



Real-Time Water Quality Deployment Report

Iron Ore Company of Canada
Labrador West Network

July 17 to
August 28, 2019



Government of Newfoundland & Labrador
Department of Municipal Affairs and
Environment
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.
- Between July 16th and 17th, real-time water quality monitoring instruments were deployed at the four IOC stations. The instruments were deployed for a period of 43 days at Julienne Narrows, 41 days at Dumbell Stream and Pumphouse Stream and 40 days at Dolomite Road. The instruments were removed between August 26th and 28th.
- There is no water quality data for this period for the Dolomite Road station. Normally, there are two backups of the data. One is with the data logger on site and the other is the internal log file in the instrument. In this case, data was not recorded on the logger due to a cable issue and the internal log file was lost during a computer upgrade. The cable was replaced at the station to ensure the station records and transmits the data. Also, steps have been taken to ensure that log files are not solely located in one location.

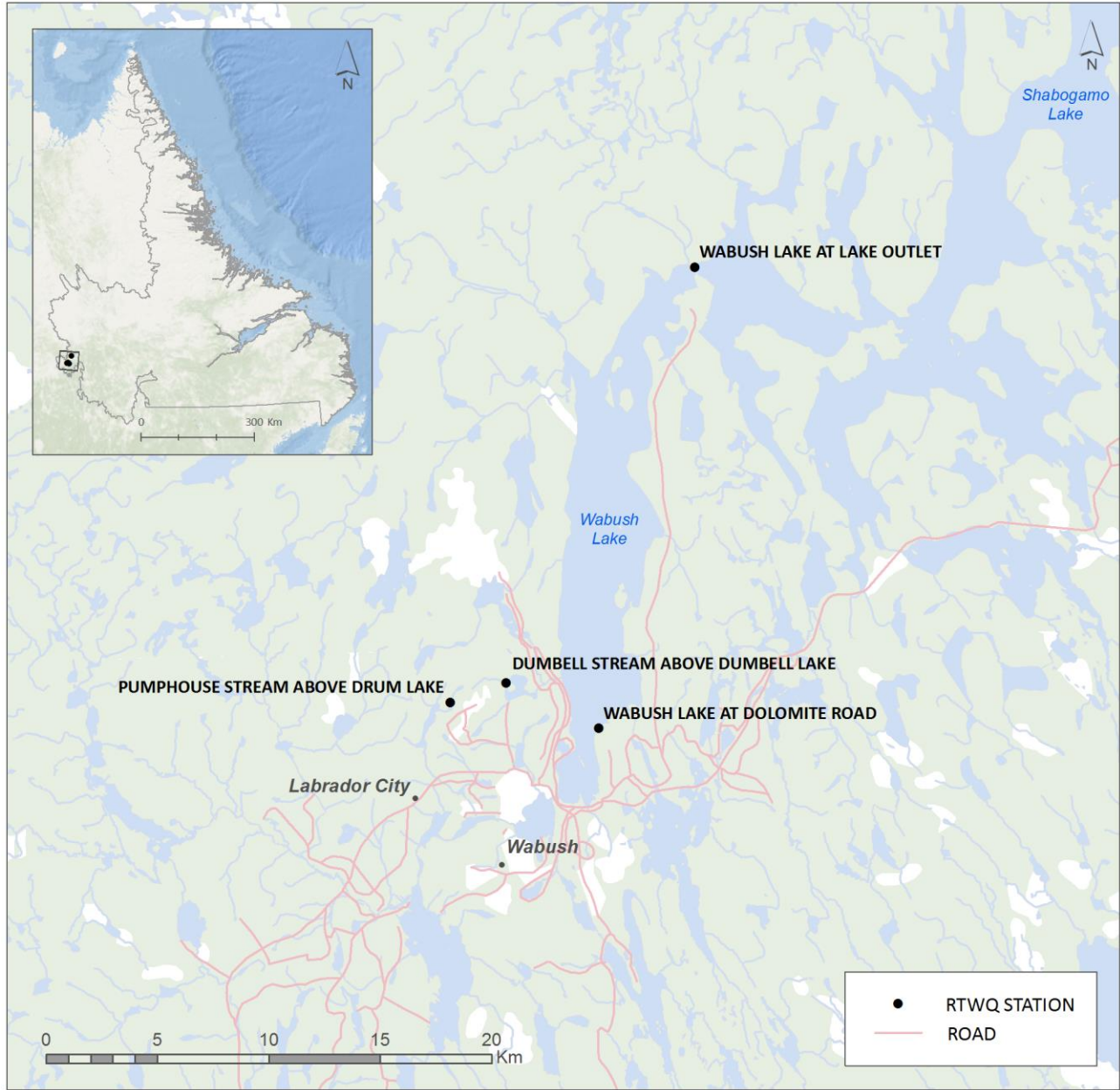


Figure 1: RTWQ Monitoring Stations in Labrador West

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 dependant, 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 16-17 and August 26-28, 2019 are summarized in Table 2.

Table 2: QA/QC comparison rankings for IOC stations between July 16-17 and August 26-28, 2019.

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Dolomite Road	July 17, 2019	Deployment	Excellent	Excellent	Excellent	Fair	Excellent
	Aug 26, 2019	Removal	Good	Fair	Excellent	Fair	Excellent
Julienne Narrows	July 16, 2019	Deployment	Good	Good	Excellent	Good	Good
	Aug 28, 2019	Removal	Good	Poor	Excellent	Excellent	Excellent
Dumbell Stream	July 17, 2019	Deployment	Excellent	Good	Excellent	Good	Excellent
	Aug 27, 2019	Removal	Excellent	Good	Excellent	Excellent	Excellent
Pumphouse Stream	July 17, 2019	Deployment	Good	Good	Excellent	Fair	Poor
	Aug 27, 2019	Removal	Good	Good	Excellent	Fair	Poor

▪ **Dolomite Road**

At deployment, all parameters with the exception of dissolved oxygen ranked ‘excellent’. Dissolved oxygen ranked ‘fair’. The field instrument read a value of 9.81 mg/l, while the QA/QC instrument read a value of 9.15 mg/l.

At removal, temperature, conductivity and turbidity ranked either ‘excellent’ or ‘good’. pH ranked ‘fair’. The field instrument read a value of 7.41, while the QA/QC instrument read a value of 7.93. Dissolved oxygen ranked ‘fair’. The field instrument read a value of 10.03 mg/l, while the QA/QC instrument read a value of 9.52 mg/l.

▪ **Julienne Narrows**

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

At removal, all parameters with the exception of pH ranked either ‘excellent’ or ‘good’. pH ranked ‘poor’. The field instrument read a value of 7.58, while the QA/QC sonde read a value of 8.75.

▪ **Dumbell Stream**

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

▪ **Pumphouse Stream**

At deployment, all parameters with the exception of dissolved oxygen and turbidity ranked either ‘good’ or ‘excellent’. Dissolved oxygen ranked ‘fair’. The field instrument read a value of 8.62 mg/l, while the QA/QC instrument read a value of 8.10 mg/l. Turbidity ranked ‘poor’. The field instrument read a value of 13.9 NTU, while the QA/QC read a value of 2.5 NTU.

At removal, all parameters with the exception of dissolved oxygen and turbidity ranked either ‘good’ or ‘excellent’. Dissolved oxygen ranked ‘fair’. The field instrument read a value of 9.72 mg/l, while the QA/QC instrument read a value of 9.07 mg/l. Turbidity ranked ‘poor’. The field instrument read a value of 12.8 NTU, while the QA/QC read a value of 0.0 NTU.

- 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.

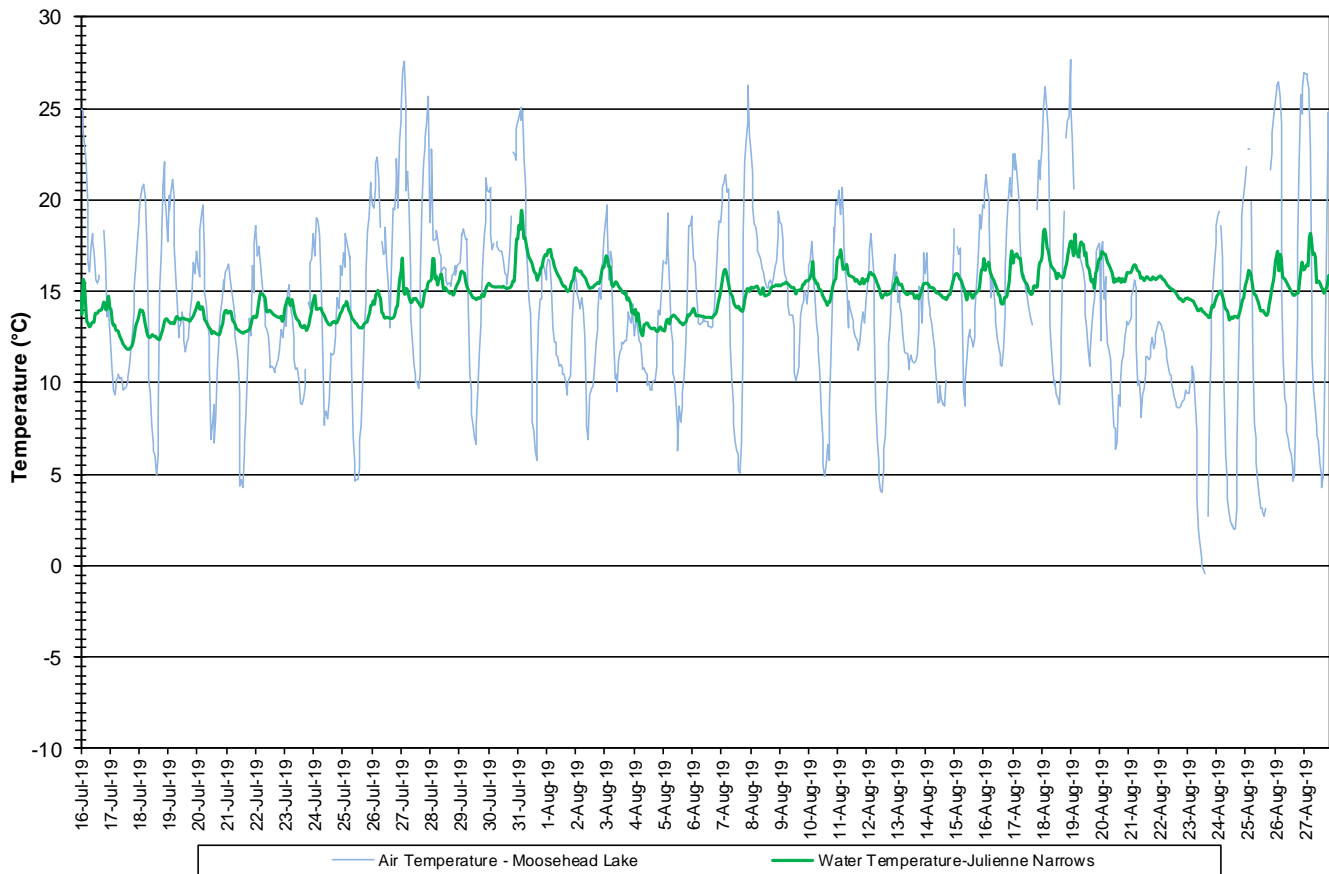
Data Interpretation

- The following graphs and discussion illustrate water quality-related events from June 16-17 to August 26-28, 2019 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 11.87 to 19.43°C at Julienne Narrows during this deployment period (Figure 2).
- Water temperature increased during this deployment period with occasional decreases, which corresponds with the ambient air temperature during this time (Figure 2).

**Water and Air Temperature : Julienne Narrows
July 16 to August 28, 2019**



**Figure 2: Water and Air Temperature – Julienne Narrows
(Weather data collected from climate station near Moosehead Lake)**

- pH ranges from 7.3 to 7.83 pH units at Julienne Narrows throughout the deployment period (Figure 3). The median pH is 7.52 units.
- 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.
- 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: Julienne Narrows
July 16 to August 28, 2019**

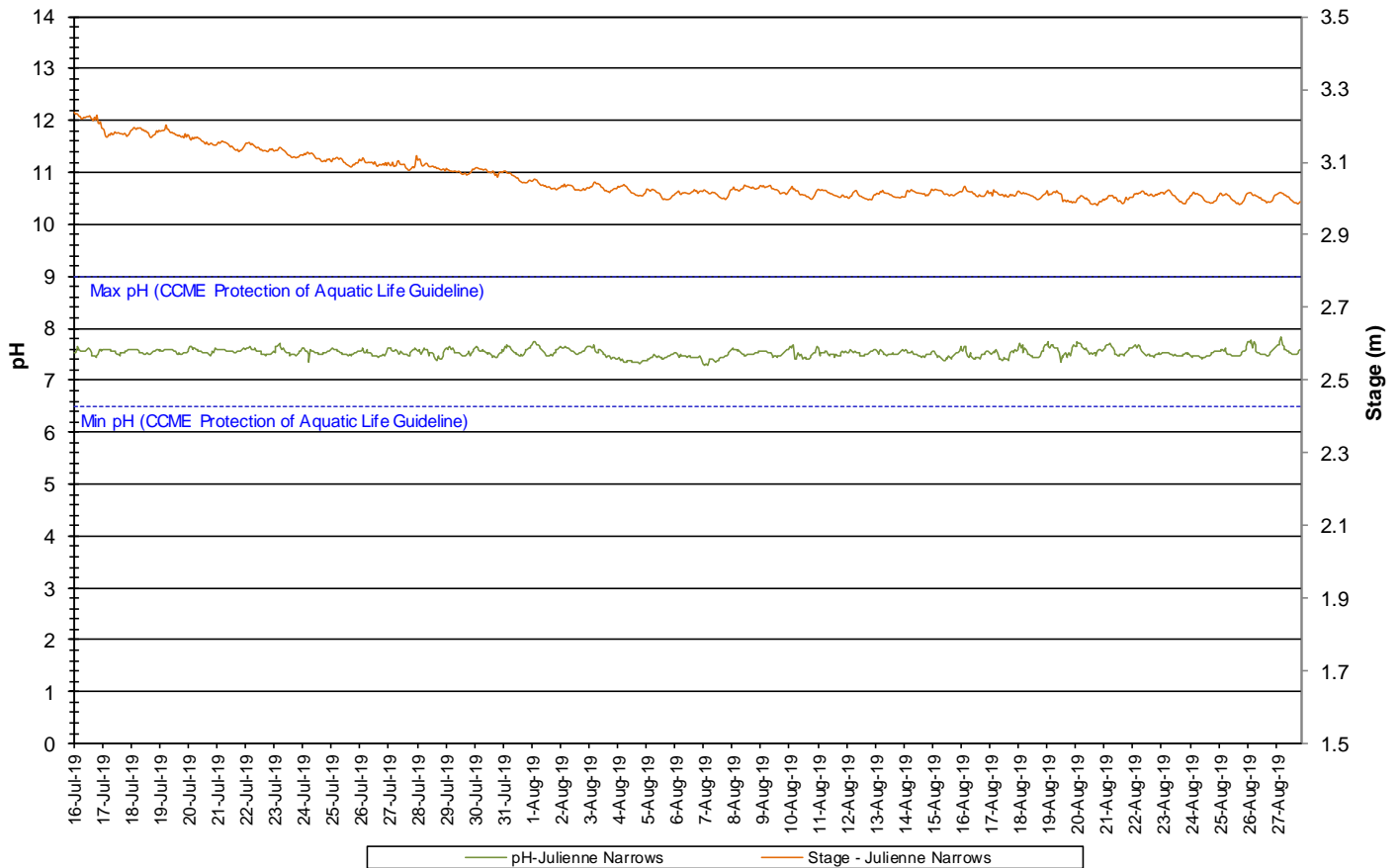


Figure 3: Water pH and Stage– Julienne Narrows

- Specific conductivity ranged from 71.0 to 104.0 $\mu\text{S}/\text{cm}$ 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.
- 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: Julienne Narrows
July 16 to August 28, 2019**

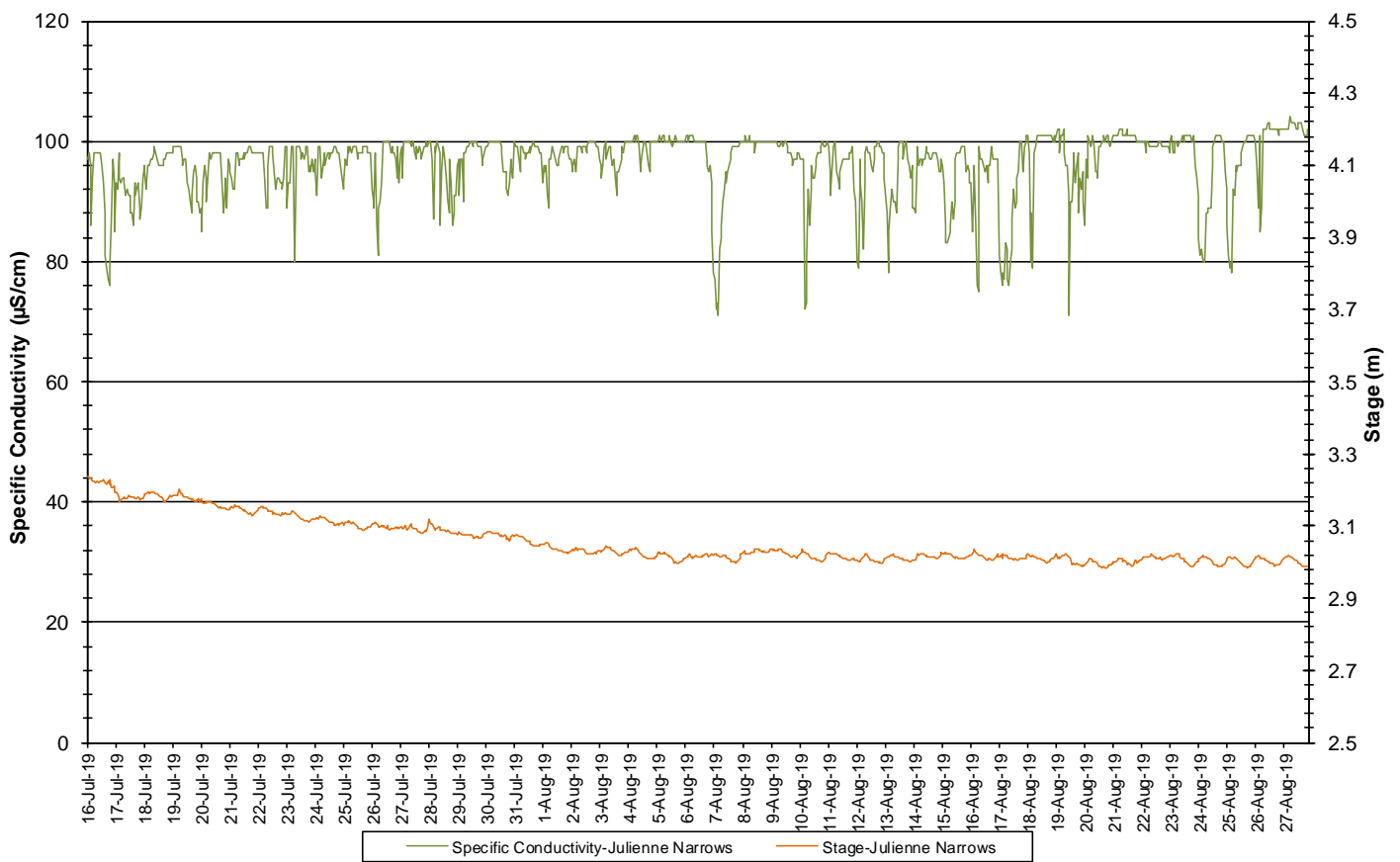


Figure 4: Specific Conductivity and Stage – Julienne Narrows

- At the Julienne Narrows station, the saturation of dissolved oxygen ranged from 85.9 to 104.5% while the dissolved oxygen content ranged from 8.56 to 10.12 mg/l with a median value of 9.36 mg/l (Figure 5).
- All values recorded at Julienne Narrows were above the CCME Guideline for the Protection of Aquatic Life for Cold Water Biota of Other Life Stages of 6.5 mg/l. The majority of values 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 fluctuated daily with decreases observed at night.

Dissolved Oxygen and Percent Saturation : Julienne Narrows
July 16 to August 28, 2019

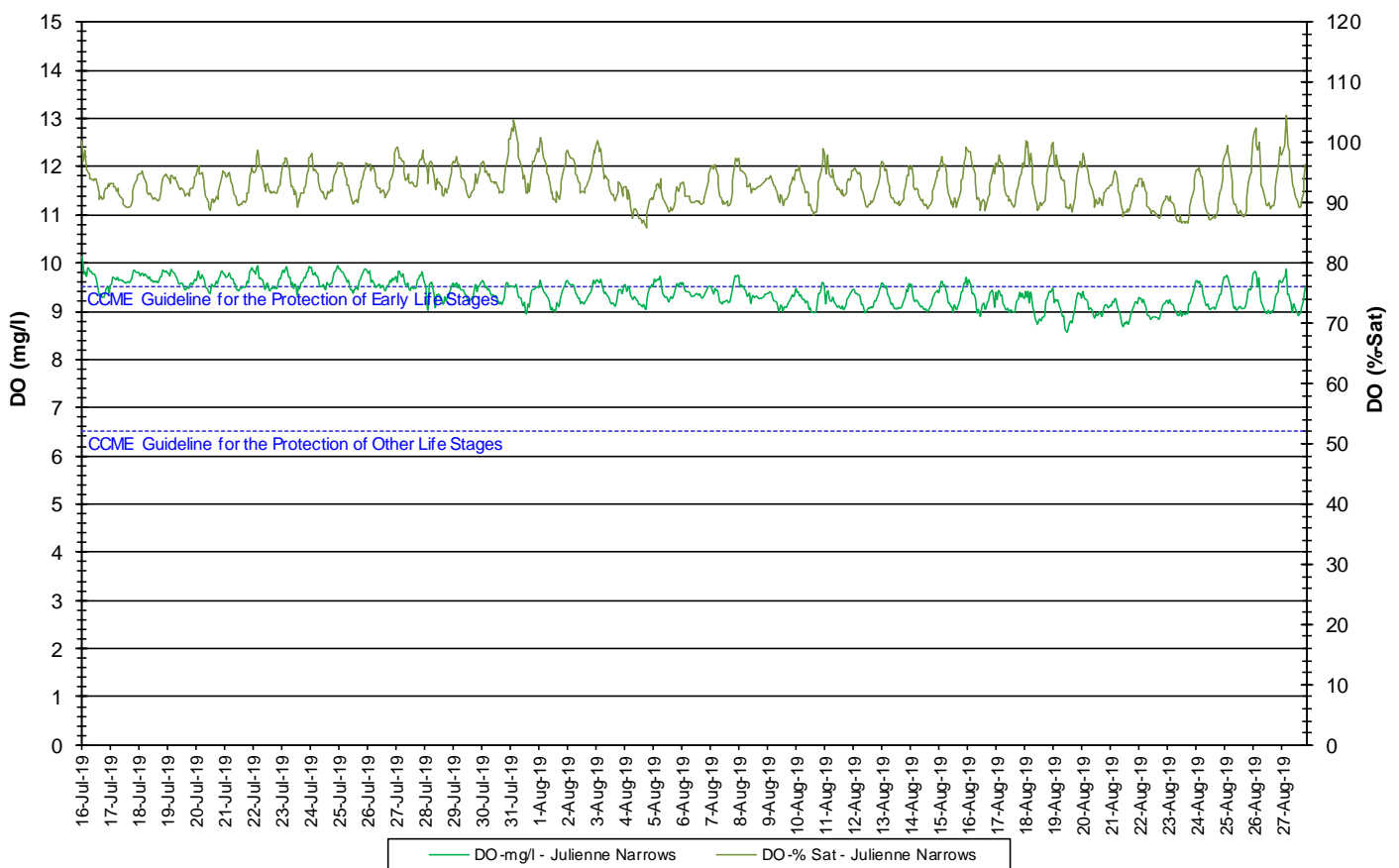
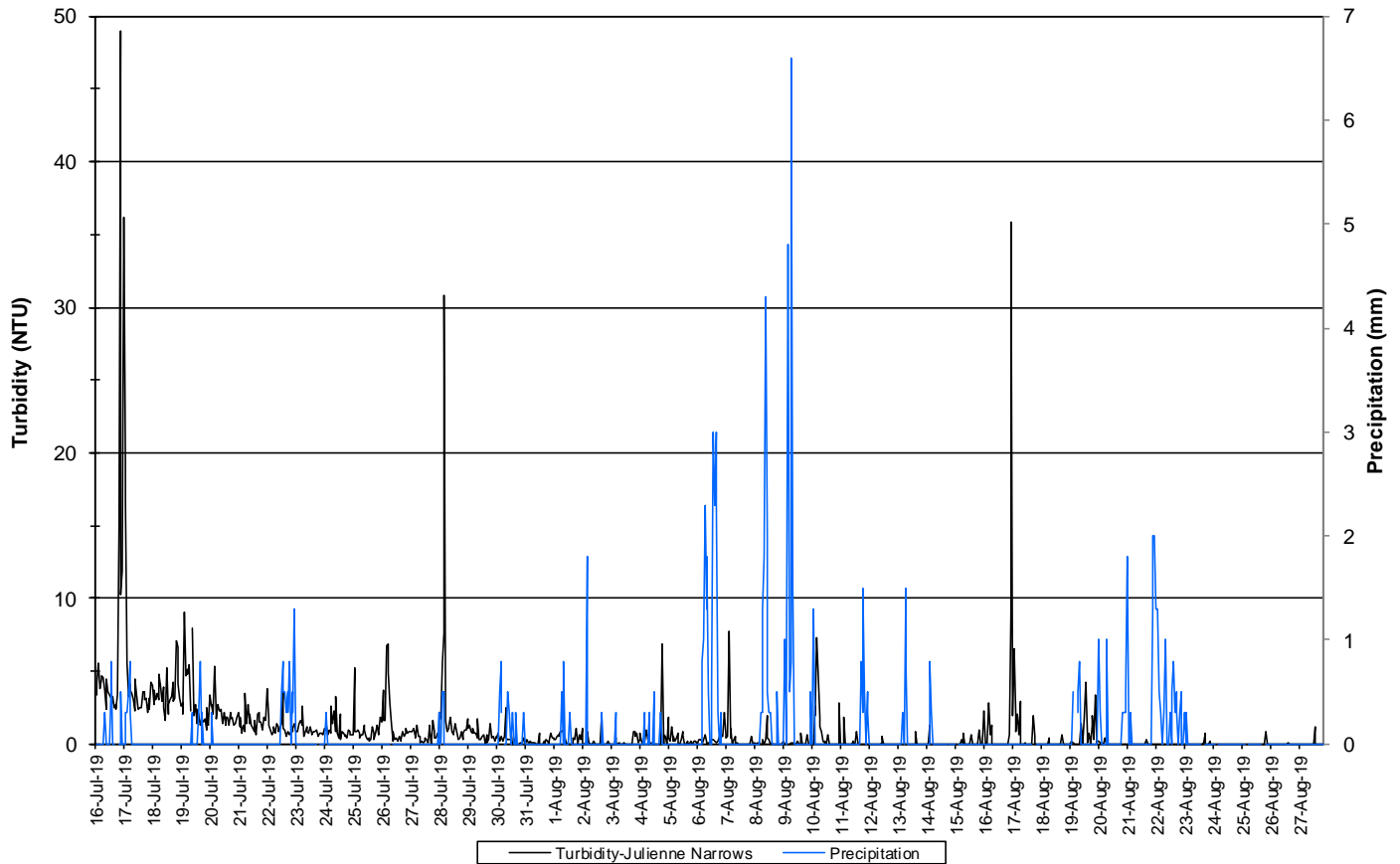


Figure 5: Dissolved Oxygen and Percent Saturation – Julienne Narrows

- At the Julienne Narrows station, turbidity values range from 0.0 to 49.0 NTU throughout the deployment period (Figure 6). The median value was 0.1 NTU.
- In some instances, turbidity spikes can be attributed to precipitation events.

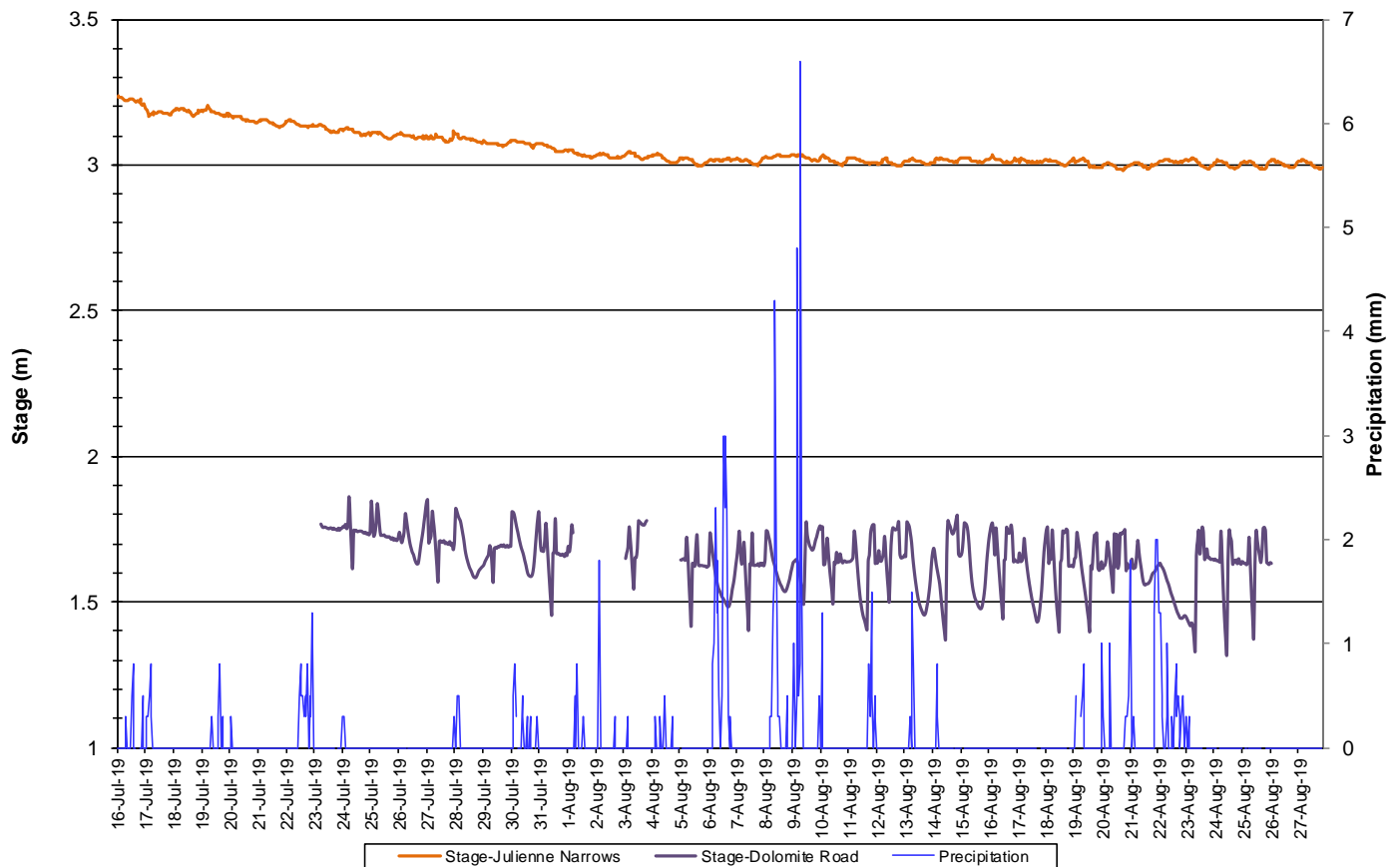
**Water Turbidity and Precipitation: Julienne Narrows
July 16 to August 28, 2019**



**Figure 6: Turbidity and Precipitation – Julienne Narrows
(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 7).
- Stage decreased throughout the deployment period at Julienne Narrows. There is a portion of data missing from Dolomite Road. Stage decreased slightly and then fluctuated within a small range at this station.
- 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 16 to August 28, 2019**

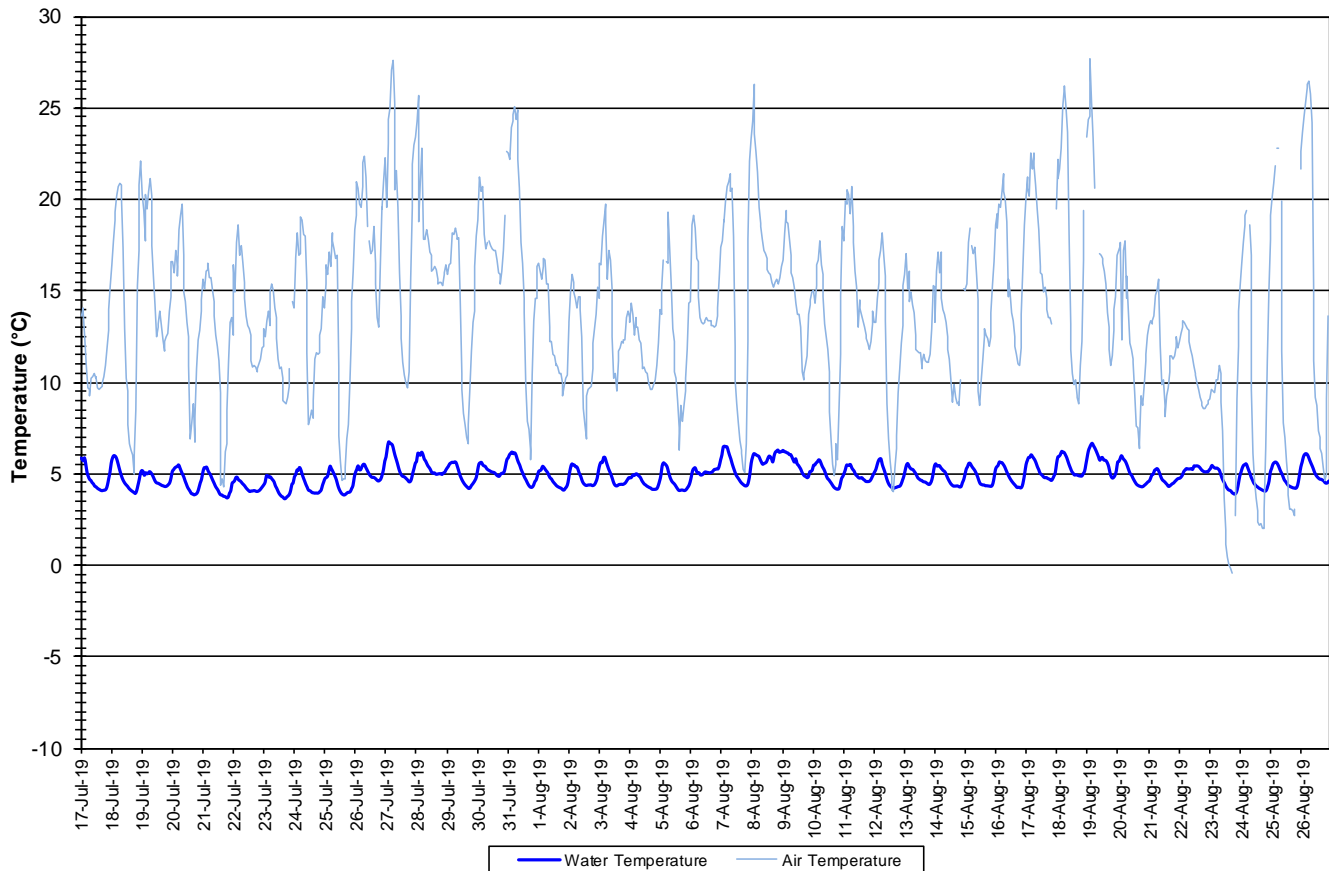


**Figure 7: Stage and Precipitation – Wabush Lake Network
(Weather data collected at climate station located near Moosehead Lake)**

Dumbell Stream

- Water temperature ranged from 3.61 to 7.62°C during this deployment period (Figure 8).
- Water temperature generally fluctuated within this range for the deployment period. This area is very shaded and minimally influenced by the increasing air temperature (Figure 9).

**Water and Air Temperature : Dumbell Stream above Dumbell Lake
July 17 to August 27, 2019**



**Figure 8: Water and Air Temperature – Dumbell Stream
(Weather data collected from climate station near Moosehead Lake)**

- pH ranged from 7.35 to 7.71 pH units (Figure 9). The median pH was 7.58.
- 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.
- 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 17 to August 27, 2019

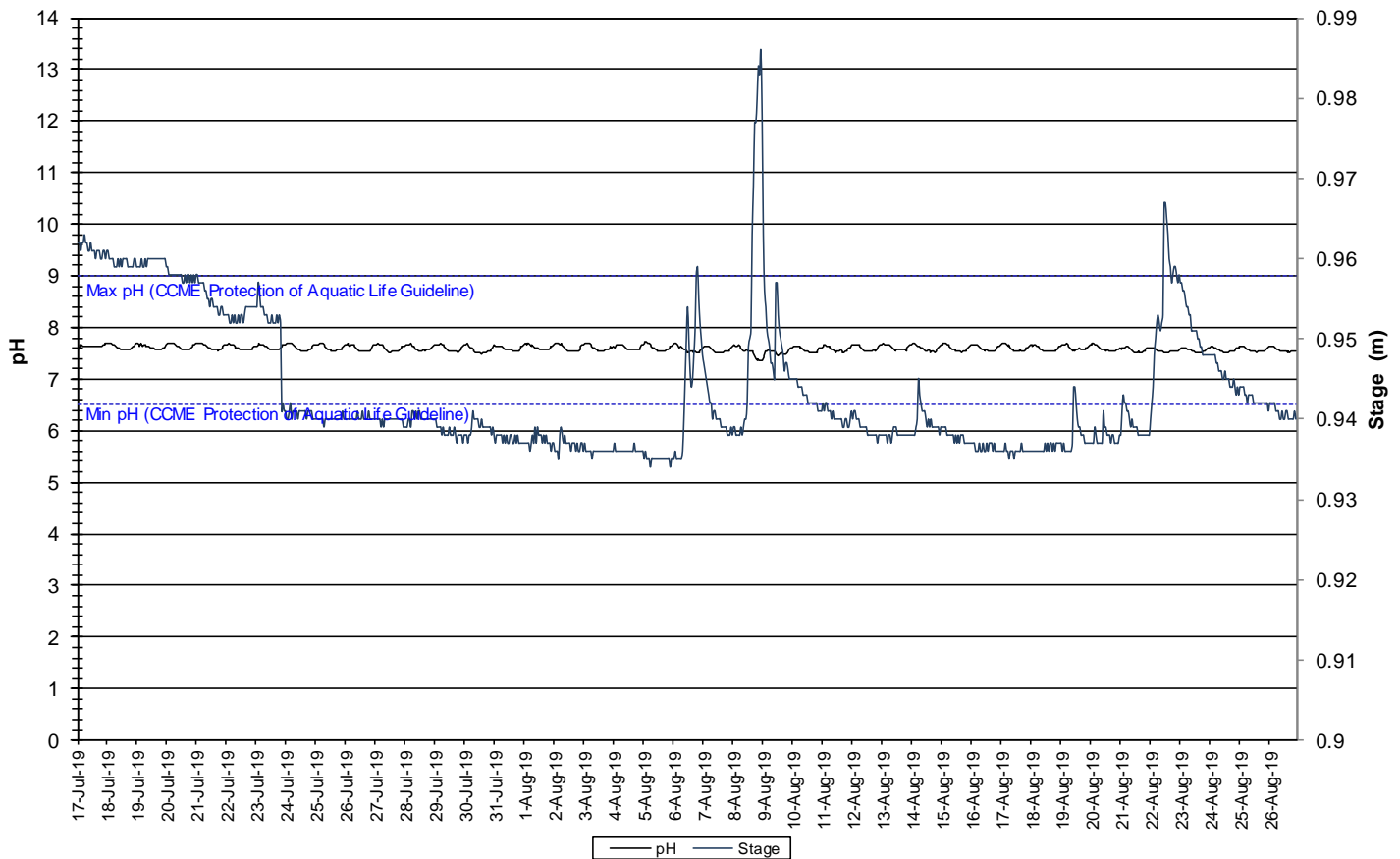


Figure 9: Water pH and Stage – Dumbell Stream

- Specific conductivity ranged from 46.6 to 75.3 $\mu\text{S}/\text{cm}$, throughout the deployment period (Figure 10).
- 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. These decreases are indicated in red on Figure 10.
- 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: Dumbell Stream above Dumbell Lake
July 17 to August 27, 2019

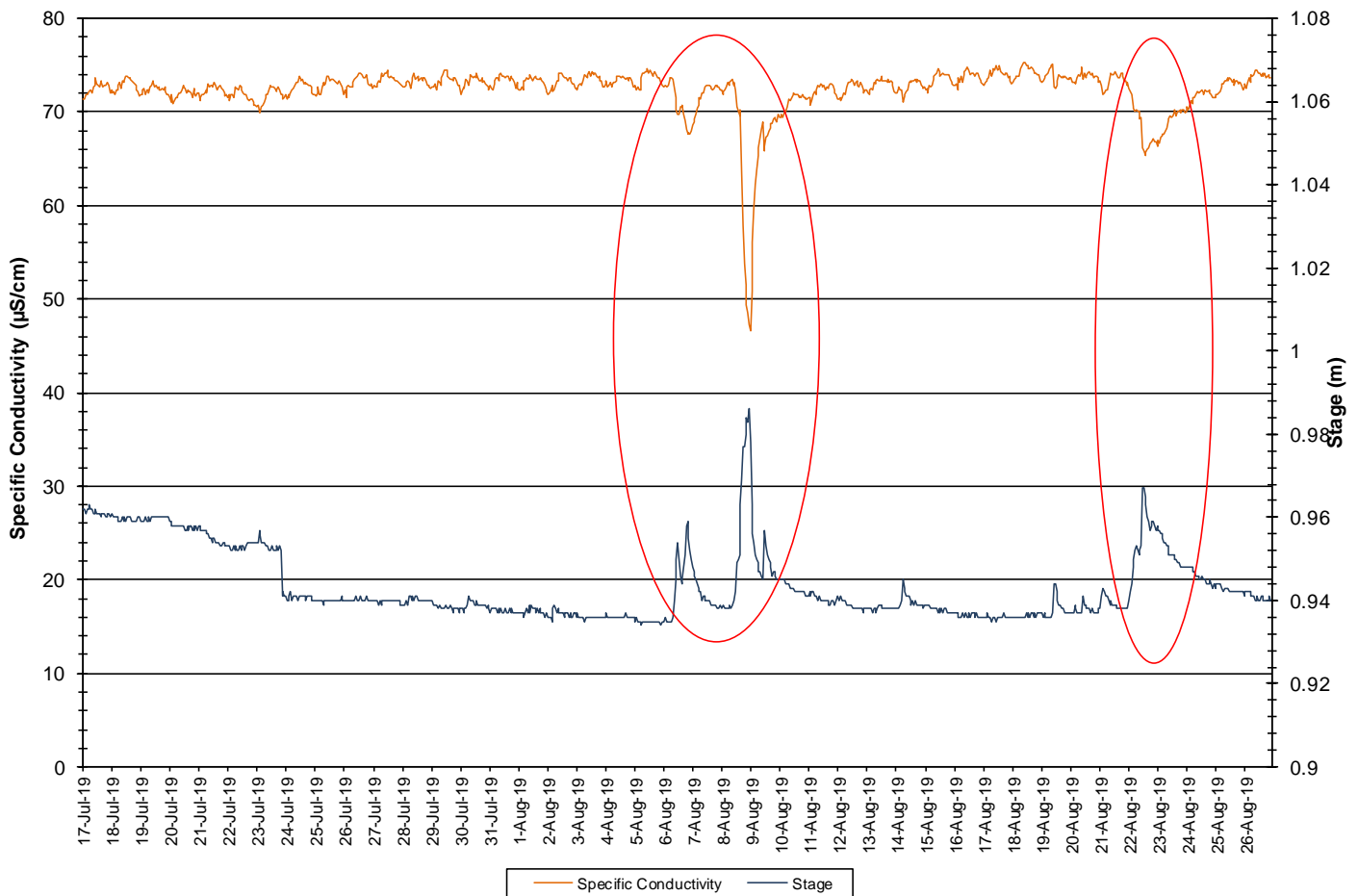


Figure 10: Specific conductivity and stage – Dumbell Stream

- The saturation of dissolved oxygen ranged from 91.9 to 95.5% while the dissolved oxygen content ranged from 11.35 to 12.37 mg/l with a median value of 11.91 mg/l (Figure 11).
- 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 11.
- Dissolved oxygen decreased very slightly between the end of July and third week of August as water temperature increased.
- Dissolved oxygen fluctuated daily with decreases observed at night.

Dissolved Oxygen Concentration and Saturation : Dumbell Stream at Dumbell Lake
July 17 to August 27, 2019

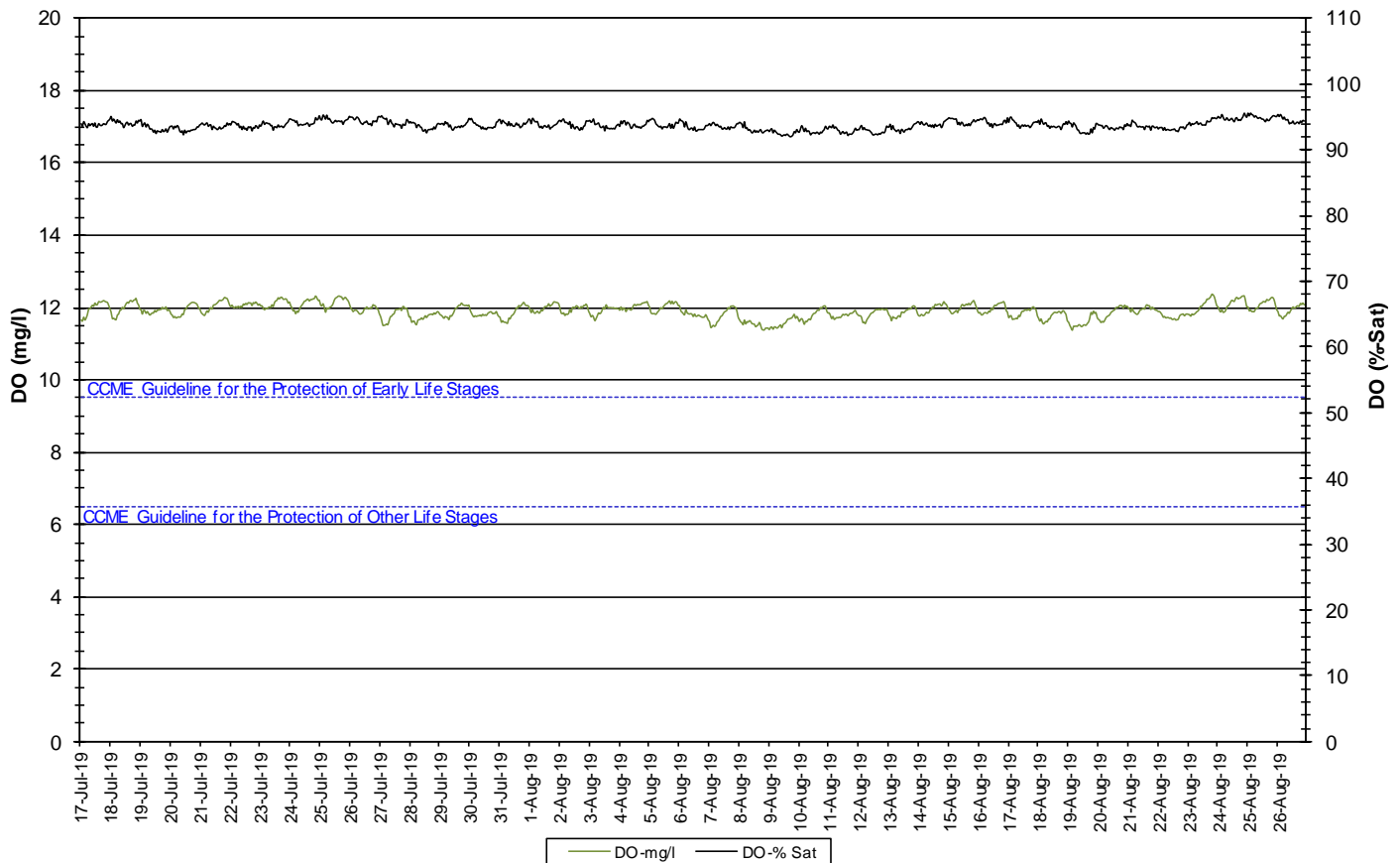
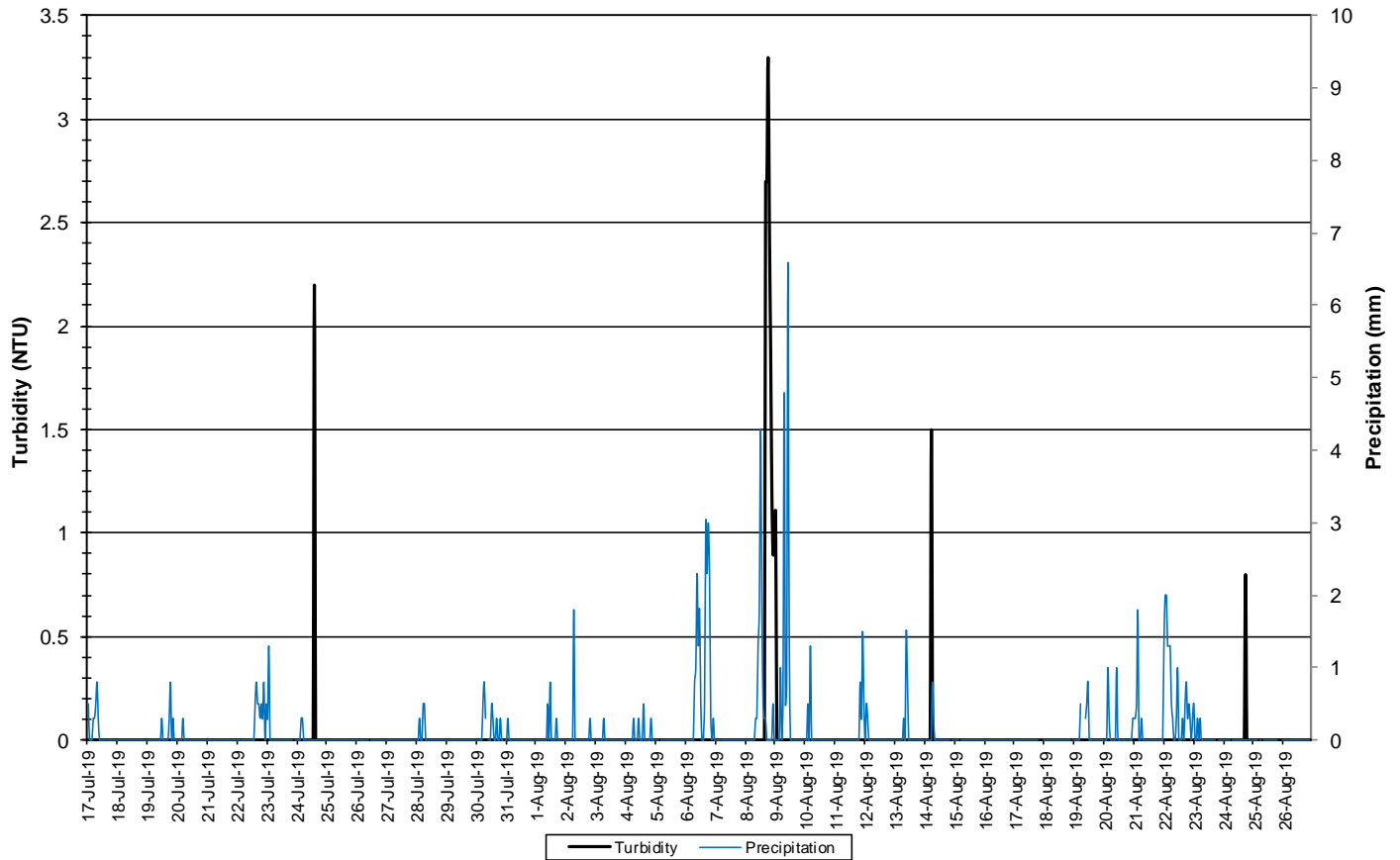


Figure 11: Dissolved oxygen – Dumbell Stream

- Turbidity values ranged from 0.0 NTU to 3.3 NTU, throughout the deployment period (Figure 12). The median value was 0.0 NTU.

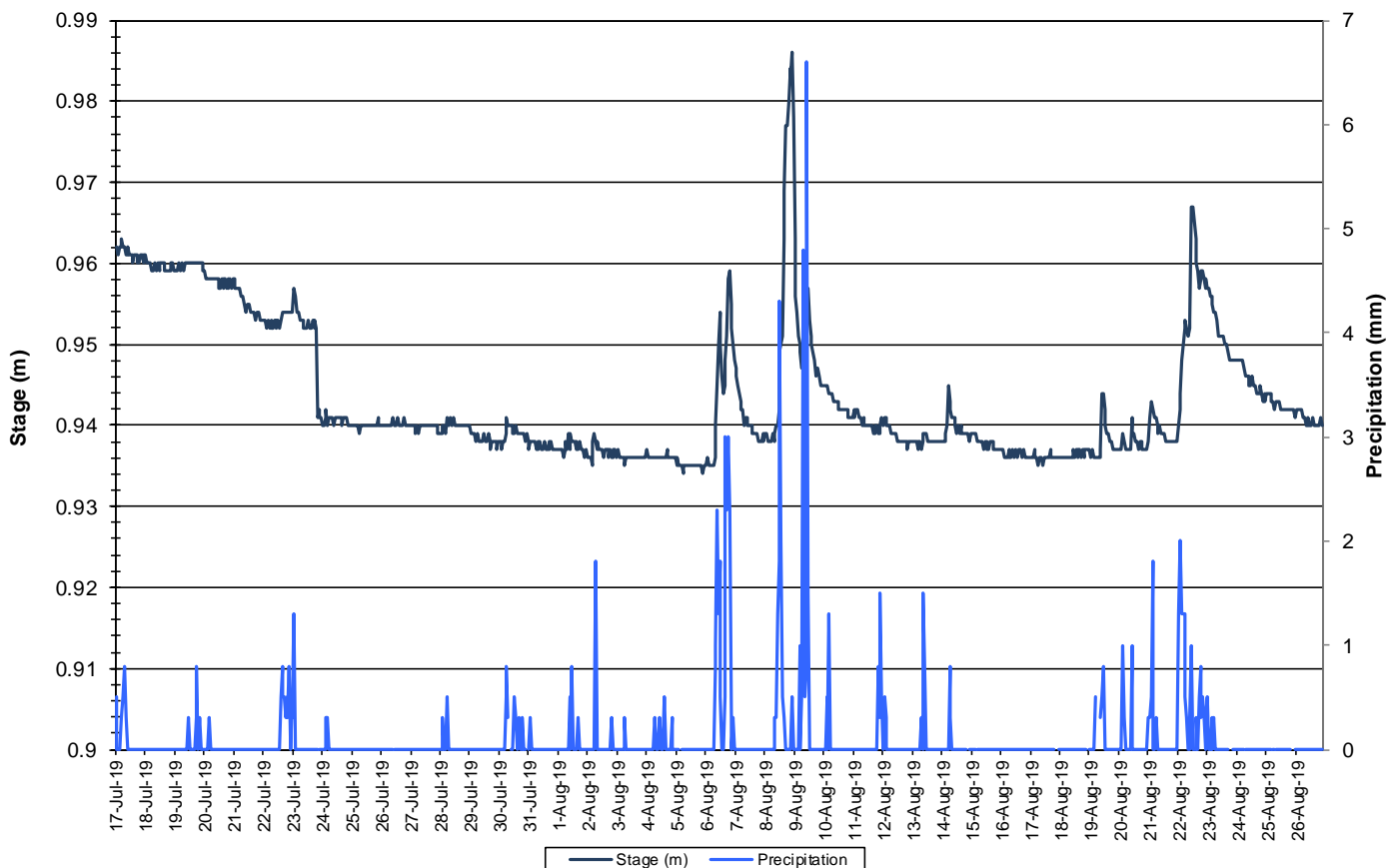
**Water Turbidity and Precipitation : Dumbell Stream above Dumbell Lake
July 17 to August 27, 2019**



**Figure 12: 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 13).
- Overall, stage decreased throughout the deployment period, with precipitation events causing periodic spikes.
- 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 17 to August 27, 2019**

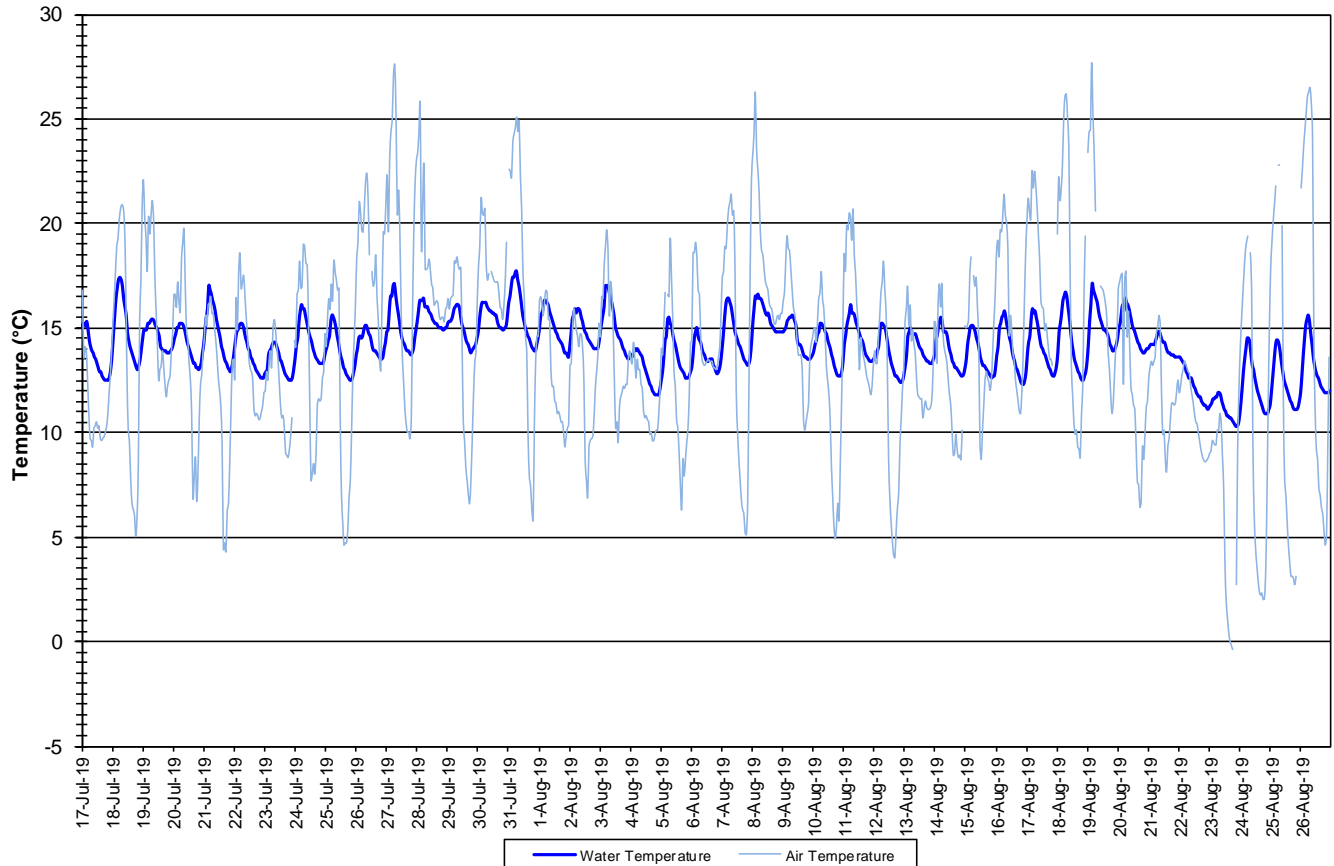


**Figure 13: Stage and Precipitation – Dumbell Stream
(Weather data collected from climate station near Moosehead Lake)**

Pumphouse Stream

- Water temperature ranged from 10.30 to 17.70°C during this deployment period (Figure 14).
- Water temperature decreased during the third week of August, corresponding to decreasing ambient air temperatures (Figure 14).

**Water and Air Temperature : Pumphouse Stream above Drum Lake
July 17 to August 27, 2019**



**Figure 14: Water and Air Temperature – Pumphouse Stream
(Weather data collected from climate station near Moosehead Lake)**

- pH ranged from 7.20 to 7.72 pH units (Figure 15). The median pH was 7.57.
- 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.
- 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 17 to August 27, 2019

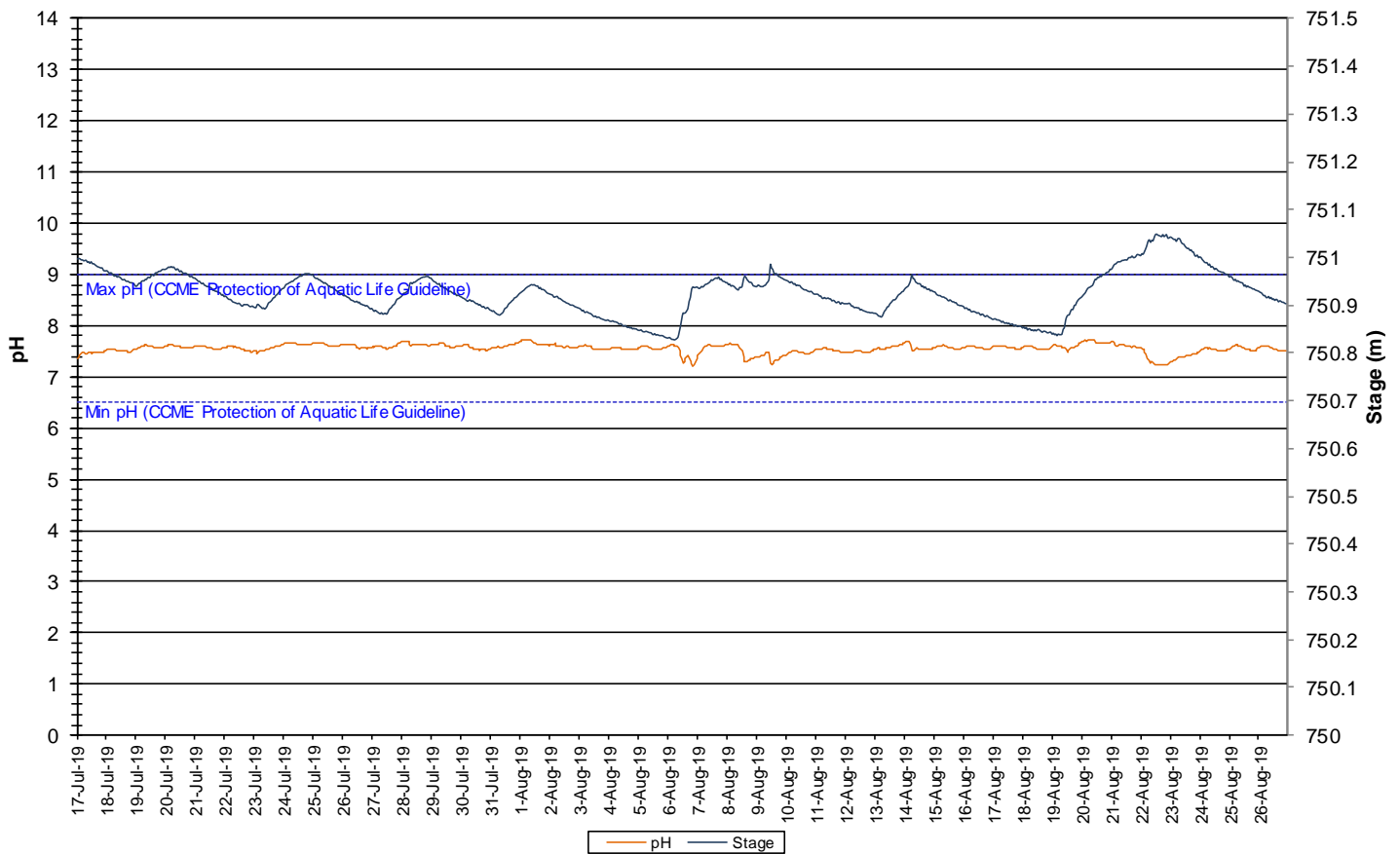


Figure 15: Water pH and Stage – Pumphouse Stream

- Specific conductivity ranged from 158.2 to 211.0 $\mu\text{S}/\text{cm}$, throughout the deployment period (Figure 16).
- Some 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. They 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 Level : Pumphouse Stream above Drum Lake
July 17 to August 27, 2019**

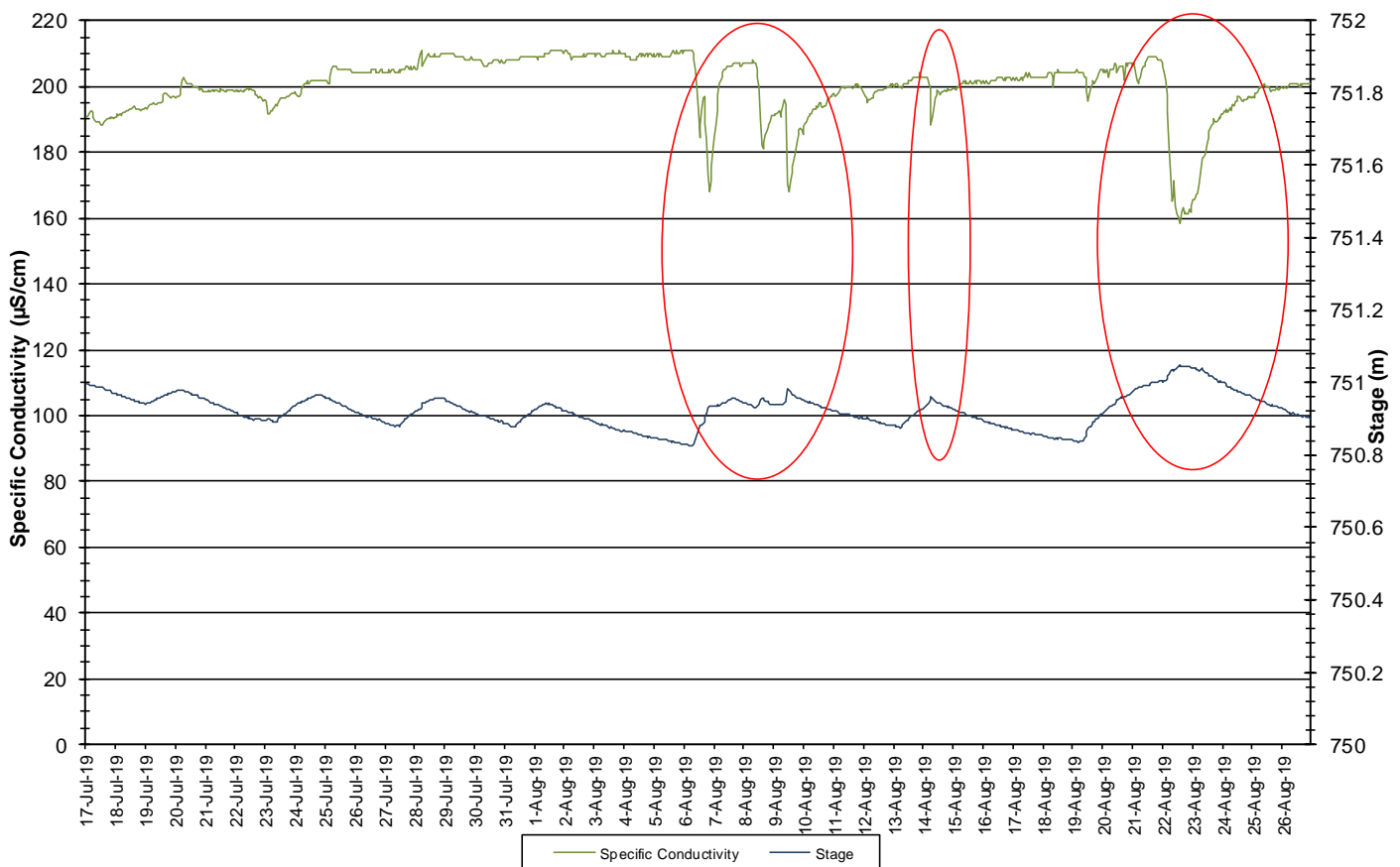


Figure 16: Specific Conductivity and Stage – Pumphouse Stream

- The saturation of dissolved oxygen ranged from 82.0 to 96.2% while the dissolved oxygen ranged from 8.41 to 9.98 mg/l with a median value of 9.08 mg/l (Figure 17).
- 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. The majority of values 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 17.
- Dissolved oxygen fluctuated daily with decreases observed at night.

**Dissolved Oxygen Concentration and Saturation : Pumphouse Stream above Drum Lake
July 17 to August 27, 2019**

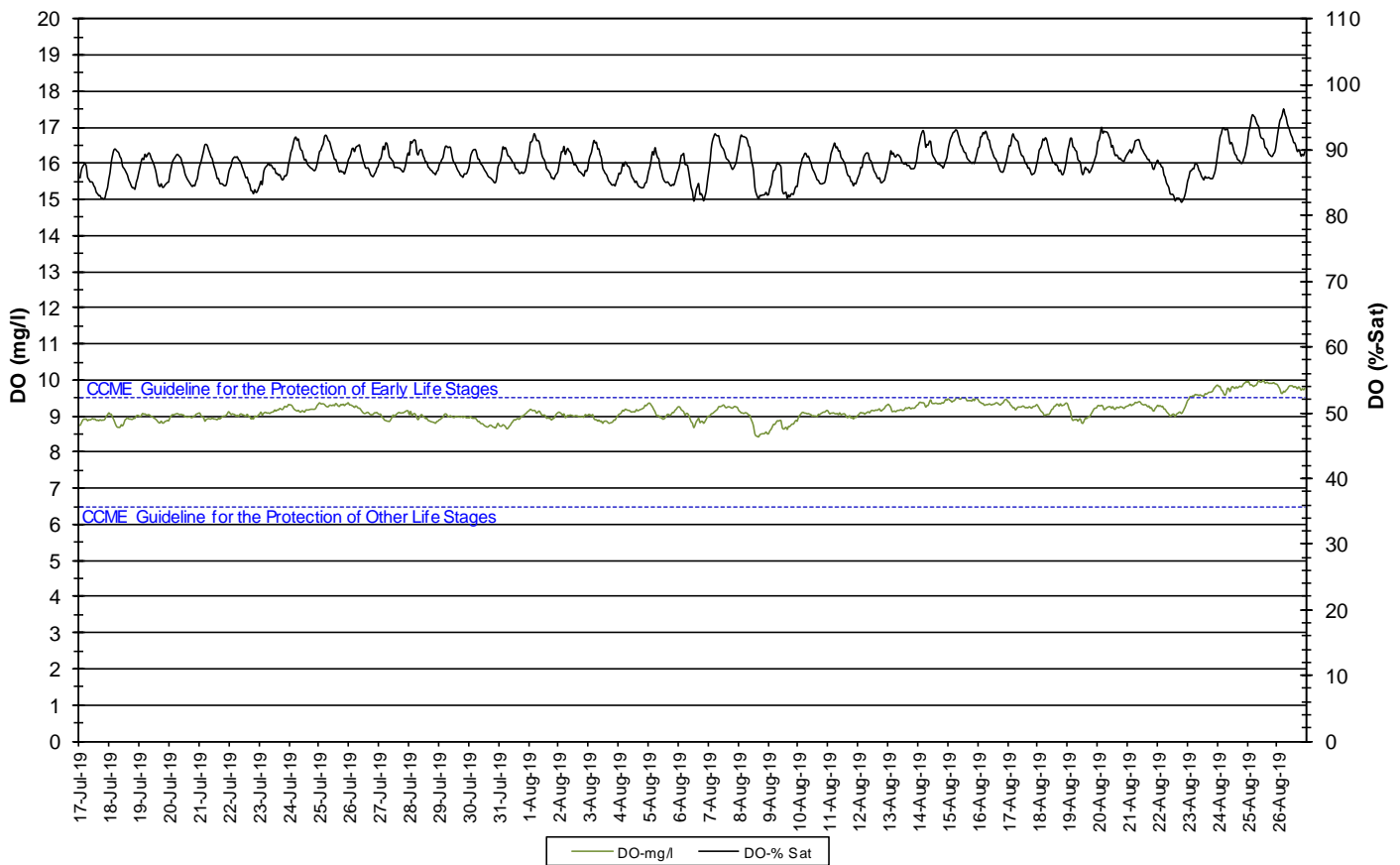
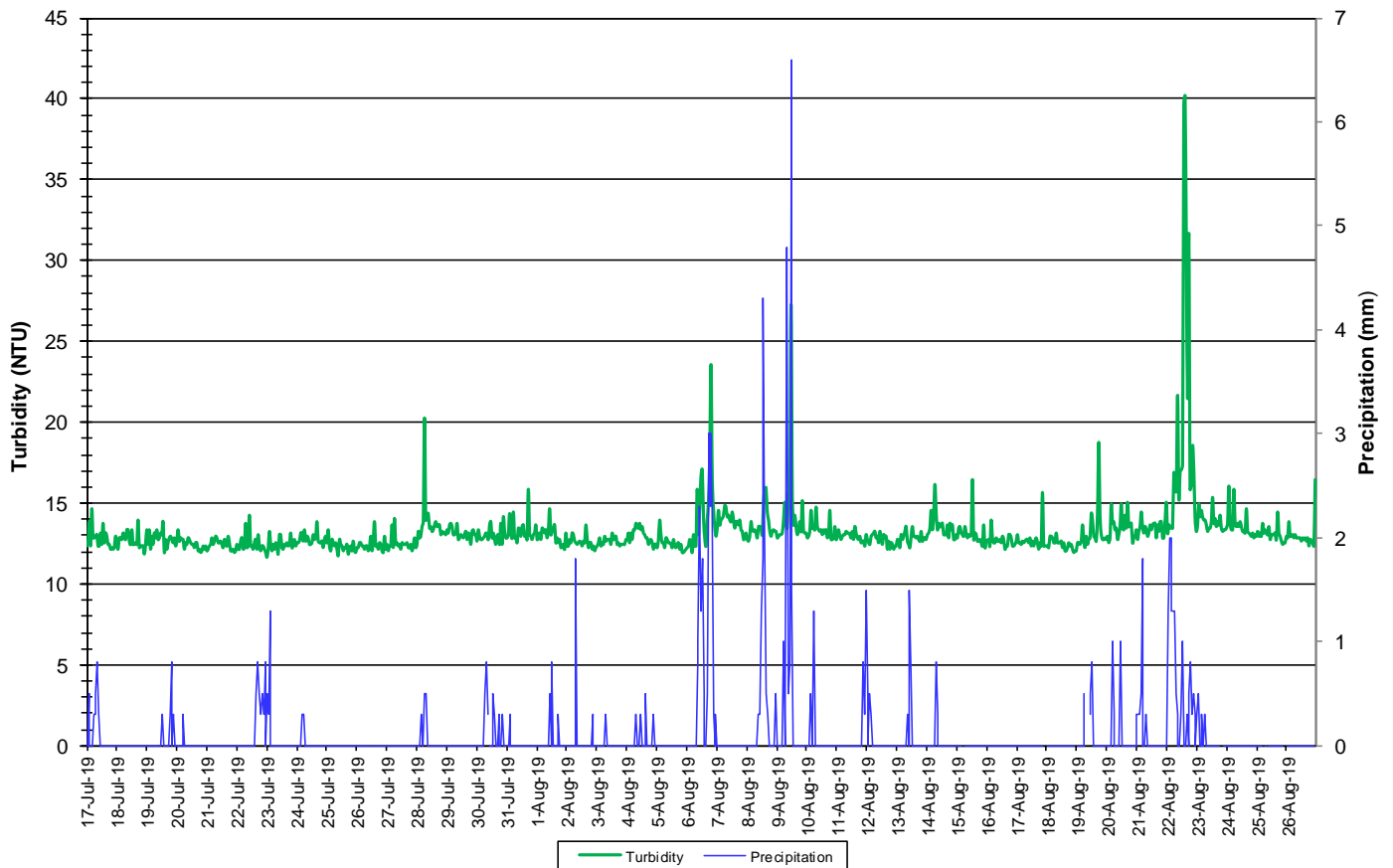


Figure 17: Dissolved Oxygen – Pumphouse Stream

- Turbidity values range from 11.7 to 40.2 NTU throughout the deployment period (Figure 18). The median value was 12.9 NTU.
- Baseline turbidity values during this deployment are higher than expected. This instrument rated 'poor' at deployment and upon removal when compared to the QA/QC sonde, which suggests a minor calibration or sensor error. Data has been retained, however, because natural fluctuations in turbidity levels are still evident and these changes are important in the assessment of water quality.
- In some instances, turbidity spikes can be attributed to precipitation events.

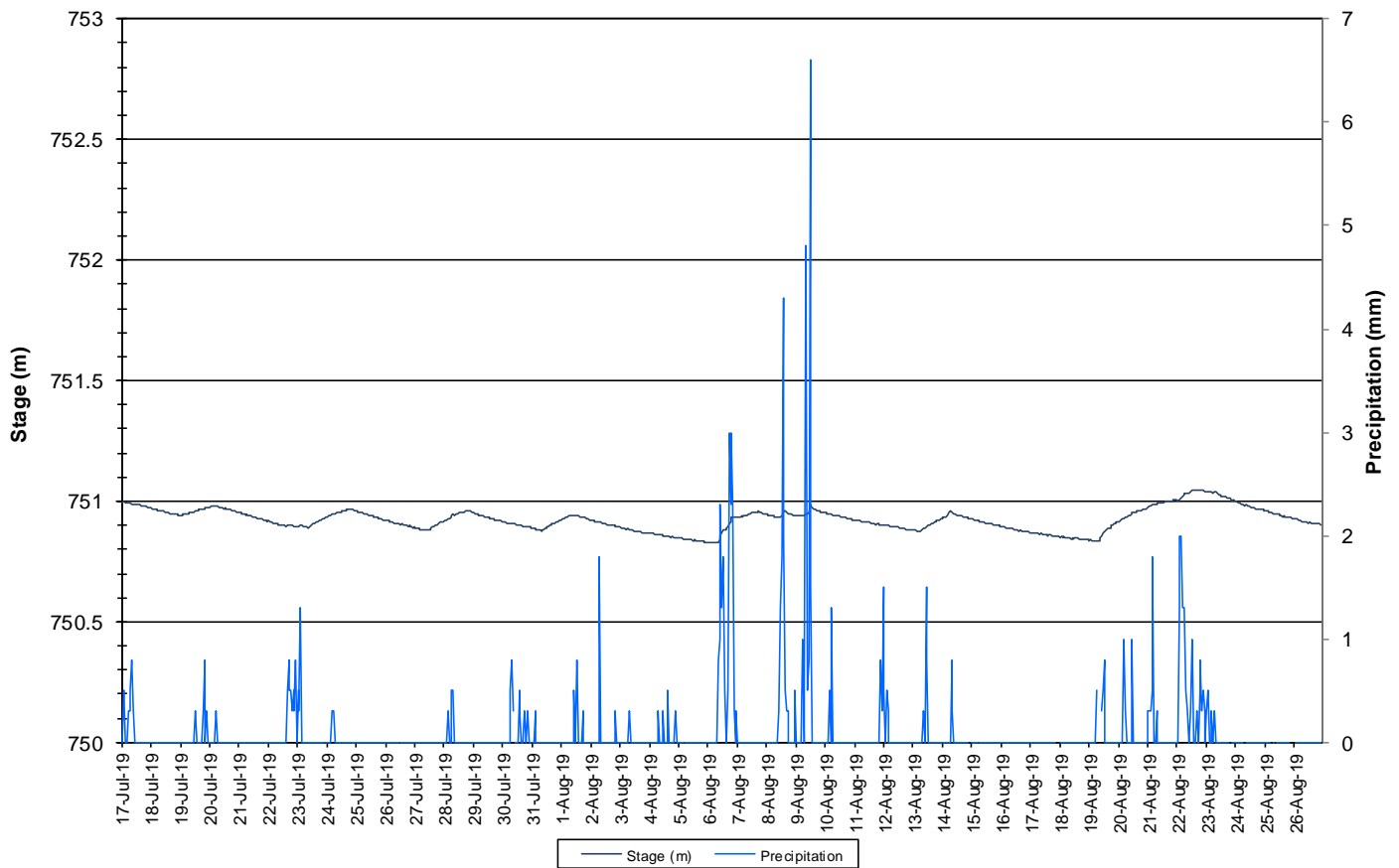
**Water Turbidity and Precipitation : Pumphouse Stream above Drum Lake
July 17 to August 27, 2019**



**Figure 18: 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 19).
- Overall, stage decreased slightly throughout the deployment period, with precipitation events causing periodic spikes.
- 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 17 to August 27, 2019**



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

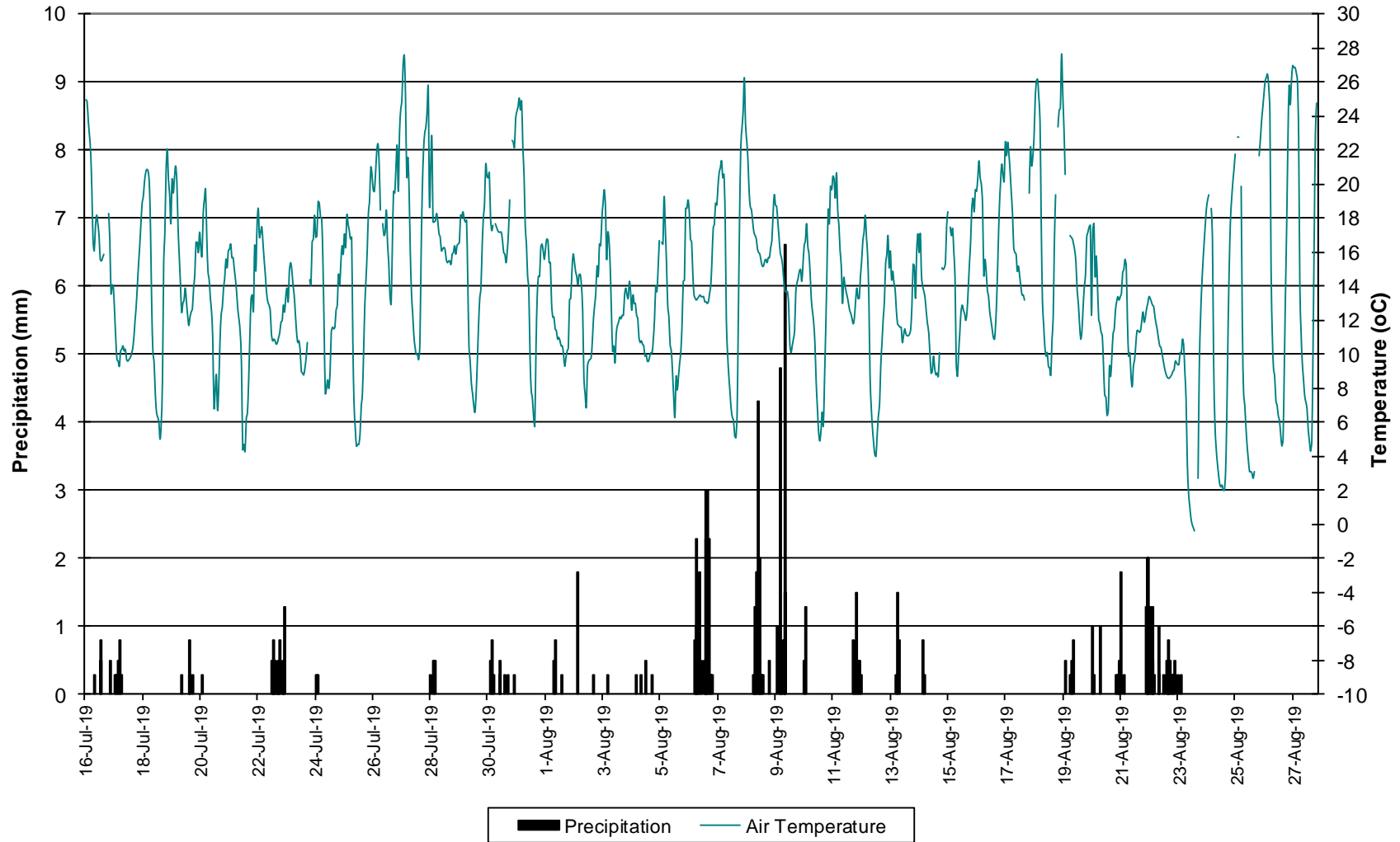
Conclusions

- Instruments were deployed on June 16th and 17th, and removed by August 28th, 2019, for calibration and maintenance.
- 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 3.61 and 19.43°C at these stations.
- All of the pH values were within the recommended CCME Guidelines for the Protection of Aquatic Life. pH ranged between 7.20 and 7.83. 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 71.0 µs/cm to 104.0 µs/cm at the Julienne Narrows, 46.6 to 75.3 µs/cm at Dumbell Stream and 158.2 to 211.0 µs/cm at Pumphouse Stream.
- At all 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 values at Julienne Narrows and Pumphouse stream were below the guidelines, while all the values at Dumbell Stream were above.
- Turbidity spikes at Julienne Narrows occurred frequently. The median value was 0.1 NTU.
- Turbidity at Dumbell Stream had a median value of 0.0 NTU. There were few, low spikes during this deployment period.
- Turbidity at Pumphouse Stream fluctuated throughout the deployment period with a few spikes, some attributed to precipitation. The median value was 12.9 NTU.
- Stage steadily decreased at Julienne Narrows throughout the deployment period.
- At Dumbell Stream and Pumphouse Stream, stage decreased overall, with spikes noted 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

Prepared by:
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Water Resources Management Division
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Appendix 1

Air Temperature and Precipitation: Moosehead Lake, NL July 16 to August 28, 2019



Appendix 2
QA/QC Grab Sample Results

Client: Department of Environment
Attention: Ms. Leona Hyde
Client Project:
Purchase Order: 2180014303

COC Number:
Date Reported: 2019-08-06
Date Submitted: 2019-07-23
Sample Matrix: Water

<u>LAB ID</u>	<u>Supply / Description</u>	<u>Client Sample ID</u>	<u>Sample Date</u>	<u>ANALYTE</u>	<u>UNIT</u>	<u>MRL</u>	<u>RESULT</u>
1442905	WS-S-0000 Julienne Narrows	2019-6314-00-SI-SP	2019-07-16	Alkalinity as CaCO3	mg/L	5	39
				Bromide	mg/L	0.25	<0.25
				Chloride	mg/L	1	2
				Colour	TCU	2	20
				Conductivity	uS/cm	5	91
				Dissolved Organic Carbon	mg/L	0.5	4.3
				Fluoride	mg/L	0.10	<0.10
				Hardness as CaCO3	mg/L	1	41
				N-NH3 (Ammonia)	mg/L	0.010	<0.010
				N-NO2 (Nitrite)	mg/L	0.10	<0.10
				N-NO3 (Nitrate)	mg/L	0.10	0.45
				pH		1.00	7.53
				Sulphate	mg/L	1	4
				Total Dissolved Solids (COND - CALC)	mg/L	1	59
				Total Kjeldahl Nitrogen	mg/L	0.15	<0.15
				Total Organic Carbon	mg/L	0.5	4.4
				Turbidity	NTU	0.1	0.4
				Aluminum	mg/L	0.01	0.02

Sample comment:

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

Client: Department of Environment
Attention: Ms. Leona Hyde
Client Project:
Purchase Order: 2180014303

COC Number:
Date Reported: 2019-08-06
Date Submitted: 2019-07-23
Sample Matrix: Water

<u>LAB ID</u>	<u>Supply / Description</u>	<u>Client Sample ID</u>	<u>Sample Date</u>	<u>ANALYTE</u>	<u>UNIT</u>	<u>MRL</u>	<u>RESULT</u>
1442905	WS-S-0000 Julienne Narrows	2019-6314-00-SI-SP	2019-07-16	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	10
				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	0.10
				Lead	mg/L	0.001	<0.001
				Magnesium	mg/L	1	4
				Manganese	mg/L	0.01	0.04
				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	0.017

Sample comment:

Report comment:

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APPROVAL: 
 Sarah Horner

Client: Department of Environment

Attention: Ms. Leona Hyde

Client Project:

Purchase Order: 2180014303

COC Number:

Date Reported: 2019-08-06

Date Submitted: 2019-07-23


Sample Matrix: Water

<u>LAB ID</u>	<u>Supply / Description</u>	<u>Client Sample ID</u>	<u>Sample Date</u>	<u>ANALYTE</u>	<u>UNIT</u>	<u>MRL</u>	<u>RESULT</u>
1442905	WS-S-0000 Julienne Narrows	2019-6314-00-SI-SP	2019-07-16	Uranium	mg/L	0.001	<0.001
				Zinc	mg/L	0.01	0.03
				Phosphorus	mg/L	0.002	0.003
				Total Suspended Solids	mg/L	2	2

Sample comment:

Report comment:

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Purchase Order: 2180014303

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Sample Matrix: Water

<u>LAB ID</u>	<u>Supply / Description</u>	<u>Client Sample ID</u>	<u>Sample Date</u>	<u>ANALYTE</u>	<u>UNIT</u>	<u>MRL</u>	<u>RESULT</u>
1442906	WS-S-0000 Dolomite Road	2019-6315-00-SI-SP	2019-07-17	Alkalinity as CaCO3	mg/L	5	24
				Bromide	mg/L	0.25	<0.25
				Chloride	mg/L	1	<1
				Colour	TCU	2	26
				Conductivity	uS/cm	5	50
				Dissolved Organic Carbon	mg/L	0.5	4.0
				Fluoride	mg/L	0.10	<0.10
				Hardness as CaCO3	mg/L	1	23
				N-NH3 (Ammonia)	mg/L	0.010	<0.010
				N-NO2 (Nitrite)	mg/L	0.10	<0.10
				N-NO3 (Nitrate)	mg/L	0.10	<0.10
				pH		1.00	7.45
				Sulphate	mg/L	1	2
				Total Dissolved Solids (COND - CALC)	mg/L	1	32
				Total Kjeldahl Nitrogen	mg/L	0.15	0.20
				Total Organic Carbon	mg/L	0.5	4.6
				Turbidity	NTU	0.1	1.7
				Aluminum	mg/L	0.01	0.04

Sample comment:

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1442906	WS-S-0000 Dolomite Road	2019-6315-00-SI-SP	2019-07-17	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	6
				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	0.11
				Lead	mg/L	0.001	<0.001
				Magnesium	mg/L	1	2
				Manganese	mg/L	0.01	0.06
				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	0.012

Sample comment:

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1442906	WS-S-0000 Dolomite Road	2019-6315-00-SI-SP	2019-07-17	Uranium	mg/L	0.001	<0.001
				Zinc	mg/L	0.01	<0.01
				Phosphorus	mg/L	0.002	0.007
				Total Suspended Solids	mg/L	2	7

Sample comment:

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Sample Matrix: Water

<u>LAB ID</u>	<u>Supply / Description</u>	<u>Client Sample ID</u>	<u>Sample Date</u>	<u>ANALYTE</u>	<u>UNIT</u>	<u>MRL</u>	<u>RESULT</u>
1442909	WS-S-0000 Dumbell Stream	2019-6318-00-SI-SP	2019-07-17	Alkalinity as CaCO3	mg/L	5	35
				Bromide	mg/L	0.25	<0.25
				Chloride	mg/L	1	<1
				Colour	TCU	2	2
				Conductivity	uS/cm	5	69
				Dissolved Organic Carbon	mg/L	0.5	<0.5
				Fluoride	mg/L	0.10	<0.10
				Hardness as CaCO3	mg/L	1	36
				N-NH3 (Ammonia)	mg/L	0.010	<0.010
				N-NO2 (Nitrite)	mg/L	0.10	<0.10
				N-NO3 (Nitrate)	mg/L	0.10	0.64
				pH		1.00	7.64
				Sulphate	mg/L	1	1
				Total Dissolved Solids (COND - CALC)	mg/L	1	45
				Total Kjeldahl Nitrogen	mg/L	0.15	<0.15
				Total Organic Carbon	mg/L	0.5	0.8
				Turbidity	NTU	0.1	0.1
				Aluminum	mg/L	0.01	<0.01

Sample comment:

Report comment:

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<u>LAB ID</u>	<u>Supply / Description</u>	<u>Client Sample ID</u>	<u>Sample Date</u>	<u>ANALYTE</u>	<u>UNIT</u>	<u>MRL</u>	<u>RESULT</u>
1442909	WS-S-0000 Dumbell Stream	2019-6318-00-SI-SP	2019-07-17	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	8
				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	4
				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	0.011

Sample comment:

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1442909	WS-S-0000 Dumbell Stream	2019-6318-00-SI-SP	2019-07-17	Uranium	mg/L	0.001	<0.001
				Zinc	mg/L	0.01	<0.01
				Phosphorus	mg/L	0.002	<0.002
				Total Suspended Solids	mg/L	2	10

Sample comment:

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1442908	WS-S-0000 Pumphouse Stream	2019-6317-00-SI-SP	2019-07-17	Alkalinity as CaCO3	mg/L	5	57
				Bromide	mg/L	0.25	<0.25
				Chloride	mg/L	1	3
				Colour	TCU	2	8
				Conductivity	uS/cm	5	173
				Dissolved Organic Carbon	mg/L	0.5	2.0
				Fluoride	mg/L	0.10	<0.10
				Hardness as CaCO3	mg/L	1	80
				N-NH3 (Ammonia)	mg/L	0.010	0.523
				N-NO2 (Nitrite)	mg/L	0.10	0.13
				N-NO3 (Nitrate)	mg/L	0.10	7.89
				pH		1.00	7.83
				Sulphate	mg/L	1	6
				Total Dissolved Solids (COND - CALC)	mg/L	1	112
				Total Kjeldahl Nitrogen	mg/L	0.15	0.75
				Total Organic Carbon	mg/L	0.5	2.1
				Turbidity	NTU	0.1	1.9
				Aluminum	mg/L	0.01	0.10

Sample comment:

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<u>LAB ID</u>	<u>Supply / Description</u>	<u>Client Sample ID</u>	<u>Sample Date</u>	<u>ANALYTE</u>	<u>UNIT</u>	<u>MRL</u>	<u>RESULT</u>
1442908	WS-S-0000 Pumphouse Stream	2019-6317-00-SI-SP	2019-07-17	Antimony	mg/L	0.0005	<0.0005
				Arsenic	mg/L	0.001	<0.001
				Barium	mg/L	0.01	0.02
				Boron	mg/L	0.01	<0.01
				Calcium	mg/L	1	22
				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	0.08
				Lead	mg/L	0.001	<0.001
				Magnesium	mg/L	1	6
				Manganese	mg/L	0.01	0.08
				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	0.032

Sample comment:

Report comment:

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1442908	WS-S-0000 Pumphouse Stream	2019-6317-00-SI-SP	2019-07-17	Uranium	mg/L	0.001	<0.001
				Zinc	mg/L	0.01	<0.01
				Phosphorus	mg/L	0.002	0.005
				Total Suspended Solids	mg/L	2	4

Sample comment:

Report comment:

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