



Real-Time Water Quality Deployment Report

Paddy's Pond at Outlet

May 10, 2023 to July 5, 2023



Government of Newfoundland & Labrador
Department of Environment and Climate Change
Water Resources Management Division
St. John's, NL, A1B 4J6 Canada

CONTENTS

GENERAL	3
MAINTENANCE AND CALIBRATION OF INSTRUMENT	3
DATA INTERPRETATION.....	5
WATER TEMPERATURE.....	5
PH	7
SPECIFIC CONDUCTIVITY	8
DISSOLVED OXYGEN	9
TURBIDITY	11
APPENDIX A : MEAN DAILY TEMPERATURE AND TOTAL PRECIPITATION	13
APPENDIX B : QA/QC GRAB SAMPLE FIELD RESULTS	15

General

The Department of Environment and Climate Change, Water Resources Management Division staff monitor water quality in real-time at Paddy's Pond at outlet to Three Arm Pond (47.488129N, 52.893809W).

Data transmission was lost on July 1, 2023 at 18:30 due to the displacement of power fuse from connecting wire. Upon investigation, it appears the fuse connector separated due to a possible power surge as a result of a thunderstorm on June 30-July 1, 2023. Data could not be analyzed from July 1-5, 2023 due to the collection of erroneous, incoherent data via the internal log file.



Figure 1: Paddy's Pond at Outlet Real-Time Water Quality Station location

Maintenance and Calibration of Instrument

As part of the Quality Assurance and Quality Control protocol (QAQC), 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.

Upon deployment, a QA/QC Sonde is temporarily deployed *in situ*, adjacent to the Field Sonde. Depending on the degree of difference between each parameter from the Field and QA/QC sondes, a qualitative rank is assigned (See Table 1). The possible ranks, from most to least

desirable, are Excellent, Good, Fair, Marginal, and Poor. A grab sample is also taken for additional confirmation of conditions at deployment and to allow for future modelling studies.

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

At the end of a deployment period, a freshly cleaned and calibrated QA/QC Sonde is placed *in situ*, adjacent to the Field Sonde. Deployment and removal comparison rankings for the station at Paddy's Pond deployed from May 10, 2023 to July 05, 2023 are summarized in Table 2.

Table 2: Qualitative QA/QC comparison rankings for Paddy's Pond at outlet station May 10, 2023 through July 5, 2023.

Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Paddy's Pond at Outlet	2023-05-10	Deployment	Excellent	Excellent	Poor	Fair	Excellent
	2023-05-10	Grab Sample #2021-1702-00-SI-SP	N/A	Poor	Excellent	N/A	Excellent
	2023-07-05	Removal	--	--	--	--	--

- On May 10, 2023, a real-time water quality monitoring instrument was deployed at the station Paddy's Pond at Outlet. The instrument was deployed for a period of 58 days and was removed on July 05, 2023. On July 1, 2023, data transmission was lost due to the separation of the power wire at the location of the one (1) Amp fast-blow fuse. This may have been the result of a power surge due to a June 30-July 1, 2023 thunderstorm.
- Upon deployment, sensors ranked 'Excellent' and 'Fair' against the calibrated QA/QC sonde with exception of conductivity, which ranked 'Poor'. This may be the result of inadequate time provided for the sensor to stabilize, stirring up of sediments, calibration error and/or sensor issues. It is noted during the QAQC comparison rankings that the field conductivity sensor provided concentration data lower than that observed with the QAQC sonde. Upon

review of the 'Excellent' ranking provided from the third-party lab analyzed grab sample, it can be suggested that the QA/QC sonde may have required additional time to acclimate to the conditions or calibration issues.

- Due to transmission issues and erroneous logfile, ranking of the field sonde against the QAQC instrument was not possible at the time of removal. A grab sample taken at the time of deployment, however, was found to be in close agreement with the deployed EXO2 giving good credibility to readings.

DATA INTERPRETATION

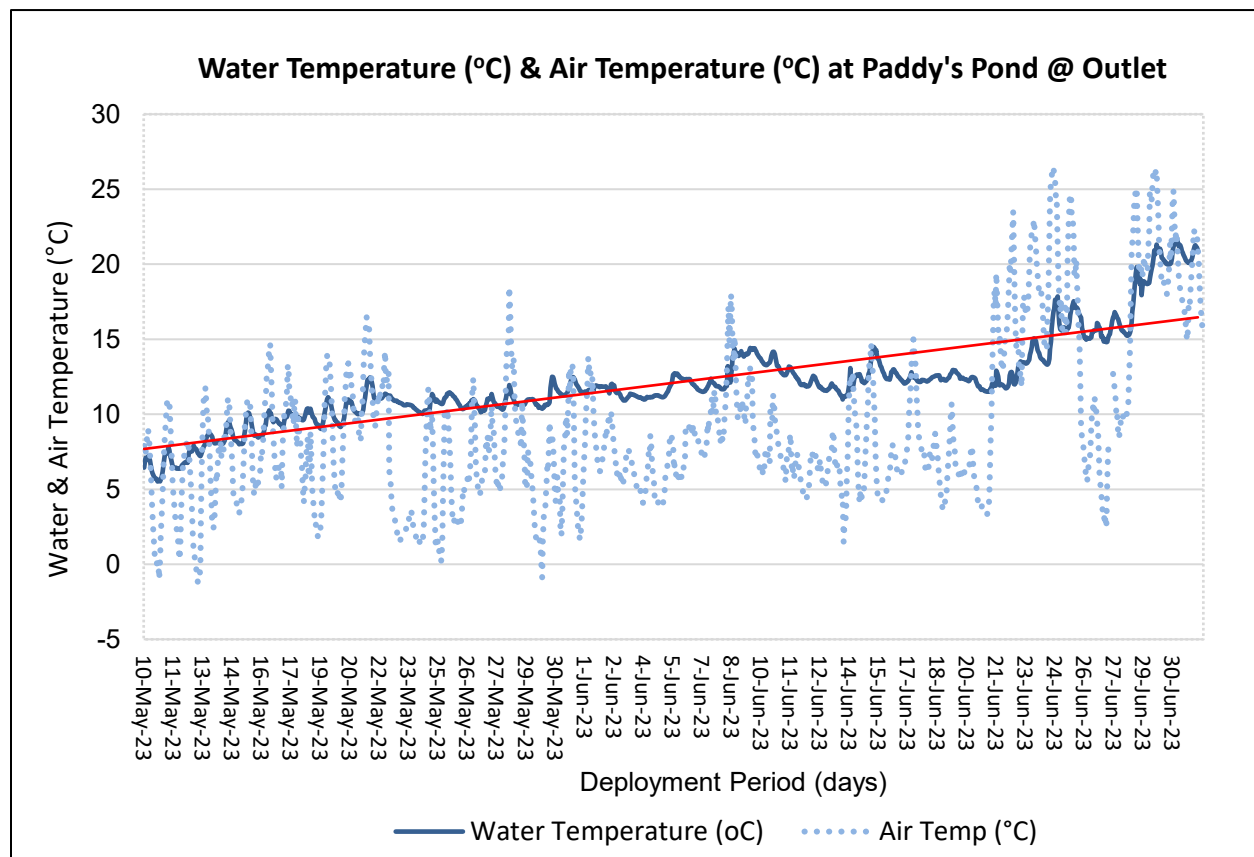
The following graphs and discussion illustrate water quality data obtained hourly from May 10, 2023 through July 1, 2023 at Paddy's Pond at outlet to Three Arm Pond, St. John's, NL.

Stage is not monitored at this station to date and as such cannot be discussed with respect to other monitored water quality parameters. All data used in the preparation of the graphs and subsequent discussion adhere to this stringent QA/QC protocol.

Mean daily temperature and total precipitation data was obtained from the Department of Environment and Climate Change Canada (ECCC) historical weather data at https://climate.weather.gc.ca/historical_data/search_historic_data_e.html and can be found illustrated in Appendix A. Gaps in available daily data were removed for graphing purposes.

Water Temperature

- Water Temperature is a major factor used to describe water quality. Temperature has major implications on both the ecology and chemistry of a water body, governing processes such as the metabolic rate of aquatic plants and animals and the degree of dissolved oxygen saturation.
- 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. 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.



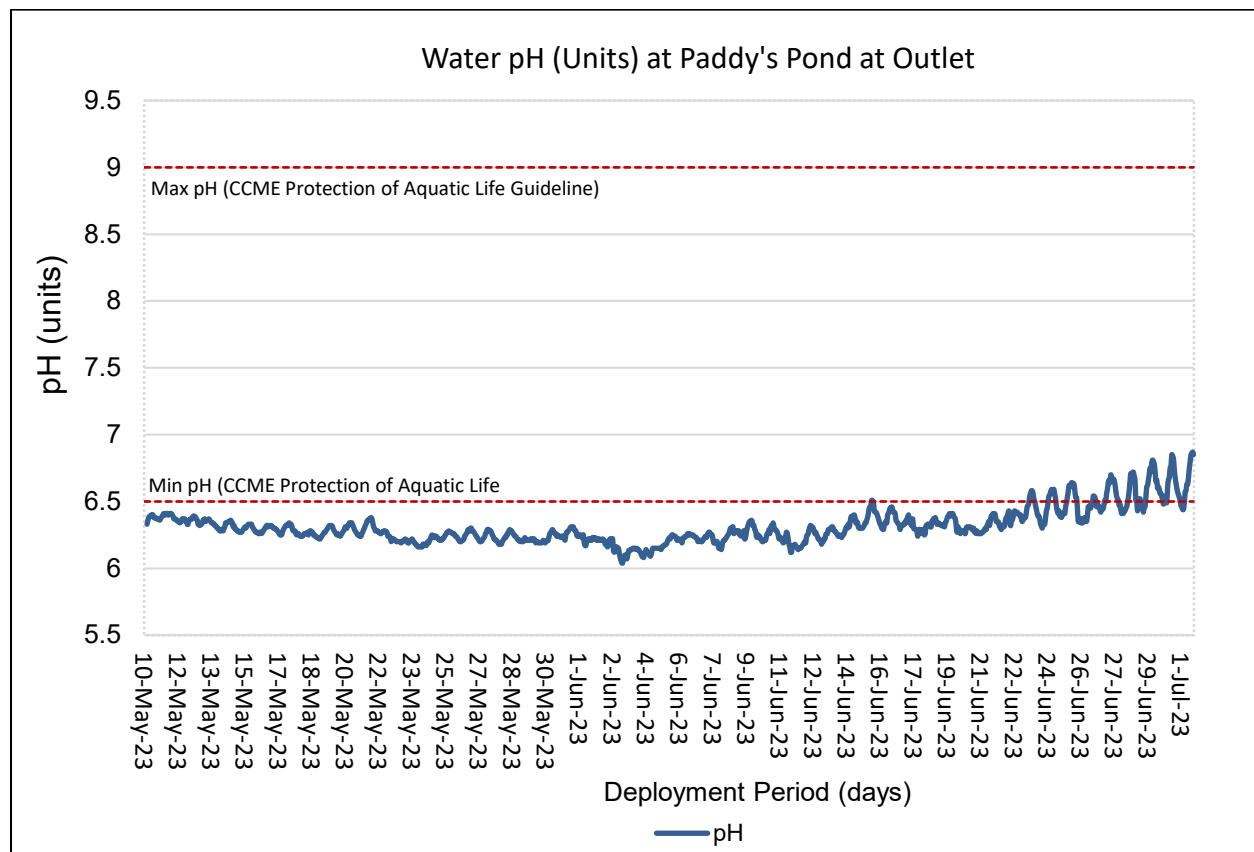
Mean	Median	Min	Max
12.07	11.71	5.52	21.80

Figure 2: Water temperature (°C) values at Paddy's Pond at Outlet.

- Over the 58-day deployment period, water temperature fluctuated naturally in correlation to air temperature. The mean temperature was 12.07°C with a median of 11.71°C.
- Minimum water temperature of 5.52°C was observed on May 11, 2023, and a maximum water temperature of 21.80°C was observed on June 30, 2023 (Figure 2).
- Water temperature gradually increased over the deployment period with greater increases in temperature at the end of June. This is an expected seasonal trend this time of year as summer months warm. (See Figure 7- Appendix A).
- A natural diurnal variation pattern was minimal throughout the deployment period as temperature fluctuations from day and overnight were low, as expected for this time of the year.

pH

- pH is used to give an indication of the acidity or basicity of a solution. A pH of seven (7) denotes a neutral solution while lower values are acidic and higher values are basic. Technically, the pH of a solution indicates the availability of protons to react with molecules dissolved in water. Such reactions can affect how molecules function chemically and metabolically.
- pH values are temperature dependant as well as influenced by photosynthesis and respiration by aquatic organisms. The concentration of dissolved carbon dioxide in the water throughout the day, especially overnight when oxygen production is reduced relative to carbon dioxide levels. Carbon dioxide dissolved in water yields a slightly acidic solution.



Mean	Median	Min	Max
6.31	6.28	6.04	6.85

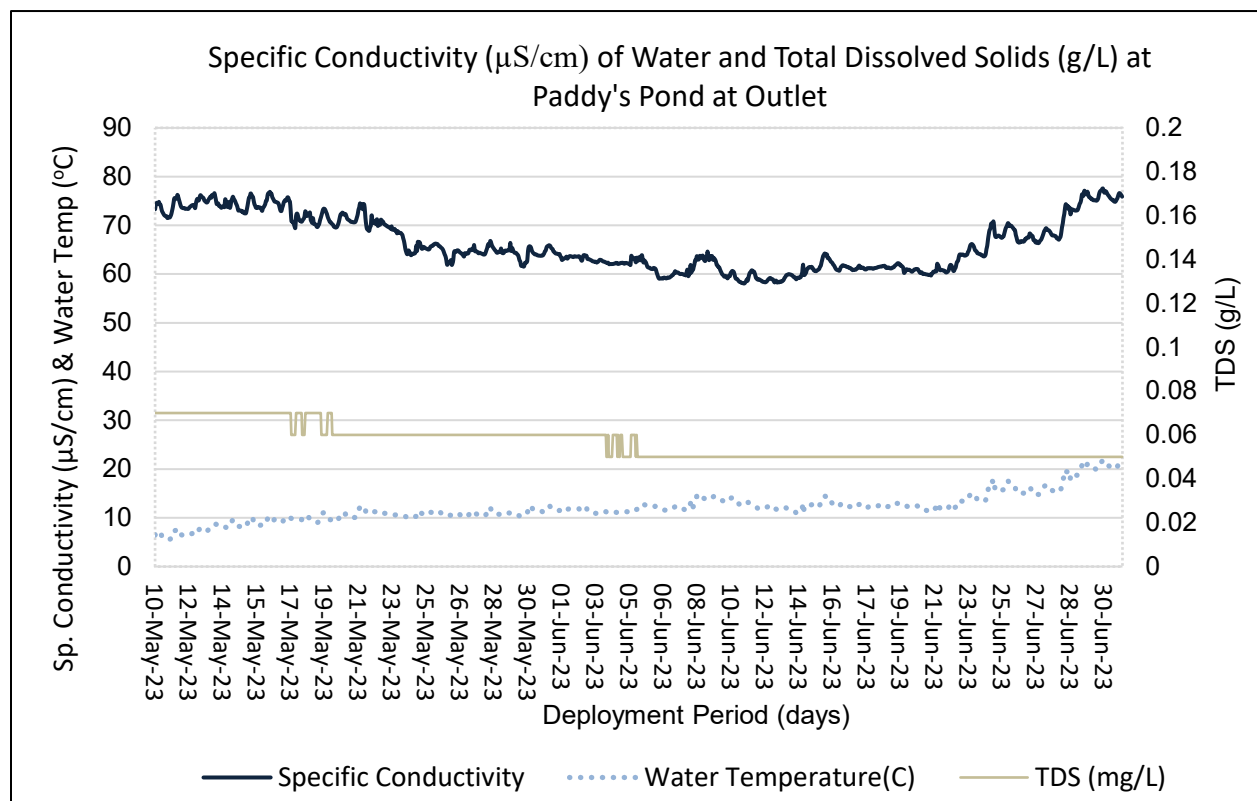
Figure 3: pH (pH units) at Paddy's Pond at outlet from May 10, 2023 through July 1, 2023.

- Throughout the deployment period, pH values were stable within 6.04 to 6.85 pH units, with a mean unit value of 6.31 and median of 6.28 units (Figure 3).
- pH (Figure 2) was observed to slightly decrease until early June until levels began to increase in correlation with an increase in air and water temperatures.

- The CCME guideline for the protection of aquatic life states the requirement of a minimum pH value of 6.5 and maximum value of 9.0. This guideline provides a basis for the overall health of the waterbody. Paddy's Pond at Outlet pH values were slightly below the minimum guideline until June 23, 2023, and steadily increased above 6.5 pH units until the end of the deployment period. This is likely the result of lower water temperature and the addition of more acidic rainwater and/or snowmelt runoff. (See Figure 7 – Appendix A).
- Diurnal variation pattern was visible throughout the deployment period. The magnitude of variation correlates to daily water temperature range, length of days and fluctuations in photosynthesis and respiration rates. As such, the observed increase in the diurnal pattern is expected due to the increase in aquatic biotic activity and higher daily temperature ranges during late spring-summer season.

Specific Conductivity

- Conductivity relates to the ease of passing an electric charge – or resistance – through a solution. Conductivity is highly influenced by the concentration of dissolved ions in solution: distilled water has zero conductivity (infinite resistance) while salty solutions have high conductivity (low resistance). Specific Conductivity is corrected to 25°C to allow comparison across variable temperatures.



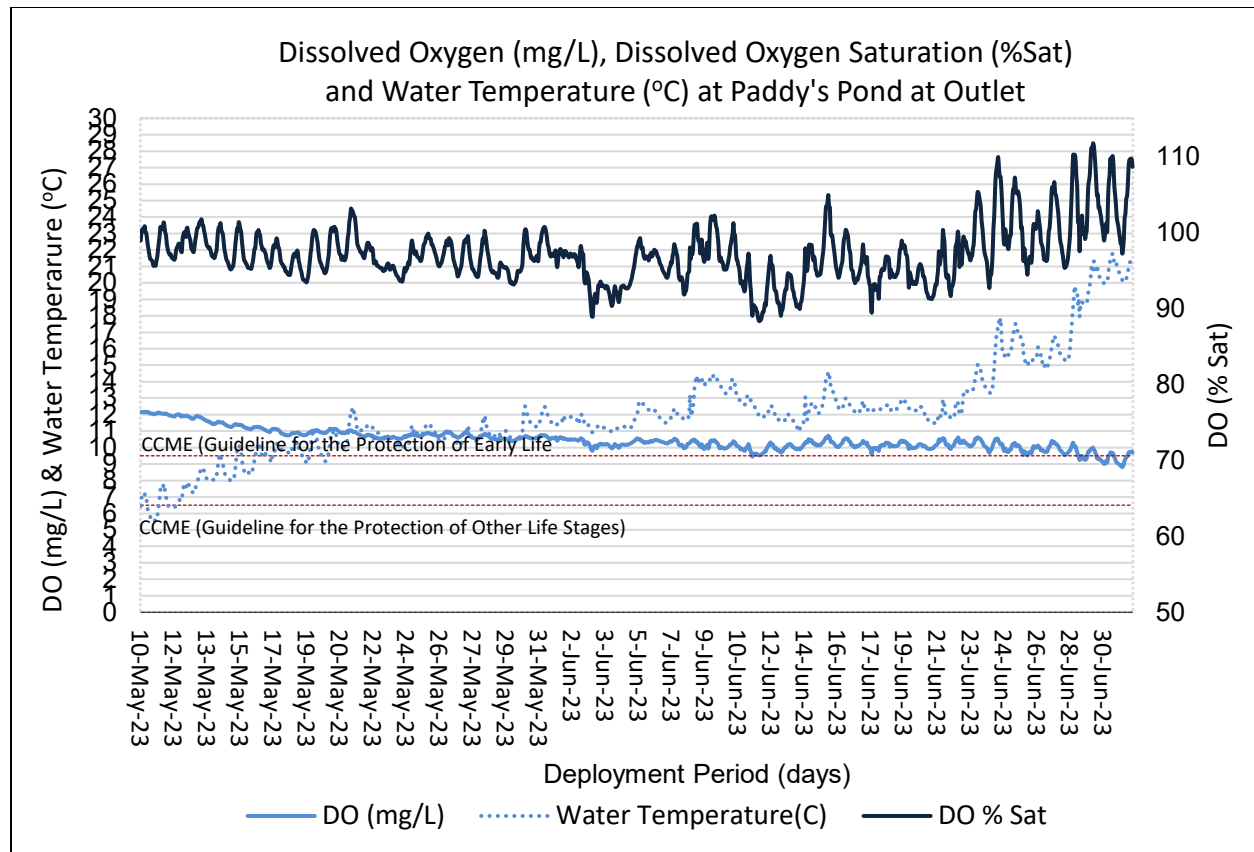
Mean	Median	Min	Max
66.2	64.5	59.1	76.9

Figure 4: Specific Conductivity ($\mu\text{S}/\text{cm}$) values at Paddy's Pond at Outlet.

- Specific conductivity values fluctuated slightly throughout the deployment. Conductivity decreased from the beginning of the deployment period until June 21, 2023, and began to increase through the remainder of the deployment period.
- The decreasing trend in conductivity is likely the result of an increase in precipitation events as seen in Appendix A - Figure 7. As temperatures increase, the passing of electric charge becomes less difficult. The increase in conductivity from the end of June to the remainder of the deployment period is in correlation with an increase in water temperature expected as the summer season nears.
- Given the isolated station location, sources of disturbances that may affect conductivity are considered minimal.
- The calculated Total Dissolved Solids (TDS) value range from 0.0500 to 0.0700 g/L throughout the deployment period.

Dissolved Oxygen

- Dissolved oxygen is a metabolic requirement of aquatic plants and animals. The concentration of oxygen in water depends on many factors, especially temperature – the saturation of oxygen in water is inversely proportional to water temperature. Oxygen concentrations also tend to be higher in flowing water compared to still, lake environments. Low oxygen concentrations can give an indication of excessive decomposition of organic matter or the presence of oxidizing materials.



Parameter	Mean	Median	Min	Max
DO (mg/L)	10.48	10.42	8.81	12.17
DO (% Sat)	97.1	96.8	88.3	111.7

Figure 5: Dissolved Oxygen (mg/L & Percent (%) Saturation) values at Paddy's Pond at Outlet.

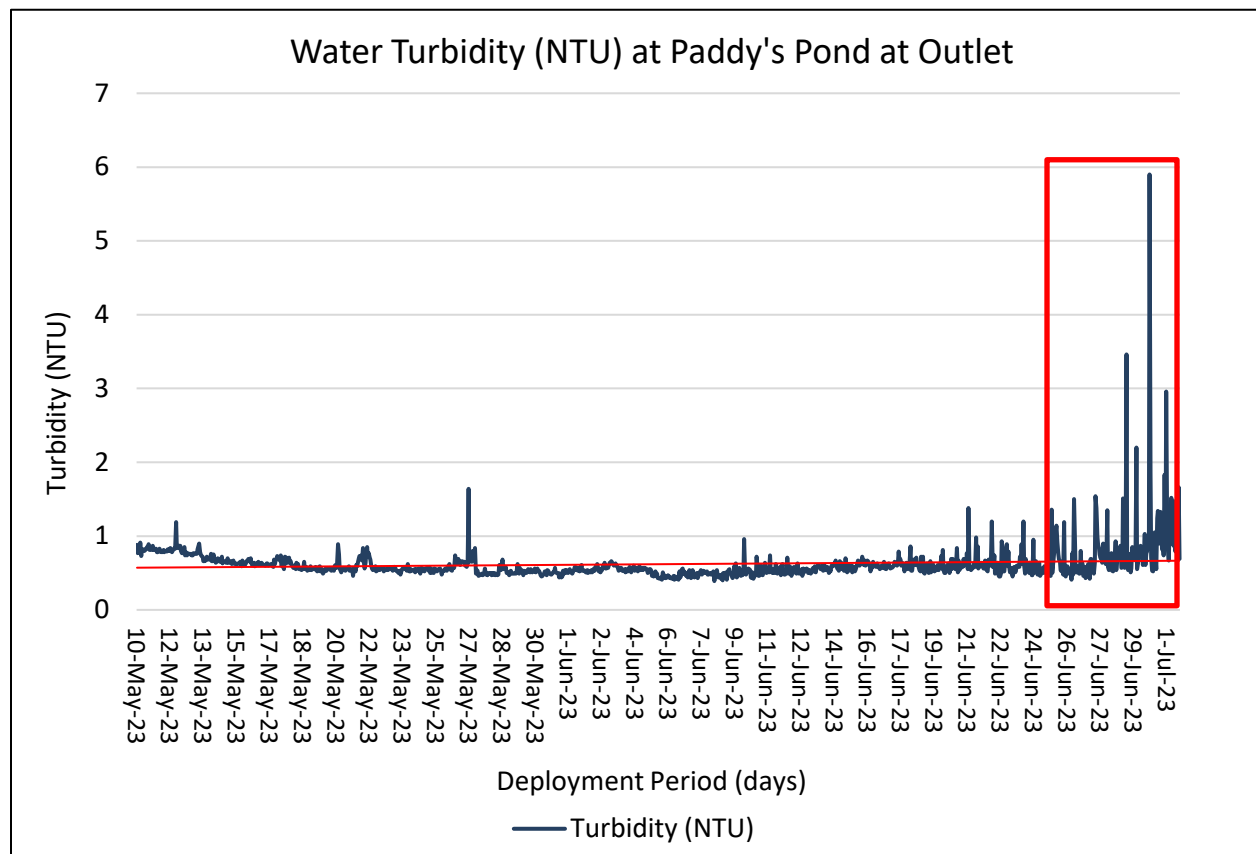
- In correlation with increasing water temperatures, dissolved oxygen (DO) concentrations (mg/L) had a slight decreasing trend throughout the deployment period. A maximum DO of 12.17 mg/L (111.7 % Sat) to a minimum DO of 8.81 mg/L (88.3 % Sat) were observed. Dissolved oxygen (% Saturation) readings of greater than 100% air saturation can occur in ambient water because of the production of pure oxygen by photosynthetically-active organisms and/or because of non-ideal equilibration of dissolved oxygen between the water and the air above it.
- Diurnal variations were observed throughout the deployment period due to temperature ranges from day to night. Variations can be influenced by water depth during deployment as shallow water temperatures will change more rapidly, especially in a lake environment such as Paddy's Pond. As well as linked to the daily range of water temperature, duration of daylight, and fluctuations in rates of photosynthesis and respiration. Consequently, the observed amplification of the diurnal pattern observed in early June until the end of the

deployment period is expected, given the increase in aquatic biotic activity, and broadening daily temperature ranges during the spring to summer season.

- The dissolved oxygen values were above and near the CCME Guideline for the Protection of Early Life Stages (9.5 mg/L) and remained above the CCME Guideline for the Protection of Other Life Stages (6.5mg/L) for the entire deployment period.

Turbidity

- Turbidity is typically caused by fine suspended solids such as silt, clay, or organic material. Consistently high levels of turbidity tend to block sunlight penetration into a waterbody, discouraging plant growth. High turbidity can also damage the delicate respiratory organs of aquatic animals and cover spawning areas.



Mean	Median	Min	Max
0.6	0.6	0.4	5.9

Figure 6: Water turbidity (NTU) values at Paddy's Pond at Outlet during deployment period May 10, 2023 through July 1, 2023.

- Turbidity measurements throughout the deployment period indicated very low turbidity. This is consistent with historical data for this location. An increase in turbidity was observed in the last

week of the deployment period and may be a result of sensor bio-fouling and/or sediment build-up around the sensor as a result of wave action.

- Turbidity values range from 0.4 to 5.9 NTU, with a mean of 0.6 NTU and a median value of 0.6 NTU (Figure 6).
- Turbidity levels were low during the deployment period; however, events above baseline levels did occur. For example, a turbidity peak was observed on June 30, 2023 (5.9 NTU) of which are likely influenced by debris, suspended algae, suspended sediment, or siltation due to wave action and precipitation events.

APPENDIX A : MEAN DAILY TEMPERATURE AND TOTAL PRECIPITATION

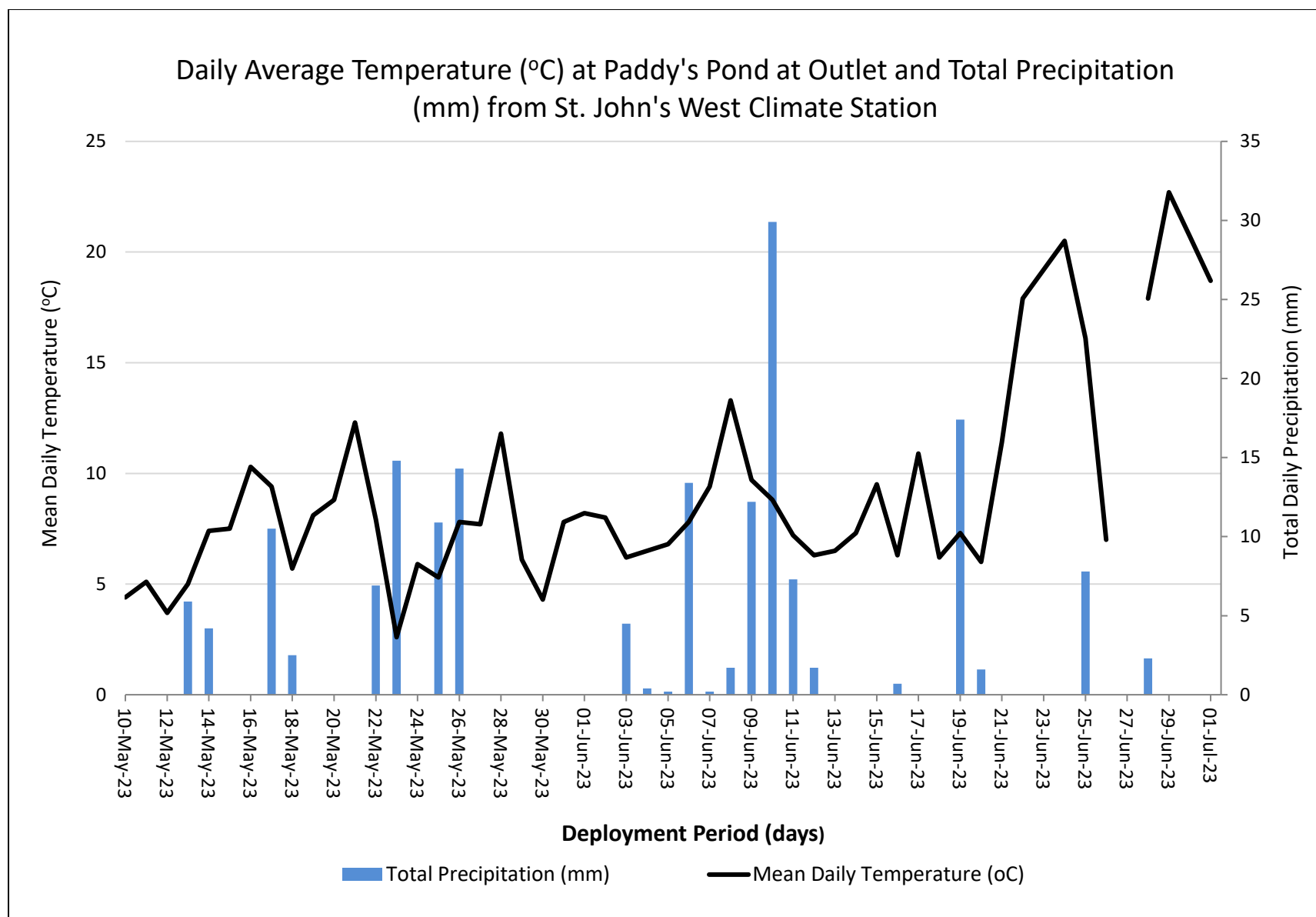


Figure 7: Mean daily air temperature and total precipitation at St. John's West near Paddy's Pond September 20, 2022 to November 2, 2022.

APPENDIX B : QA/QC GRAB SAMPLE FIELD RESULTS



Bureau Veritas - Partial/Rush Results

Your P.O. #: 220028978-9
Site Location: PADDY'S POND @ OUTLET
Your C.O.C. #: N/A

Attention: Robert Richard Harvey

NL Department of Environment, Climate Change and Municipalities
Water Resources
PO Box 8700
St. John's, NL
CANADA A1B 4J6

Report Date: 2023/05/18
Report #: R7634193
Version: 1 - Partial

CERTIFICATE OF ANALYSIS – PARTIAL RESULTS

BUREAU VERITAS JOB #: C3D6001

Received: 2023/05/10, 12:30

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date	Date	Laboratory Method	Analytical Method
		Extracted	Analyzed		
Alkalinity	1	N/A	2023/05/16	ATL SOP 00142	SM 24 2320 B
Colour	1	N/A	2023/05/17	ATL SOP 00020	SM 24 2120C m
Organic carbon - Diss (DOC) (2)	1	N/A	2023/05/17	ATL SOP 00203	SM 24 5310B m
Conductance - water	1	N/A	2023/05/16	ATL SOP 00004	SM 24 2510B m
Fluoride	1	N/A	2023/05/16	ATL SOP 00043	SM 24 4500-F- C m
Hardness (calculated as CaCO3)	1	N/A	2023/05/16	ATL SOP 00048	Auto Calc
Mercury - Total (CVAA,LL)	1	2023/05/15	2023/05/16	ATL SOP 00026	EPA 245.1 R3 m
Metals Water Total MS	1	2023/05/15	2023/05/15	ATL SOP 00058	EPA 6020B R2 m
Nitrogen Ammonia - water	1	N/A	2023/05/17	ATL SOP 00015	EPA 350.1 R2 m
Nitrogen - Nitrate + Nitrite	1	N/A	2023/05/17	ATL SOP 00016	USGS I-2547-11m
Nitrogen - Nitrite	1	N/A	2023/05/17	ATL SOP 00017	SM 24 4500-NO2- B m
Nitrogen - Nitrate (as N)	1	N/A	2023/05/17	ATL SOP 00018	ASTM D3867-16
pH (3)	1	N/A	2023/05/16	ATL SOP 00003	SM 24 4500-H+ B m
Calculated TDS (DW Pkg)	1	N/A	2023/05/17	N/A	Auto Calc
Total Kjeldahl Nitrogen in Water (1)	1	2023/05/16	2023/05/17	CAM SOP-00938	OMOE E3516 m
Organic carbon - Total (TOC) (2)	1	N/A	2023/05/16	ATL SOP 00203	SM 24 5310B m
Total Phosphorus (Colourimetric) (1)	1	2023/05/16	2023/05/17	CAM SOP-00407	SM 23 4500-P I
Total Suspended Solids	1	2023/05/15	2023/05/16	ATL SOP 00007	SM 24 2540D m
Turbidity	1	N/A	2023/05/17	ATL SOP 00011	EPA 180.1 R2 m

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

- (1) This test was performed by Bureau Veritas Mississauga, 6740 Campobello Rd , Mississauga, ON, L5N 2L8
- (2) TOC / DOC present in the sample should be considered as non-purgeable TOC / DOC.
- (3) The APHA Standard Method requires pH to be analyzed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the APHA Standard Method holding time.



Bureau Veritas - Partial/Rush Results

Your P.O. #: 220028978-9
Site Location: PADDY'S POND @ OUTLET
Your C.O.C. #: N/A

Attention: Robert Richard Harvey

NL Department of Environment, Climate Change and Municipalities
Water Resources
PO Box 8700
St. John's, NL
CANADA A1B 4J6

Report Date: 2023/05/18
Report #: R7634193
Version: 1 - Partial

CERTIFICATE OF ANALYSIS – PARTIAL RESULTS

BUREAU VERITAS JOB #: C3D6001
Received: 2023/05/10, 12:30

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Gemarie Balatico, Project Manager
Email: Gemarie.Balatico@bureauveritas.com
Phone# (905)817-5787

=====

This report has been generated and distributed using a secure automated process.

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Suzanne Rogers, General Manager responsible for Nova Scotia Environmental laboratory operations.



BUREAU VERITAS

Bureau Veritas Job #: C3D6001
Report Date: 2023/05/18

NL Department of Environment, Climate Change and
Municipalities

Site Location: PADDY'S POND @ OUTLET

Your P.O. #: 220028978-9

Sampler Initials: LB

Bureau Veritas - Partial/Rush Results

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
VUK130 PADDY'S POND @ OUTLET								
Sampling Date		2023/05/10 11:05						
Matrix		W						
Sample #		2023-1702-00-SI-SP						
Registration #		SA-0000						
RESULTS OF ANALYSES OF WATER								
Calculated Parameters								
Hardness (CaCO3)	-	9.9	1.0	mg/L	N/A	2023/05/16		8660957
Nitrate (N)	-	ND	0.050	mg/L	N/A	2023/05/17		8660960
Total dissolved solids (calc., EC)	-	63	1.0	mg/L	N/A	2023/05/17		8661508
Inorganics								
Conductivity	-	110	1.0	uS/cm	N/A	2023/05/16	NGI	8667474
Total Alkalinity (Total as CaCO3)	-	2.5	2.0	mg/L	N/A	2023/05/16	NGI	8666904
Colour	-	34	5.0	TCU	N/A	2023/05/17	TGO	8667608
Dissolved Fluoride (F-)	-	ND	0.10	mg/L	N/A	2023/05/16	NGI	8667517
Total Kjeldahl Nitrogen (TKN)	-	0.12	0.10	mg/L	2023/05/16	2023/05/17	RTY	8667799
Nitrate + Nitrite (N)	-	ND	0.050	mg/L	N/A	2023/05/17	TGO	8667617
Nitrite (N)	-	ND	0.010	mg/L	N/A	2023/05/17	TGO	8667626
Nitrogen (Ammonia Nitrogen)	-	ND	0.050	mg/L	N/A	2023/05/17	TGO	8667378
Dissolved Organic Carbon (C)	-	4.4	0.50	mg/L	N/A	2023/05/17	CPP	8669270
Total Organic Carbon (C)	-	4.4	0.50	mg/L	N/A	2023/05/16	CPP	8667659
pH	-	6.62		pH	N/A	2023/05/16	NGI	8667511
Total Phosphorus	-	0.006	0.004	mg/L	2023/05/16	2023/05/17	GYA	8666060
Total Suspended Solids	-	1.2	1.0	mg/L	2023/05/15	2023/05/16	RDM	8665200
Turbidity	-	1.5	0.10	NTU	N/A	2023/05/17	NGI	8669363
MERCURY BY COLD VAPOUR AA (WATER)								
Metals								
Total Mercury (Hg)	-	ND	0.000013	mg/L	2023/05/15	2023/05/16	SGK	8665028
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Aluminum (Al)	-	0.11	0.0050	mg/L	2023/05/15	2023/05/15	JHY	8664570
Total Antimony (Sb)	-	ND	0.0010	mg/L	2023/05/15	2023/05/15	JHY	8664570
Total Arsenic (As)	-	ND	0.0010	mg/L	2023/05/15	2023/05/15	JHY	8664570
Total Barium (Ba)	-	0.0045	0.0010	mg/L	2023/05/15	2023/05/15	JHY	8664570
Total Boron (B)	-	ND	0.050	mg/L	2023/05/15	2023/05/15	JHY	8664570
Total Cadmium (Cd)	-	ND	0.000010	mg/L	2023/05/15	2023/05/15	JHY	8664570
Total Calcium (Ca)	-	2.7	0.10	mg/L	2023/05/15	2023/05/15	JHY	8664570
Total Chromium (Cr)	-	ND	0.0010	mg/L	2023/05/15	2023/05/15	JHY	8664570
Total Copper (Cu)	-	ND	0.00050	mg/L	2023/05/15	2023/05/15	JHY	8664570
Total Iron (Fe)	-	0.16	0.050	mg/L	2023/05/15	2023/05/15	JHY	8664570
Total Lead (Pb)	-	ND	0.00050	mg/L	2023/05/15	2023/05/15	JHY	8664570
Total Magnesium (Mg)	-	0.74	0.10	mg/L	2023/05/15	2023/05/15	JHY	8664570
Total Manganese (Mn)	-	0.033	0.0020	mg/L	2023/05/15	2023/05/15	JHY	8664570
Total Nickel (Ni)	-	ND	0.0020	mg/L	2023/05/15	2023/05/15	JHY	8664570
Total Phosphorus (P)	-	ND	0.10	mg/L	2023/05/15	2023/05/15	JHY	8664570



BUREAU
VERITAS

Bureau Veritas Job #: C3D6001
Report Date: 2023/05/18

NL Department of Environment, Climate Change and
Municipalities

Site Location: PADDY'S POND @ OUTLET

Your P.O. #: 220028978-9

Sampler Initials: LB

Bureau Veritas - Partial/Rush Results

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
VUK130 PADDY'S POND @ OUTLET								
Sampling Date 2023/05/10 11:05								
Matrix W								
Sample # 2023-1702-00-SI-SP								
Registration # SA-0000								
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Potassium (K)	-	0.48	0.10	mg/L	2023/05/15	2023/05/15	JHY	8664570
Total Selenium (Se)	-	ND	0.00050	mg/L	2023/05/15	2023/05/15	JHY	8664570
Total Sodium (Na)	-	18	0.10	mg/L	2023/05/15	2023/05/15	JHY	8664570
Total Strontium (Sr)	-	0.0086	0.0020	mg/L	2023/05/15	2023/05/15	JHY	8664570
Total Uranium (U)	-	ND	0.00010	mg/L	2023/05/15	2023/05/15	JHY	8664570
Total Zinc (Zn)	-	ND	0.0050	mg/L	2023/05/15	2023/05/15	JHY	8664570



BUREAU
VERITAS

Bureau Veritas Job #: C3D6001
Report Date: 2023/05/18

NL Department of Environment, Climate Change and
Municipalities
Site Location: PADDY'S POND @ OUTLET
Your P.O. #: 220028978-9
Sampler Initials: LB

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	7.0°C
-----------	-------

Results relate only to the items tested.

Bureau Veritas - Partial/Rush Results



BUREAU VERITAS

Bureau Veritas Job #: C3D6001
Report Date: 2023/05/18

NL Department of Environment, Climate Change and
Municipalities
Site Location: PADDY'S POND @ OUTLET
Your P.O. #: 220028978-9
Sampler Initials: LB

QUALITY ASSURANCE REPORT

QA/QC		QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
Batch	Init							
8664570	JHY	Matrix Spike	Total Aluminum (Al)	2023/05/15		100	%	80 - 120
			Total Antimony (Sb)	2023/05/15		100	%	80 - 120
			Total Arsenic (As)	2023/05/15		92	%	80 - 120
			Total Barium (Ba)	2023/05/15		95	%	80 - 120
			Total Boron (B)	2023/05/15		94	%	80 - 120
			Total Cadmium (Cd)	2023/05/15		92	%	80 - 120
			Total Calcium (Ca)	2023/05/15		99	%	80 - 120
			Total Chromium (Cr)	2023/05/15		91	%	80 - 120
			Total Copper (Cu)	2023/05/15		91	%	80 - 120
			Total Iron (Fe)	2023/05/15		99	%	80 - 120
			Total Lead (Pb)	2023/05/15		95	%	80 - 120
			Total Magnesium (Mg)	2023/05/15		101	%	80 - 120
			Total Manganese (Mn)	2023/05/15		96	%	80 - 120
			Total Nickel (Ni)	2023/05/15		94	%	80 - 120
			Total Phosphorus (P)	2023/05/15		100	%	80 - 120
			Total Potassium (K)	2023/05/15		103	%	80 - 120
			Total Selenium (Se)	2023/05/15		98	%	80 - 120
			Total Sodium (Na)	2023/05/15		101	%	80 - 120
			Total Strontium (Sr)	2023/05/15		95	%	80 - 120
			Total Uranium (U)	2023/05/15		101	%	80 - 120
Total Zinc (Zn)	2023/05/15		95	%	80 - 120			
8664570	JHY	Spiked Blank	Total Aluminum (Al)	2023/05/15		100	%	80 - 120
			Total Antimony (Sb)	2023/05/15		101	%	80 - 120
			Total Arsenic (As)	2023/05/15		92	%	80 - 120
			Total Barium (Ba)	2023/05/15		94	%	80 - 120
			Total Boron (B)	2023/05/15		95	%	80 - 120
			Total Cadmium (Cd)	2023/05/15		93	%	80 - 120
			Total Calcium (Ca)	2023/05/15		99	%	80 - 120
			Total Chromium (Cr)	2023/05/15		93	%	80 - 120
			Total Copper (Cu)	2023/05/15		92	%	80 - 120
			Total Iron (Fe)	2023/05/15		102	%	80 - 120
			Total Lead (Pb)	2023/05/15		95	%	80 - 120
			Total Magnesium (Mg)	2023/05/15		104	%	80 - 120
			Total Manganese (Mn)	2023/05/15		97	%	80 - 120
			Total Nickel (Ni)	2023/05/15		95	%	80 - 120
			Total Phosphorus (P)	2023/05/15		98	%	80 - 120
			Total Potassium (K)	2023/05/15		97	%	80 - 120
			Total Selenium (Se)	2023/05/15		98	%	80 - 120
			Total Sodium (Na)	2023/05/15		101	%	80 - 120
			Total Strontium (Sr)	2023/05/15		94	%	80 - 120
			Total Uranium (U)	2023/05/15		100	%	80 - 120
Total Zinc (Zn)	2023/05/15		97	%	80 - 120			
8664570	JHY	Method Blank	Total Aluminum (Al)	2023/05/15	ND, RDL=0.0050		mg/L	
			Total Antimony (Sb)	2023/05/15	ND, RDL=0.0010		mg/L	
			Total Arsenic (As)	2023/05/15	ND, RDL=0.0010		mg/L	
			Total Barium (Ba)	2023/05/15	ND, RDL=0.0010		mg/L	
			Total Boron (B)	2023/05/15	ND, RDL=0.050		mg/L	

Bureau Veritas - Partial/Rush Results



BUREAU
VERITAS

Bureau Veritas Job #: C3D6001
Report Date: 2023/05/18

NL Department of Environment, Climate Change and
Municipalities

Site Location: PADDY'S POND @ OUTLET

Your P.O. #: 220028978-9

Sampler Initials: LB

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Cadmium (Cd)	2023/05/15	ND, RDL=0.000010		mg/L	
			Total Calcium (Ca)	2023/05/15	ND, RDL=0.10		mg/L	
			Total Chromium (Cr)	2023/05/15	ND, RDL=0.0010		mg/L	
			Total Copper (Cu)	2023/05/15	ND, RDL=0.00050		mg/L	
			Total Iron (Fe)	2023/05/15	ND, RDL=0.050		mg/L	
			Total Lead (Pb)	2023/05/15	ND, RDL=0.00050		mg/L	
			Total Magnesium (Mg)	2023/05/15	ND, RDL=0.10		mg/L	
			Total Manganese (Mn)	2023/05/15	ND, RDL=0.0020		mg/L	
			Total Nickel (Ni)	2023/05/15	ND, RDL=0.0020		mg/L	
			Total Phosphorus (P)	2023/05/15	ND, RDL=0.10		mg/L	
			Total Potassium (K)	2023/05/15	ND, RDL=0.10		mg/L	
			Total Selenium (Se)	2023/05/15	ND, RDL=0.00050		mg/L	
			Total Sodium (Na)	2023/05/15	ND, RDL=0.10		mg/L	
			Total Strontium (Sr)	2023/05/15	ND, RDL=0.0020		mg/L	
			Total Uranium (U)	2023/05/15	ND, RDL=0.00010		mg/L	
			Total Zinc (Zn)	2023/05/15	ND, RDL=0.0050		mg/L	
8664570	JHY	RPD	Total Aluminum (Al)	2023/05/15	5.9		%	20
			Total Antimony (Sb)	2023/05/15	NC		%	20
			Total Arsenic (As)	2023/05/15	NC		%	20
			Total Barium (Ba)	2023/05/15	4.2		%	20
			Total Boron (B)	2023/05/15	NC		%	20
			Total Cadmium (Cd)	2023/05/15	4.7		%	20
			Total Calcium (Ca)	2023/05/15	6.8		%	20
			Total Chromium (Cr)	2023/05/15	NC		%	20
			Total Copper (Cu)	2023/05/15	6.7		%	20
			Total Iron (Fe)	2023/05/15	6.8		%	20
			Total Lead (Pb)	2023/05/15	NC		%	20
			Total Magnesium (Mg)	2023/05/15	6.2		%	20
			Total Manganese (Mn)	2023/05/15	5.6		%	20
			Total Nickel (Ni)	2023/05/15	NC		%	20
			Total Phosphorus (P)	2023/05/15	NC		%	20
			Total Potassium (K)	2023/05/15	0.34		%	20
			Total Selenium (Se)	2023/05/15	NC		%	20
			Total Sodium (Na)	2023/05/15	5.0		%	20
			Total Strontium (Sr)	2023/05/15	1.5		%	20
			Total Uranium (U)	2023/05/15	NC		%	20
			Total Zinc (Zn)	2023/05/15	13		%	20

Bureau Veritas - Partial/Rush Results



BUREAU
VERITAS

Bureau Veritas Job #: C3D6001
Report Date: 2023/05/18

NL Department of Environment, Climate Change and
Municipalities

Site Location: PADDY'S POND @ OUTLET

Your P.O. #: 220028978-9

Sampler Initials: LB

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8665028	SGK	Matrix Spike	Total Mercury (Hg)	2023/05/16		100	%	80 - 120
8665028	SGK	Spiked Blank	Total Mercury (Hg)	2023/05/16		99	%	80 - 120
8665028	SGK	Method Blank	Total Mercury (Hg)	2023/05/16	ND, RDL=0.000013		mg/L	
8665028	SGK	RPD	Total Mercury (Hg)	2023/05/16	NC		%	20
8665200	RDM	QC Standard	Total Suspended Solids	2023/05/16		96	%	80 - 120
8665200	RDM	Method Blank	Total Suspended Solids	2023/05/16	ND, RDL=1.0		mg/L	
8665200	RDM	RPD	Total Suspended Solids	2023/05/16	NC		%	20
8666060	GYA	Matrix Spike	Total Phosphorus	2023/05/17		98	%	80 - 120
8666060	GYA	QC Standard	Total Phosphorus	2023/05/17		105	%	80 - 120
8666060	GYA	Spiked Blank	Total Phosphorus	2023/05/17		110	%	80 - 120
8666060	GYA	Method Blank	Total Phosphorus	2023/05/17	ND, RDL=0.004		mg/L	
8666060	GYA	RPD	Total Phosphorus	2023/05/17	0.73		%	20
8666904	NGI	Spiked Blank	Total Alkalinity (Total as CaCO3)	2023/05/16		97	%	80 - 120
8666904	NGI	Method Blank	Total Alkalinity (Total as CaCO3)	2023/05/16	ND, RDL=2.0		mg/L	
8666904	NGI	RPD	Total Alkalinity (Total as CaCO3)	2023/05/16	13		%	20
8667378	TGO	Matrix Spike	Nitrogen (Ammonia Nitrogen)	2023/05/17		108	%	80 - 120
8667378	TGO	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2023/05/17		115	%	80 - 120
8667378	TGO	Method Blank	Nitrogen (Ammonia Nitrogen)	2023/05/17	ND, RDL=0.050		mg/L	
8667378	TGO	RPD	Nitrogen (Ammonia Nitrogen)	2023/05/17	NC		%	20
8667474	NGI	Spiked Blank	Conductivity	2023/05/16		97	%	80 - 120
8667474	NGI	Method Blank	Conductivity	2023/05/16	ND, RDL=1.0		uS/cm	
8667474	NGI	RPD	Conductivity	2023/05/16	0.18		%	10
8667511	NGI	Spiked Blank	pH	2023/05/16		100	%	97 - 103
8667511	NGI	RPD	pH	2023/05/16	0.0013		%	N/A
8667517	NGI	Matrix Spike	Dissolved Fluoride (F-)	2023/05/16		85	%	80 - 120
8667517	NGI	Spiked Blank	Dissolved Fluoride (F-)	2023/05/16		92	%	80 - 120
8667517	NGI	Method Blank	Dissolved Fluoride (F-)	2023/05/16	ND, RDL=0.10		mg/L	
8667517	NGI	RPD	Dissolved Fluoride (F-)	2023/05/16	NC		%	20
8667608	TGO	Spiked Blank	Colour	2023/05/17		96	%	80 - 120
8667608	TGO	Method Blank	Colour	2023/05/17	ND, RDL=5.0		TCU	
8667608	TGO	RPD	Colour	2023/05/17	NC		%	20
8667617	TGO	Matrix Spike	Nitrate + Nitrite (N)	2023/05/17		93	%	80 - 120
8667617	TGO	Spiked Blank	Nitrate + Nitrite (N)	2023/05/17		104	%	80 - 120
8667617	TGO	Method Blank	Nitrate + Nitrite (N)	2023/05/17	ND, RDL=0.050		mg/L	
8667617	TGO	RPD	Nitrate + Nitrite (N)	2023/05/17	20		%	20
8667626	TGO	Matrix Spike	Nitrite (N)	2023/05/17		95	%	80 - 120
8667626	TGO	Spiked Blank	Nitrite (N)	2023/05/17		101	%	80 - 120
8667626	TGO	Method Blank	Nitrite (N)	2023/05/17	ND, RDL=0.010		mg/L	
8667626	TGO	RPD	Nitrite (N)	2023/05/17	NC		%	20
8667659	CPP	Matrix Spike	Total Organic Carbon (C)	2023/05/16		98	%	85 - 115
8667659	CPP	Spiked Blank	Total Organic Carbon (C)	2023/05/16		98	%	80 - 120

Bureau Veritas - Partial/Rush Results



BUREAU
VERITAS

Bureau Veritas Job #: C3D6001
Report Date: 2023/05/18

NL Department of Environment, Climate Change and
Municipalities

Site Location: PADDY'S POND @ OUTLET

Your P.O. #: 220028978-9

Sampler Initials: LB

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8667659	CPP	Method Blank	Total Organic Carbon (C)	2023/05/16	ND, RDL=0.50		mg/L	
8667659	CPP	RPD	Total Organic Carbon (C)	2023/05/16	NC		%	15
8667799	RTY	Matrix Spike	Total Kjeldahl Nitrogen (TKN)	2023/05/17		105	%	80 - 120
8667799	RTY	QC Standard	Total Kjeldahl Nitrogen (TKN)	2023/05/17		99	%	80 - 120
8667799	RTY	Spiked Blank	Total Kjeldahl Nitrogen (TKN)	2023/05/17		101	%	80 - 120
8667799	RTY	Method Blank	Total Kjeldahl Nitrogen (TKN)	2023/05/17	ND, RDL=0.10		mg/L	
8667799	RTY	RPD	Total Kjeldahl Nitrogen (TKN)	2023/05/17	18		%	20
8669270	CPP	Matrix Spike	Dissolved Organic Carbon (C)	2023/05/17		97	%	85 - 115
8669270	CPP	Spiked Blank	Dissolved Organic Carbon (C)	2023/05/17		94	%	80 - 120
8669270	CPP	Method Blank	Dissolved Organic Carbon (C)	2023/05/17	ND, RDL=0.50		mg/L	
8669270	CPP	RPD	Dissolved Organic Carbon (C)	2023/05/17	1.6		%	15
8669363	NGI	QC Standard	Turbidity	2023/05/17		91	%	80 - 120
8669363	NGI	Spiked Blank	Turbidity	2023/05/17		102	%	80 - 120
8669363	NGI	Method Blank	Turbidity	2023/05/17	ND, RDL=0.10		NTU	
8669363	NGI	RPD	Turbidity	2023/05/17	1.0		%	20

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

Bureau Veritas - Partial/Rush Results



BUREAU
VERITAS

Bureau Veritas Job #: C3D6001
Report Date: 2023/05/18

NL Department of Environment, Climate Change and
Municipalities
Site Location: PADDY'S POND @ OUTLET
Your P.O. #: 220028978-9
Sampler Initials: LB

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Anastassia Hamanov, Scientific Specialist

Janah Rhyno, Metals Supervisor-Bedford

Mike MacGillivray, Scientific Specialist (Inorganics)

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by {0}, {1} responsible for {2} {3} laboratory operations.

Bureau Veritas - Partial/Rush Results