



Real-Time Water Quality Deployment Report

Iron Ore Company of Canada
Labrador West Network

July 28 to
September 9, 2021



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

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General

- The Water Resources Management Division, in partnership with the Iron Ore Company of Canada (IOC) and Environment and Climate Change Canada (ECCC), maintain two real-time water quality (RTWQ) and water quantity stations at Wabush Lake.
- The official name of each station is *Wabush Lake at Dolomite Road* and *Wabush Lake at Lake Outlet*, hereafter referred to as the Dolomite Road station and the Julienne Narrows station.
- These stations are situated upstream (Dolomite Road) and downstream (Julienne Narrows) of the IOC tailings disposal area in Wabush Lake.
- 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 Dumbell Stream.
- 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 Pumphouse Stream.
- Water Resources Management Division staff monitor the real-time graphs regularly. They will inform IOC of any significant water quality events by email notification and by monthly deployment reports.
- On July 28th and 29th, real-time water quality monitoring instruments were deployed at the four IOC stations. The instruments were deployed for a period of 41-43 days at each station. The instruments were removed between September 7th and 9th. This was the second deployment of 2021 for these stations.



Figure 1: RTWQ Monitoring Stations in Labrador West

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 each 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 1).

Table 1: 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 dependent, temperature compensated and temperature independent. Because 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 deployed between July 28-29 and September 7-9 are summarized in Table 2.

Table 2: QA/QC comparison rankings for IOC stations between July 28-29 and September 7-9, 2021.

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Dolomite Road	Jul 28, 2021	Deployment	Good	Good	Excellent	Excellent	Excellent
	Sep 7, 2021	Removal	Good	Good	Excellent	Good	Excellent
Julienne Narrows	Jul 28, 2021	Deployment	Good	Good	Excellent	Excellent	Excellent
	Sep 9, 2021	Removal	Good	Good	Good	Excellent	Excellent
Dumbell Stream	Jul 28, 2021	Deployment	Good	Good	Excellent	Marginal	Excellent
	Sep 9, 2021	Removal	Good	Good	Excellent	Fair	Excellent
Pumphouse Stream	Jul 29, 2021	Deployment	Excellent	Good	Excellent	Good	Excellent
	Sep 8, 2021	Removal	Excellent	Good	Good	Excellent	Excellent

▪ **Dolomite Road**

At deployment and removal, all parameters ranked either ‘excellent’ or ‘good’.

▪ **Julienne Narrows**

At deployment and removal, all parameters ranked either ‘excellent’ or ‘good’.

▪ **Dumbell Stream**

At deployment, all parameters besides dissolved oxygen ranked either ‘excellent’ or ‘good’. Dissolved oxygen ranked ‘marginal’. The field instrument read a value of 12.82 mg/l, while the QA/QC instrument read a value of 11.83 mg/l.

At removal, all parameters besides dissolved oxygen ranked either ‘excellent’ or ‘good’. Dissolved oxygen ranked ‘fair’. The field instrument read a value of 12.26 mg/l, while the QA/QC instrument read a value of 11.59 mg/l.

▪ **Pumphouse Stream**

At deployment and removal, all parameters ranked either ‘excellent’ or ‘good’.

- There are a few circumstances which may cause less than ideal QA/QC rankings to be obtained. These include: the placement of the QA/QC sonde in relation to the field sonde; the amount of time each sonde was given to stabilize before readings were recorded; and deteriorating performance of one or more of the sensors.

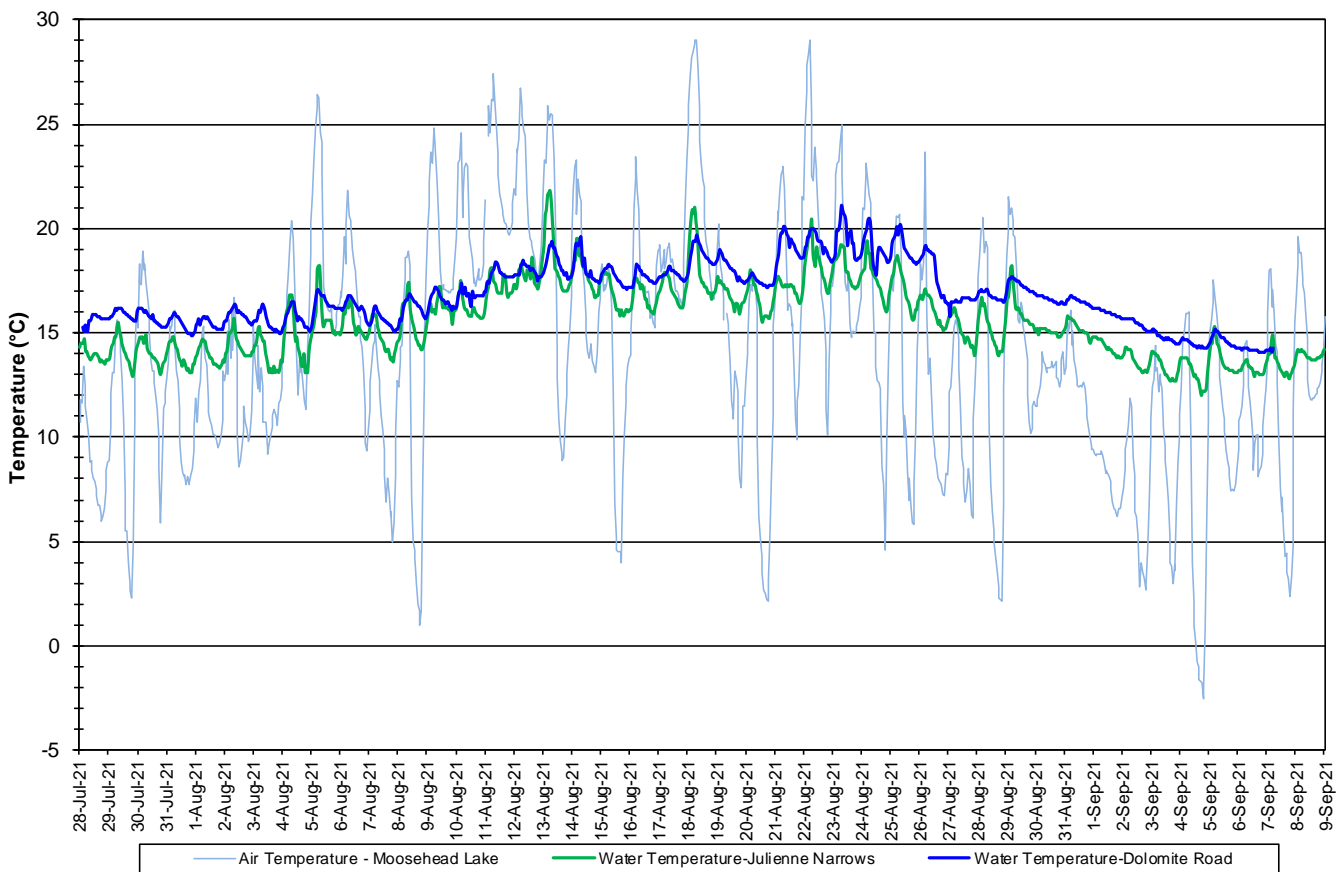
Data Interpretation

- The following graphs and discussion illustrate water quality-related events from July 28-29 to September 7-9, 2021 at the IOC RTWQ monitoring stations in Labrador West.
- 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 this stringent QA/QC protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

Wabush Lake Network

- Water temperature ranged from 14.10 to 21.10°C at Dolomite Road and 12.0 to 21.8°C at Julienne Narrows during this deployment period (Figure 2).
- Water temperature increased until the end of August, and then decreased, corresponding with ambient air temperature trends (Figure 2).

**Water and Air Temperature : Wabush Lake Network
July 28 to September 9, 2021**



**Figure 2: Water and Air Temperature - Wabush Lake network
(Weather data collected from climate station near Moosehead Lake)**

- pH ranges from 7.35 to 8.21 pH units at Dolomite Road, and from 7.64 to 8.44 pH units at Julienne Narrows throughout the deployment period (Figure 3). The median pH is 7.71 and 7.90 units respectively.
- All values during the deployment are within the CCME Guidelines for the Protection of Aquatic Life (between 6.5 and 9 pH units). pH fluctuates slightly throughout the day and night.
- There is a noticeable decrease in pH at Dolomite Road on August 26th which coincides with a rise in stage. This is due to a significant rainfall event.
- With the exception of water quantity data (Stage and Flow), all data used in the preparation of the graphs and subsequent discussion adhere to this stringent QA/QC protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

**Water pH and Stage: Wabush Lake Network
July 28 to September 9, 2021**

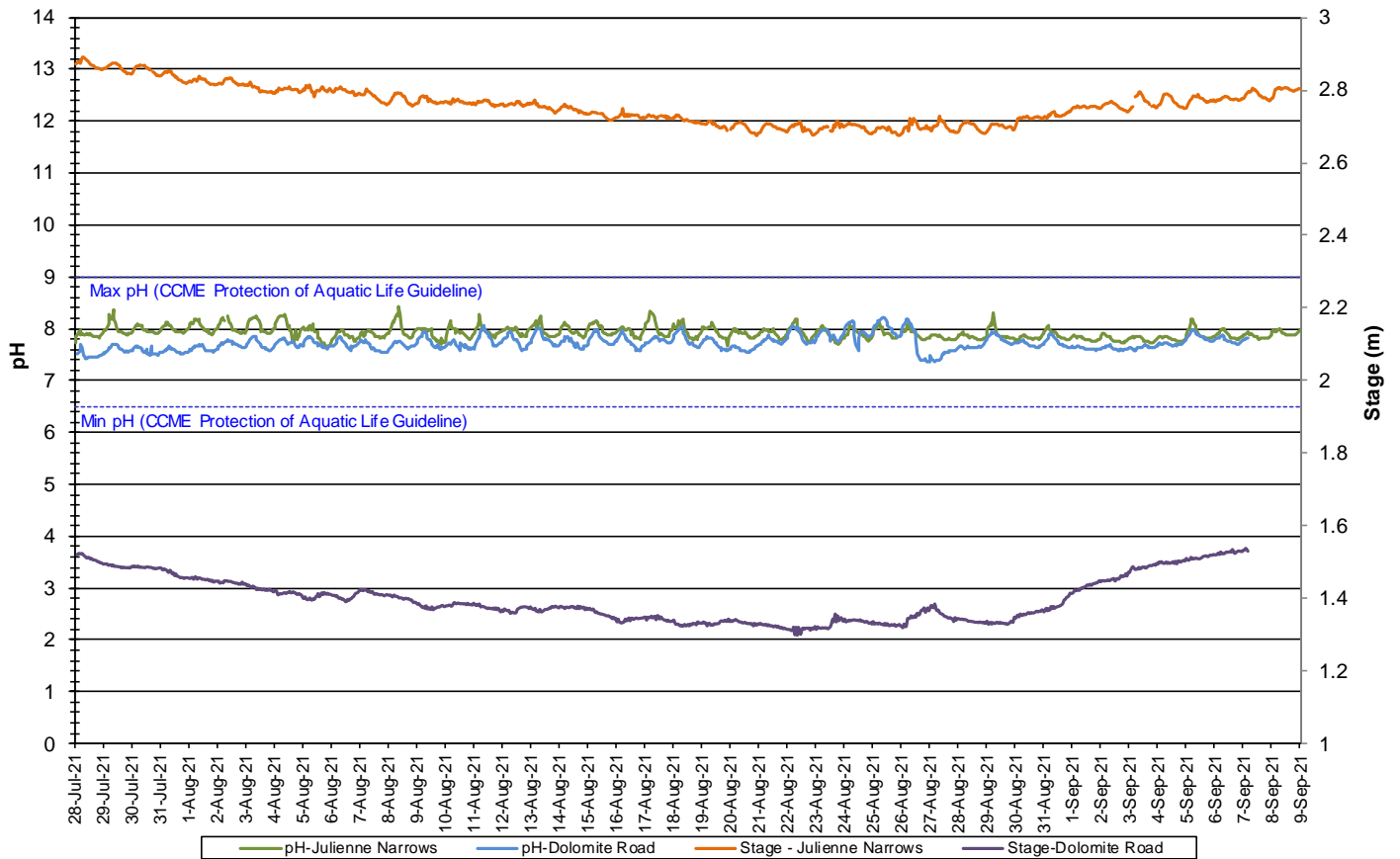


Figure 3: Water pH and Stage– Wabush Lake network

- Specific conductivity ranged from 54.9 to 82.2 $\mu\text{S}/\text{cm}$ at Dolomite Road and from 78.4 to 109.0 $\mu\text{S}/\text{cm}$ at Julienne Narrows throughout the deployment period (Figure 4).
- Daily fluctuations are evident at the Julienne Narrows station. This can be attributed to varying contributions of iron ore tailings deposited into Wabush Lake upstream of Julienne Narrows and downstream of Dolomite Road. This can also explain the difference in specific conductivity levels between the two stations as conductance values are generally higher at Julienne Narrows.
- Specific conductance increases at both stations during this deployment period.
- With the exception of water quantity data (Stage and Flow), all data used in the preparation of the graphs and subsequent discussion adhere to this stringent QA/QC protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

**Specific Conductivity and Stage: Wabush Lake Network
July 28 to September 9, 2021**

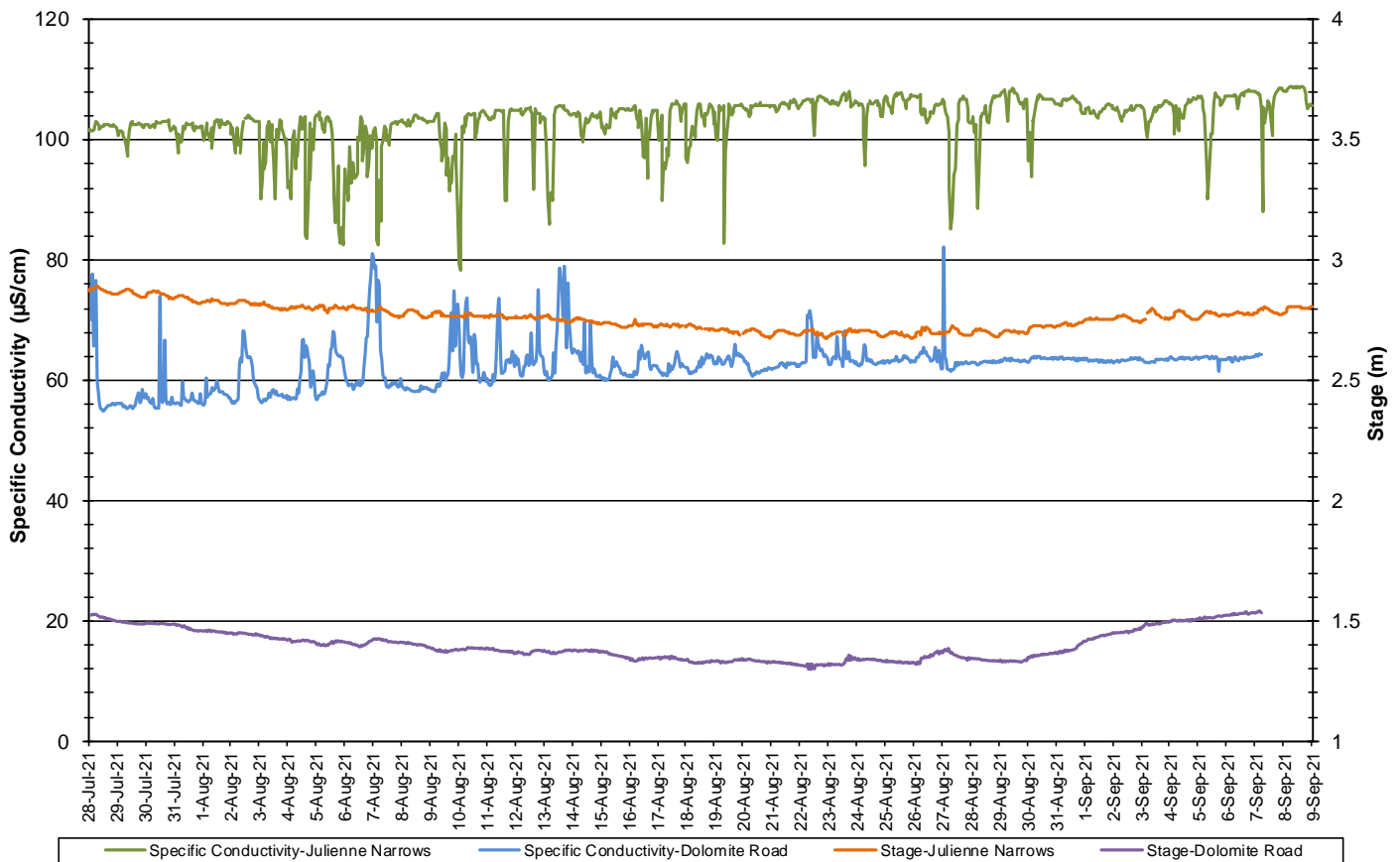


Figure 4: Specific Conductivity and Stage – Wabush Lake network

- At the Dolomite Road station, the saturation of dissolved oxygen ranged from 79.9 to 101.3% while the dissolved oxygen content ranged from 7.79 to 9.29 mg/l with a median value of 8.68 mg/l (Figure 5).
- At the Julienne Narrows station, the saturation of dissolved oxygen ranged from 82.5 to 107.2% while the dissolved oxygen content ranged from 8.10 to 10.34 mg/l with a median value of 9.03 mg/l (Figure 5).
- All values recorded at Julienne Narrows and Dolomite Road were above the CCME Guideline for the Protection of Aquatic Life for Cold Water Biota of Other Life Stages of 6.5 mg/l. All of the values at Dolomite Road and the majority of values at Julienne Narrows, were below the CCME Guideline for the Protection of Aquatic Life for Cold Water Biota of Early Life Stages of 9.5 mg/l. The guidelines are indicated in blue on Figure 5.
- Dissolved oxygen decreased at both stations over the course of this deployment period, as water temperature increased. Dissolved oxygen fluctuated daily with decreases observed at night.

**Dissolved Oxygen and Percent Saturation : Wabush Lake Network
July 28 to September 9, 2021**

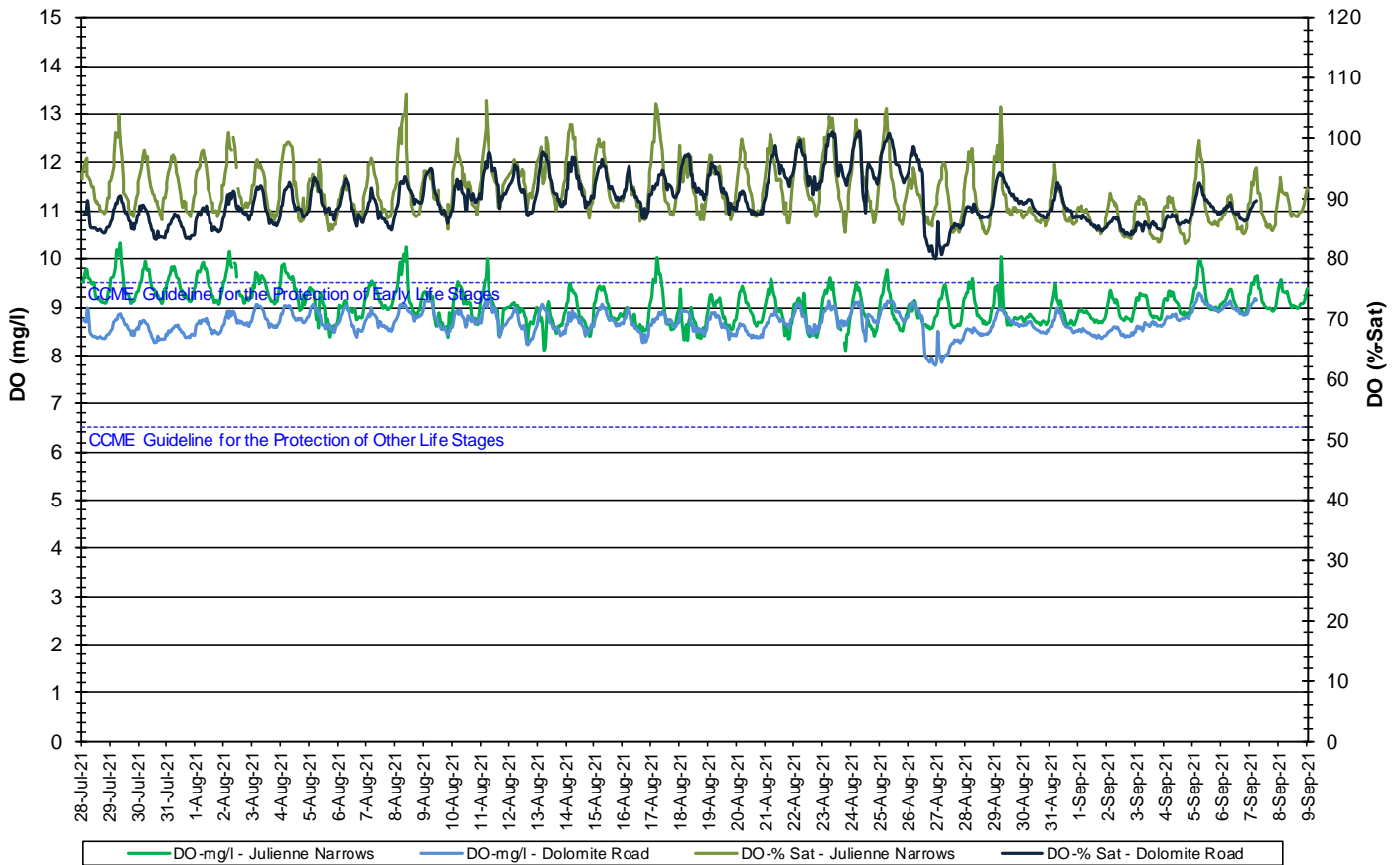
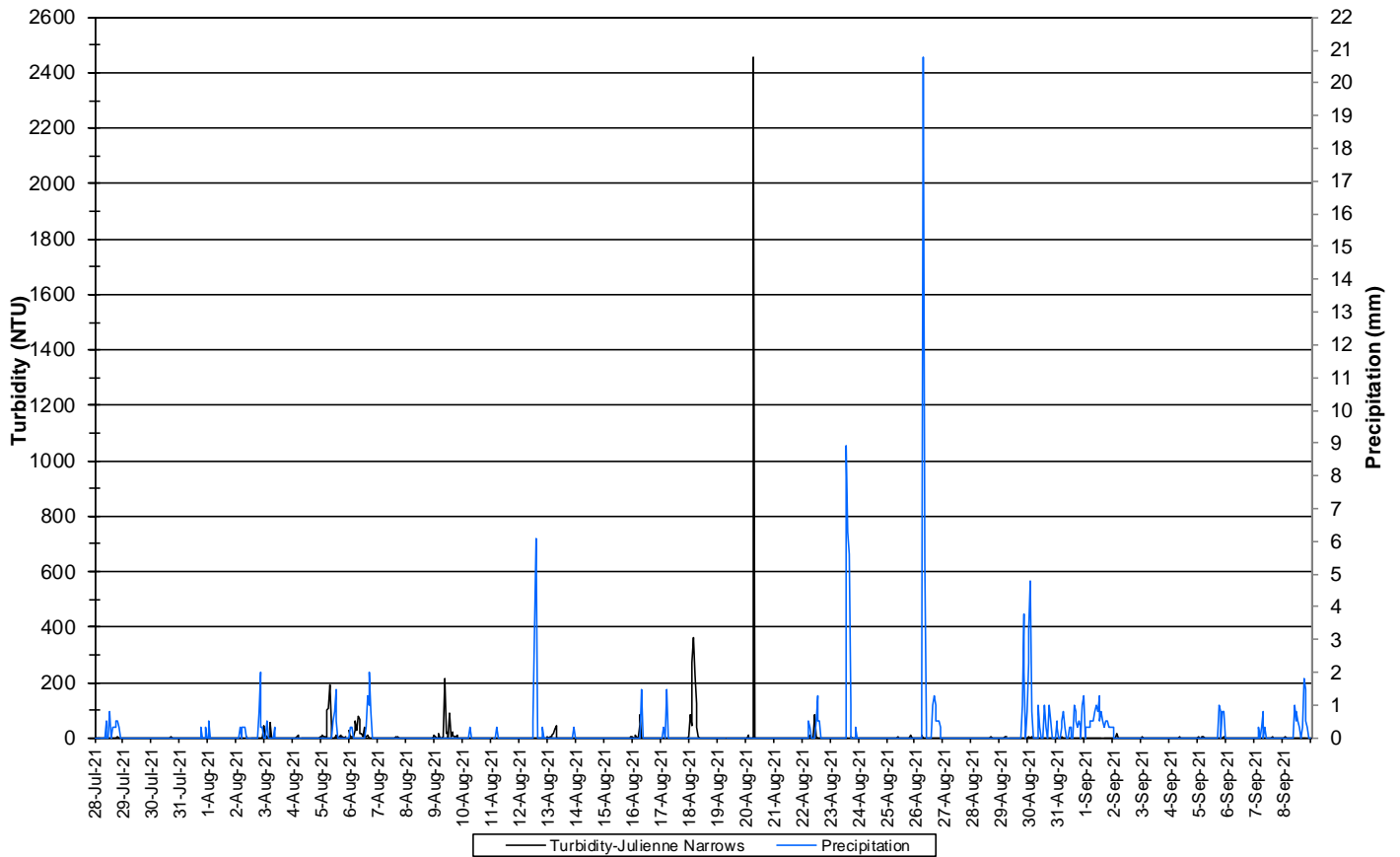


Figure 5: Dissolved Oxygen and Percent Saturation – Wabush Lake Network

- At the Julienne Narrows station, turbidity values range from 0.0 to 361.50 NTU throughout the deployment period (Figure 6). The median value was 0.0 NTU.
- In some instances, turbidity spikes can be attributed to precipitation events. Others may be the result of wave action near the instrument.

**Water Turbidity and Precipitation: Julienne Narrows
July 28 to September 9, 2021**



**Figure 6: Turbidity and Precipitation – Julienne Narrows
(Weather data collected from climate station near Moosehead Lake)**

- At the Dolomite Road station, turbidity values range from 1.3 NTU to 15.4 NTU throughout the deployment period (Figure 7). The median value was 2.1 NTU.

Turbidity and Precipitation : Dolomite Road
July 28 to September 7, 2021

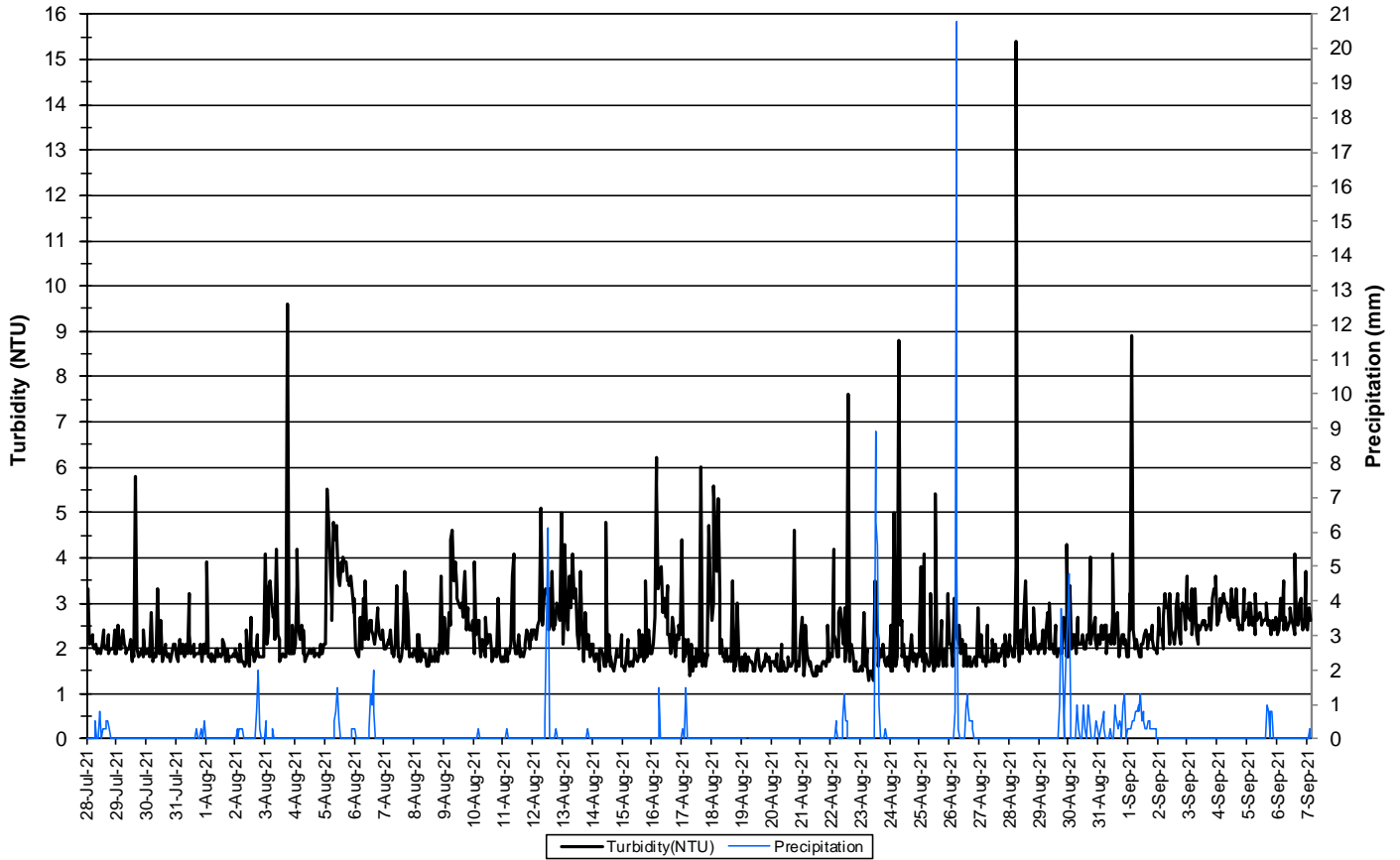


Figure 7: Turbidity and Precipitation – Dolomite Road
(Weather data collected from climate station near Moosehead Lake)

- Stage and precipitation are graphed below to show the relationship between rainfall and water level at Dolomite Road and Julienne Narrows (Figure 8).
- Stage decreased at both Julienne Narrows and Dolomite Road, until the end of August. It then increased over the remainder of the deployment period.
- With the exception of water quantity data (Stage and Flow), all data used in the preparation of the graphs and subsequent discussion adhere to this stringent QA/QC protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

Stage and Precipitation: Wabush Lake Network
July 28 to September 9, 2021

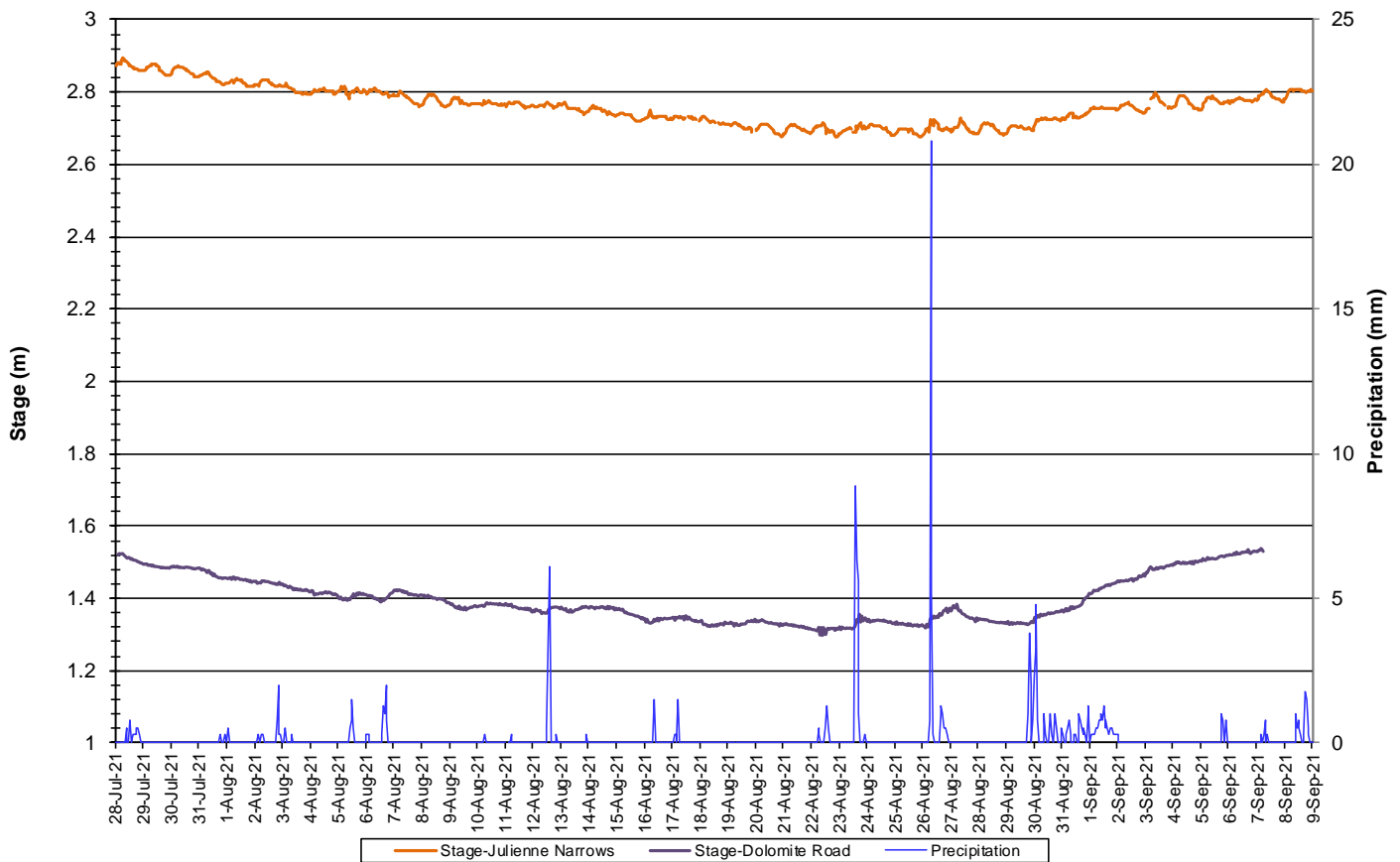


Figure 8: Stage and Precipitation – Wabush Lake Network
(Weather data collected at climate station located near Moosehead Lake)

Dumbell Stream

- Water temperature ranged from 2.88 to 7.24°C during this deployment period (Figure 9).
- Water temperature increased slightly during August. Water temperature at Dumbell Stream is typically much lower than other stations (Figure 9).

Water and Air Temperature : Dumbell Stream above Dumbell Lake
July 28 to September 9, 2021

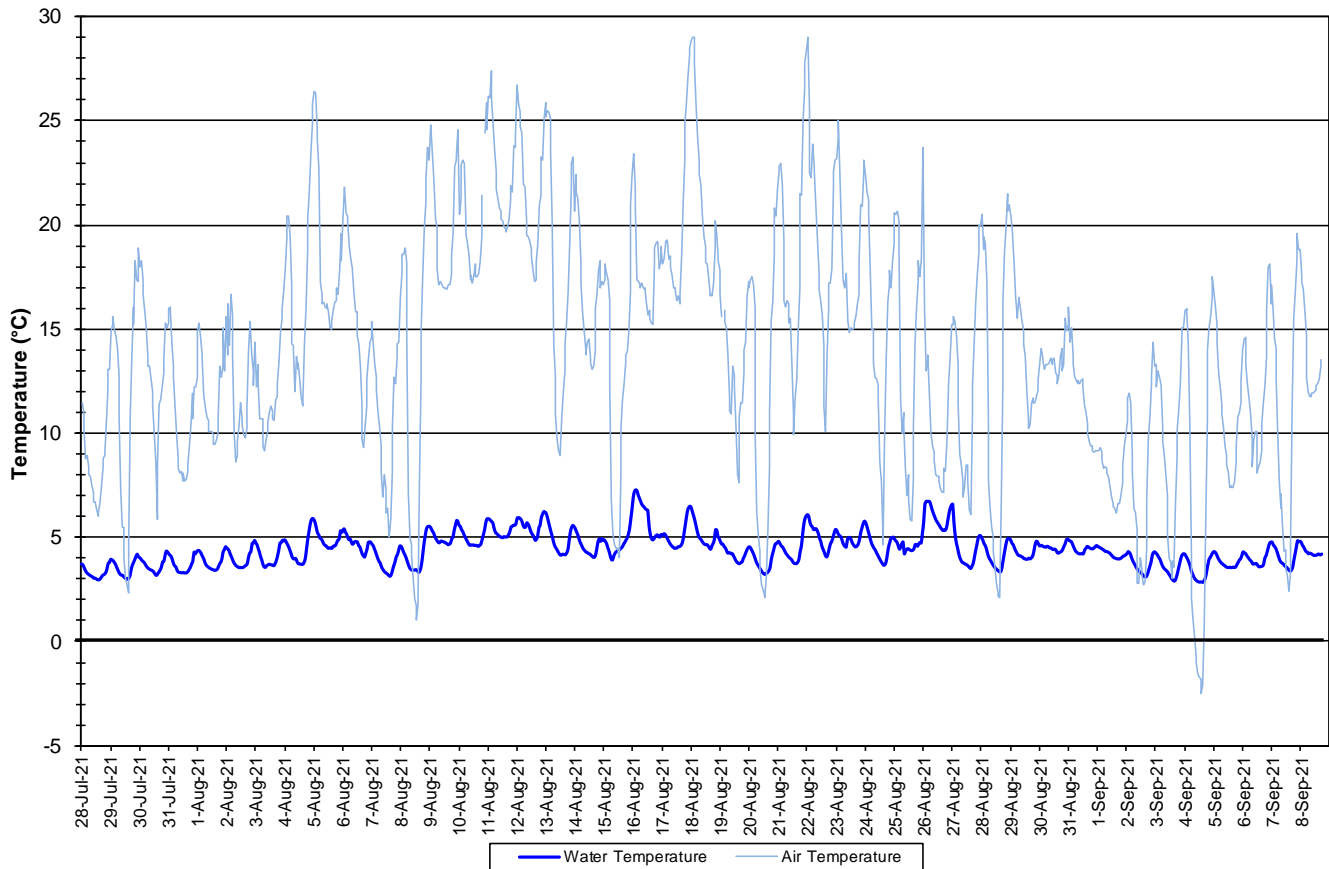


Figure 9: Water and Air Temperature – Dumbell Stream
(Weather data collected from climate station near Moosehead Lake)

- pH ranged from 7.32 to 7.99 pH units (Figure 10). The median pH was 7.84.
- All values are within the CCME Guidelines for the Protection of Aquatic Life (between 6.5 and 9 pH units). pH fluctuates slightly throughout the day and night.
- With the exception of water quantity data (Stage and Flow), all data used in the preparation of the graphs and subsequent discussion adhere to this stringent QA/QC protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

Water pH and Stage : Dumbell Stream above Dumbell Lake
July 28 to September 9, 2021

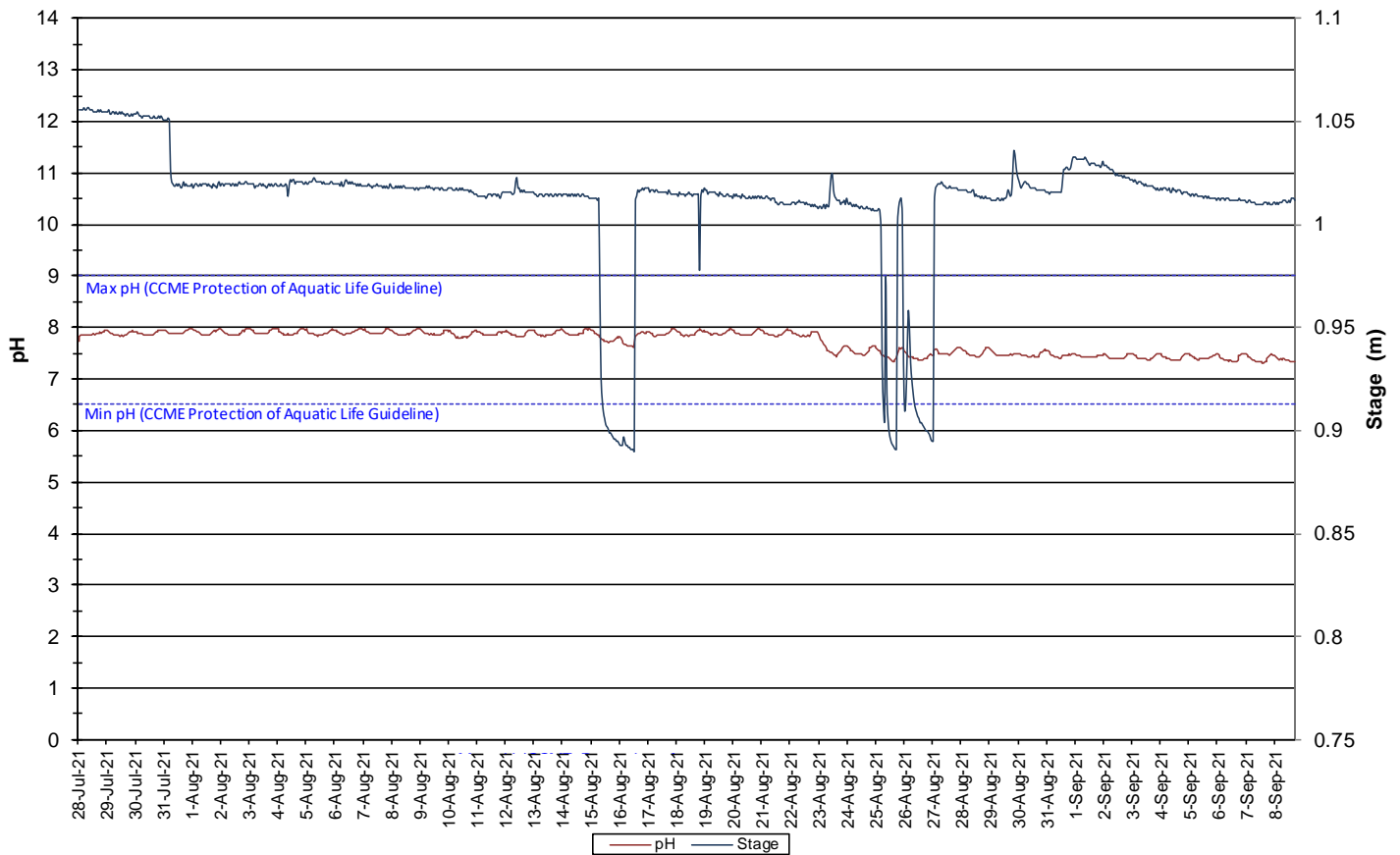


Figure 10: Water pH and Stage – Dumbell Stream

- Specific conductivity ranged from 99.7 to 183.7 $\mu\text{S}/\text{cm}$, throughout the deployment period (Figure 11).
- Specific conductivity fluctuates over the course of the deployment period, with periodic decreases noted during or after precipitation events as the system is temporarily diluted. Some of these occurrences are noted on the graph in red.
- With the exception of water quantity data (Stage and Flow), all data used in the preparation of the graphs and subsequent discussion adhere to this stringent QA/QC protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

**Specific Conductivity of Water and Precipitation: Dumbell Stream above Dumbell Lake
July 28 to September 9, 2021**

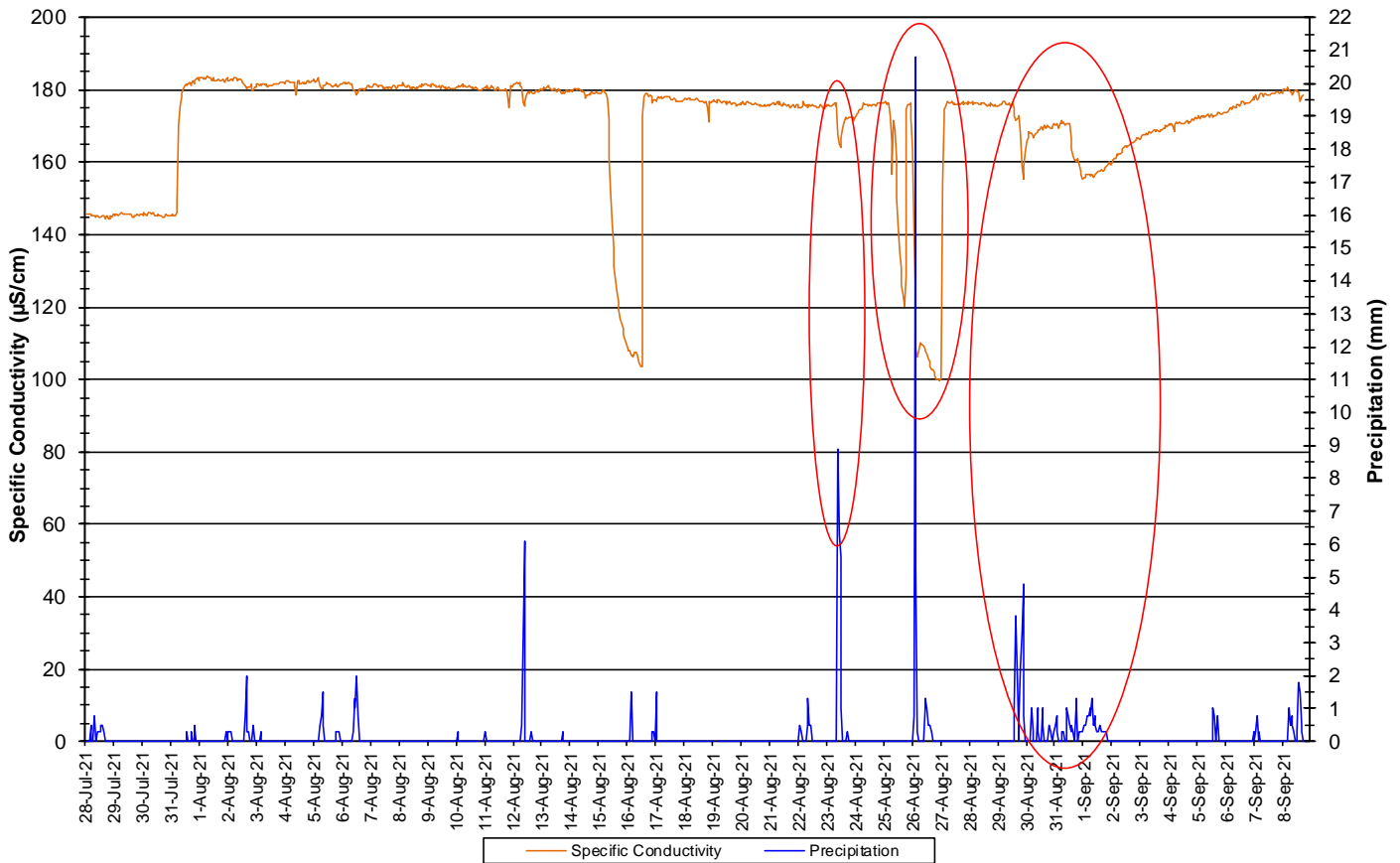


Figure 11: Specific conductivity and stage – Dumbell Stream

- The saturation of dissolved oxygen ranged from 92.9 to 97.1% while the dissolved oxygen content ranged from 11.25 to 12.88 mg/l with a median value of 12.37 mg/l (Figure 12).
- All values recorded at Dumbell Stream were above the CCME Guideline for the Protection of Aquatic Life for Cold Water Biota of Other Life Stages of 6.5 mg/l and the CCME Guideline for the Protection of Aquatic Life for Cold Water Biota of Early Life Stages of 9.5 mg/l. The guidelines are indicated in blue on Figure 12.
- Dissolved oxygen decreased slightly during the middle of the deployment period, showing an inverse relationship to water temperature. Dissolved oxygen fluctuated daily with decreases observed at night.

Dissolved Oxygen Concentration and Saturation : Dumbell Stream at Dumbell Lake
July 28 to September 9, 2021

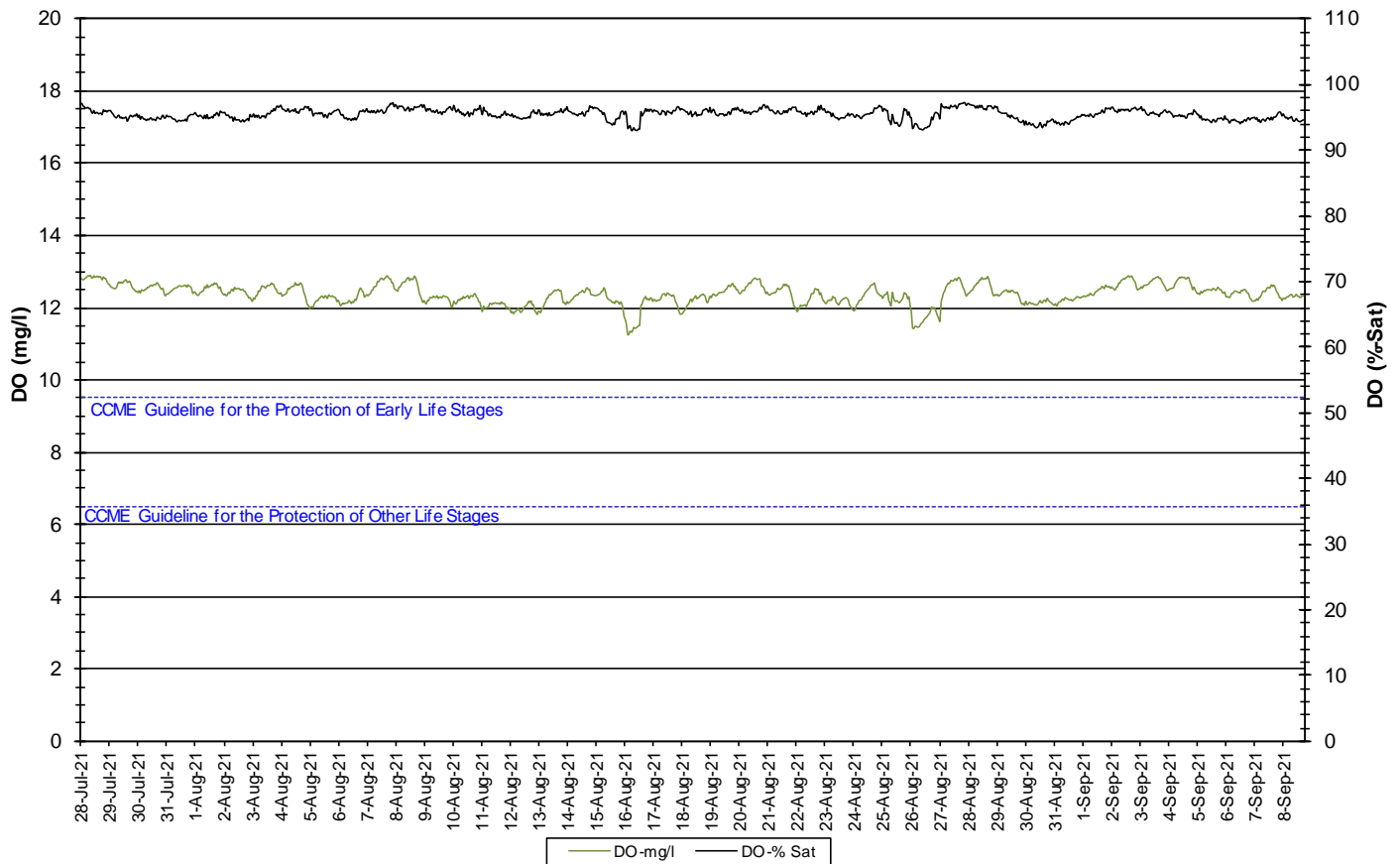
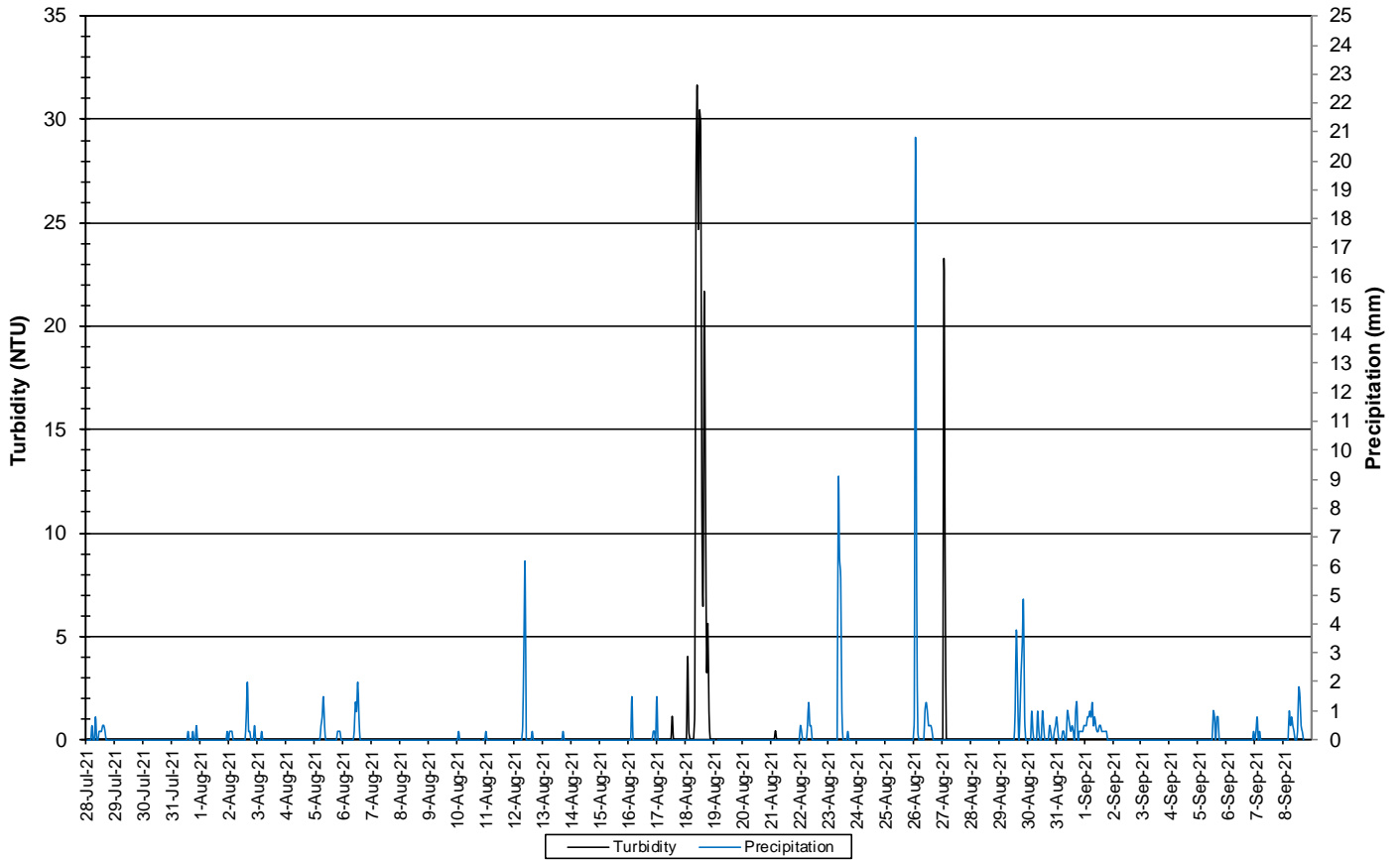


Figure 12: Dissolved oxygen – Dumbell Stream

- Turbidity values ranged from 0.0 NTU to 31.7 NTU, throughout the deployment period (Figure 13). The median value was 0.0 NTU.

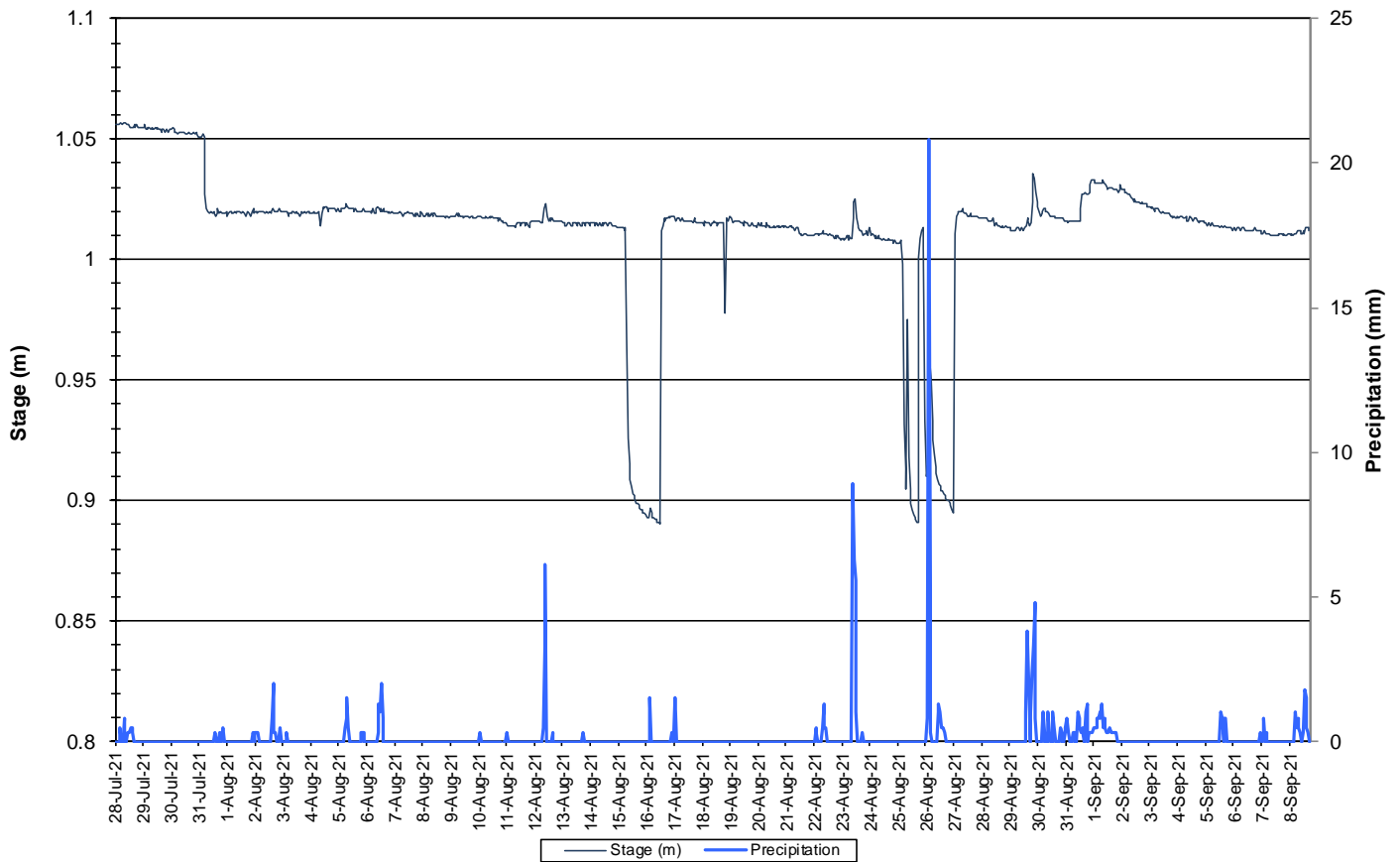
**Water Turbidity and Precipitation : Dumbell Stream above Dumbell Lake
July 28 to September 9, 2021**



**Figure 13: Turbidity and Precipitation – Dumbell Stream
(Weather data collected from climate station near Moosehead Lake)**

- Stage and precipitation are graphed below to show the relationship between rainfall and water level at Dumbell Stream (Figure 14).
- With the exception of water quantity data (Stage and Flow), all data used in the preparation of the graphs and subsequent discussion adhere to this stringent QA/QC protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

**Stage and Precipitation: Dumbell Stream
July 28 to September 9, 2021**

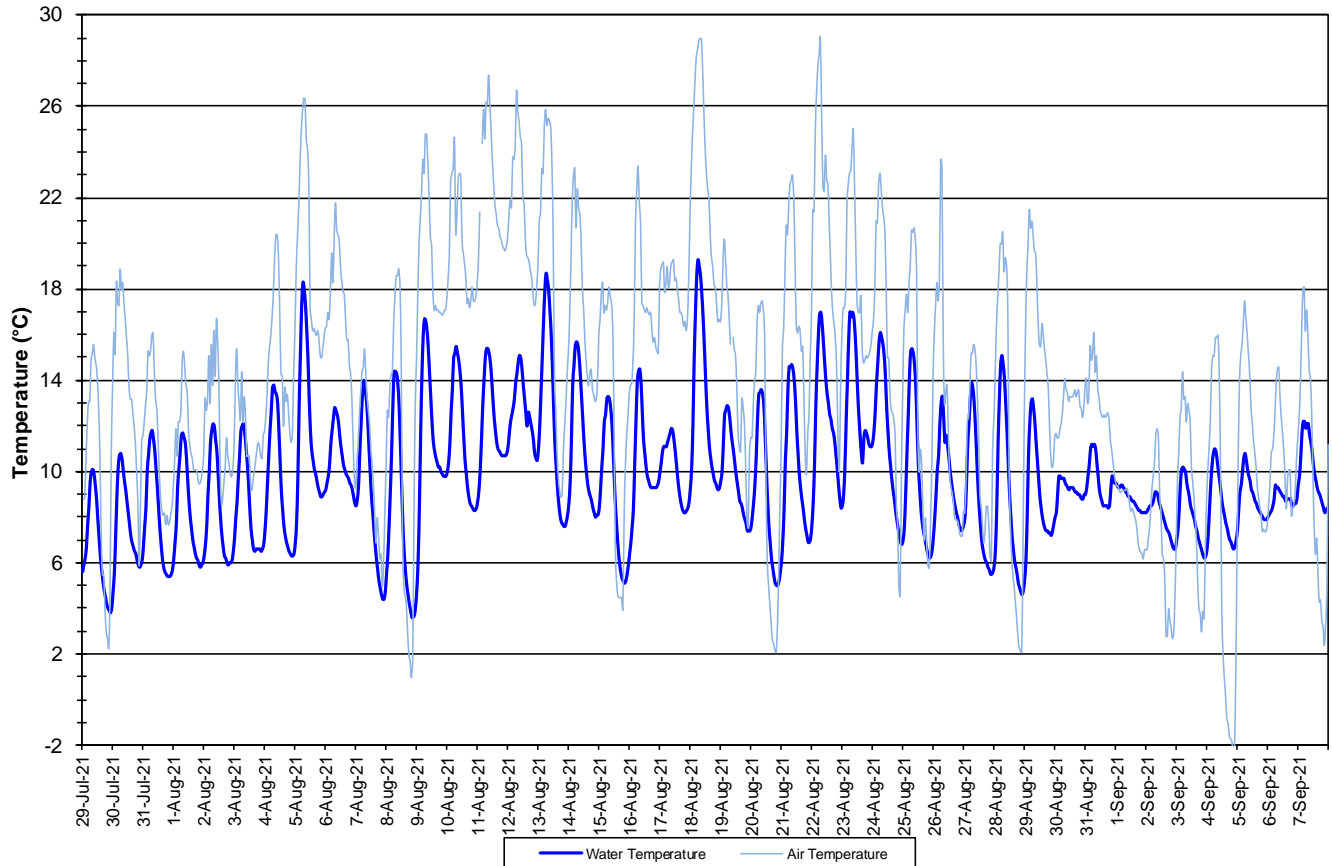


**Figure 14: Stage and Precipitation – Dumbell Stream
(Weather data collected from climate station near Moosehead Lake)**

Pumphouse Stream

- Water temperature ranged from 3.60 to 19.30°C during this deployment period (Figure 15).
- Water temperature increased after the first week of deployment, it then decreased at the end of August (Figure 15).

**Water and Air Temperature : Pumhouse Stream above Drum Lake
July 29 to September 8, 2021**



**Figure 15: Water and Air Temperature – Pumhouse Stream
(Weather data collected from climate station near Moosehead Lake)**

- pH ranged from 6.84 to 7.97 pH units (Figure 16). The median pH was 7.70.
- All values during the deployment are within the CCME Guidelines for the Protection of Aquatic Life (between 6.5 and 9 pH units). pH fluctuates slightly throughout the day and night and decreases after stage increases.
- With the exception of water quantity data (Stage and Flow), all data used in the preparation of the graphs and subsequent discussion adhere to this stringent QA/QC protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

**Water pH and Stage : Pumphouse Stream above Drum Lake
July 29 to September 8, 2021**

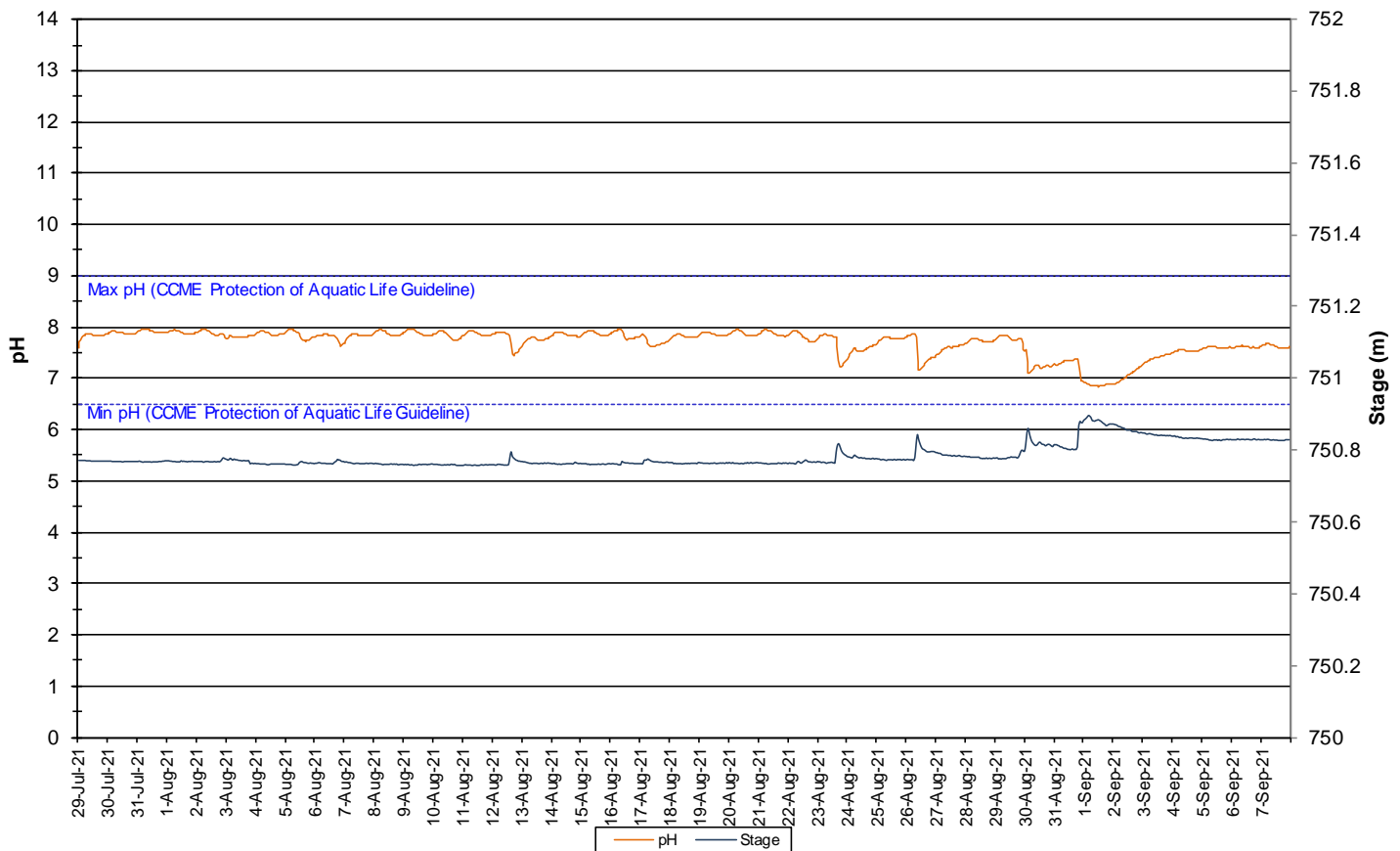
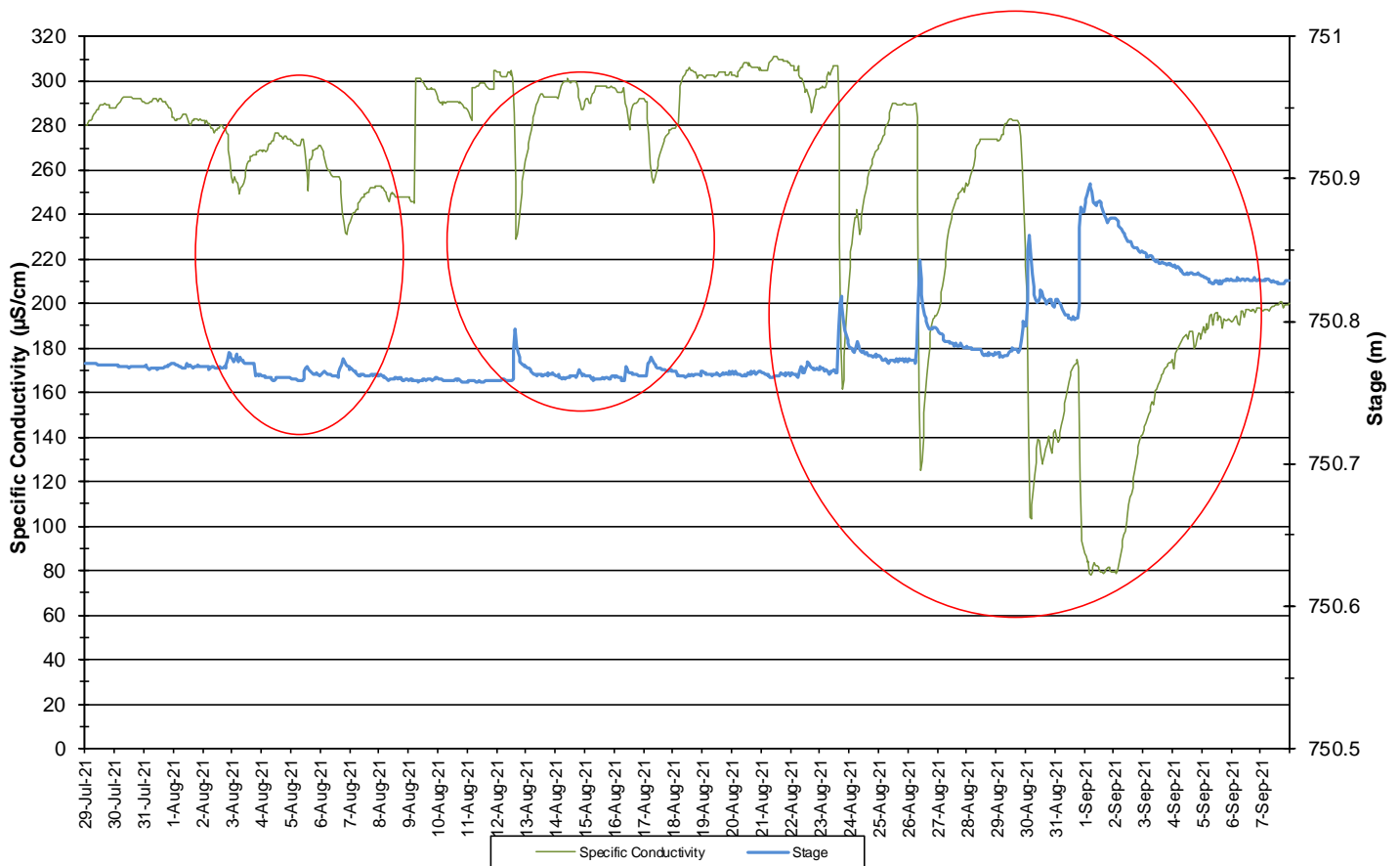


Figure 16: Water pH and Stage – Pumphouse Stream

- Specific conductivity ranged from 78.0 to 311.0 $\mu\text{S}/\text{cm}$, throughout the deployment period (Figure 17).
- The majority of decreases in specific conductivity correspond to increases in stage. As more water is added to the system from precipitation, the solids in the water are diluted, decreasing conductivity. Some correlations are identified on the graph in red.
- With the exception of water quantity data (Stage and Flow), all data used in the preparation of the graphs and subsequent discussion adhere to this stringent QA/QC protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

**Specific Conductivity of Water and Stage: Pumphouse Stream above Drum Lake
July 29 to September 8, 2021**



**Figure 17: Specific Conductivity and Stage – Pumphouse Stream
(Weather data collected from climate station near Moosehead Lake)**

- The saturation of dissolved oxygen ranged from 70.2 to 97.8% while the dissolved oxygen ranged from 7.60 to 11.04 mg/l with a median value of 9.47 mg/l (Figure 18).
- All values recorded at Pumphouse Stream were above the CCME Guideline for the Protection of Aquatic Life for Cold Water Biota of Other Life Stages of 6.5 mg/l. Over half of the values were above the CCME Guideline for the Protection of Aquatic Life for Cold Water Biota of Early Life Stages of 9.5 mg/l. The guidelines are indicated in blue on Figure 18.
- Dissolved oxygen decreased slightly during the middle of the deployment period, showing a natural inverse relationship to water temperature. Dissolved oxygen fluctuated daily with decreases observed at night.

Dissolved Oxygen Concentration and Saturation : Pumphouse Stream above Drum Lake
July 29 to September 8, 2021

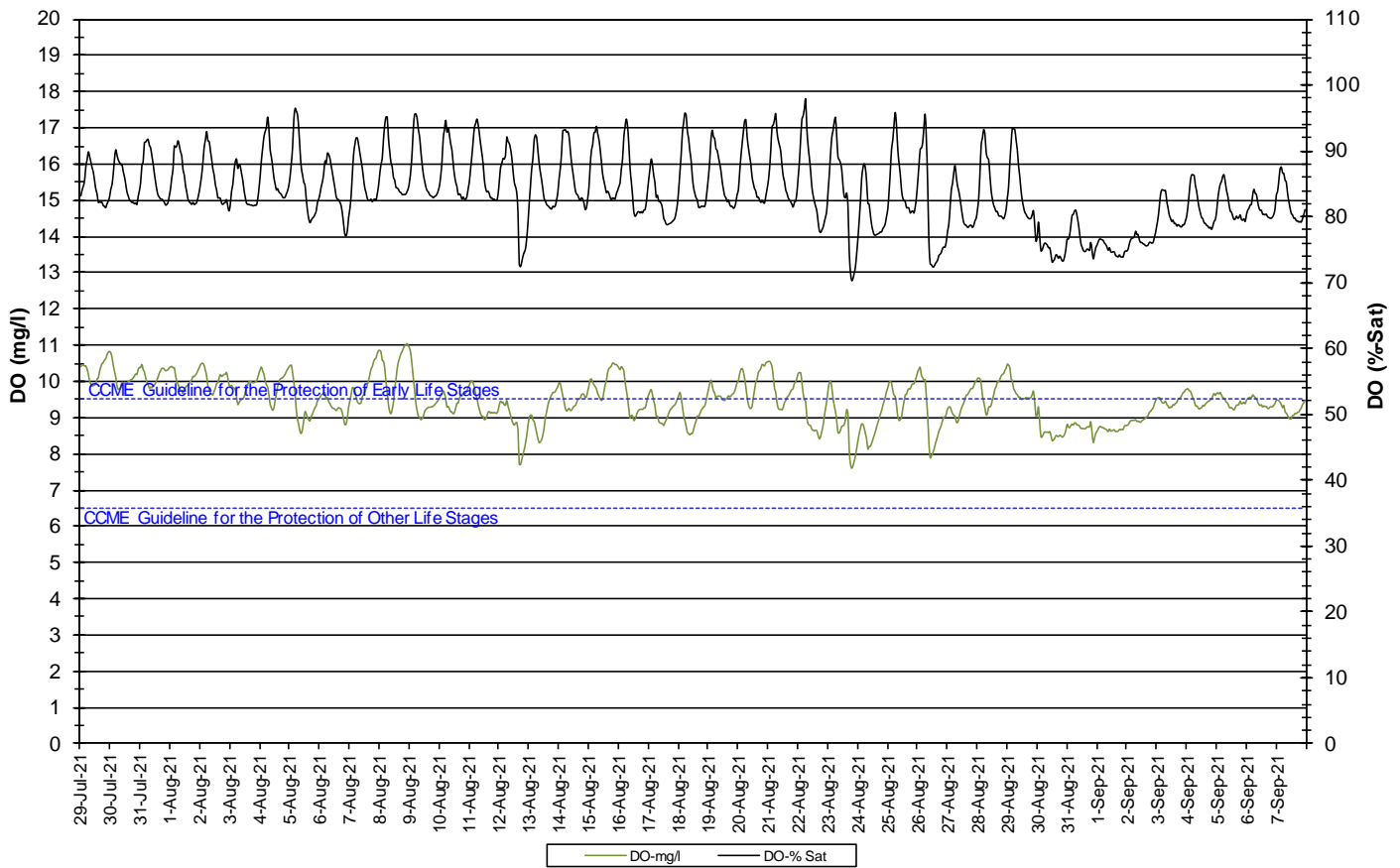
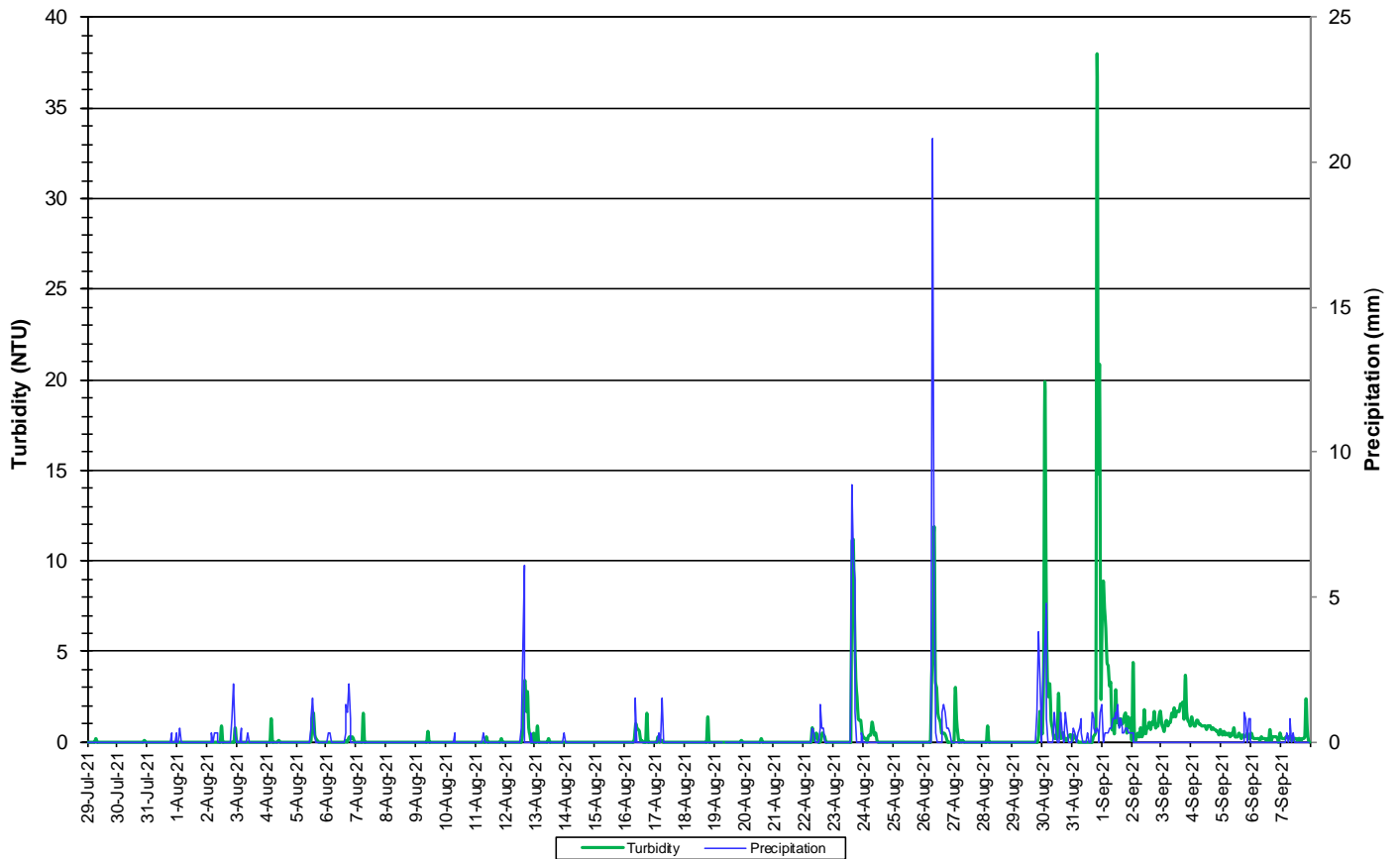


Figure 18: Dissolved Oxygen – Pumphouse Stream

- Turbidity values range from 0.0 to 38.0 NTU throughout the deployment period (Figure 19). The median value was 0.0 NTU.
- In some instances, turbidity spikes can be attributed to precipitation events.

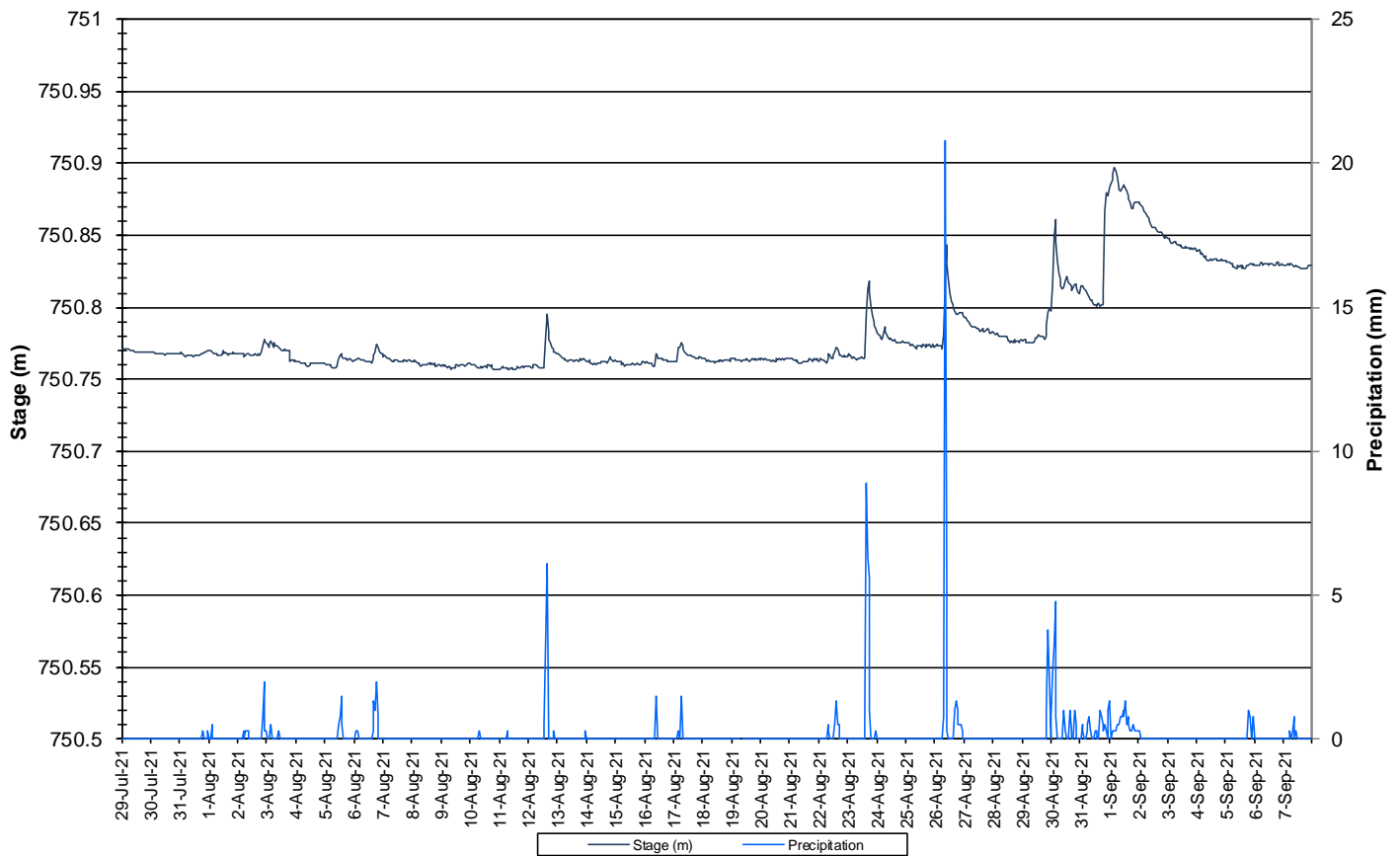
**Water Turbidity and Precipitation : Pumphouse Stream above Drum Lake
July 29 to September 8, 2021**



**Figure 19: Turbidity and Precipitation – Pumphouse Stream
(Weather data collected from climate station near Moosehead Lake)**

- Stage and precipitation are graphed below to show the relationship between rainfall and water level at Pumphouse Stream (Figure 20).
- Overall, stage increased over the course of this deployment period, with spikes noted after precipitation events.
- With the exception of water quantity data (Stage and Flow), all data used in the preparation of the graphs and subsequent discussion adhere to this stringent QA/QC protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request.

**Stage & Precipitation: Pumphouse Stream
July 29 to September 8, 2021**



**Figure 20: Stage and Precipitation – Pumphouse Stream
(Weather data collected from climate station near Moosehead Lake)**

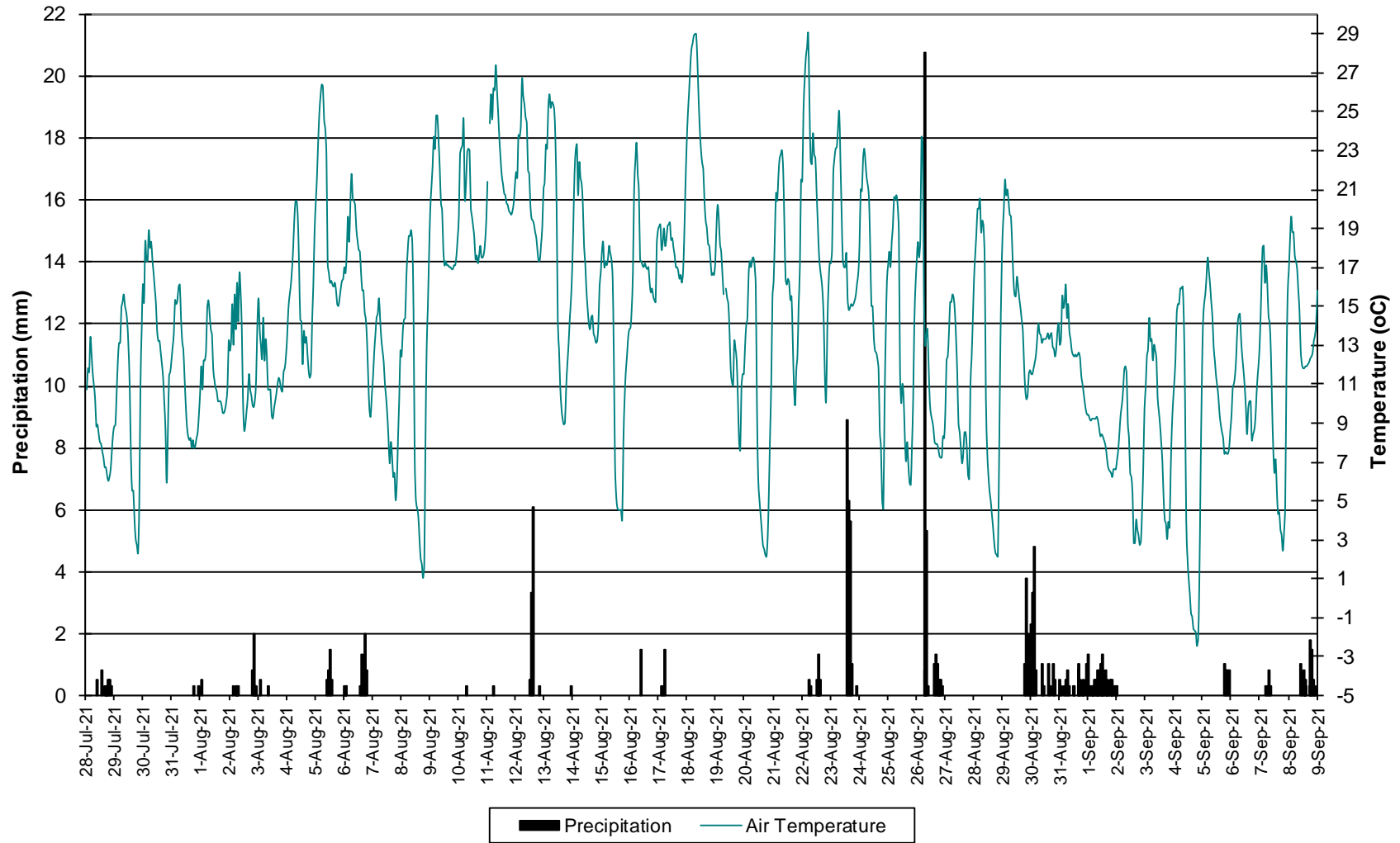
Conclusions

- Instruments were deployed on July 28th and 29th and removed by September 9th, 2021. This was the second deployment period for this season.
- In most cases, precipitation events or increase/decreases in water level could be used to explain the data fluctuations. Most values recorded were within ranges as suggested by the CCME Guidelines for the Protection of Aquatic Life for pH and dissolved oxygen.
- Water temperature corresponded with air temperature at all stations. Temperature typically ranged between 2.88 and 21.80°C at these stations.
- All of the pH values were within the recommended CCME Guidelines for the Protection of Aquatic Life. pH ranged between 6.84 and 8.44. Fluctuations were noted between day and night.
- Specific conductivity differed between the two Wabush Lake stations. This can be attributed to varying concentrations of iron ore tailings deposited between the stations. Specific conductivity ranged from 54.9 µs/cm to 109.0 µs/cm at the Wabush Lake stations, 99.7 to 183.7 µs/cm at Dumbell Stream and 78.0 to 311.0 µs/cm at Pumphouse Stream.
- At all four stations, all dissolved oxygen values were above the minimum CCME Guideline for the Protection of Aquatic Life for Cold Water Biota at Other Life Stages of 6.5 mg/L. When dissolved oxygen values are compared to the CCME Guideline for the Protection of Aquatic Life for Cold Water Biota at Early Life Stages of 9.5 mg/L, the majority of the values were below this guideline.
- At Pumphouse Pond, notable increases and decreases in parameters are related to precipitation. This is a small stream, thus more sensitive to increases in stage.
- Turbidity at Dolomite Road and Julienne Narrows ranged from 0.0 to 361.50 NTU.
- Turbidity at Dumbell Stream ranged from 0.4 to 31.7 NTU.
- Turbidity at Pumphouse Stream ranged from 0.0 to 38.0 NTU.
- At Julienne Narrows and Dolomite Road stage decreased until the end of August, it then increased.
- At Dumbell Stream, stage showed periodic increases after precipitation events. There were occasional decreases; these decreases may not be accurate.
- At Pumphouse Stream, stage generally increased over the course of this deployment period with periodic spikes after precipitation events.
- With the exception of of water quantity data (Stage and Flow), all data used in the preparation of the graphs and subsequent discussion adhere to this stringent QA/QC protocol. Water Survey of Canada is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request

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Appendix 1

Air Temperature and Precipitation: Moosehead Lake, NL July 28 to September 9, 2021



Appendix 2
QA/QC Grab Sample Results



BUREAU
VERITAS

Bureau Veritas Job #: C1U3257
Report Date: 2021/11/01

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

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
QYW369 JULIENNE NARROWS								
Sampling Date		2021/10/13 09:40						
Matrix		W						
Sample #		2021-6340-00-SI-SP						
Registration #		WS-S-0000						
RESULTS OF ANALYSES OF WATER								
Calculated Parameters								
Hardness (CaCO3)	-	54	1.0	mg/L	N/A	2021/10/21		7644904
Nitrate (N)	-	0.48	0.050	mg/L	N/A	2021/10/29		7644907
Total dissolved solids (calc., EC)	-	58	1.0	mg/L	N/A	2021/10/22		7645123
Inorganics								
Conductivity	-	100	1.0	uS/cm	N/A	2021/10/22	SHW	7653378
Chloride (Cl-)	-	1.7	1.0	mg/L	N/A	2021/10/25	FD	7655220
Bromide (Br-)	-	ND	1.0	mg/L	N/A	2021/10/25	FD	7655220
Sulphate (SO4)	-	4.9	1.0	mg/L	N/A	2021/10/25	FD	7655220
Total Alkalinity (Total as CaCO3)	-	50	5.0	mg/L	N/A	2021/11/01	EMT	7665907
Colour	-	7.3	5.0	TCU	N/A	2021/10/29	EMT	7665918
Dissolved Fluoride (F-)	-	ND	0.10	mg/L	N/A	2021/10/22	SHW	7653380
Total Kjeldahl Nitrogen (TKN)	-	ND	0.10	mg/L	2021/10/25	2021/10/25	MJ1	7658028
Nitrate + Nitrite (N)	-	0.48	0.050	mg/L	N/A	2021/10/29	EMT	7665922
Nitrite (N)	-	ND	0.010	mg/L	N/A	2021/10/29	EMT	7665927
Nitrogen (Ammonia Nitrogen)	-	ND	0.050	mg/L	N/A	2021/10/27	MCN	7662913
Dissolved Organic Carbon (C)	-	2.5	0.50	mg/L	N/A	2021/10/22	NGI	7653396
Total Organic Carbon (C)	-	2.4	0.50	mg/L	N/A	2021/10/22	NGI	7651040
pH	-	7.69		pH	N/A	2021/10/22	SHW	7653379
Total Phosphorus	-	ND	0.004	mg/L	2021/10/26	2021/10/27	SSV	7661349
Total Suspended Solids	-	ND	1.0	mg/L	2021/10/20	2021/10/25		7648151
Turbidity	-	0.62	0.10	NTU	N/A	2021/10/22	SHW	7653510
MERCURY BY COLD VAPOUR AA (WATER)								
Metals								
Total Mercury (Hg)	-	ND	0.000013	mg/L	2021/10/29	2021/10/29	NHU	7666442
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Aluminum (Al)	-	0.012	0.0050	mg/L	2021/10/20	2021/10/20	BAN	7647886
Total Antimony (Sb)	-	ND	0.0010	mg/L	2021/10/20	2021/10/20	BAN	7647886
Total Arsenic (As)	-	ND	0.0010	mg/L	2021/10/20	2021/10/20	BAN	7647886
Total Barium (Ba)	-	0.0015	0.0010	mg/L	2021/10/20	2021/10/20	BAN	7647886
Total Boron (B)	-	ND	0.050	mg/L	2021/10/20	2021/10/20	BAN	7647886
Total Cadmium (Cd)	-	ND	0.000010	mg/L	2021/10/20	2021/10/20	BAN	7647886
Total Calcium (Ca)	-	13	0.10	mg/L	2021/10/20	2021/10/20	BAN	7647886
Total Chromium (Cr)	-	ND	0.0010	mg/L	2021/10/20	2021/10/20	BAN	7647886
Total Copper (Cu)	-	ND	0.00050	mg/L	2021/10/20	2021/10/20	BAN	7647886
Total Iron (Fe)	-	ND	0.050	mg/L	2021/10/20	2021/10/20	BAN	7647886
Total Lead (Pb)	-	ND	0.00050	mg/L	2021/10/20	2021/10/20	BAN	7647886
Total Magnesium (Mg)	-	5.1	0.10	mg/L	2021/10/20	2021/10/20	BAN	7647886
Total Manganese (Mn)	-	0.0057	0.0020	mg/L	2021/10/20	2021/10/20	BAN	7647886
Total Nickel (Ni)	-	ND	0.0020	mg/L	2021/10/20	2021/10/20	BAN	7647886



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Bureau Veritas Job #: C1U3257
Report Date: 2021/11/01

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

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
QYW369 JULIENNE NARROWS								
Sampling Date 2021/10/13 09:40								
Matrix W								
Sample # 2021-6340-00-SI-SP								
Registration # WS-S-0000								
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Phosphorus (P)	-	ND	0.10	mg/L	2021/10/20	2021/10/20	BAN	7647886
Total Potassium (K)	-	1.2	0.10	mg/L	2021/10/20	2021/10/20	BAN	7647886
Total Selenium (Se)	-	ND	0.00050	mg/L	2021/10/20	2021/10/20	BAN	7647886
Total Sodium (Na)	-	1.4	0.10	mg/L	2021/10/20	2021/10/20	BAN	7647886
Total Strontium (Sr)	-	0.017	0.0020	mg/L	2021/10/20	2021/10/20	BAN	7647886
Total Uranium (U)	-	0.00011	0.00010	mg/L	2021/10/20	2021/10/20	BAN	7647886
Total Zinc (Zn)	-	ND	0.0050	mg/L	2021/10/20	2021/10/20	BAN	7647886



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BV Labs Job #: C1Q3045
Report Date: 2021/09/24

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

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
QQG176 DOLOMITE ROAD								
Sampling Date		2021/09/07 16:30						
Matrix		W						
Sample #		2021-6329-00-SI-SP						
RESULTS OF ANALYSES OF WATER								
Calculated Parameters								
Hardness (CaCO3)	-	28	1.0	mg/L	N/A	2021/09/16		7575341
Nitrate (N)	-	ND	0.050	mg/L	N/A	2021/09/21		7575348
Total dissolved solids (calc., EC)	-	35	1.0	mg/L	N/A	2021/09/20		7575560
Inorganics								
Conductivity	-	63	1.0	uS/cm	N/A	2021/09/20	SHW	7587028
Chloride (Cl-)	-	ND	1.0	mg/L	N/A	2021/09/16	FD	7580093
Bromide (Br-)	-	ND	1.0	mg/L	N/A	2021/09/16	FD	7580093
Sulphate (SO4)	-	2.0	1.0	mg/L	N/A	2021/09/16	FD	7580093
Total Alkalinity (Total as CaCO3)	-	29	5.0	mg/L	N/A	2021/09/20	EMT	7587072
Colour	-	16	5.0	TCU	N/A	2021/09/20	EMT	7587086
Dissolved Fluoride (F-)	-	ND	0.10	mg/L	N/A	2021/09/20	SHW	7587032
Total Kjeldahl Nitrogen (TKN)	-	ND	0.10	mg/L	2021/09/17	2021/09/20	MJ1	7584518
Nitrate + Nitrite (N)	-	ND	0.050	mg/L	N/A	2021/09/20	EMT	7587088
Nitrite (N)	-	ND	0.010	mg/L	N/A	2021/09/20	EMT	7587090
Nitrogen (Ammonia Nitrogen)	-	ND	0.050	mg/L	N/A	2021/09/17	EMT	7580777
Dissolved Organic Carbon (C)	-	3.6	0.50	mg/L	N/A	2021/09/22	NGI	7592572
Total Organic Carbon (C)	-	3.9	0.50	mg/L	N/A	2021/09/24	NGI	7595223
pH	-	7.64		pH	N/A	2021/09/20	SHW	7587030
Total Phosphorus	-	0.007	0.004	mg/L	2021/09/21	2021/09/23	SSV	7589902
Total Suspended Solids	-	2.2	1.0	mg/L	2021/09/14	2021/09/16	MKX	7575648
Turbidity	-	1.8	0.10	NTU	N/A	2021/09/17	SHW	7583522
MERCURY BY COLD VAPOUR AA (WATER)								
Metals								
Total Mercury (Hg)	-	ND	0.000013	mg/L	2021/09/23	2021/09/23	NHU	7590258
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Aluminum (Al)	-	0.015	0.0050	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Antimony (Sb)	-	ND	0.0010	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Arsenic (As)	-	ND	0.0010	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Barium (Ba)	-	0.0086	0.0010	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Boron (B)	-	ND	0.050	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Cadmium (Cd)	-	ND	0.000010	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Calcium (Ca)	-	6.7	0.10	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Chromium (Cr)	-	ND	0.0010	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Copper (Cu)	-	0.00066	0.00050	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Iron (Fe)	-	ND	0.050	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Lead (Pb)	-	ND	0.00050	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Magnesium (Mg)	-	2.8	0.10	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Manganese (Mn)	-	0.030	0.0020	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Nickel (Ni)	-	ND	0.0020	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Phosphorus (P)	-	ND	0.10	mg/L	2021/09/15	2021/09/15	BAN	7578466



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BV Labs Job #: C1Q3045
Report Date: 2021/09/24

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

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
QQG176 DOLOMITE ROAD								
Sampling Date 2021/09/07 16:30								
Matrix W								
Sample # 2021-6329-00-SI-SP								
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Potassium (K)	-	0.92	0.10	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Selenium (Se)	-	ND	0.00050	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Sodium (Na)	-	0.86	0.10	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Strontium (Sr)	-	0.014	0.0020	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Uranium (U)	-	ND	0.00010	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Zinc (Zn)	-	ND	0.0050	mg/L	2021/09/15	2021/09/15	BAN	7578466



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BV Labs Job #: C1Q3045
Report Date: 2021/09/24

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

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
QQG180 DUMBELL STREAM								
Sampling Date		2021/09/09 09:25						
Matrix		W						
Sample #		2021-6333-00-SI-SP						
RESULTS OF ANALYSES OF WATER								
Calculated Parameters								
Hardness (CaCO3)	-	79	1.0	mg/L	N/A	2021/09/16		7575341
Nitrate (N)	-	8.3	0.25	mg/L	N/A	2021/09/21		7575348
Total dissolved solids (calc., EC)	-	100	1.0	mg/L	N/A	2021/09/20		7575560
Inorganics								
Conductivity	-	180	1.0	uS/cm	N/A	2021/09/20	SHW	7587028
Chloride (Cl-)	-	2.5	1.0	mg/L	N/A	2021/09/16	FD	7580093
Bromide (Br-)	-	ND	1.0	mg/L	N/A	2021/09/16	FD	7580093
Sulphate (SO4)	-	5.1	1.0	mg/L	N/A	2021/09/16	FD	7580093
Total Alkalinity (Total as CaCO3)	-	46	5.0	mg/L	N/A	2021/09/20	EMT	7587138
Colour	-	ND	5.0	TCU	N/A	2021/09/20	EMT	7587149
Dissolved Fluoride (F-)	-	ND	0.10	mg/L	N/A	2021/09/20	SHW	7587032
Total Kjeldahl Nitrogen (TKN)	-	ND(1)	0.50	mg/L	2021/09/17	2021/09/20	MJ1	7584518
Nitrate + Nitrite (N)	-	8.3	0.25	mg/L	N/A	2021/09/20	EMT	7587151
Nitrite (N)	-	0.014	0.010	mg/L	N/A	2021/09/20	EMT	7587152
Nitrogen (Ammonia Nitrogen)	-	ND	0.050	mg/L	N/A	2021/09/20	EMT	7587173
Dissolved Organic Carbon (C)	-	0.52	0.50	mg/L	N/A	2021/09/24	NGI	7595221
Total Organic Carbon (C)	-	0.59	0.50	mg/L	N/A	2021/09/24	NGI	7595223
pH	-	7.76		pH	N/A	2021/09/20	SHW	7587030
Total Phosphorus	-	ND	0.004	mg/L	2021/09/21	2021/09/23	SSV	7589902
Total Suspended Solids	-	ND	1.0	mg/L	2021/09/16	2021/09/17	MKX	7581578
Turbidity	-	0.15	0.10	NTU	N/A	2021/09/17	SHW	7583536
MERCURY BY COLD VAPOUR AA (WATER)								
Metals								
Total Mercury (Hg)	-	ND	0.000013	mg/L	2021/09/23	2021/09/23	NHU	7590258
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Aluminum (Al)	-	0.0059	0.0050	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Antimony (Sb)	-	ND	0.0010	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Arsenic (As)	-	ND	0.0010	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Barium (Ba)	-	0.0034	0.0010	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Boron (B)	-	ND	0.050	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Cadmium (Cd)	-	ND	0.000010	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Calcium (Ca)	-	18	0.10	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Chromium (Cr)	-	ND	0.0010	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Copper (Cu)	-	ND	0.00050	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Iron (Fe)	-	ND	0.050	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Lead (Pb)	-	ND	0.00050	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Magnesium (Mg)	-	8.0	0.10	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Manganese (Mn)	-	ND	0.0020	mg/L	2021/09/15	2021/09/15	BAN	7578466

(1) Due to a high concentration of NOx, the sample required dilution. The detection limit was adjusted accordingly.



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BV Labs Job #: C1Q3045
Report Date: 2021/09/24

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

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
QQG180 DUMBELL STREAM								
Sampling Date 2021/09/09 09:25								
Matrix W								
Sample # 2021-6333-00-SI-SP								
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Nickel (Ni)	-	ND	0.0020	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Phosphorus (P)	-	ND	0.10	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Potassium (K)	-	1.0	0.10	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Selenium (Se)	-	ND	0.00050	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Sodium (Na)	-	0.75	0.10	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Strontium (Sr)	-	0.021	0.0020	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Uranium (U)	-	ND	0.00010	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Zinc (Zn)	-	ND	0.0050	mg/L	2021/09/15	2021/09/15	BAN	7578466



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BV Labs Job #: C1Q3045
Report Date: 2021/09/24

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

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
QQG177 PUMPHOUSE STREAM								
Sampling Date		2021/09/08 09:50						
Matrix		W						
Sample #		2021-6330-00-SI-SP						
RESULTS OF ANALYSES OF WATER								
Calculated Parameters								
Hardness (CaCO3)	-	100	1.0	mg/L	N/A	2021/09/16		7575341
Nitrate (N)	-	2.5	0.25	mg/L	N/A	2021/09/21		7575348
Total dissolved solids (calc., EC)	-	110	1.0	mg/L	N/A	2021/09/20		7575560
Inorganics								
Conductivity	-	200	1.0	uS/cm	N/A	2021/09/20	SHW	7587028
Chloride (Cl-)	-	ND	1.0	mg/L	N/A	2021/09/16	FD	7580093
Bromide (Br-)	-	ND	1.0	mg/L	N/A	2021/09/16	FD	7580093
Sulphate (SO4)	-	12	1.0	mg/L	N/A	2021/09/16	FD	7580093
Total Alkalinity (Total as CaCO3)	-	87	5.0	mg/L	N/A	2021/09/20	EMT	7587138
Colour	-	12	5.0	TCU	N/A	2021/09/20	EMT	7587149
Dissolved Fluoride (F-)	-	ND	0.10	mg/L	N/A	2021/09/20	SHW	7587032
Total Kjeldahl Nitrogen (TKN)	-	ND	0.10	mg/L	2021/09/17	2021/09/20	MJ1	7584518
Nitrate + Nitrite (N)	-	2.6	0.25	mg/L	N/A	2021/09/20	EMT	7587151
Nitrite (N)	-	0.013	0.010	mg/L	N/A	2021/09/20	EMT	7587152
Nitrogen (Ammonia Nitrogen)	-	ND	0.050	mg/L	N/A	2021/09/20	EMT	7587173
Dissolved Organic Carbon (C)	-	2.6	0.50	mg/L	N/A	2021/09/24	NGI	7595221
Total Organic Carbon (C)	-	2.9	0.50	mg/L	N/A	2021/09/24	NGI	7595223
pH	-	7.89		pH	N/A	2021/09/20	SHW	7587030
Total Phosphorus	-	0.008	0.004	mg/L	2021/09/21	2021/09/23	SSV	7589902
Total Suspended Solids	-	4.0	1.0	mg/L	2021/09/15	2021/09/18	BBD	7578467
Turbidity	-	2.0	0.10	NTU	N/A	2021/09/17	SHW	7583522
MERCURY BY COLD VAPOUR AA (WATER)								
Metals								
Total Mercury (Hg)	-	ND	0.000013	mg/L	2021/09/23	2021/09/23	NHU	7590258
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Aluminum (Al)	-	0.054	0.0050	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Antimony (Sb)	-	ND	0.0010	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Arsenic (As)	-	ND	0.0010	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Barium (Ba)	-	0.013	0.0010	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Boron (B)	-	ND	0.050	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Cadmium (Cd)	-	ND	0.000010	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Calcium (Ca)	-	25	0.10	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Chromium (Cr)	-	ND	0.0010	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Copper (Cu)	-	ND	0.00050	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Iron (Fe)	-	0.17	0.050	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Lead (Pb)	-	ND	0.00050	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Magnesium (Mg)	-	9.6	0.10	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Manganese (Mn)	-	0.043	0.0020	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Nickel (Ni)	-	ND	0.0020	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Phosphorus (P)	-	ND	0.10	mg/L	2021/09/15	2021/09/15	BAN	7578466



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BV Labs Job #: C1Q3045
Report Date: 2021/09/24

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

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
QQG177 PUMPHOUSE STREAM								
Sampling Date 2021/09/08 09:50								
Matrix W								
Sample # 2021-6330-00-SI-SP								
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Potassium (K)	-	1.6	0.10	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Selenium (Se)	-	ND	0.00050	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Sodium (Na)	-	0.58	0.10	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Strontium (Sr)	-	0.024	0.0020	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Uranium (U)	-	0.00019	0.00010	mg/L	2021/09/15	2021/09/15	BAN	7578466
Total Zinc (Zn)	-	0.0075	0.0050	mg/L	2021/09/15	2021/09/15	BAN	7578466