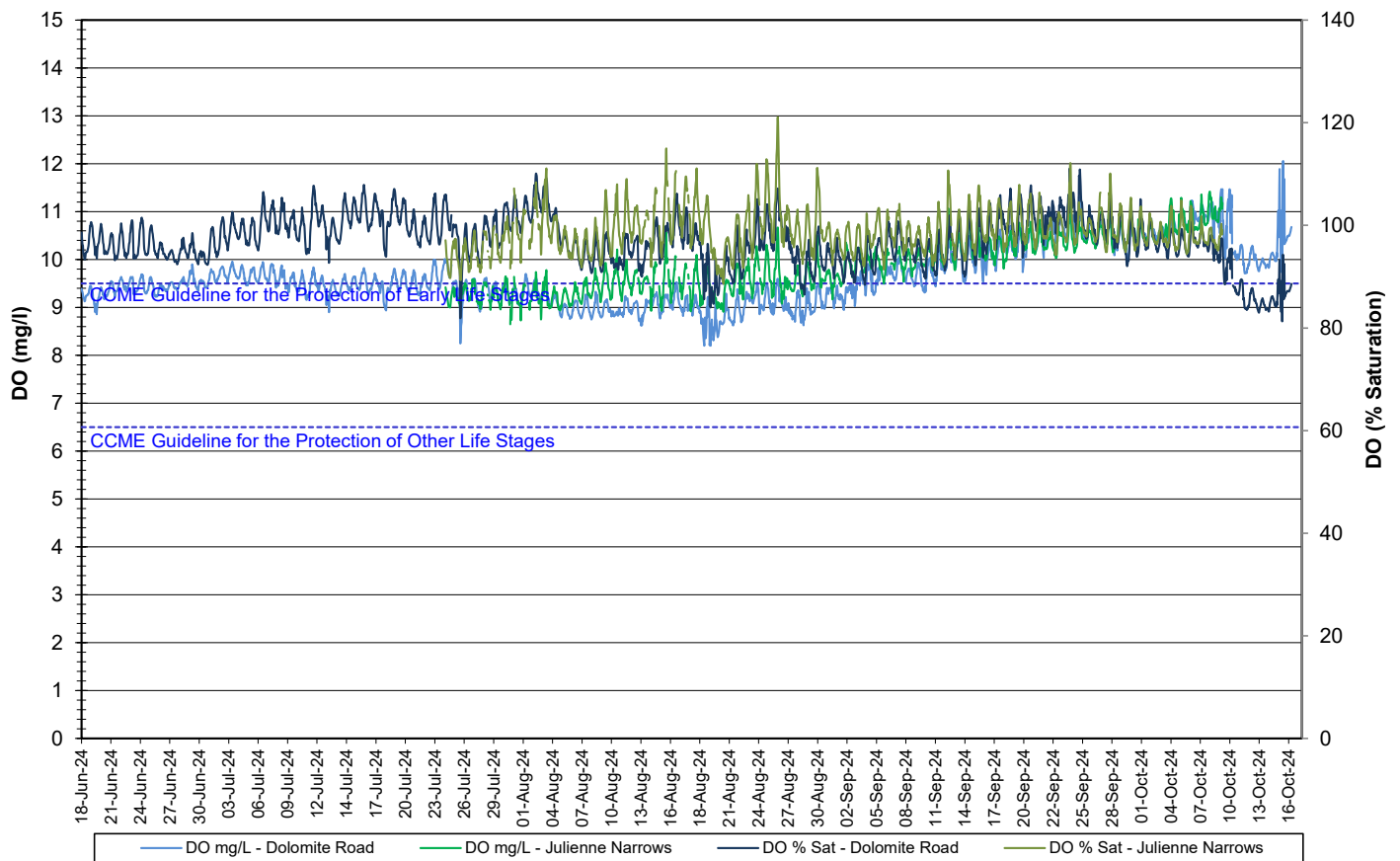


Figure 5: Dissolved Oxygen and Percent Saturation – Wabush Lake Network

- At the Julienne Narrows station, turbidity values ranged from 0.2 to 99.2 NTU with a median value of 0.9 NTU (Figure 6) indicating very low background turbidity (Figure 6b).
- Most turbidity readings are below 20 NTU. There are occasional spikes in turbidity throughout the season, and there is a slight increase from mid-season to the end.

**Water Turbidity and Precipitation: Julienne Narrows
July 24 to October 17, 2024**

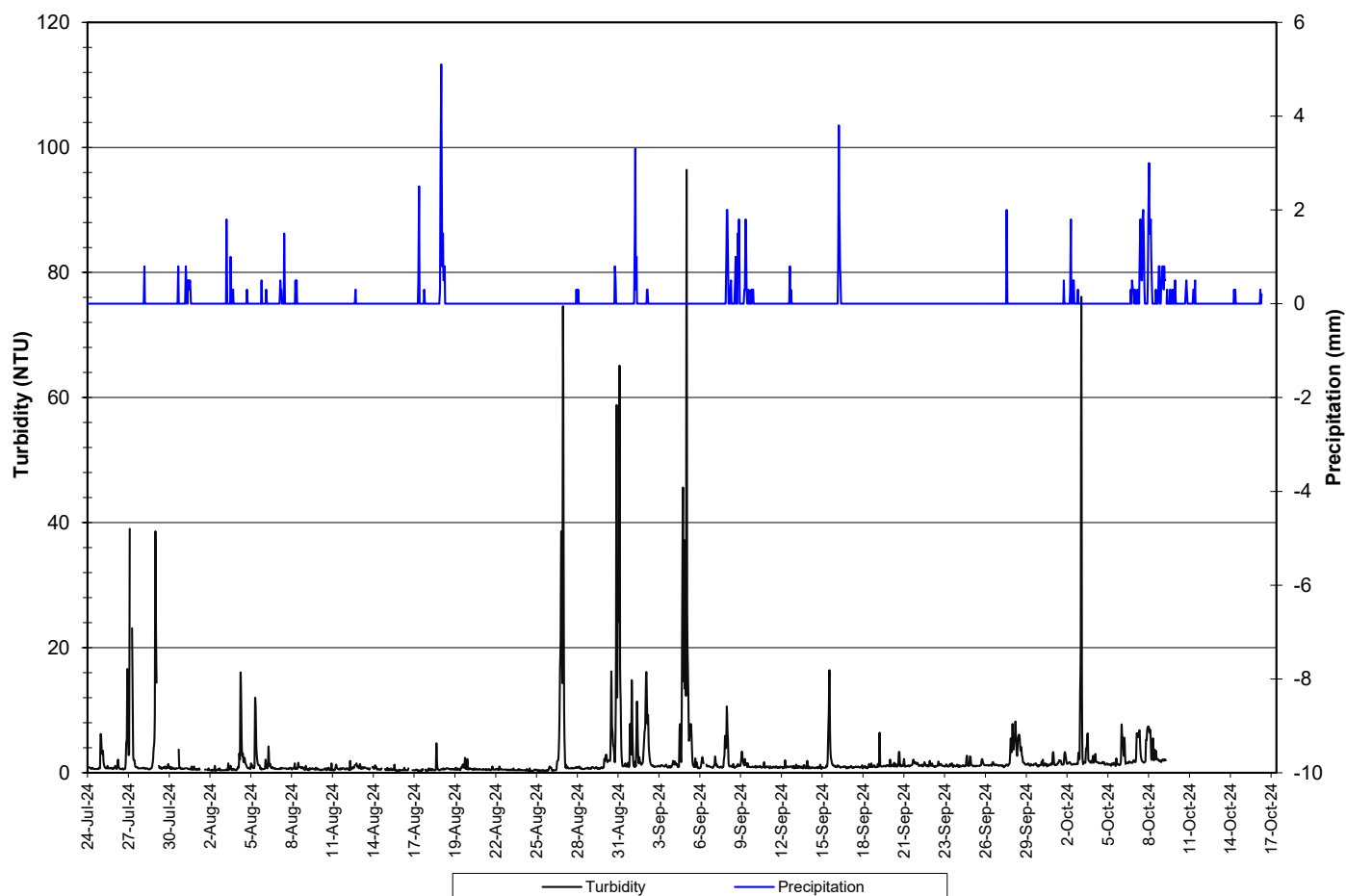


Figure 6: Water Turbidity and Precipitation: Julienne Narrows

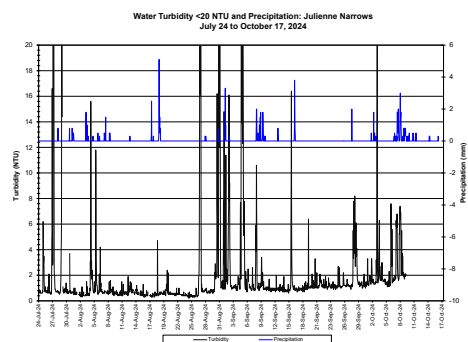


Figure 6b: Water Turbidity <20 NTU and Precipitation: Julienne Narrows

- At the Dolomite Road station, turbidity values ranged from 0.5 to 46.1 NTU, with a median value of 1.6 NTU (Figure 7).
- Background turbidity levels were less than 5 NTU. There is a slight increase in turbidity beginning the end of August and continuing until the end of the deployment season.

**Turbidity and Precipitation : Dolomite Road
June 18 to October 16, 2024**

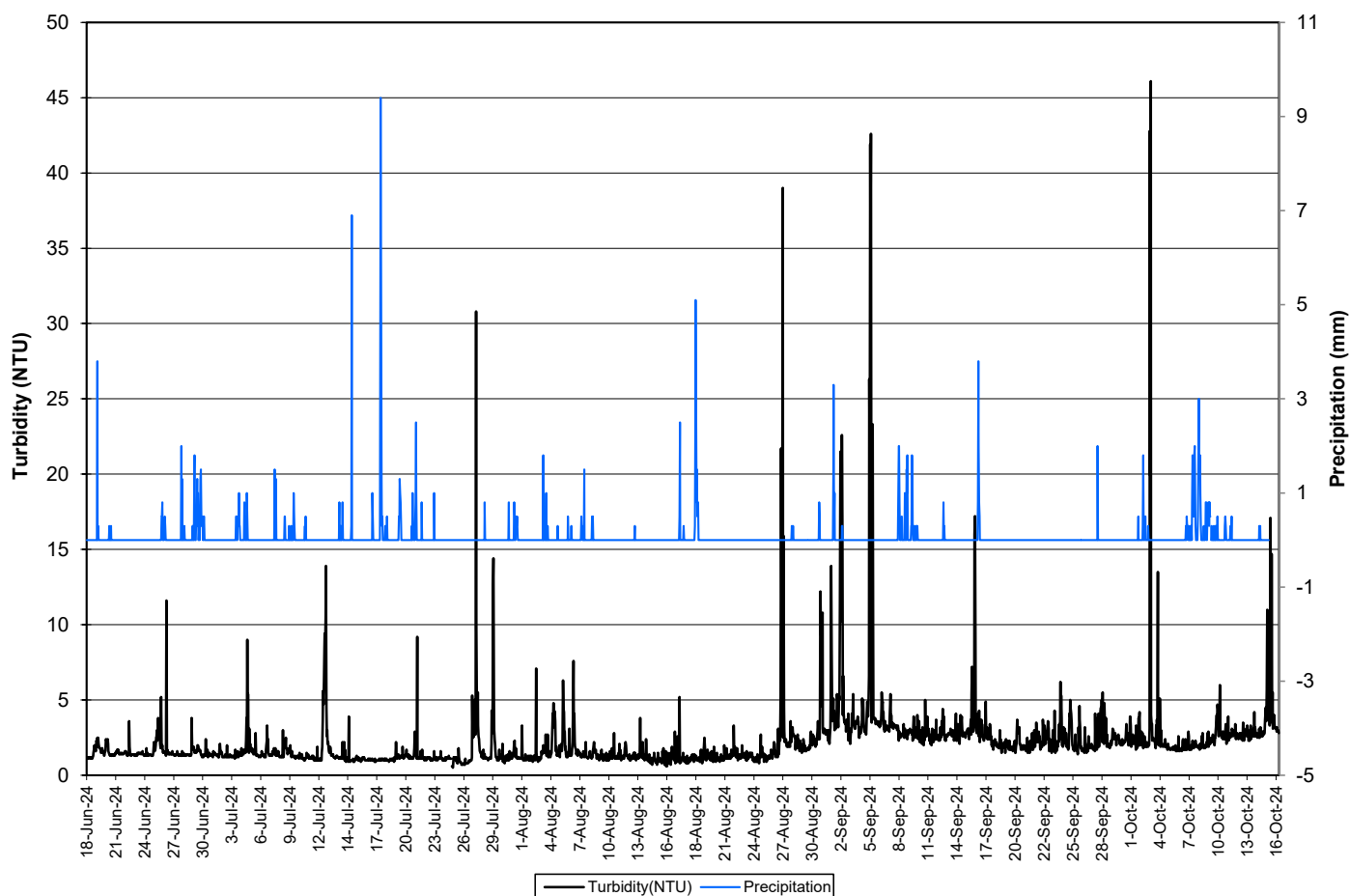


Figure 7: Turbidity and Precipitation: Dolomite Road

- Stage and precipitation are graphed below to show the relationship between rainfall and water level at Julianne Narrows and Dolomite Road (Figure 8).
- At both stations, stage decreased steadily throughout the deployment season.
- Water Survey Canada operates the hydrometric component of this station. Due to differences in protocols, Water Survey Canada hydrometric data is quality controlled on a less frequent basis than water quality data. The hydrometric data shown for these stations is provisional and has not undergone quality control checks. Corrected hydrometric data can be obtained at <https://wateroffice.ec.gc.ca/> or upon request to Water Survey Canada.

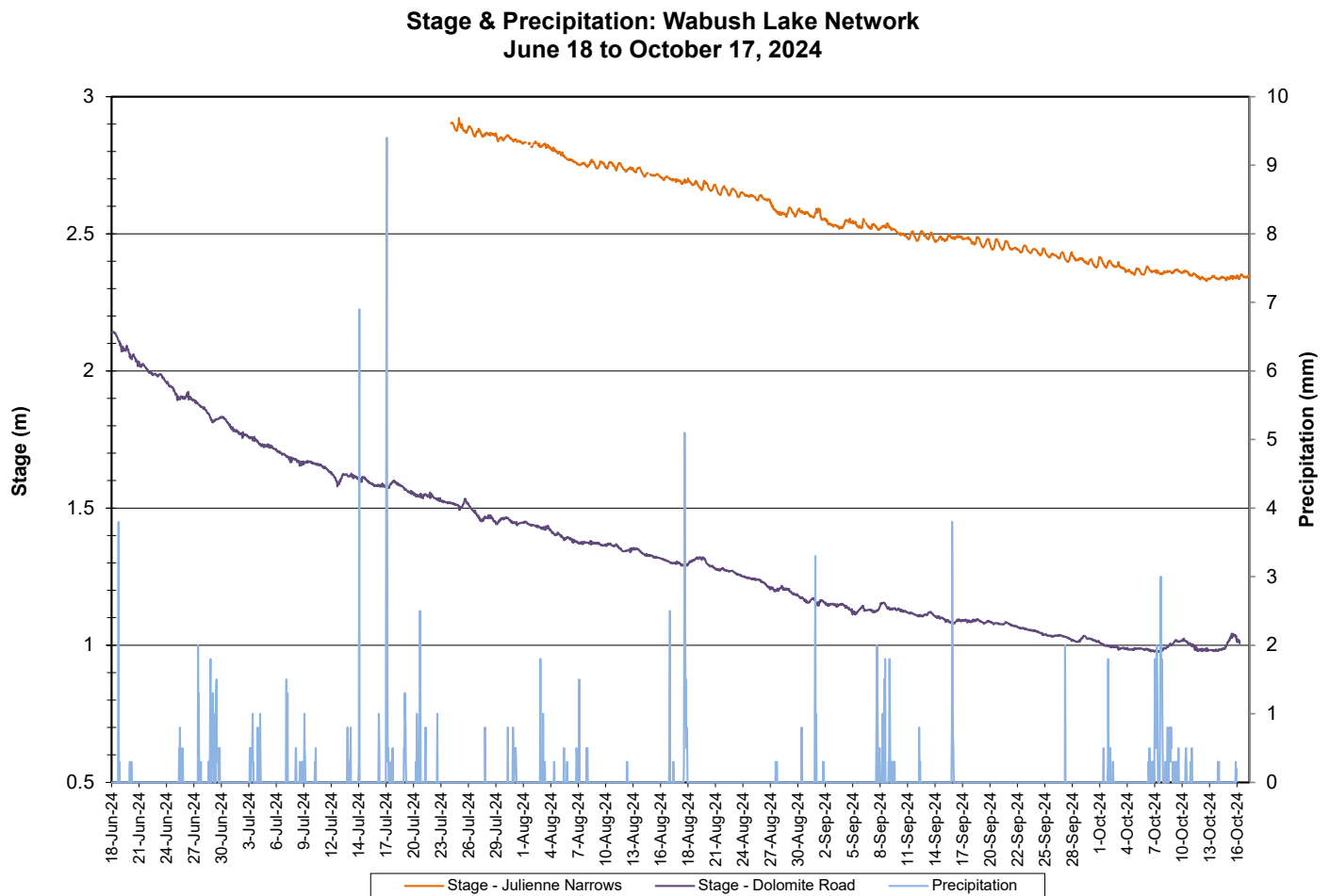


Figure 8: Stage and Precipitation: Wabush Lake Network

Dumbell Stream

- Water temperature ranged from 1.81 to 8.65°C at Dumbell Stream during the 2024 deployment season. The median value was 4.65 °C (Figure 9).
- Water temperature at this station remains within a small range throughout the season and is influenced less than the other stations by air temperature values. It decreased slightly during the last few weeks of the season as Fall approached.

**Water and Air Temperature : Dumbell Stream above Dumbell Lake
June 18 to October 16, 2024**

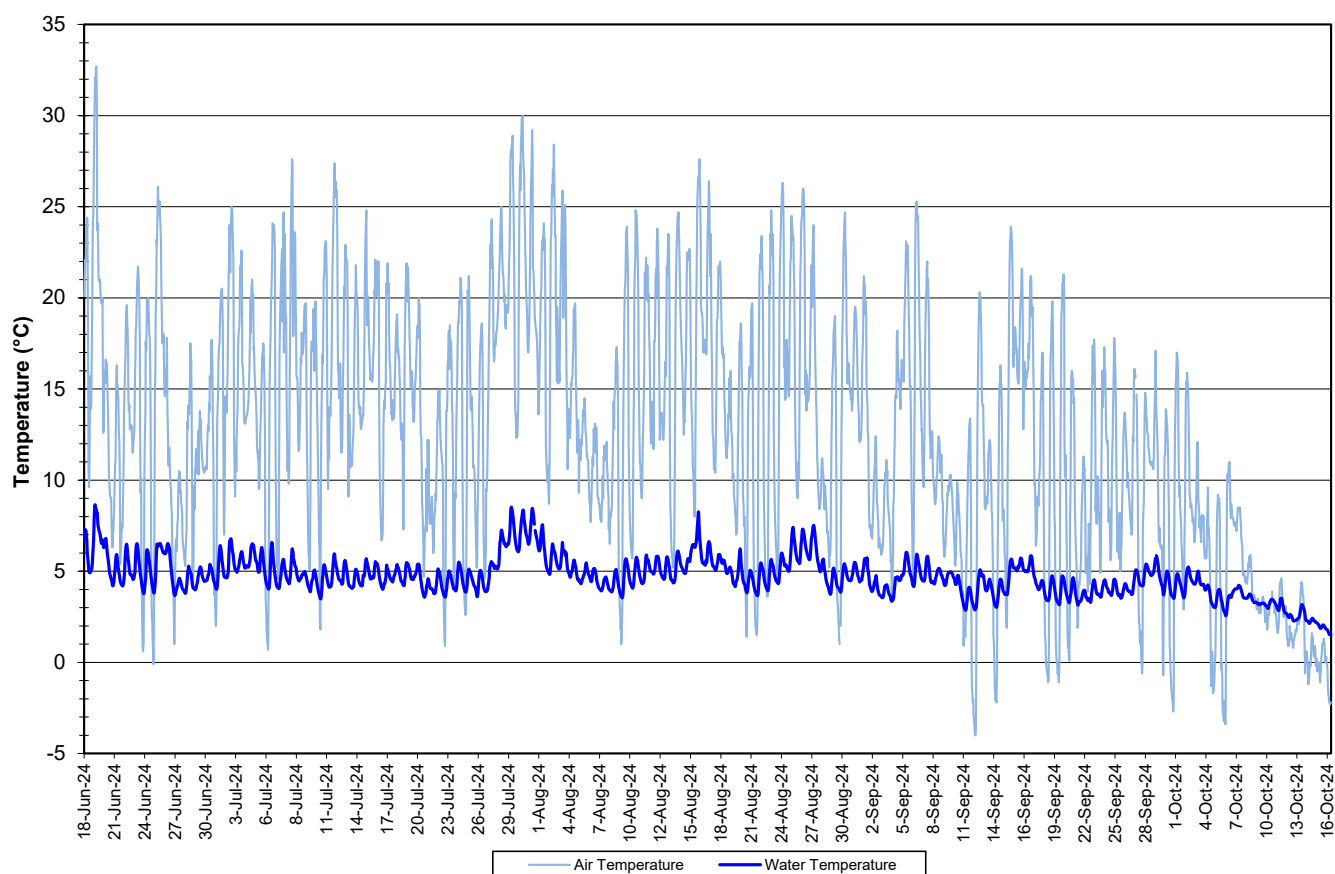


Figure 9: Water and Air Temperature – Dumbell Stream above Dumbell Lake

- pH ranges from 7.36 to 8.03 pH units at Dumbell Stream (Figure 10). The median pH is 7.82 units.
- pH fluctuates daily. Peaks are observed during late afternoon and into early evening.
- All values during the deployment are within the CCME Water Quality Guidelines for the Protection of Aquatic Life (between 6.5 and 9 pH units).
- There is a slight decrease in pH in September, this could be due to the calibration process. There is a noticeable decrease in October, that correlates with an increase in turbidity and a precipitation event.

**Water pH and Stage : Dumbell Stream above Dumbell Lake
June 18 to October 16, 2024**

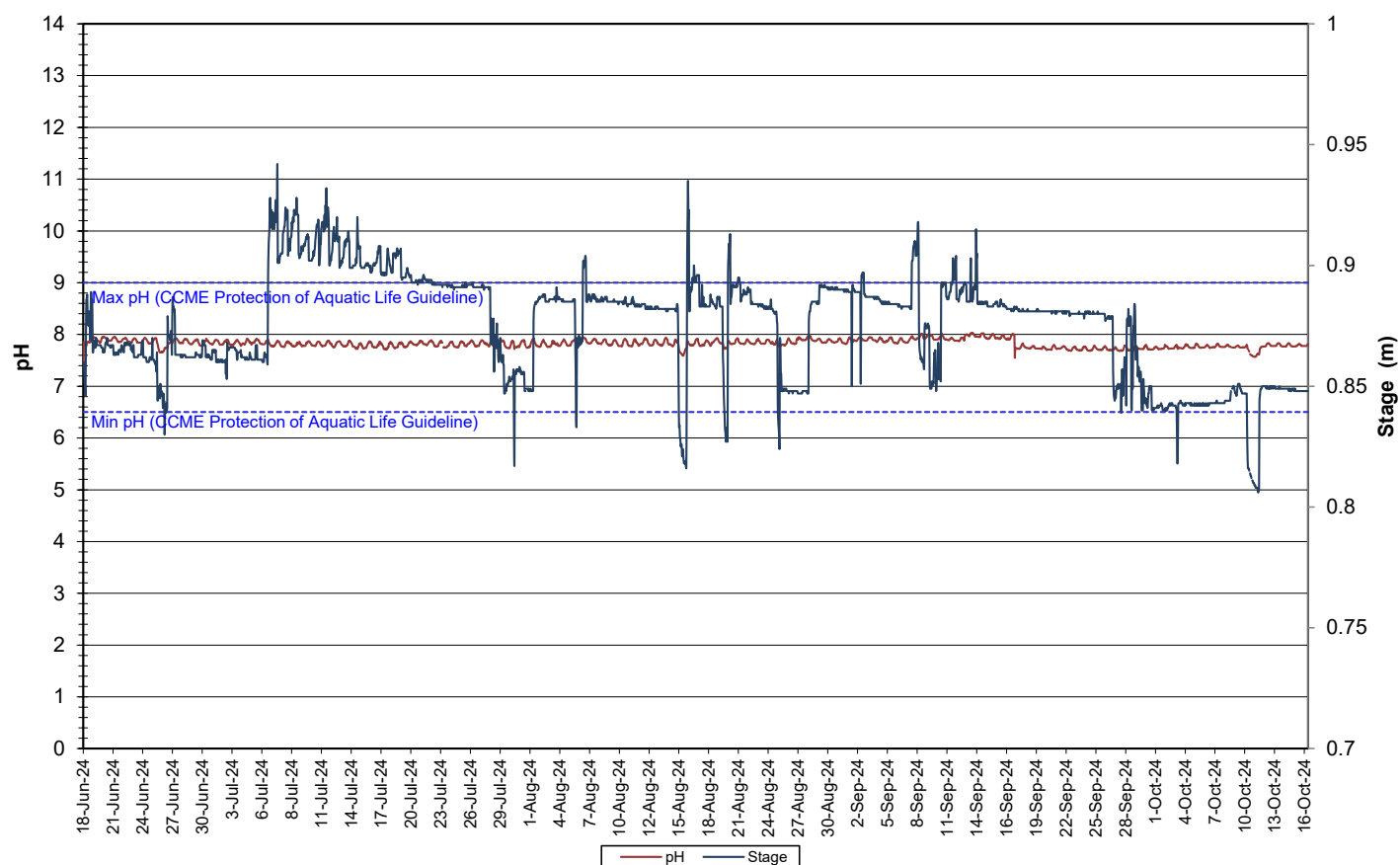


Figure 10: Water pH and Stage – Dumbell Stream above Dumbell Lake

- Throughout the 2024 deployment season, specific conductivity ranged from 124.2 to 313.1 $\mu\text{S}/\text{cm}$ at Dumbell Stream (Figure 11).
- Sudden spikes in conductivity have occurred for unknown reasons. Further monitoring and investigation are needed to identify the cause.
- Water Survey Canada operates the hydrometric component of this station. Due to differences in protocols, Water Survey Canada hydrometric data is quality controlled on a less frequent basis than water quality data. The hydrometric data shown for this station is provisional and has not undergone quality control checks. Corrected hydrometric data can be obtained at <https://wateroffice.ec.gc.ca/> or upon request to Water Survey Canada.

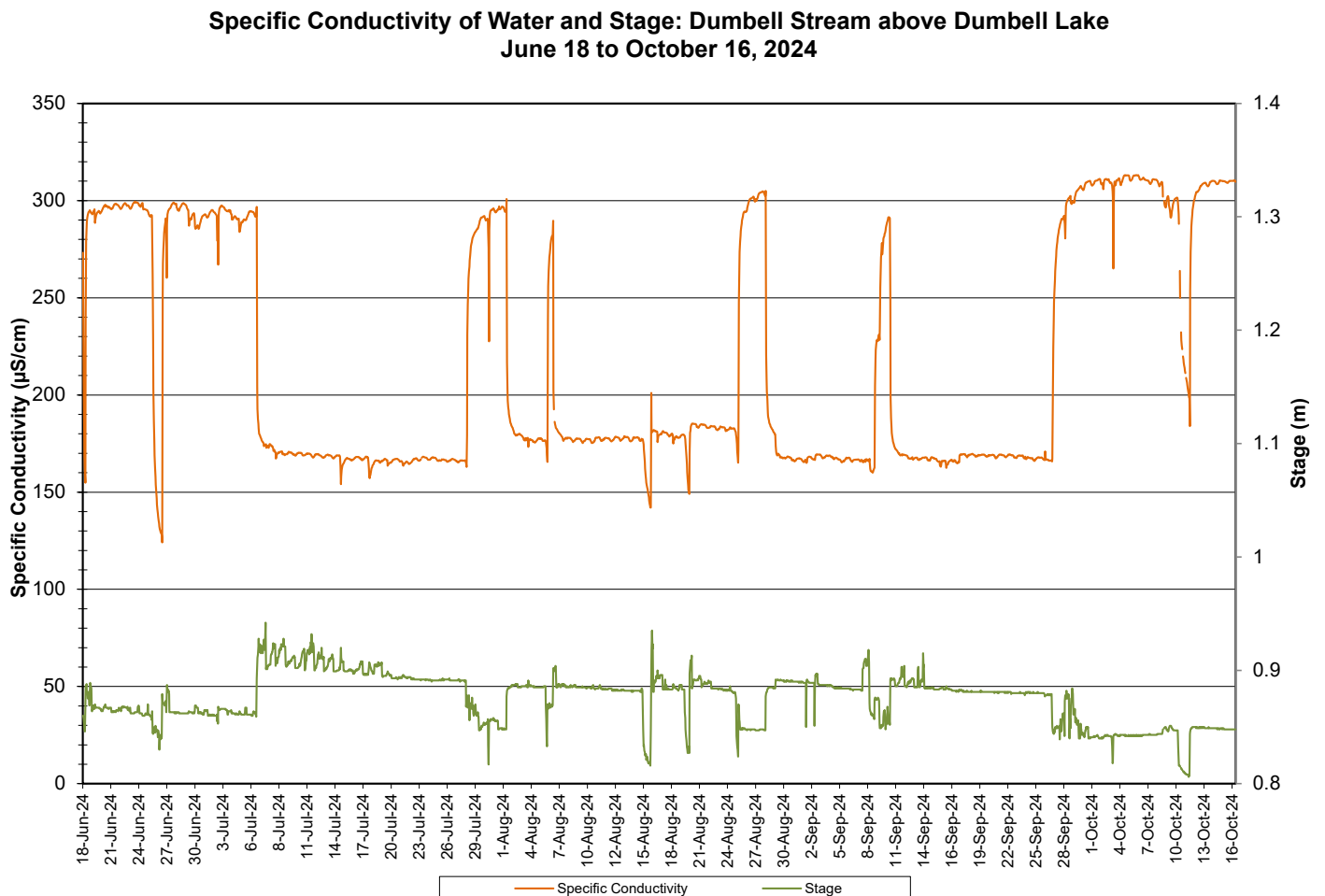


Figure 11: Specific Conductivity and Stage – Dumbell Stream above Dumbell Lake

- Dissolved oxygen ranged from 91.2 to 97.9% saturation and from 10.98 to 13.19 mg/l, with a median value of 11.73 mg/l (Figure 12).
- Dissolved oxygen fluctuated daily with decreases observed at night. There was a noticeable decrease in dissolved oxygen at the end of July, corresponding with an increase in water temperature. Levels gradually increased over the remainder of the deployment season.
- All values were above the CCME Water Quality Guidelines for the Protection of Aquatic Life for Cold Water Biota at Other Life Stages (6.5 mg/l) and Early Life Stages (9.5 mg/l). The guidelines are indicated in blue on Figure 12.

**Dissolved Oxygen Concentration and Saturation : Dumbell Stream at Dumbell Lake
June 18 to October 16, 2024**

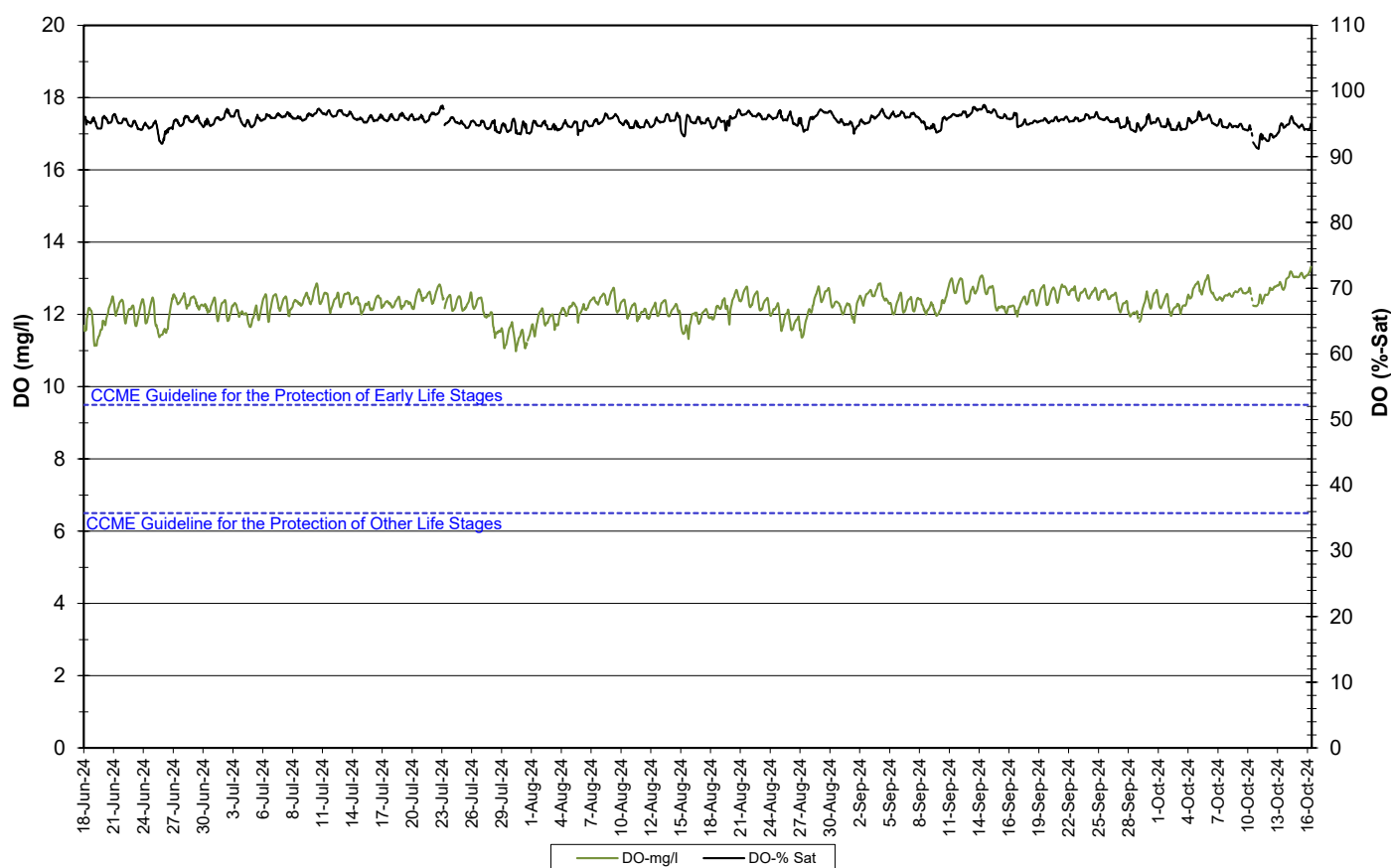


Figure 12: Dissolved Oxygen and Percent Saturation – Dumbell Stream above Dumbell Lake

- Turbidity values range from 0.0 to 14.6 NTU, with a median value of 0.3NTU (Figure 13) indicating low background turbidity. Turbidity spikes occur infrequently and for short periods of time.
- Most turbidity readings during this deployment season are less than 5.0 NTU.

**Water Turbidity and Precipitation : Dumbell Stream above Dumbell Lake
June 18 to October 16, 2024**

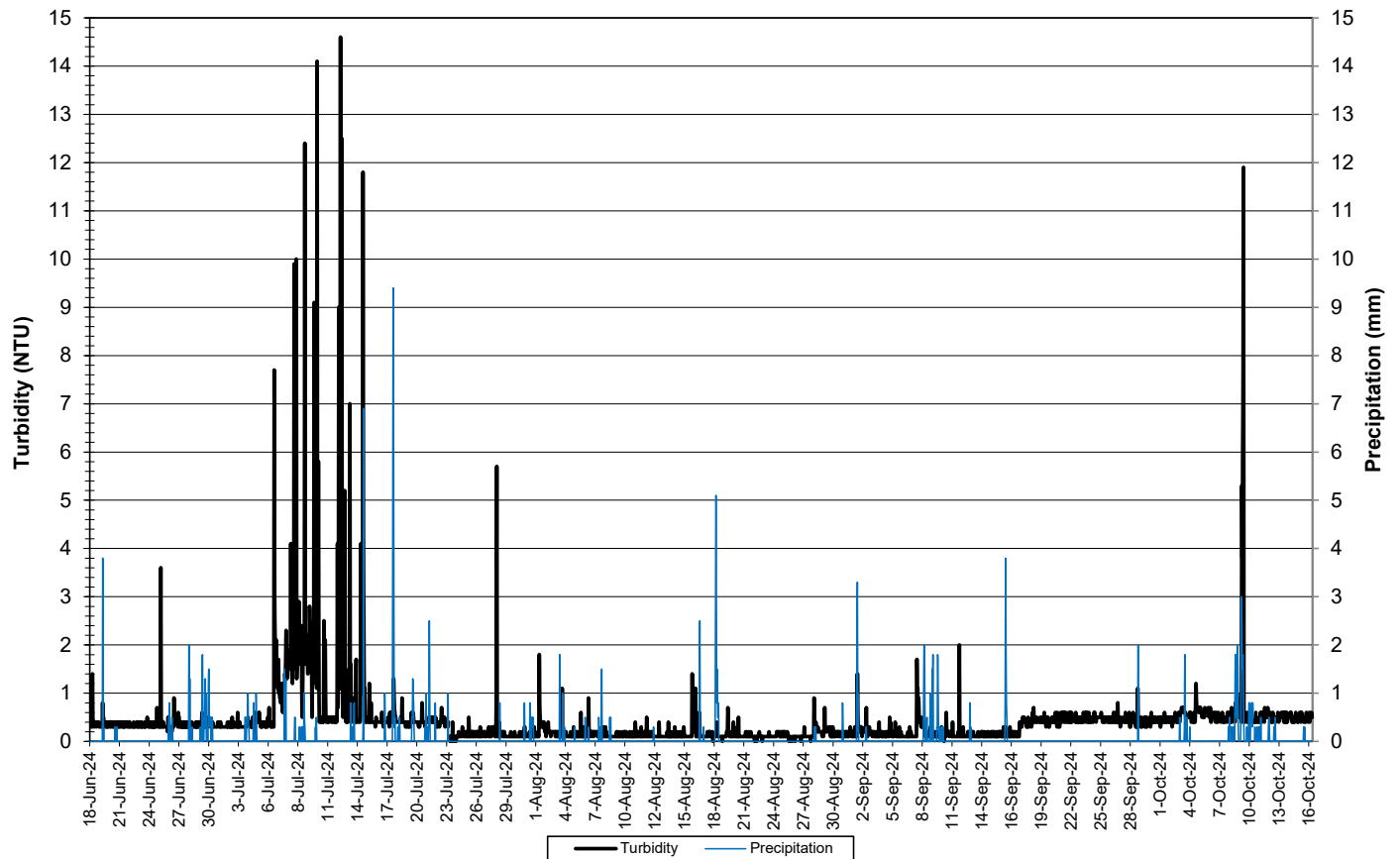


Figure 13: Turbidity and Precipitation – Dumbell Stream above Dumbell Lake

- Stage and precipitation are graphed below to show the relationship between rainfall and water level at Dumbell Stream (Figure 14). Precipitation has a direct effect on stage at this location.
- Water Survey Canada operates the hydrometric component of this station. Due to differences in protocols, Water Survey Canada hydrometric data is quality controlled on a less frequent basis than water quality data. The hydrometric data shown for this station is provisional and has not undergone quality control checks. Corrected hydrometric data can be obtained at <https://wateroffice.ec.gc.ca/> or upon request to Water Survey Canada.

Stage and Precipitation: Dumbell Stream
June 18 to October 16, 2024

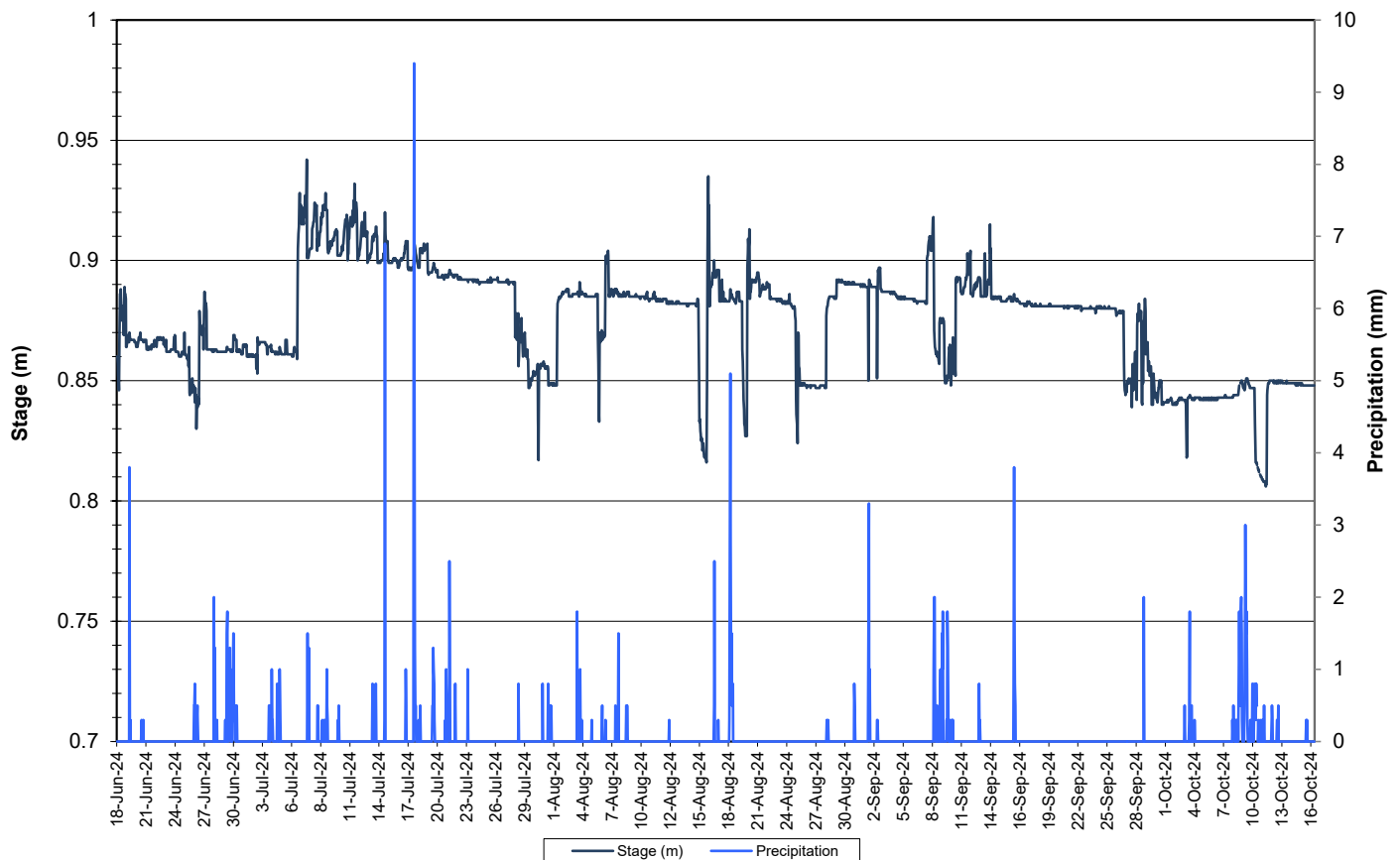


Figure 14: Stage and Precipitation – Dumbell Stream above Dumbell Lake

Pumphouse Stream

- Water temperature ranged from 1.10 to 20.40°C at Pumphouse Stream during the 2024 deployment season. The median value was 13.40°C (Figure 15).
- Water temperature corresponded closely with air temperature fluctuations. Increases were noted during periods of warm ambient air temperature. Water temperature steadily decreased during the later portion of the deployment season.

**Water and Air Temperature : Pumphouse Stream above Drum Lake
June 19 to October 16, 2024**

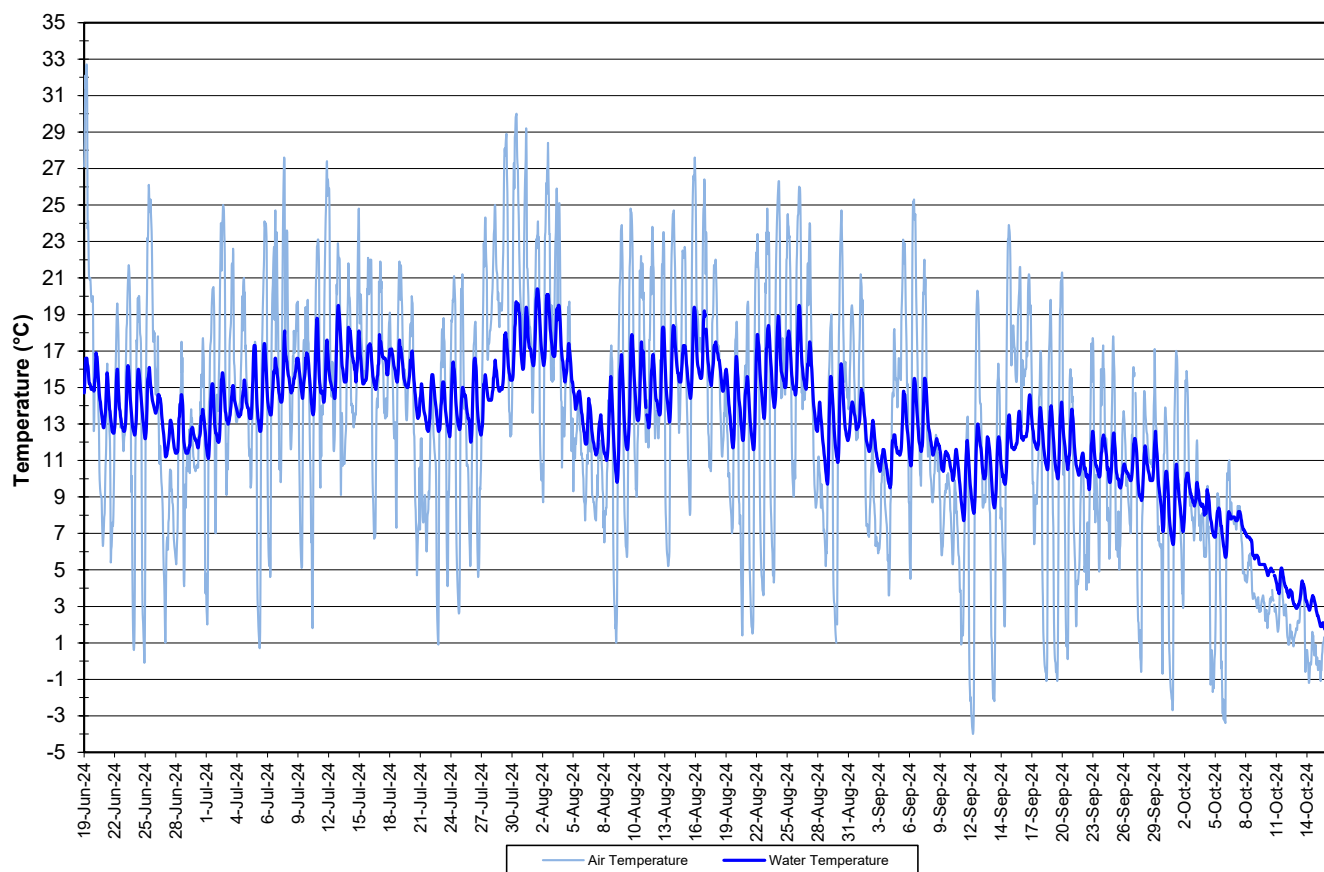


Figure 15: Water and Air Temperature – Pumphouse Stream above Drum Lake

- pH ranged from 7.47 to 7.97 pH units at Pumphouse Stream (Figure 16). The median pH was 7.73 units.
- pH fluctuated daily. Peaks were observed during late afternoon and into the early evening. There is a slight decrease in September. This could be related to the calibration process, which may have led to a slight variation in the data. Levels increase slightly at the very end of the deployment season.
- All values during the deployment are within the CCME Water Quality Guidelines for the Protection of Aquatic Life (between 6.5 and 9 pH units).

**Water pH and Precipitation: Pumphouse Stream above Drum Lake
June 19 to October 16, 2024**

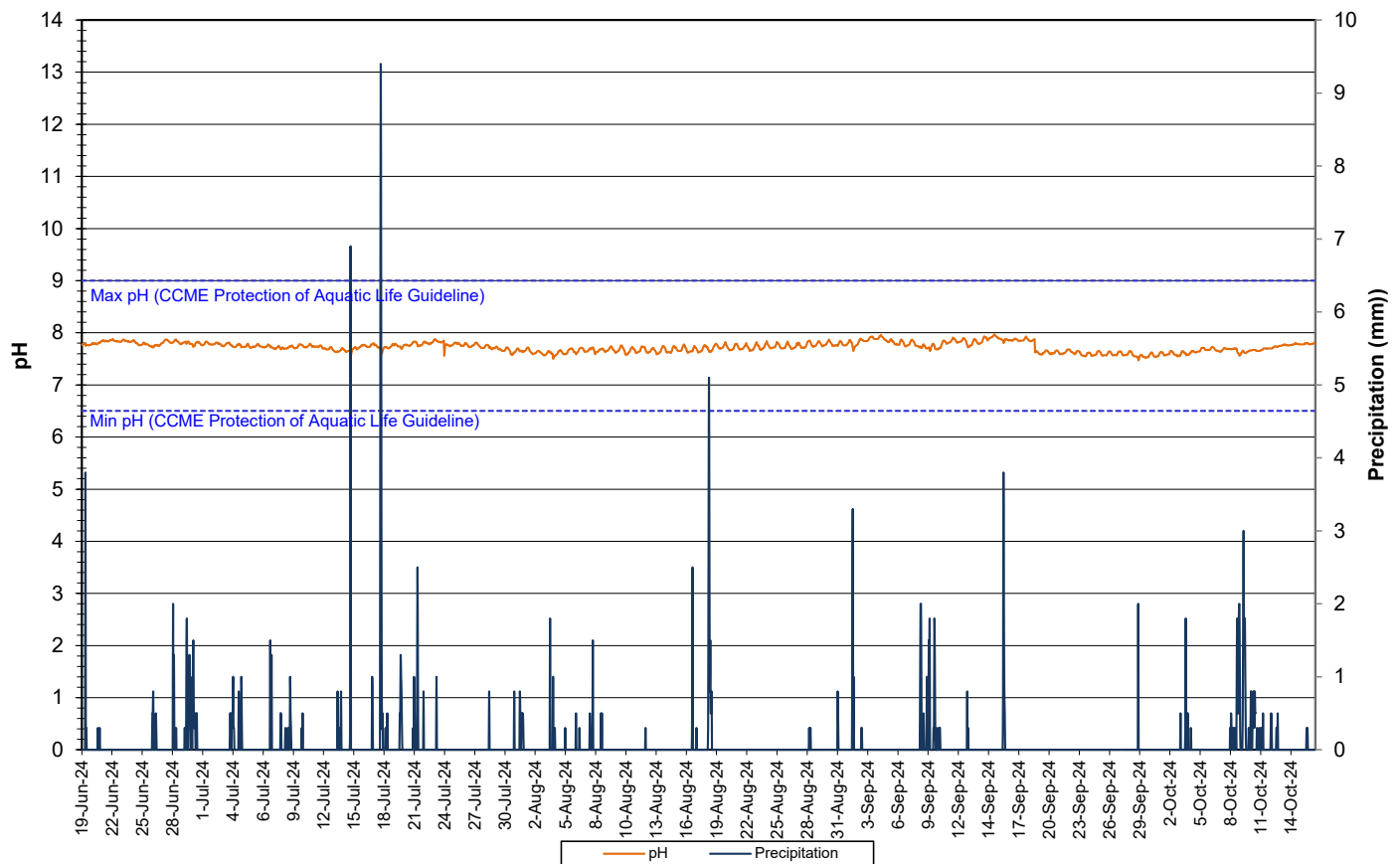


Figure 16: Water pH and Precipitation – Pumphouse Stream above Drum Lake

- Throughout the 2024 deployment season, specific conductivity ranged from 538.4 to 709.6 $\mu\text{S}/\text{cm}$ at Pumphouse Stream (Figure 17).
- Specific conductivity increased over the course of the deployment season.
- Water Survey Canada operates the hydrometric component of this station. Due to differences in protocols, Water Survey Canada hydrometric data is quality controlled on a less frequent basis than water quality data. The hydrometric data shown for this station is provisional and has not undergone quality control checks. Corrected hydrometric data can be obtained at <https://wateroffice.ec.gc.ca/> or upon request to Water Survey Canada.

**Specific Conductivity of Water and Stage: Pumphouse Stream above Drum Lake
June 19 to October 16, 2024**

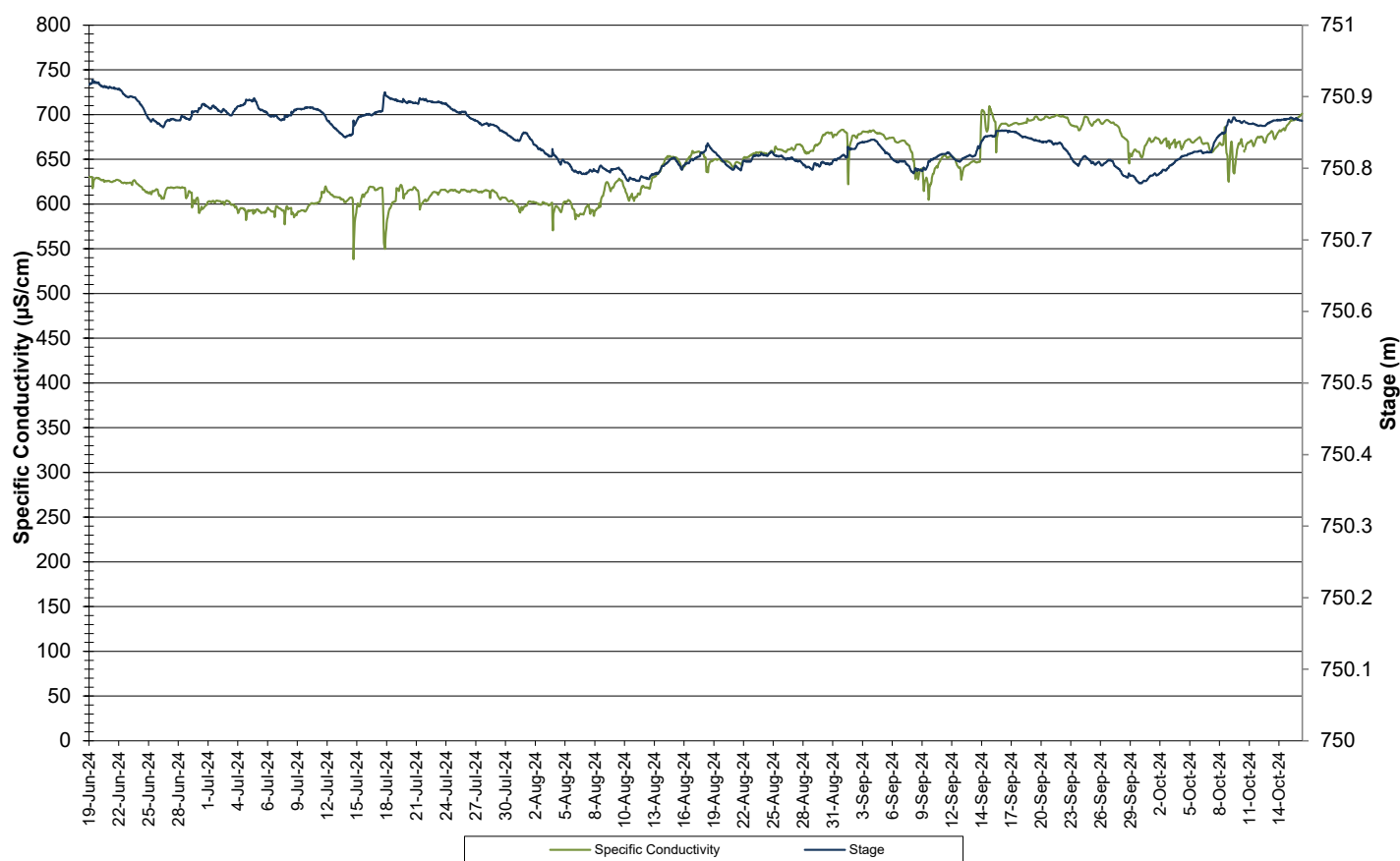


Figure 17: Specific Conductivity and Precipitation – Pumphouse Stream above Drum Lake

- Dissolved oxygen ranged from 59.5 to 91.3% saturation and 5.64 to 12.49 mg/l with a median value of 7.85 mg/l (Figure 18).
- Dissolved oxygen fluctuated diurnally with decreases observed at night and showed an inverse relationship to increases/decreases in water temperature.
- Most values were above the CCME Water Quality Guideline for the Protection of Aquatic Life for Cold Water Biota at Other Life Stages of 6.5 mg/l, dropping below when water temperatures were warmest. However, the majority of values recorded were below the minimum guideline for early life stages of 9.5 mg/l until water temperatures decreased and oxygen levels began to rise in October. The guidelines are indicated in blue on Figure 18.

**Dissolved Oxygen Concentration & Saturation and Water Temperature:
Pumphouse Stream above Drum Lake
June 19 to October 16, 2024**

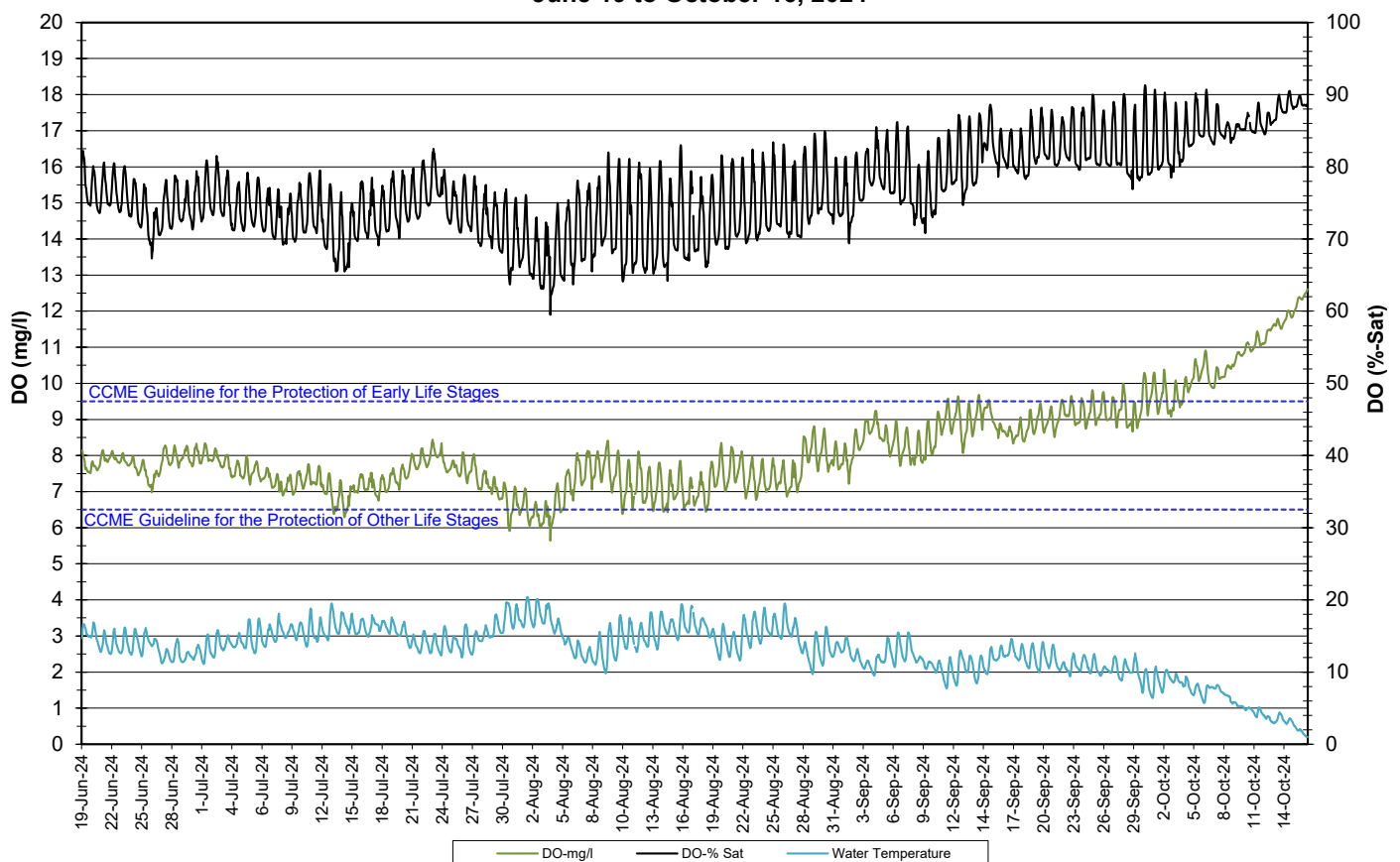


Figure 18: Dissolved Oxygen, Percent Saturation & Water Temperature – Pumphouse Stream above Drum Lake

- Turbidity values range from 0.7 to 11.2 NTU, with a median value was 1.6 NTU (Figure 19).
- Turbidity levels were low throughout the deployment season. Small spikes occur infrequently and for small periods of time. Some spikes can be attributed to precipitation events.

**Water Turbidity and Precipitation : Pumphouse Stream above Drum Lake
June 19 to October 16, 2024**

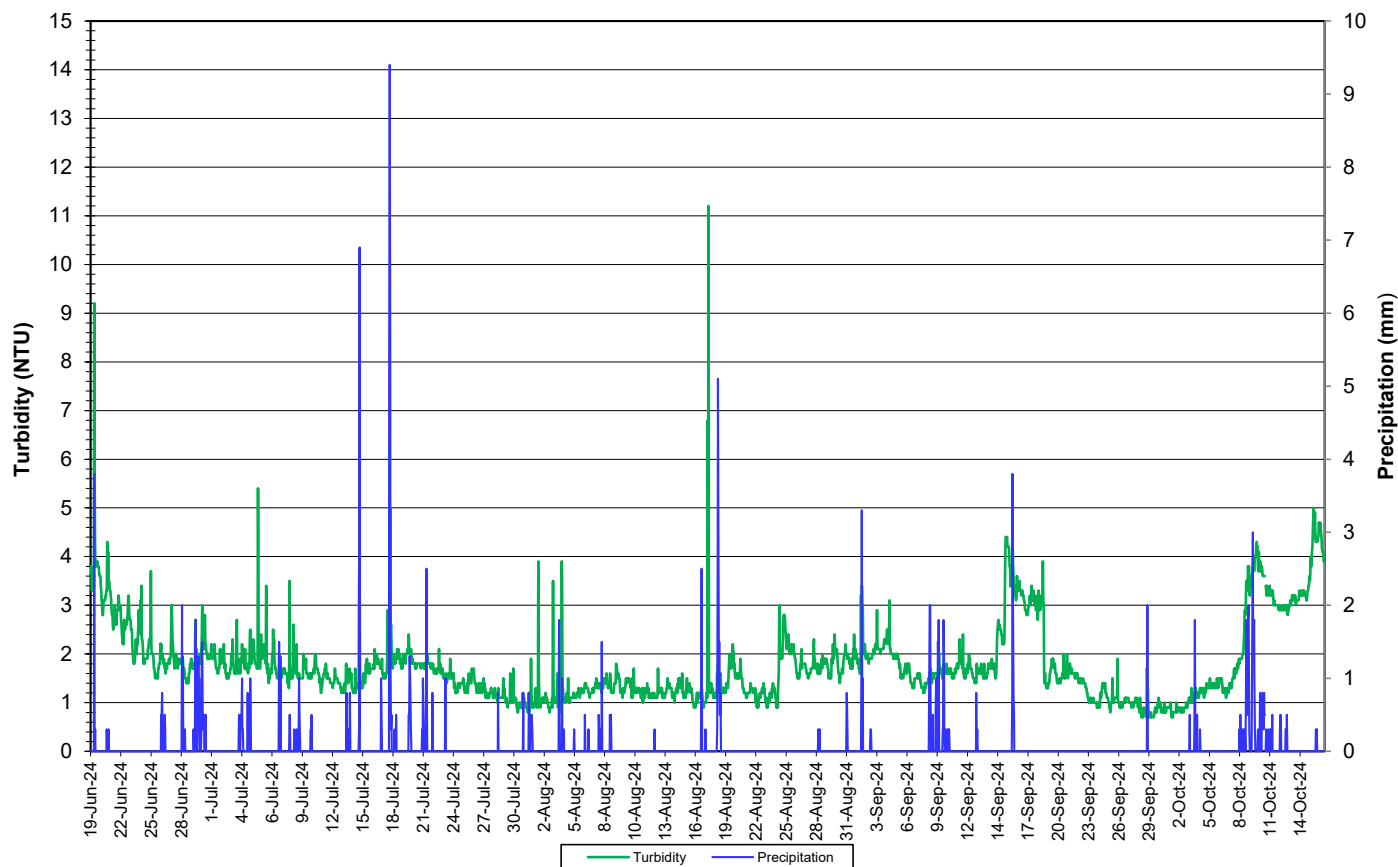


Figure 19: Turbidity and Precipitation – Pumphouse Stream above Drum Lake

- Stage and precipitation are graphed below to show the relationship between rainfall and water level at Pumphouse Stream (Figure 20).
- Stage data shows slight increases after precipitation events.
- Water Survey Canada operates the hydrometric component of this station. Due to differences in protocols, Water Survey Canada hydrometric data is quality controlled on a less frequent basis than water quality data. The hydrometric data shown for this station is provisional and has not undergone quality control checks. Corrected hydrometric data can be obtained at <https://wateroffice.ec.gc.ca/> or upon request to Water Survey Canada.

**Stage & Precipitation: Pumphouse Stream above Drum Lake
June 19 to October 16, 2024**

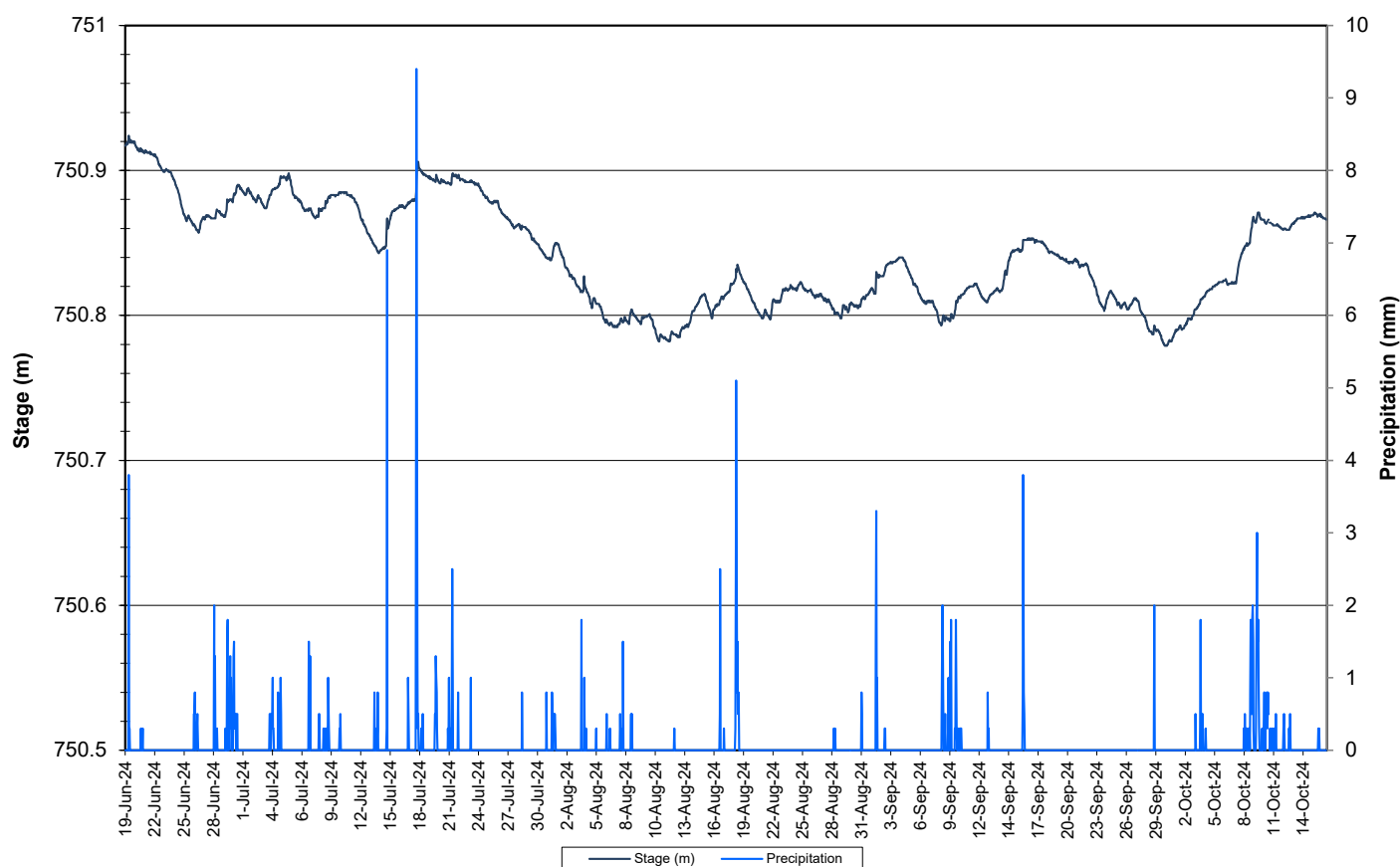


Figure 20: Stage and Precipitation – Pumphouse Stream above Drum Lake

Fraggle Rock

- Water temperature ranged from 1.96 to 20.49°C at Fraggle Rock during the 2024 deployment season. The median value was 11.92 °C (Figure 21).
- Water temperature follows a seasonal trend. Warmest temperatures are recorded during the summer months and then temperature values decrease into the fall. Water temperature corresponds with increases/decreases in ambient air temperature.

**Water and Air Temperature : Unnamed Tributary above Fraggle Rock Lake
July 24 to October 17, 2024**

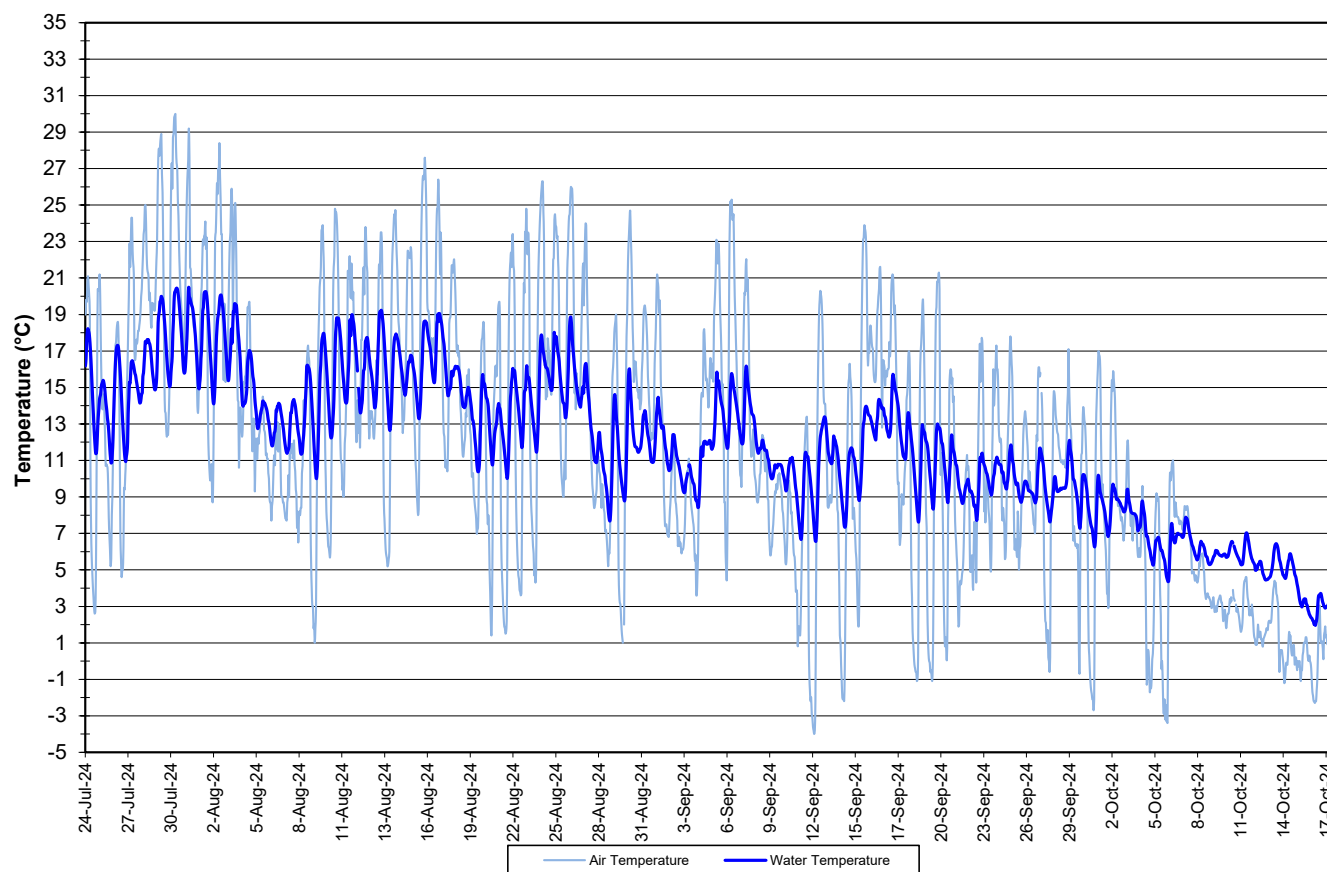


Figure 21: Water and Air Temperature – Unnamed Tributary above Fraggle Rock Lake

- pH ranges from 7.76 to 8.47 pH units at Fraggie Rock (Figure 22). The median pH is 8.18 units.
- pH fluctuates daily. Peaks are observed during late afternoon and into early evening. There is a noticeable decrease in October, that correlates with an increase in turbidity and a precipitation event
- All values during the deployment are within the CCME Water Quality Guidelines for the Protection of Aquatic Life (between 6.5 and 9 pH units).

**Water pH and Precipitation: Unnamed Tributary above Fraggie Rock Lake
July 24 to October 17, 2024**

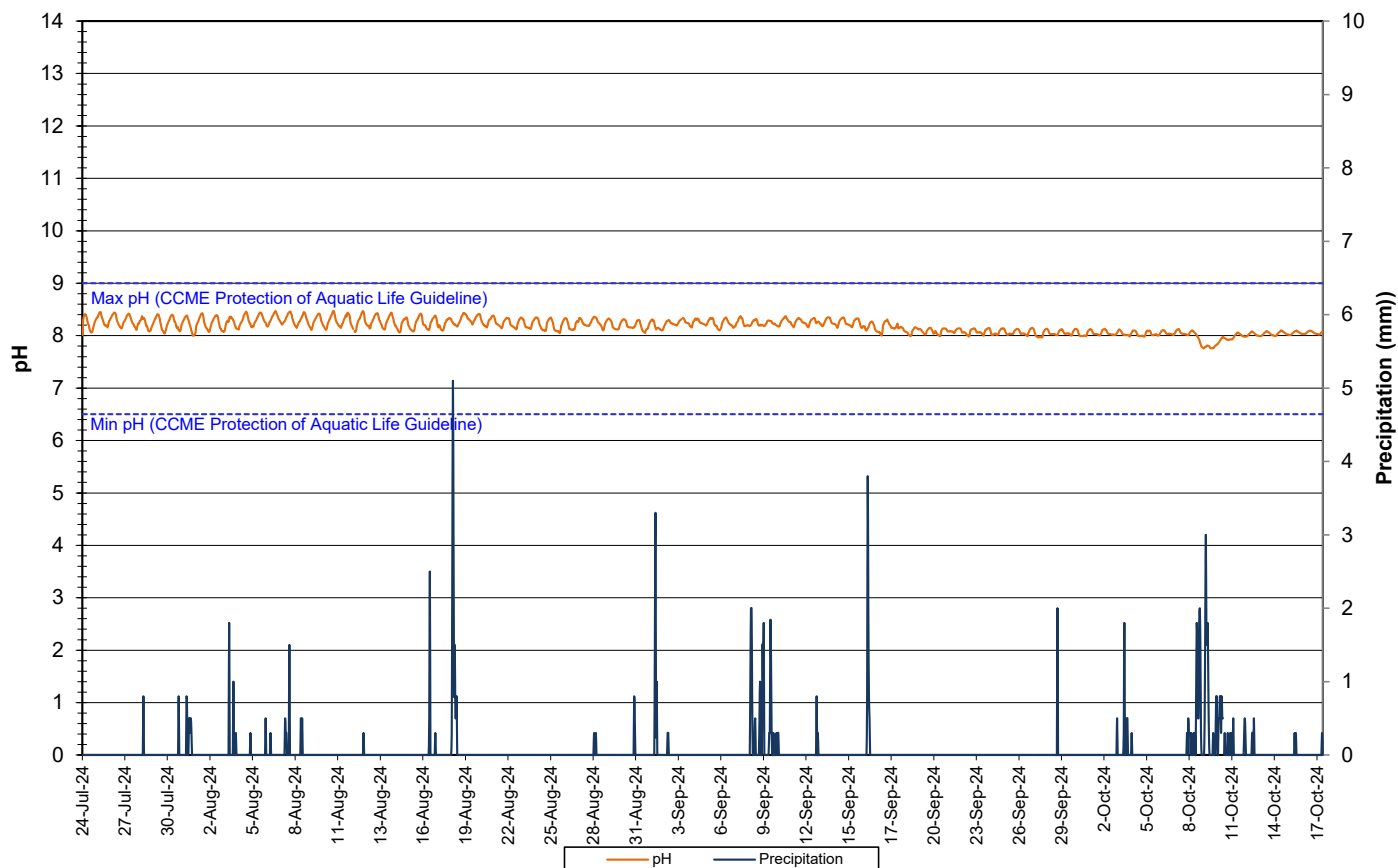


Figure 22: Water pH and Stage – Unnamed Tributary above Fraggie Rock Lake

- Throughout the 2024 deployment season, specific conductivity ranged from 129.6 to 198.6 $\mu\text{S}/\text{cm}$ at Fraggie Rock (Figure 23).
- Specific conductivity decreases as water elevation rises during precipitation events.
- Water Resources Management Division hydrometric data is quality controlled on a less frequent basis than water quality data due to differences in protocols. The hydrometric data shown for this station is provisional and has not undergone quality control checks.

**Specific Conductivity of Water and Elevation: Unnamed Tributary above Fraggie Rock Lake
July 24 to October 17, 2024**

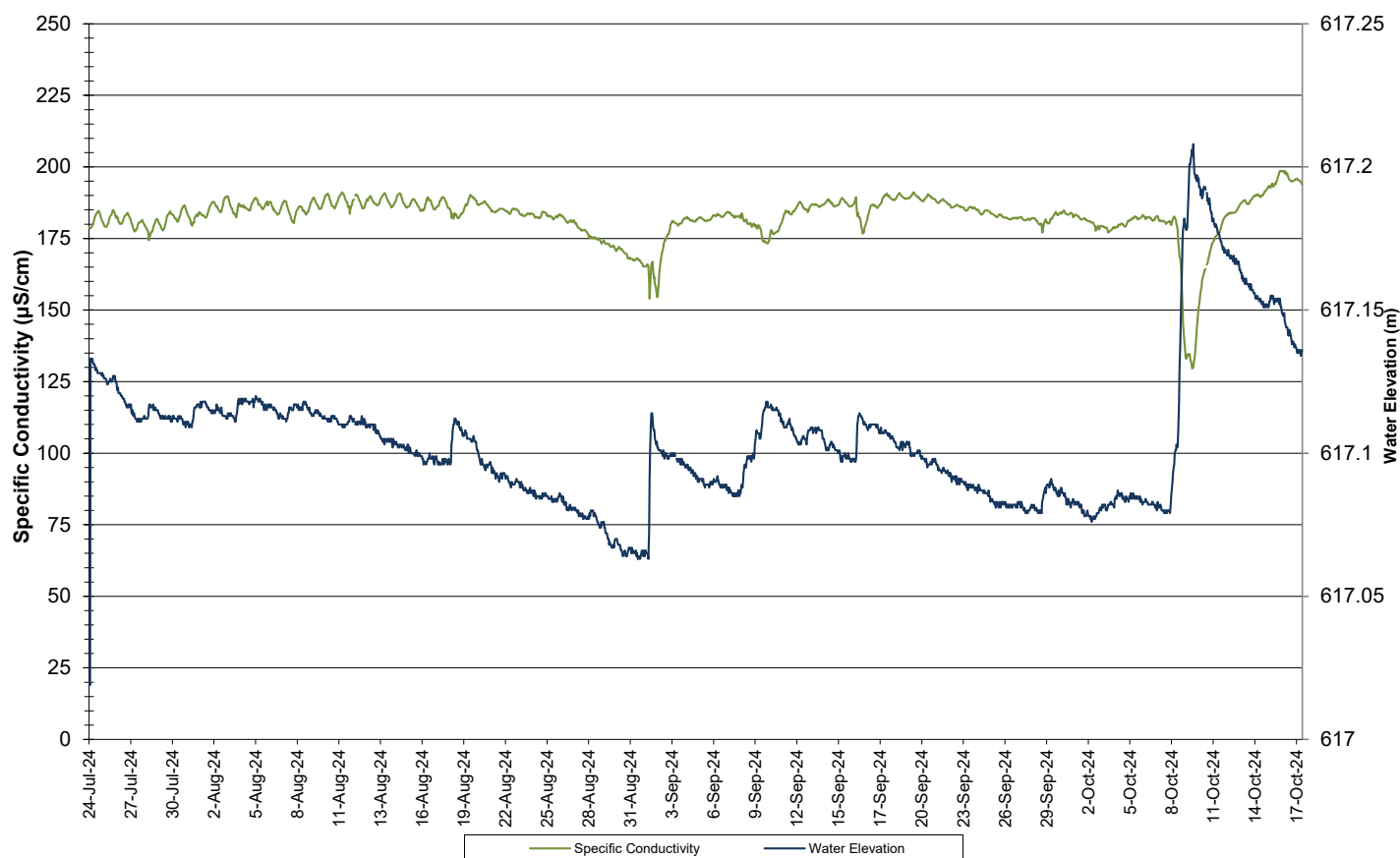


Figure 23: Specific Conductivity and Elevation – Unnamed Tributary above Fraggie Rock Lake

- Dissolved oxygen ranged from 89.4 to 100.4% saturation and 8.21 to 13.25 mg/l with a median value of 10.07 mg/l (Figure 24).
- Dissolved oxygen fluctuated diurnally with decreases observed at night and showed an inverse relationship to increases/decreases in water temperature. Levels increased over the course of the deployment season.
- All values were above the CCME Water Quality Guideline of 6.5 mg/L for the Protection of Aquatic Life for Cold Water Biota at Other Life Stages, while the majority were also above the minimum guideline for early life stages of 9.5 mg/l.

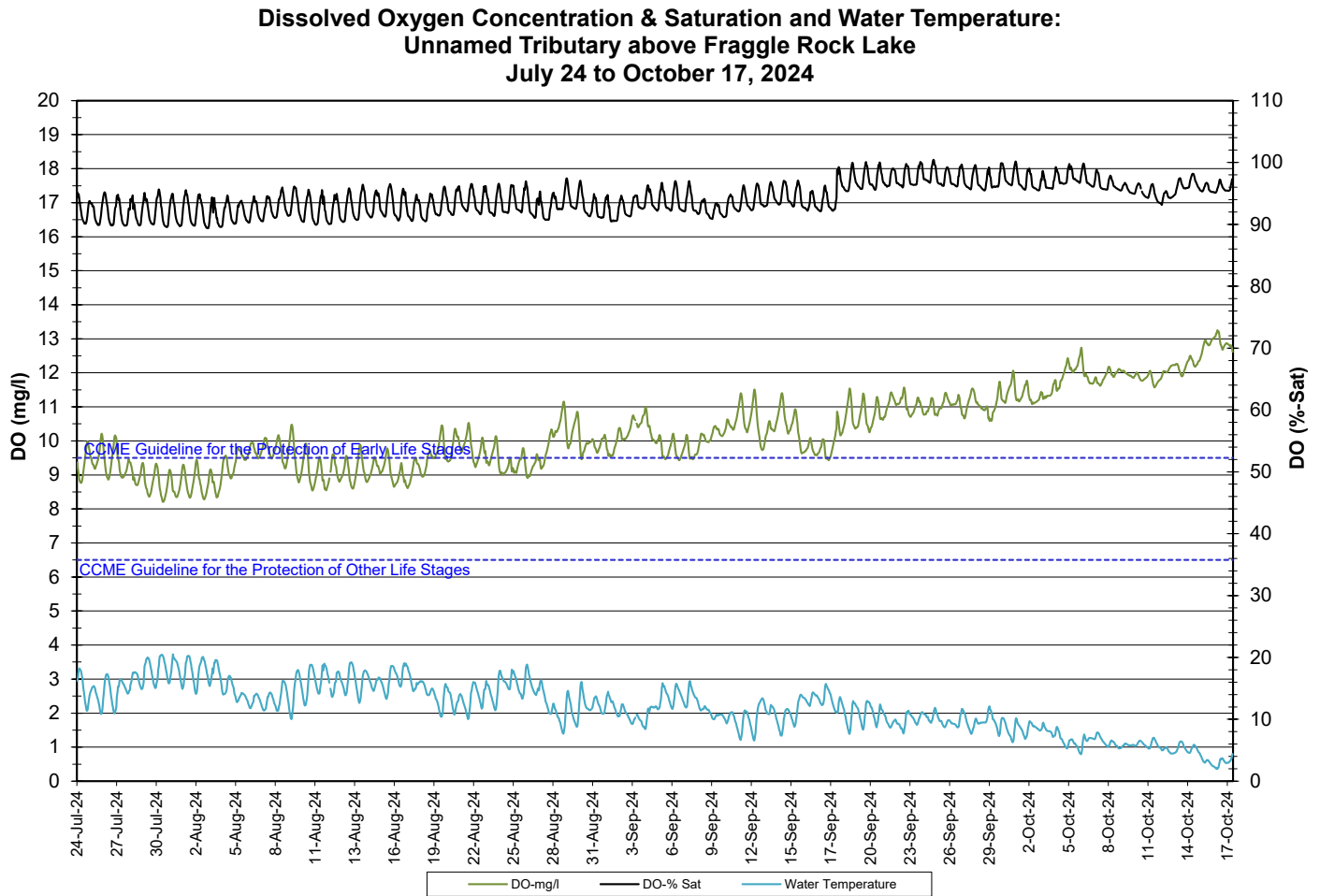


Figure 24: Dissolved Oxygen, Percent Saturation & Water Temperature –

Unnamed Tributary above Fraggie Rock Lake

- Turbidity values range from 0.1 to 3.7 NTU, with a median value was 0.5 NTU (Figure 25).
- Turbidity levels were very low throughout the deployment season. Small spikes occur infrequently and for small periods of time. The largest spike can be attributed to a precipitation event.

**Water Turbidity and Precipitation: Unnamed Tributary above Fraggie Rock Lake
July 24 to October 17, 2024**

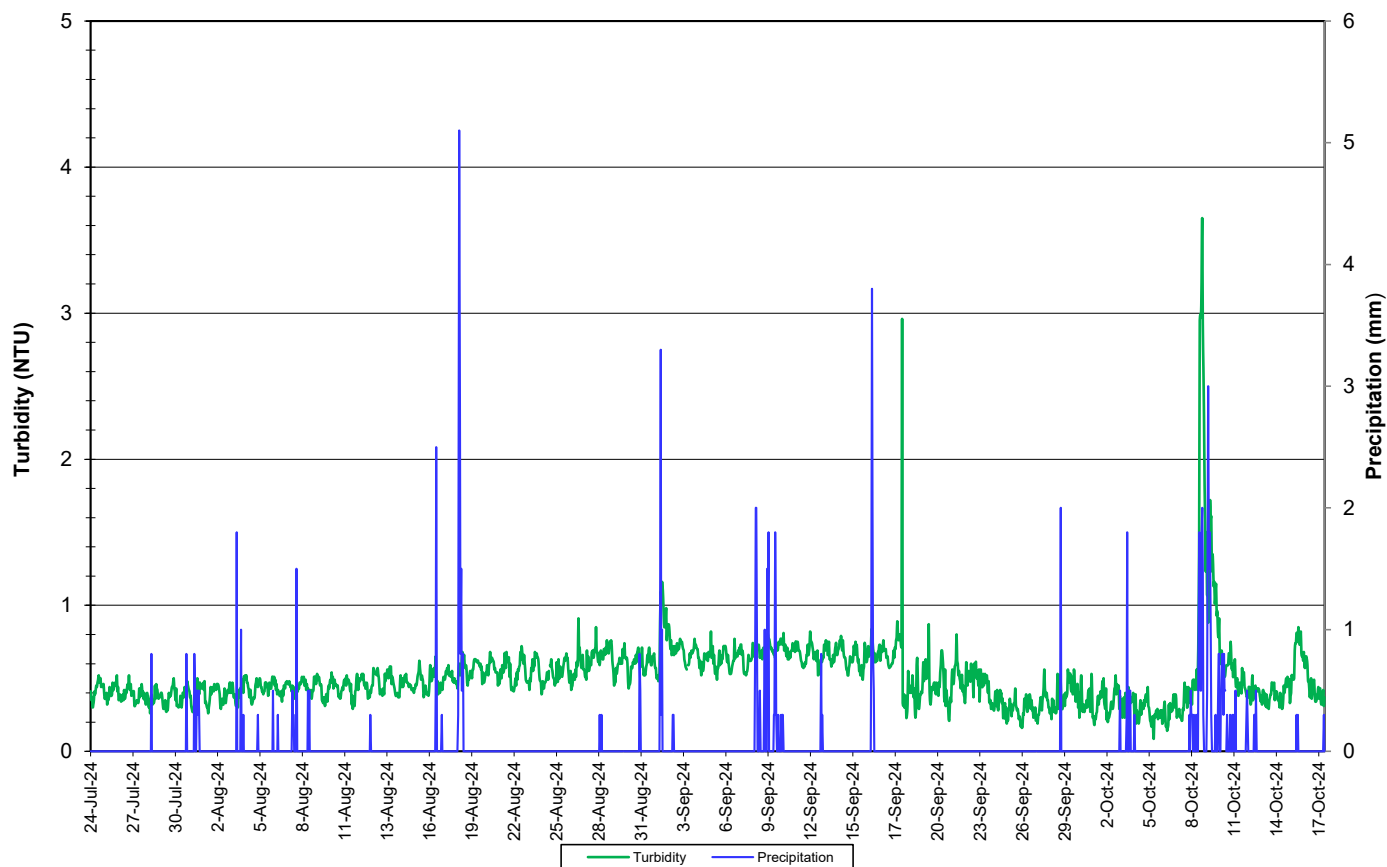


Figure 25: Turbidity and Precipitation – Unnamed Tributary above Fraggie Rock Lake

- Stage and precipitation are graphed below to show the relationship between rainfall and water level at Fraggie Rock (Figure 26).
- Stage data shows slight increases after precipitation events.
- Water Resources Management Division hydrometric data is quality controlled on a less frequent basis than water quality data due to differences in protocols. The hydrometric data shown for this station is provisional and has not undergone quality control checks.

**Water Elevation & Precipitation: Unnamed Tributary above Fraggie Rock Lake
July 24 to October 17, 2024**

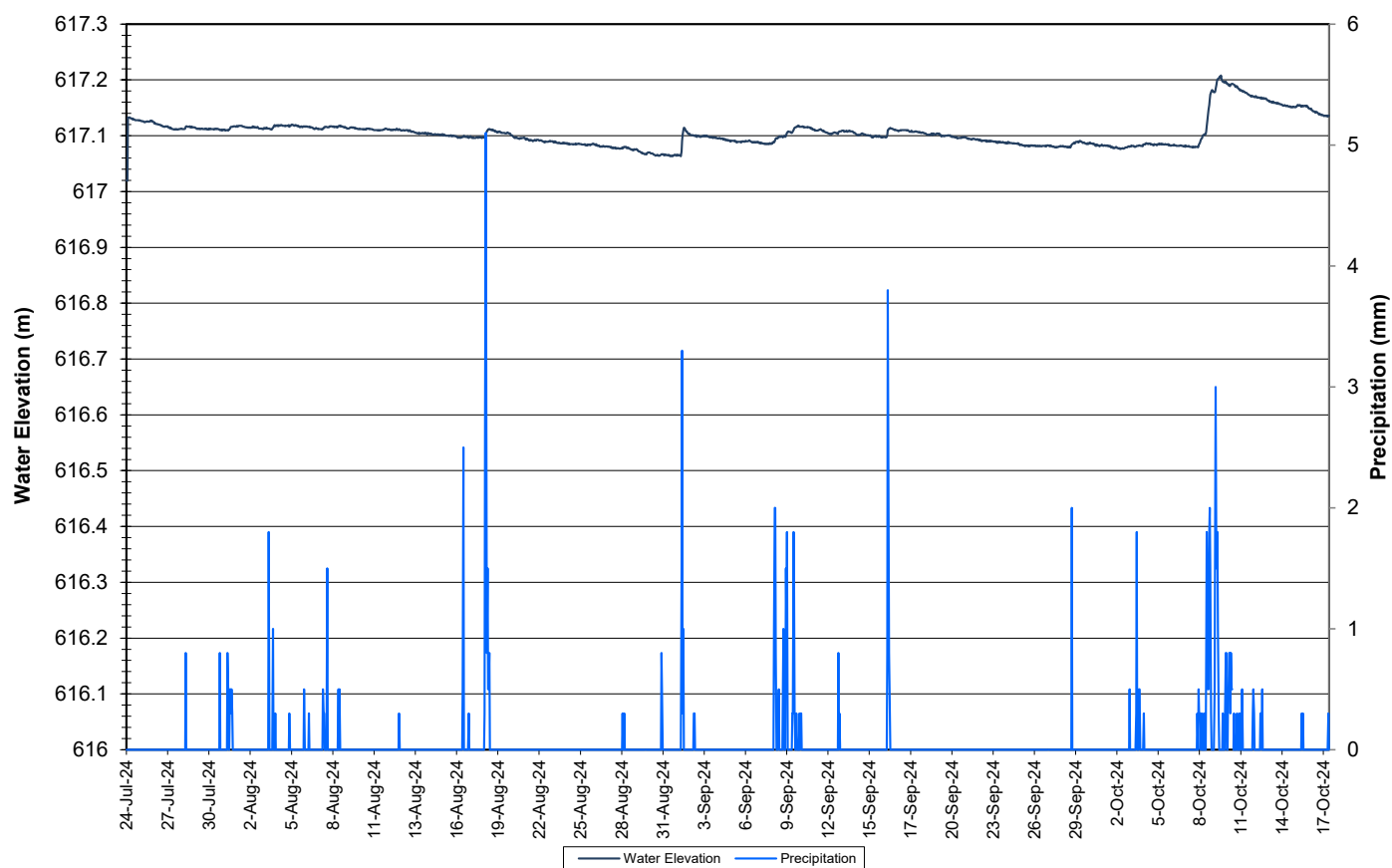


Figure 26: Water Elevation and Precipitation – Unnamed Tributary above Fraggie Rock Lake

Conclusions

- Instruments at three water quality monitoring stations in Labrador West were deployed on June 18th and 19th. Julianne Narrows and Fraggie Rock were deployed on July 24th. All instruments were removed on October 16th and 17th, 2024 for the winter season.
- This was the first deployment season with new water quality monitoring equipment at all stations. Instrumentation performed very well.
- Instruments were deployed for periods of 27 to 57 days before maintenance and calibration.
- In most cases, weather related events or increases/decreases in water level could be used to explain the fluctuations.
- Most values recorded were within ranges as suggested by the CCME Water Quality Guidelines for the Protection of Aquatic Life.
- Water temperature followed the seasonal trend of increasing during the summer and decreasing into the fall. Water temperature was cooler at Dumbell Stream but increases/decreases followed the same trends as air temperature.
- All pH values were within the acceptable range of the CCME Water Quality Guidelines for Protection of Aquatic Life.
- Specific conductivity differed between the two Wabush Lake stations. This can be attributed to varying concentrations of iron ore tailings, which are deposited into Wabush Lake downstream of Dolomite Road and upstream of Julianne Narrows. At Dolomite Road, conductivity levels fluctuated significantly, influenced by low water levels. Pumphouse Stream and Dumbell Stream, being small streams, typically respond to changes in stage. Conductivity increased at Pumphouse Stream, while Dumbell Stream experienced several sudden and unexplained spikes in conductivity. Further monitoring and investigation are needed to understand these variations.
- For the minimum dissolved oxygen CCME Water Quality Guideline for the Protection of Aquatic Life (9.5 mg/L) for Cold Water Biota at Early Life Stages, most measurements at the two Wabush Lake stations and Fraggie Rock exceeded the guideline. At Dumbell Stream, all values were above the guideline, whereas at Pumphouse Stream, the majority of values fell below it.
- All values were above the CCME Water Quality Guideline for the Protection of Aquatic Life for Cold water Biota at Other Life Stages of 6.5 mg/l at most stations. At Pumphouse Stream, there were a few instances when the levels dropped below 6.5 mg/l.
- Background turbidity levels were low at all stations. Spikes occurred infrequently and for short periods of time. Some spikes can be attributed to precipitation events.

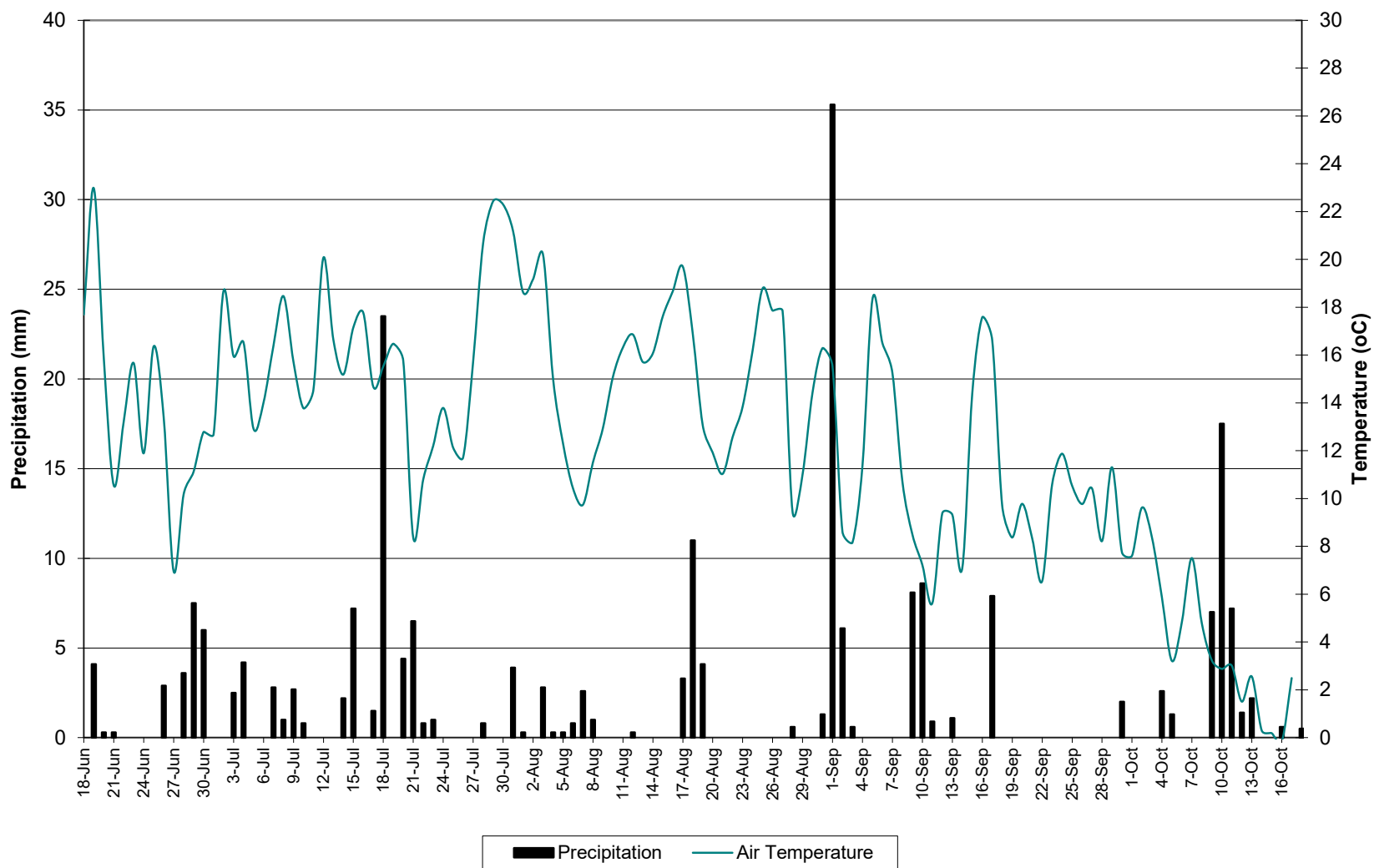
Path Forward

- ECC staff will deploy real time water quality instruments in spring 2025 when ice conditions allow and perform regular site visits throughout the 2025 deployment season for calibration and maintenance of the instruments.
- If necessary, deployment techniques will be evaluated and adapted to each site, ensuring secure and suitable conditions for RTWQ monitoring.
- ECC will update IOC staff on any changes to procedures with handling, maintenance and calibration of the real-time instruments.
- ECC will continue to work on its Automatic Data Retrieval System, to incorporate new capabilities in data management and data display.
- Open communication will continue to be maintained between ECC, ECCC and IOC employees involved with the agreement, in order to respond to emerging issues on a proactive basis.
- IOC will continue to be informed of data trends and any significant water quality events in the form of email and/or monthly deployment reports, when the deployment season begins. IOC will also receive an annual report, summarizing the events of the deployment season.

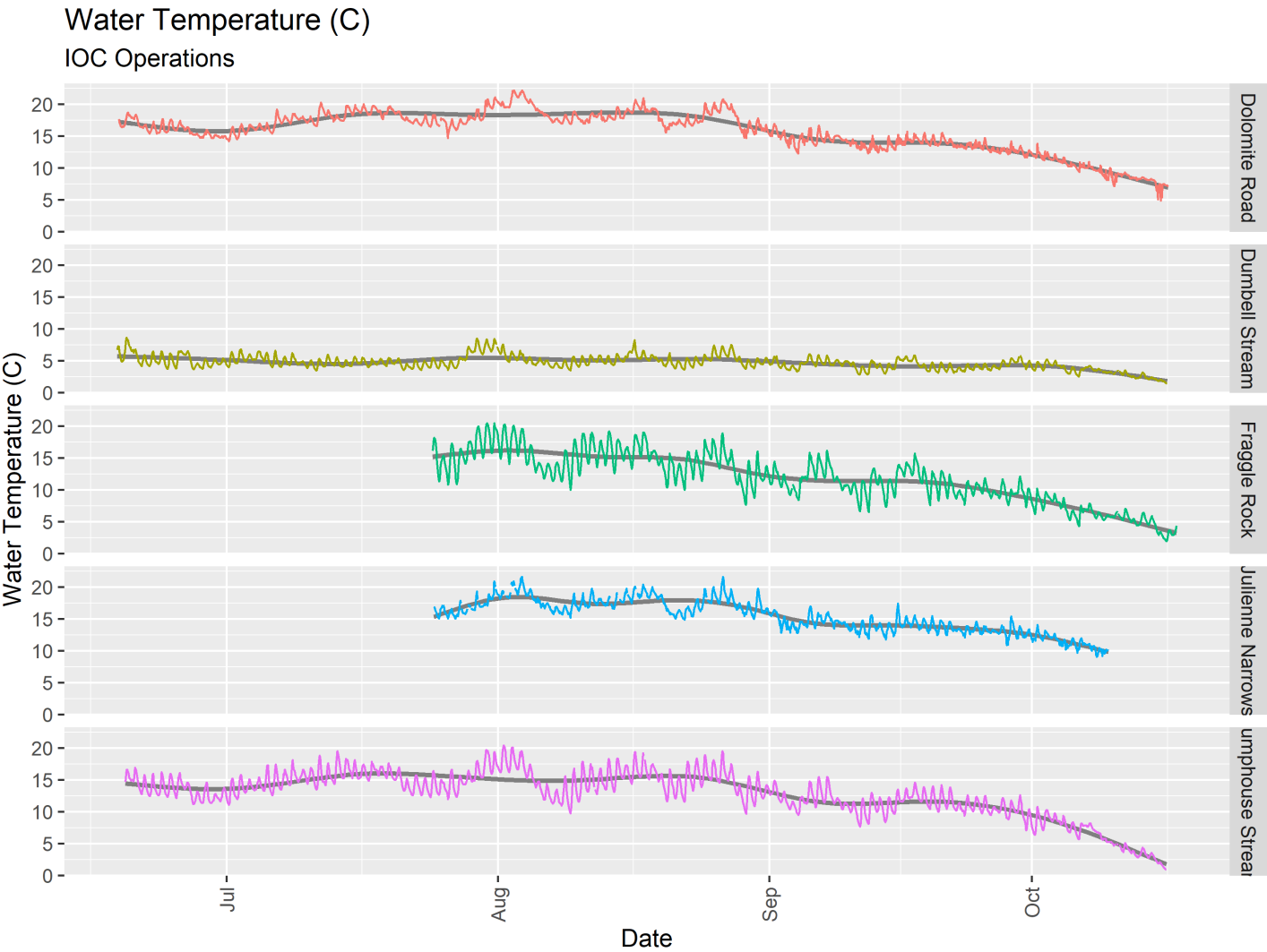
Prepared by:
Maria Murphy
Department of Environment & Climate Change
Water Resources Management Division
Phone: 709.896.7981

Appendix 1

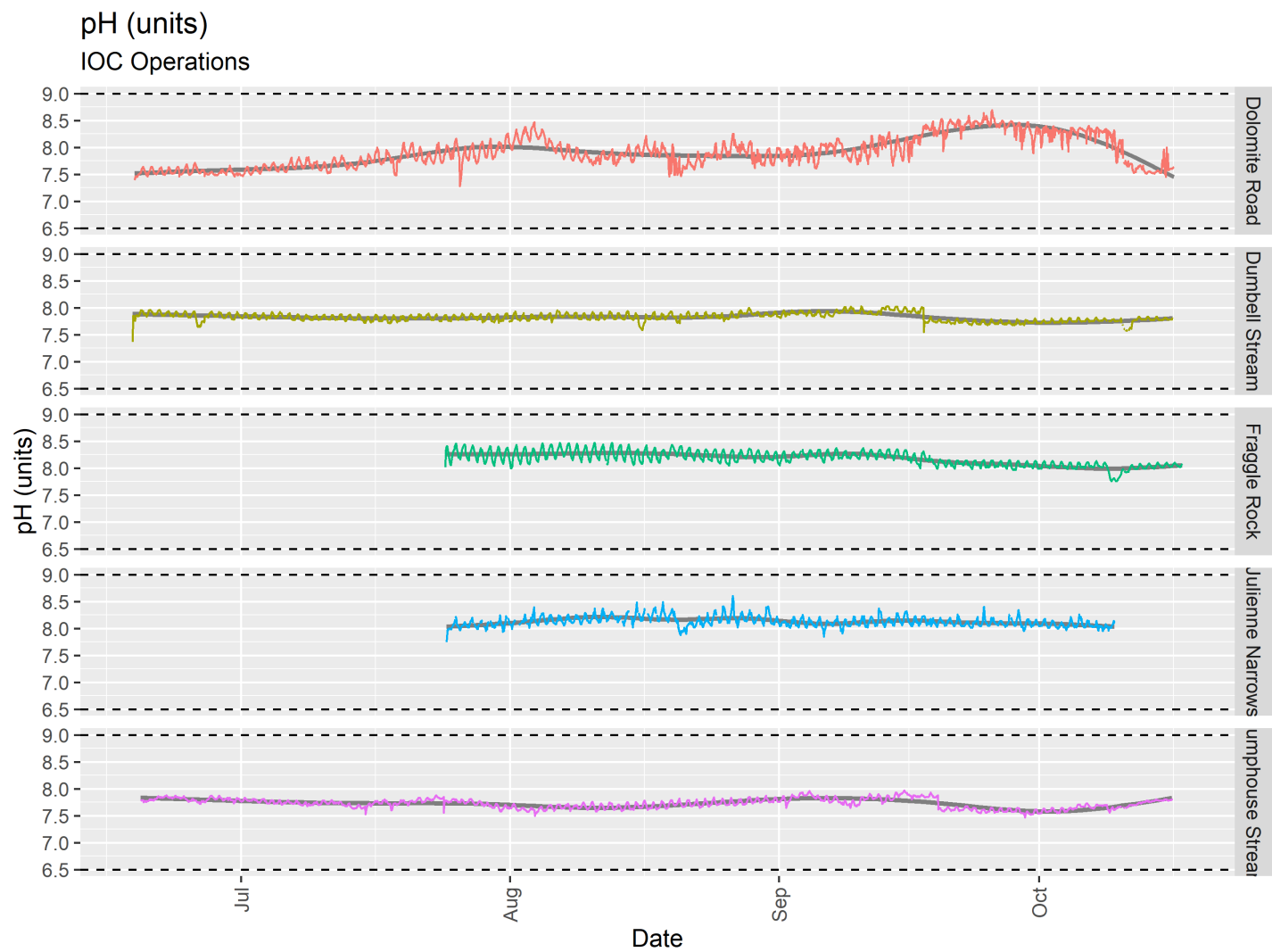
Daily Air Temperature and Precipitation: Moosehead Lake, NL June 18 to October 17, 2024



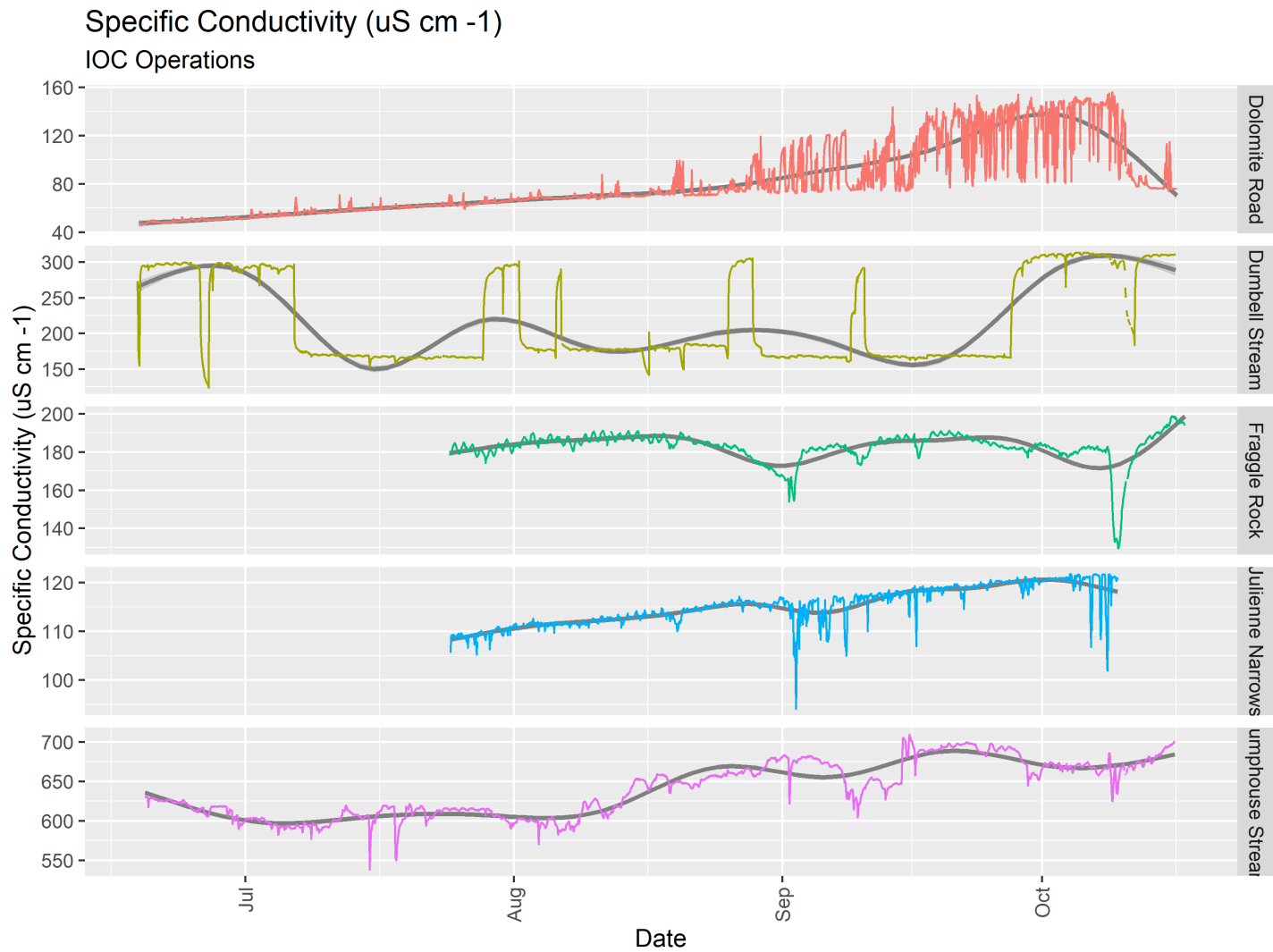
Appendix 2
Station to Station Quick View



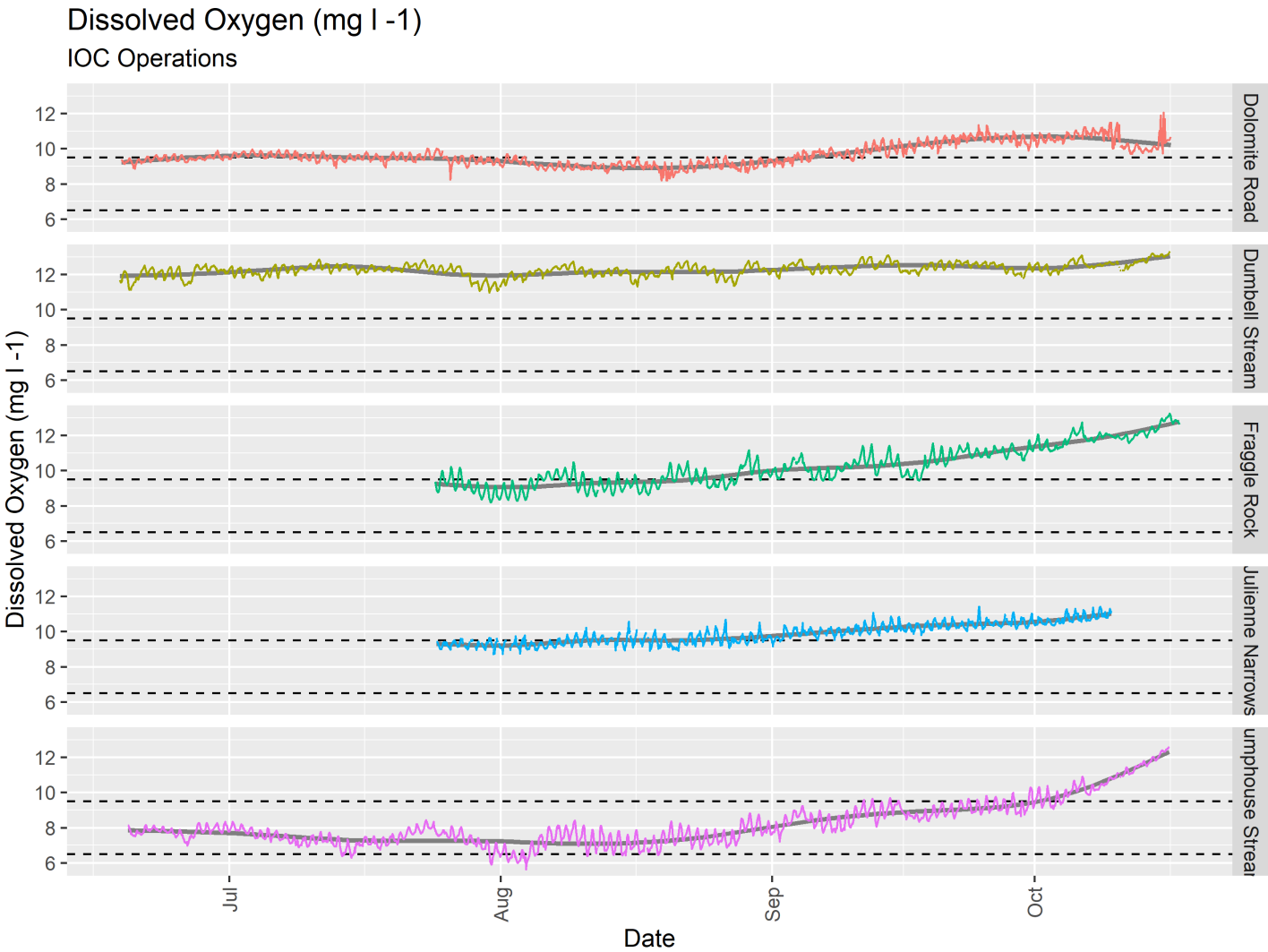
Temperature (°C)					
	Dolomite Road	Dumbell Stream	Pumphouse Stream	Julianne Narrows	Fraggle Rock
Min	4.9	1.50	1.0	9.1	1.96
Max	22.2	8.65	20.4	21.6	20.49
Median	16.4	4.65	13.3	15.5	11.91



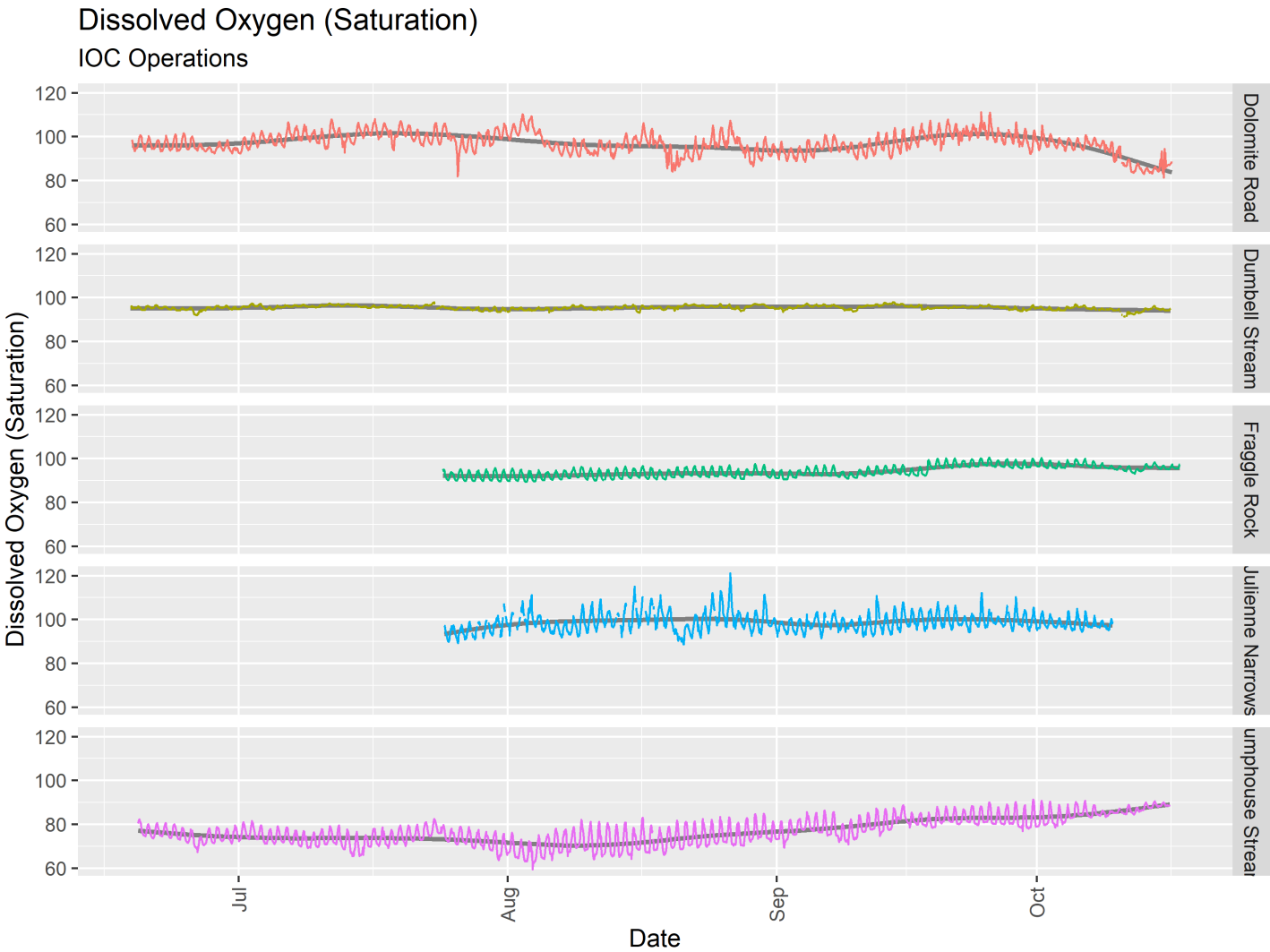
pH					
	Dolomite Road	Dumbell Stream	Pumphouse Stream	Julianne Narrows	Fraggle Rock
Min	7.28	7.36	7.47	7.74	7.76
Max	8.69	8.03	7.97	8.6	8.47
Median	7.86	7.82	7.73	8.12	8.18



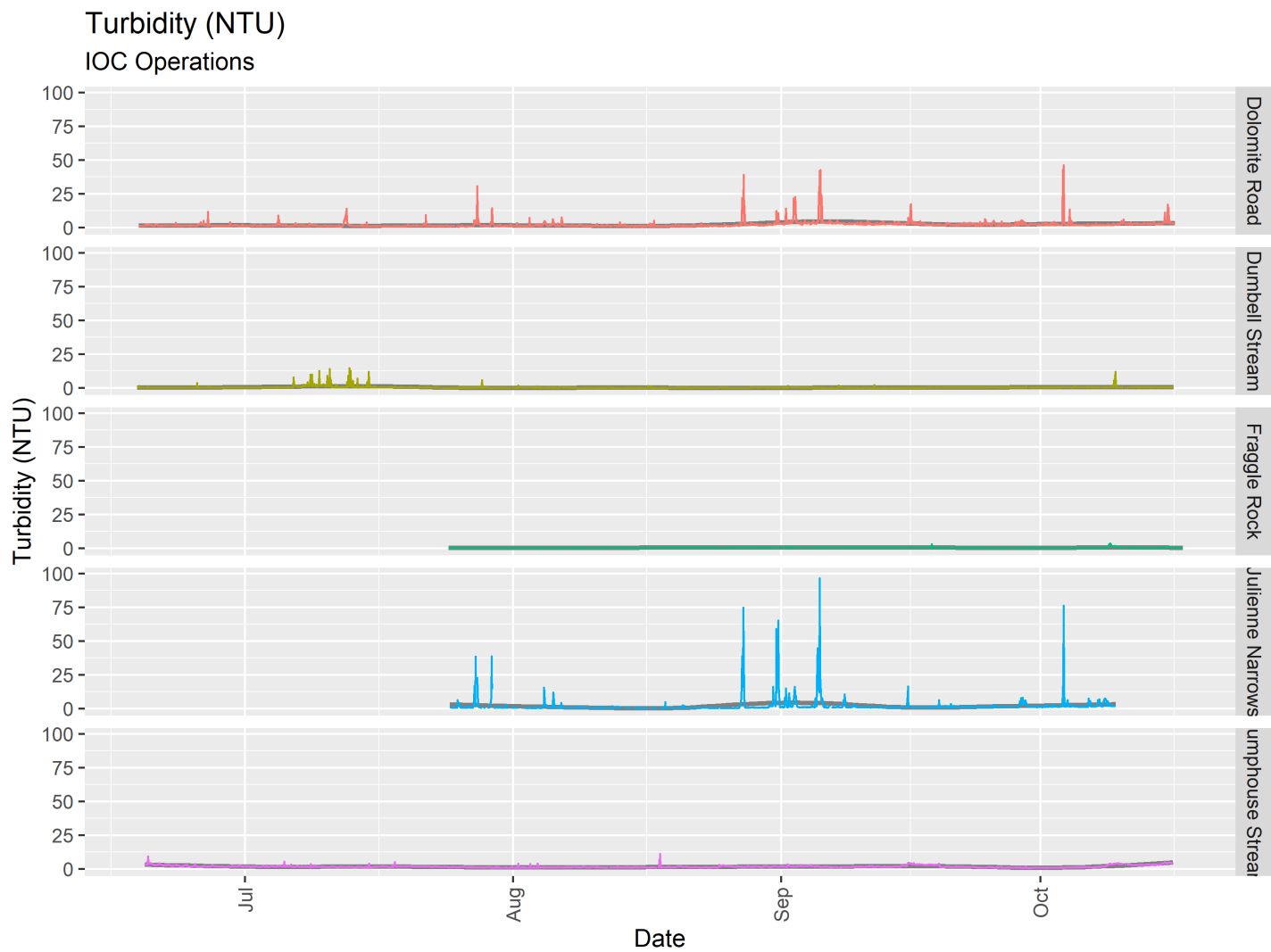
Specific Conductivity ($\mu\text{S/cm}$)					
	Dolomite Road	Dumbell Stream	Pumphouse Stream	Julianne Narrows	Fraggle Rock
Min	46.1	124.2	538.4	94.1	129.63
Max	156.3	313.1	709.6	121.8	198.63
Median	71.2	177.9	640.75	115.5	183.56



Dissolved Oxygen (mg/l)					
	Dolomite Road	Dumbell Stream	Pumphouse Stream	Julianne Narrows	Fraggie Rock
Min	8.2	10.98	5.64	8.65	8.21
Max	12.06	13.32	12.61	11.42	13.25
Median	9.53	12.3	7.85	9.86	10.07



Dissolved Oxygen (% Sat)					
	Dolomite Road	Dumbell Stream	Pumphouse Stream	Julianne Narrows	Fraggie Rock
Min	81.3	91.2	59.5	88.6	89.36
Max	111.1	97.9	91.3	121.1	100.43
Median	97.1	95.5	76.5	98.2	94.25



Turbidity (NTU)					
	Dolomite Road	Dumbell Stream	Pumphouse Stream	Julienne Narrows	Fraggle Rock
Min	0.5	0.00	0.7	0.2	0.09
Max	46.1	14.6	11.2	99.2	3.65
Median	1.6	0.3	1.6	0.9	0.48

Appendix 3 - New Station - *Unnamed Tributary above Fraggie Rock Lake*

Station Number: NF03OA0025

Coordinates: Latitude 52.973631°, Longitude -67.018726°

Station Location: This station is located on an unnamed tributary that feeds into an officially unnamed lake. It has been designated as "Fraggle Rock" due to a nearby snowmobile trail chalet of the same name located on the lake, making it recognizable to locals. The station is not accessible by road or foot but can be reached via helicopter or snowmobile.



Unnamed Tributary above Fraggie Rock Lake Watershed

