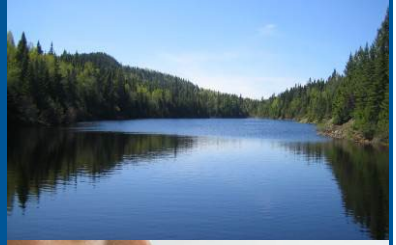
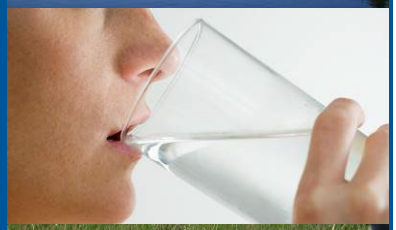






Real-Time Water Quality Report

Waterford River at Kilbride
NF02ZM0009

Deployment Period
August 28, 2024, to October 17, 2024

Newfoundland Labrador

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

Waterford River at Kilbride, Newfoundland and Labrador

Prepared by:

Water Resources Management Division
Department of Environment & Climate Change
4th Floor, Confederation Building, West Block
PO Box 8700, St. John's NL A1B 4J6

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GENERAL

The Water Resources Management Division (WRMD), in partnership with Water Survey of Canada - Environment and Climate Change Canada (WSC-ECCC), maintain a real-time water quality and water quantity monitoring station on Waterford River at Kilbride.

The purpose of the real-time water quality station is to monitor, process and publish real-time water quality data.

This deployment report discusses water quality related events occurring at this station from the instrument deployment on August 28, 2024, until removal on October 17, 2024, 51 days later. **Please note that internal data and transmission was lost on October 13, 2024, due to instrument damage and could not be included in this report.**

To ensure the success of the RTWQ program, it is crucial to stay acquainted with the latest advancements in water quality monitoring technology. In the station's history, the YSI 6600 and YSI EXO2 has been utilized for both short and long-term deployment. However, moving forward, it is important to trial new equipment and methods.

Figure 1: Aqua TROLL 800

The InSitu Aqua TROLL 800 utilized in this deployment is an advanced multiparameter sonde equipped with seven customizable ports and non-vented pressure measurement. It combines EPA-approved water quality sensors with the convenience of smartphone mobility, allowing users to collect and analyze data using the VuSitu Mobile App on their mobile devices or the Win-Situ 5 software on a PC/laptop. Notable features include a user-friendly LCD status screen that provides visual indicators for overall readiness, battery life, internal log, and sensor status. It also includes integrated Bluetooth connectivity for wireless data access and an onboard micro SD card for data backup and download.

With its low power consumption, the sonde offers a battery life of at least 6 months (with central wiper) and incorporates advanced antifouling measures to protect all sensors. The Aqua TROLL 800 includes self-compensating turbidity, optical RDO, and level sensors, and can easily integrate with the current telemetry system at Waterford River station to provide real-time feedback from remote water monitoring sites.

Figure 1: Waterford River at Kilbride Real-Time Water Quality and Quantity Station.

QUALITY ASSURANCE AND QUALITY CONTROL

As part of the Quality Assurance and Quality Control protocol (QA/QC), an assessment of the reliability of data recorded by an instrument is made at the beginning and end of the deployment period. The procedure is based on the approach used by the United States Geological Survey (Table 1).

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

WRMD staff at the Department of Environment & Climate Change (ECC) are responsible for maintaining and calibrating the water quality instrument, as well as grooming, analyzing, and reporting on water quality data recorded at the station. WSC staff are responsible for the data logging/communication aspect of the network and maintenance of the water quantity monitoring equipment. WSC staff visit the site regularly to ensure the data logging and data transmitting equipment are working properly and are responsible for handling stage and streamflow data issues. The water quantity data is transmitted via satellite and published online with the water quality data on the WRMD website. Water quantity data has not been corrected or groomed when published online or used in the monthly reports for the stations. While WSC oversees the hydrometric component of these stations, due to differences in protocols, quality control for WSC hydrometric data occurs less frequently than for water quality data.

The hydrometric data presented in this report is provisional and has not undergone quality control checks. Accurate hydrometric data can be accessed at https://wateroffice.ec.gc.ca/ or by request to Water Survey Canada.

Table 1: Instrument Performance Ranking classifications for deployment and removal.

	Rank				
Parameter	**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

Table 2: Instrument performance rankings for Waterford River at Kilbride

Station	**Date**	**Action**	**Comparison Ranking**				
			Temperature	**pH**	**Conductivity**	**Dissolved Oxygen**	**Turbidity**
Waterford River @ Kilbride	**August 28, 2024**	**Deployment**	Good	Excellent	Excellent	Excellent	Excellent
		Grab Sample # 2024-1718-00-SI-SP	N/A	Good	Good	N/A	Excellent
	October 17, 2024	**Removal**	--	--	--	--	--

The performance rankings for the water quality instruments at the Waterford River at Kilbride station provide insights into the reliability and accuracy of the measurements taken during deployment and removal, as well as a comparison with grab samples.

On August 28, 2024, during the deployment of the instrument, the temperature ranked ‘Good’, while conductivity, turbidity, pH and DO readings were all ranked as ‘Excellent’, indicating high reliability and confidence in the measurements for these parameters.

A grab sample taken on the same day (sample #2024-1718-00-SI-SP) provided ‘Good’ ranking for pH and conductivity, aligning well with the deployment ranking, thus validating these instrument readings. The turbidity was rated ‘Excellent’, also aligning with the deployment ranking.

Waterford River at Kilbride, Newfoundland and Labrador

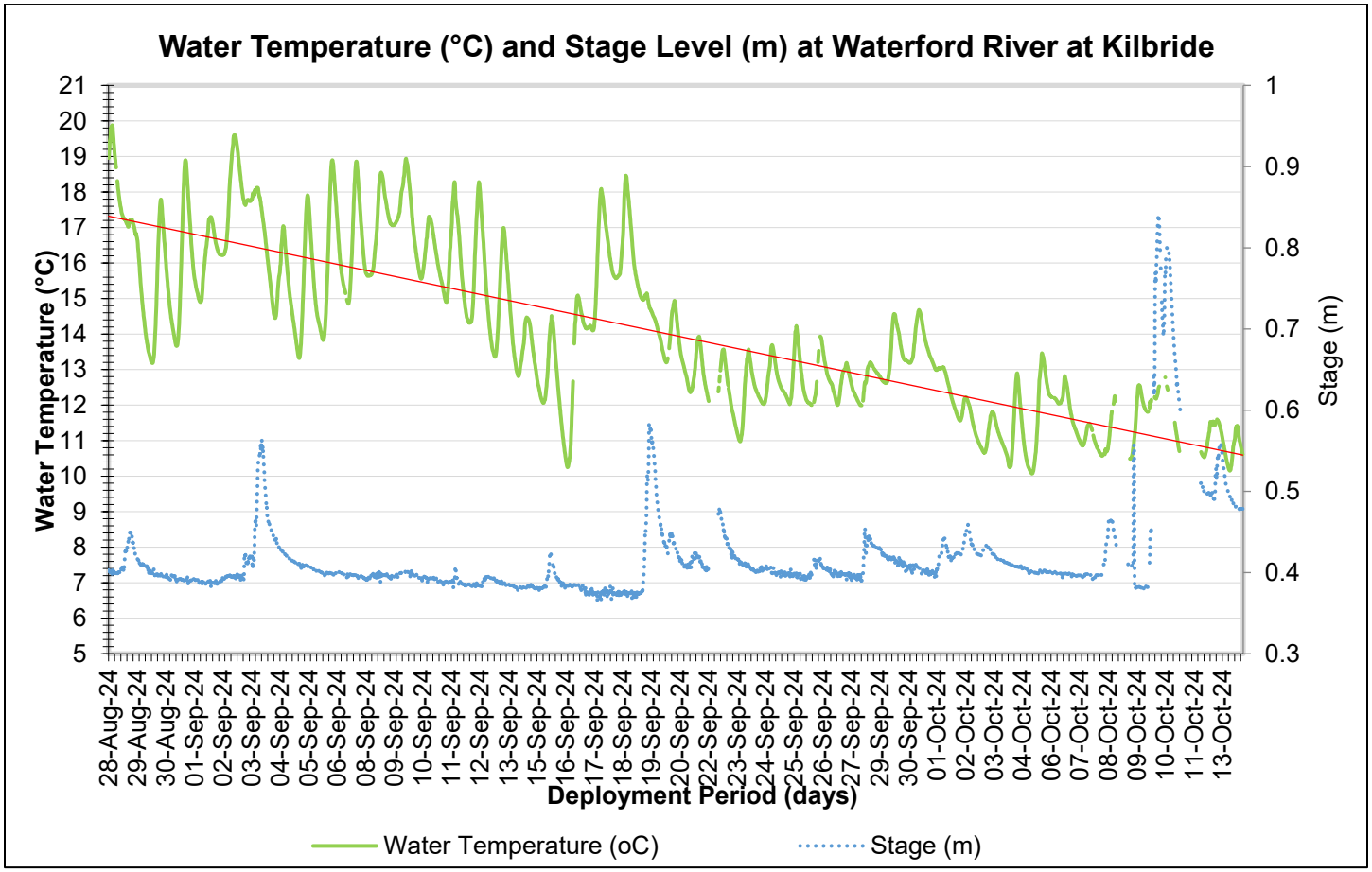
Due to loss of water quality data transmission on October 13, 2024, the instrument was removed on October 17, 2024, and no rankings could be determined. Upon removal, it was determined that significant damage to the instrument had occurred, and that water had filled the battery compartment.

DATA INTERPRETATION

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. Variations in water temperature can influence biological processes, aquatic habitats, and water chemistry, making it a crucial parameter to monitor in understanding ecosystem dynamics. Additionally, tracking temperature trends over time can provide valuable information for assessing the impacts of climate change, seasonal variations, and anthropogenic influences on aquatic ecosystems.

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.



Temperature (oC)	Mean	Median	Min	Max
Hourly	14.12	13.70	10.07	19.88

Figure 2: Water temperature (°C) and Stage (m) values at Waterford River at Kilbride

The water temperature data in Figure 2, provides valuable insights into the thermal characteristics of Waterford River. With a mean temperature of 14.12°C and a median of 13.70°C, the dataset indicates relatively consistent temperatures. The minimum temperature recorded at 10.07°C (October 5), represents cooler conditions, possibly associated with lower air temperatures and the addition of cooler water from rain events. The maximum temperature of 19.88°C was reached on August 28. The visible downward trend suggests a gradual cooling of the river water, most likely influenced by fall to winter seasonal changes, and due to a decrease in air temperature and sun hours.

The diurnal pattern characterized by temperature increases during the day and decreases overnight. This pattern highlights the river's responsiveness to external influences, particularly daily air temperature fluctuations and precipitation events. Warmer air temperatures during the day contribute to elevated water temperatures, while cooler nighttime temperatures lead to declines. Precipitation events, such as rainfall, also play a significant role, introducing cooler water into the river and contributing to fluctuations in temperature as seen on September 3 and 19 and on October 10, 2024.

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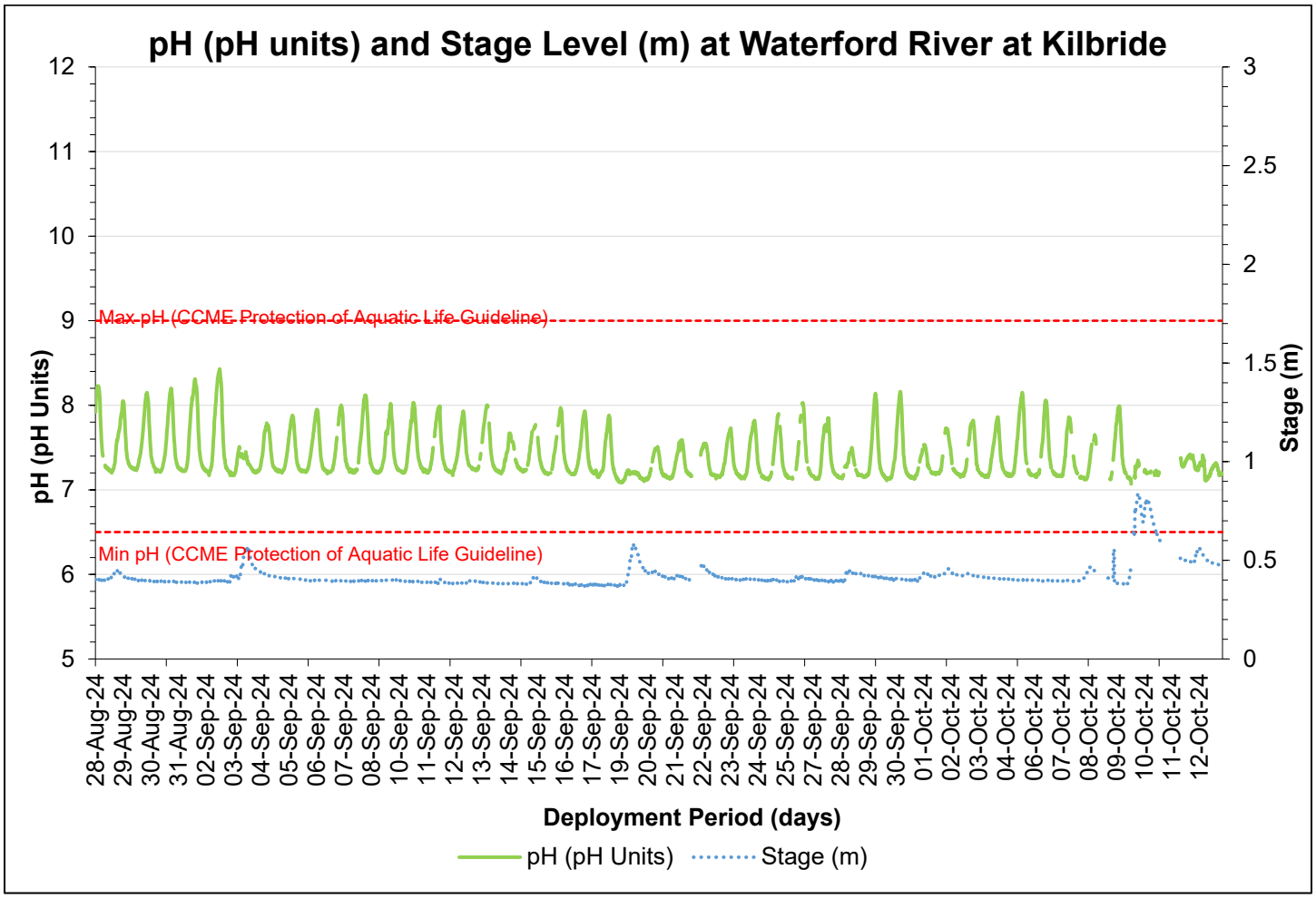
pH

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.



Temperature (oC)	Mean	Median	Min	Max
Hourly	7.40	7.28	7.07	8.43

Figure 3: pH (pH units) and stage level (m) values at Waterford River at Kilbride.

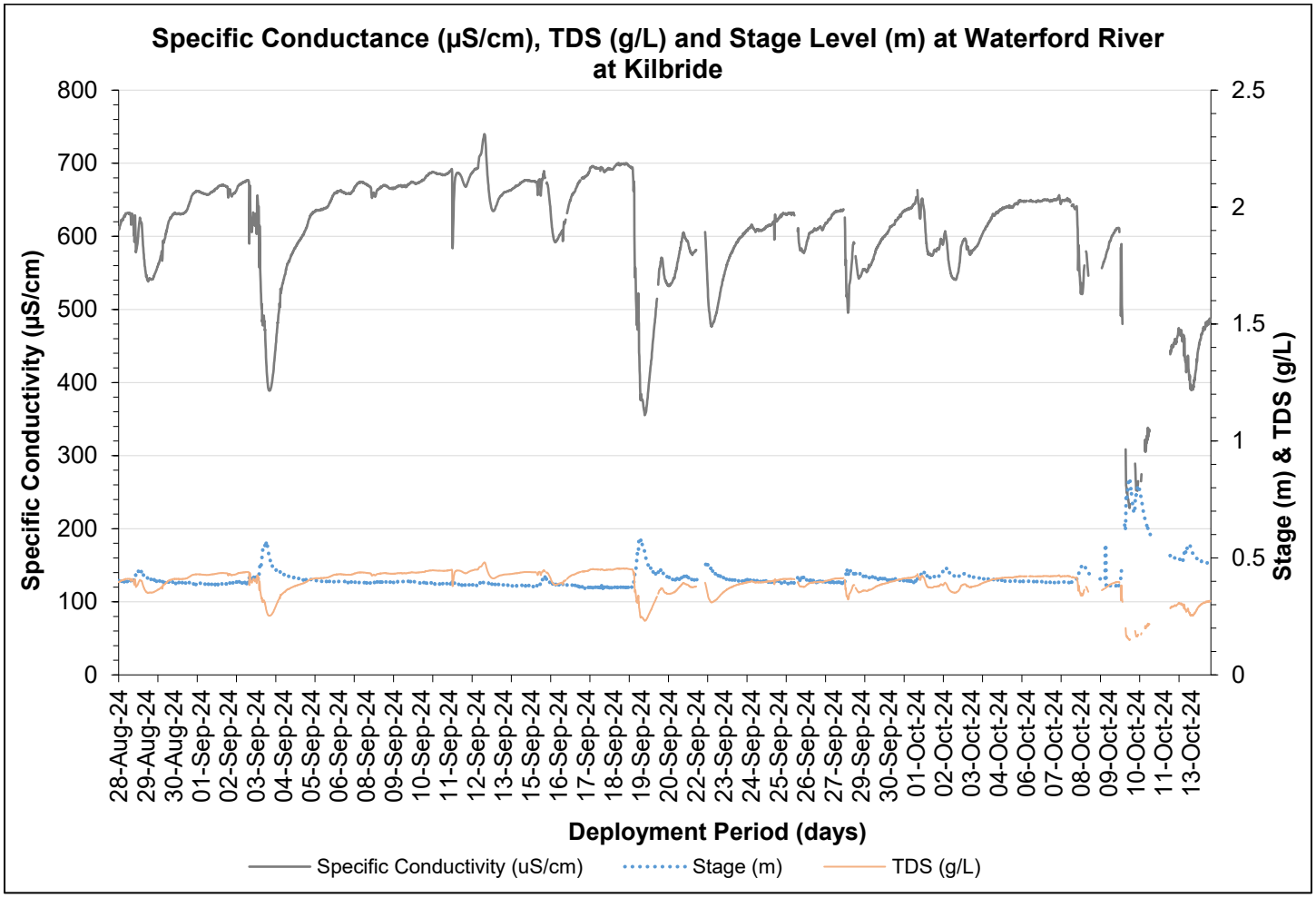
The water pH statistics for the Waterford River provide valuable insight into the acidity or alkalinity levels of the river water during the monitoring period. The mean pH of 7.40 indicates a neutral to slightly alkaline nature on average. Similarly, the median pH of 7.28 reinforces this trend, indicating that most pH measurements clustered around this value. The minimum pH recorded at 7.07 represents the lowest acidity level observed, suggesting occasional fluctuations towards slightly acidic. On the other hand, the maximum pH of 8.43 indicates the highest alkalinity level recorded (Figure 3).

The data shows relatively stable pH levels throughout, with minor fluctuations within a narrow range. These variations may be influenced by factors such as natural fluctuations in water chemistry, input from surrounding environments, and changes in weather conditions (i.e. precipitation events). Despite these minor fluctuations, the average pH values suggest that the Waterford River maintains a relatively stable neutral to slightly alkaline environment throughout the monitoring period.

The diurnal fluctuation in water pH is temperature dependent and rises during the day followed by nighttime decreases. This pattern emphasizes the river's sensitivity to external factors, especially daily shifts in air temperature and the addition of more acidic precipitation, resulting in a temporary increase in stage and decrease in fluctuation range, as seen dramatically on September 3 and 19, 2024 and on October 10, 2024.

Specific Conductivity & Total Dissolved Solids

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. Monitoring specific conductivity is crucial for assessing water quality, identifying potential sources of contamination, and ensuring the health of aquatic ecosystems. Deviations from expected conductivity levels may signal the need for further investigation and management actions to maintain water quality and ecosystem integrity.



Parameter		Mean	Median	Min	Max
Specific Conductivity (µS/cm)	Hourly	608.43	629.89	228.35	739.89
TDS (mg/L)	Hourly	0.395	0.409	0.148	0.481

Figure 4: Specific conductivity (µS/cm), and TDS (g/mL) values at Waterford River at Kilbride.

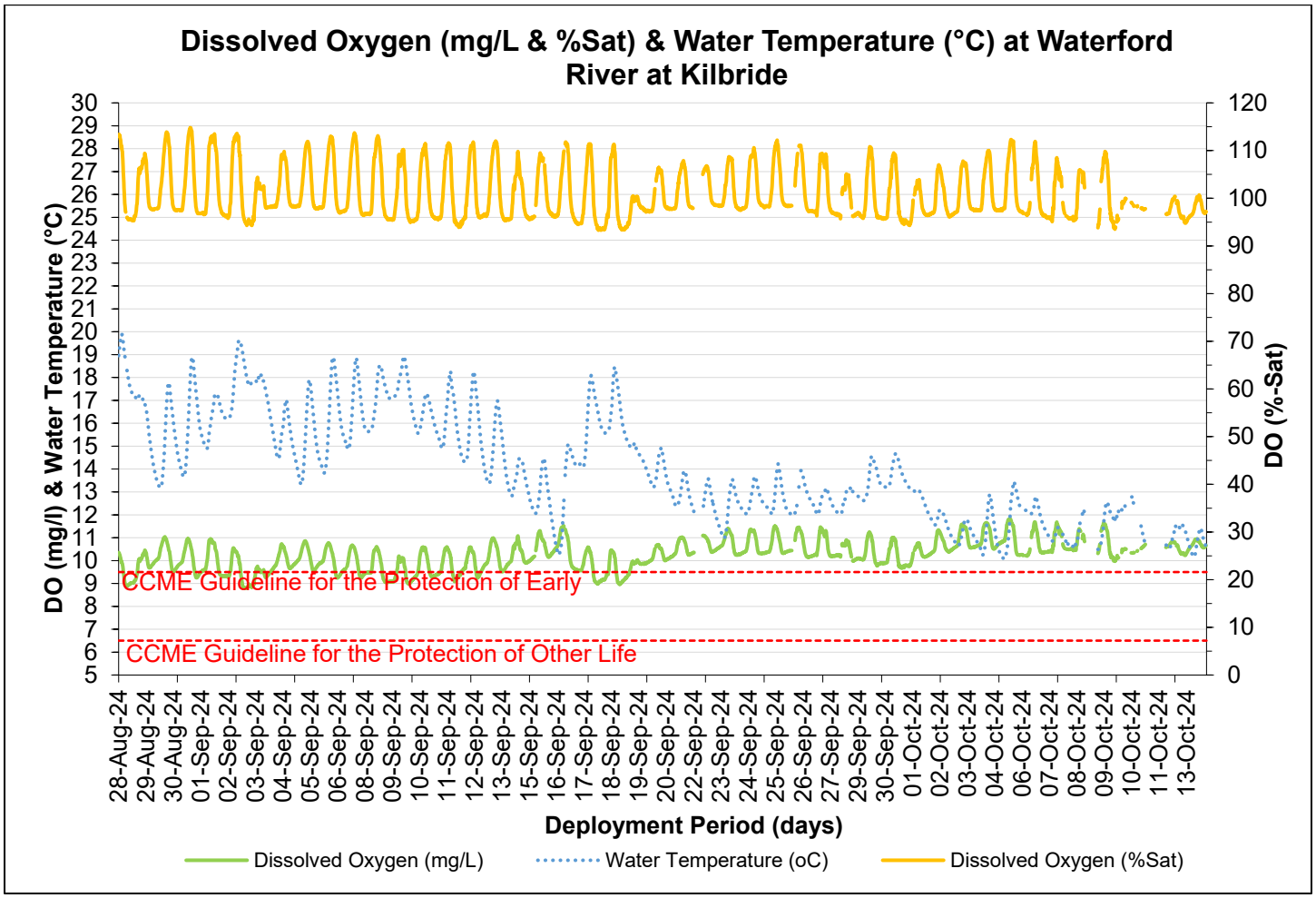
The specific conductivity and total dissolved solids (TDS) data (Figure 4) for the Waterford River shows a varied pattern over the observed period, starting at 610.98 µS/cm on August 28, 2024. Notable fluctuations are observed throughout, with occasional spikes and dips in conductivity levels. For instance, a significant decrease in conductivity was observed on September 3 and 19, 2024. On October 10, 2024, a significant decrease in conductivity was observed due to the dilution of the waterbody by the receipt of 33.5 mm of rain. Conductivity began to slowly increase until the end of the deployment period but never reached pre- rainfall event levels.

The mean specific conductivity of 608.43 µS/cm indicates a moderately high level of ion concentration, reflecting the presence of dissolved salts, minerals, and other conductive substances. The median conductivity of 629.89 µS/cm indicates minimal variable conductivity levels across the dataset. The minimum conductivity value of 228.35 µS/cm (October 10) suggests periods with lower ion concentration, while the maximum conductivity of 739.89 µS/cm (September 13) signifies elevated ion levels, likely influenced by various anthropogenic and natural factors such as variations in precipitation, runoff from surrounding areas, and changes in water flow.

In terms of the calculated TDS, the mean value of 0.395 mg/L indicates a somewhat low concentration of dissolved solids, which is generally favorable for freshwater ecosystems. The median TDS of 0.409 mg/L suggests consistent dissolved solids levels throughout the dataset. Instances of exceptionally low TDS content, represented by the minimum value of 0.148 mg/L, may occur in areas with minimal anthropogenic influence or pristine environmental conditions. Conversely, the maximum TDS of 0.481 mg/L indicates higher concentrations of dissolved solids, potentially influenced by agricultural runoff, urban pollution, or natural geological processes.

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.



Dissolved Oxygen		Mean	Median	Min	Max
DO (%Sat)	Hourly	100.99	98.5	93.3	114.8
DO (mg/L)	Hourly	10.23	10.3	8.78	11.83

Figure 5: Dissolved Oxygen (mg/L & Percent Saturation) values at Waterford River at Kilbride.

From August 28 to October 13, the dissolved oxygen (DO) levels in Waterford River exhibited fluctuations, likely influenced by temperature variations, water flow, and biological activity. The data suggests a graduall increase in DO concentrations over time, with notable variations corresponding to cooling water temperatures.

The mean DO saturation percentage of 100.99% suggesting that, on average, the water is fully saturated with oxygen, which is optimal for aquatic organisms' respiration and survival. This high mean value indicates that the river generally maintains healthy oxygen levels throughout the recorded period. The median DO saturation percentage (98.5%) is consistent with the mean, further confirming the overall stability of oxygen saturation levels.

The minimum value of 93.3% indicates a slight decrease in oxygen saturation, likely influenced by factors such as temperature fluctuations, organic matter decomposition, or reduced water flow. Conversely, the maximum value of 114.8% suggests instances of oxygen supersaturation, which could be caused by factors like increased photosynthetic activity, enhanced aeration due to higher flows, or lower water temperatures.

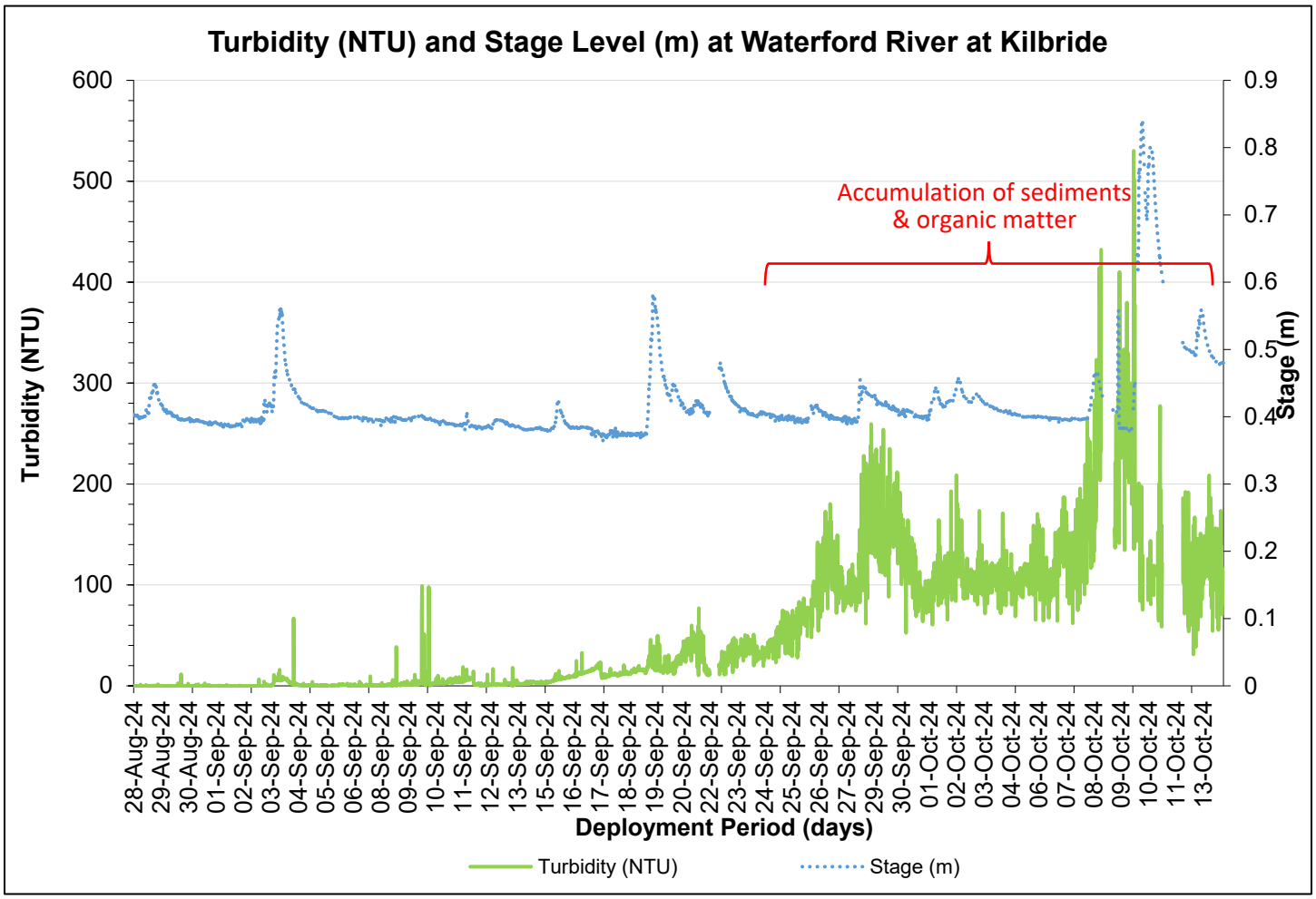
Considering dissolved oxygen concentrations in milligrams per liter (mg/L), the mean DO concentration of 10.23 mg/L aligns well with the saturation percentage data and median DO concentration (10.3 mg/L) is also consistent with the mean. The minimum DO concentration of 9.78 mg/L represents a temporary decrease in oxygen levels, and a maximum DO concentration of 11.83 mg/L.

Overall, DO levels remained mostly above the guideline for the protection of early life stages, though there were instances where values approached or dipped near critical limits, during periods of warmer water temperature.

A diurnal variation pattern was evident but significantly altered by rain events throughout the deployment period, as seen on September 3 and 19, 2024 as well as on October 10, 2024. The extent of this variation is linked to the daily range of water temperature, duration of daylight, and fluctuations in rates of photosynthesis and respiration.

Turbidity

Water turbidity is characterized by the cloudiness or haziness caused by suspended particles and can significantly impact water quality. High turbidity reduces light penetration, hindering photosynthesis and affecting aquatic vegetation growth and habitat suitability. It can lead to temperature fluctuations, oxygen depletion from microbial decomposition of organic matter, and sedimentation, smothering benthic habitats and compromising biodiversity. Turbidity can also transport nutrients and pollutants, contributing to eutrophication, algal blooms, and contamination of drinking water sources. Furthermore, it highlights the significance of monitoring and managing turbidity levels to uphold the health and functionality of aquatic ecosystems.



Turbidity (NTU)	Mean	Median	Min	Max
Hourly	52.21	15.75	0	530.19

Figure 6: Turbidity (NTU) and stage (m) values at Waterford River at Kilbride.

Figure 6 illustrates fluctuations in water turbidity over the observed period. Please note that statistical analysis was significantly influenced but the accumulation of sediment and organic matter within the sonde casing. All values should be reviewed with consideration.

With a mean turbidity of 52.21 NTU, the average clarity suggests moderately clear water conditions with suspended particles or sediment present. The median turbidity value of 15.75 NTU indicates variability across the dataset. The minimum turbidity value of 0.0 NTU represents periods of very clear water, indicating good visibility within the river. However, the maximum turbidity recorded at 530.19 NTU signifies instances of elevated cloudiness, likely caused by factors such as sediment accumulation, increased turbidity from rainfall events, and/or other environmental disturbances.

Turbidity levels continued to increase post the September 19, 2024, rainfall event. It is likely that sediments and organic matter became lodged within the sonde casing and turbidity levels continued to increase until the end of the deployment period with another observed spike in turbidity on the rain event observed on October 10, 2024.

Stage and Precipitation

Stage values are determined by a vertical reference and serve as an approximation of the water level at the monitoring station. In addition, stage plays a vital role in understanding various environmental parameters like specific conductivity, dissolved oxygen (DO), and turbidity. It typically rises in response to rainfall events, reflecting the influx of water into the river system. However, during snowfall, the increase in stage may not be as pronounced due to factors such as snow accumulation, which takes time to melt and contribute significantly to the water level. By tracking stage variations, we gain valuable insights into the impact of precipitation on river dynamics, helping us assess water quantity, quality, and potential environmental implications.

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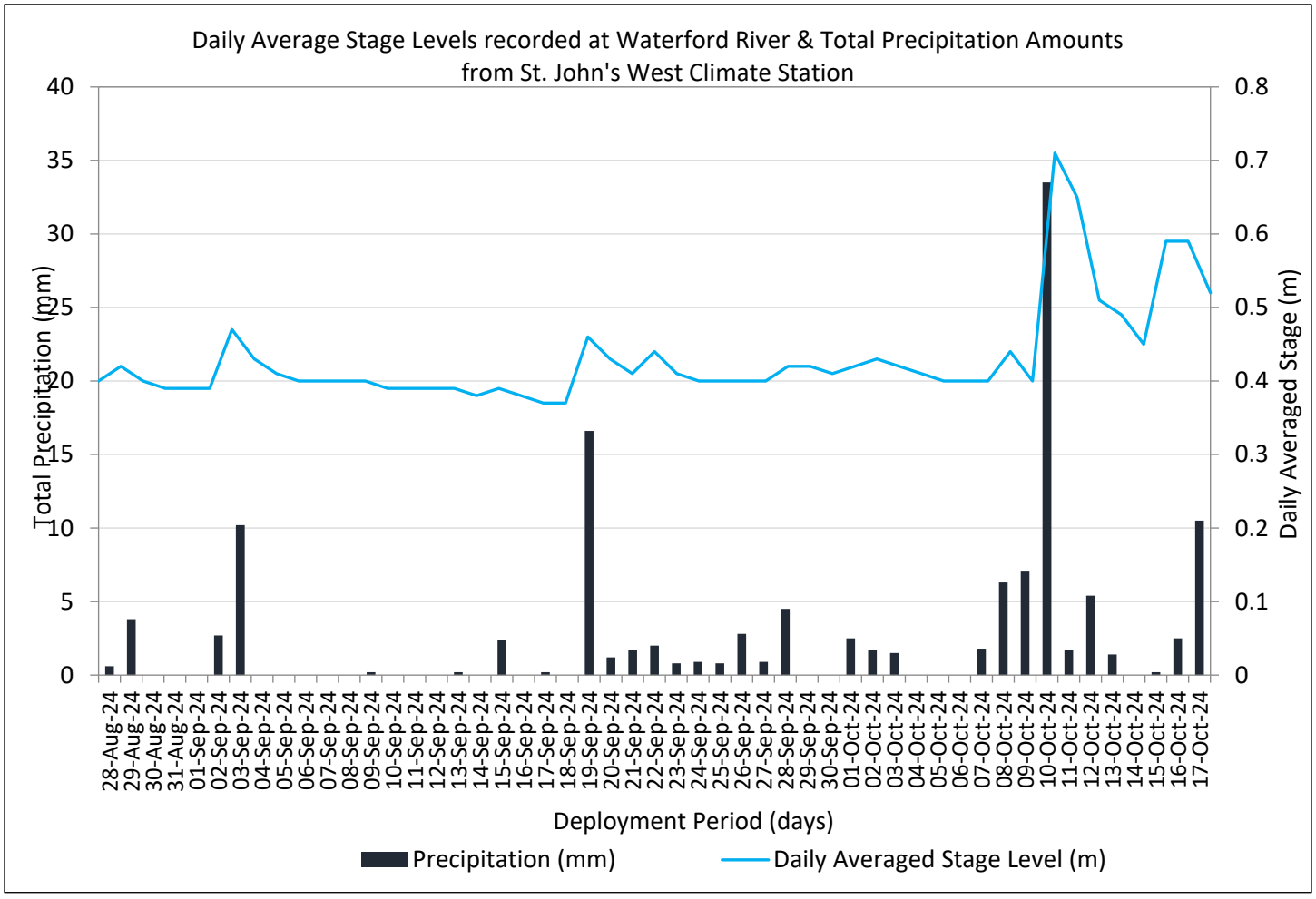


Stage (m)	Mean	Median	Min	Max
Daily Average	0.431	0.400	0.370	0.710

Figure 7: Daily average stage (m) values recorded at Waterford River at Kilbride and daily total precipitation (mm) from St. John's West Climate Station.

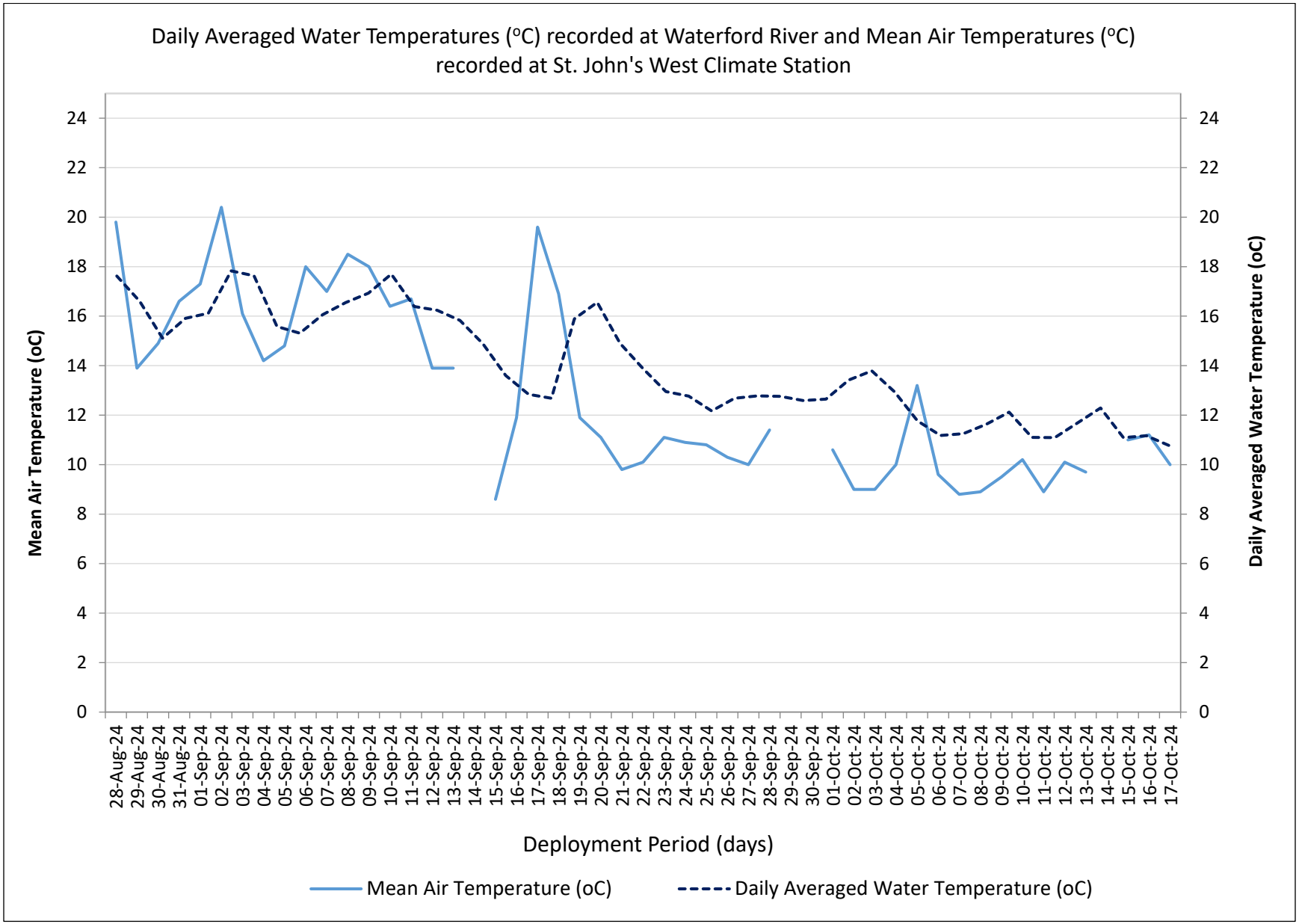
Comparing total precipitation against average daily stage (Figure 7) provides insight into the relationship between rainfall and water levels in the Waterford River at Kilbride. With a mean stage of 0.431 m, the average level of the river during this time frame, serves as a central reference point for observation of change. The median stage of 0.400 m, closely aligned with the mean, suggests a relatively symmetrical distribution. However, the range from the minimum stage of 0.370 units to the maximum stage of 0.710 units signifies variability in river levels.

On days with precipitation (Appendix A), there tends to be an observable increase in average daily stage, indicating a direct response of the river to rainfall events. For example, on September 3 and 19, 2024, there was a total precipitation of 10.2 mm and 16.6 mm respectively, corresponding to an increase in average daily stage from 0.41 m to 0.46 m. Similarly, on October 10, with a substantial precipitation of 33.5 mm, there's a noticeable spike in stage, reaching 0.71 m.

These variations highlight the complex interactions between precipitation and stage. Factors such as current soil moisture levels, land use, and basin characteristics can influence how much precipitation infiltrates the soil, runs off into the river, or evaporates.

APPENDIX A: MEAN DAILY AIR TEMPERATURE AND AVERAGE WATER TEMPERATURE

Waterford River at Kilbride, Newfoundland and Labrador



APPENDIX B: QA/QC GRAB SAMPLE FIELD RESULTS

Your P.O. #: 224006869-3

Attention: Robert Richard Harvey

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

Your C.O.C. #: N/A, 2024-1717-00-SI-SP, 2024-1718-00-SI-SP

Report Date: 2024/09/06
Report #: R8309207
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C4Q9785
Received: 2024/08/29, 09:51

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	2	N/A	2024/09/04	ATL SOP 00142	SM 24 2320 B
Anions (1)	2	N/A	2024/09/04	CAM SOP-00435	SM 23 4110 B m
Colour	2	N/A	2024/09/05	ATL SOP 00020	SM 24 2120C m
Organic carbon - Diss (DOC) (2)	2	N/A	2024/09/04	ATL SOP 00203	SM 24 5310B m
Conductance - water	2	N/A	2024/09/04	ATL SOP 00004	SM 24 2510B m
Fluoride	2	N/A	2024/09/04	ATL SOP 00043	SM 24 4500-F- C m
Hardness (calculated as CaCO3)	2	N/A	2024/09/04	ATL SOP 00048	Auto Calc
Mercury - Total (CVAA,LL)	2	2024/09/05	2024/09/05	ATL SOP 00026	EPA 245.1 R3 m
Metals Water Total MS	2	2024/09/03	2024/09/03	ATL SOP 00058	EPA 6020B R2 m
Nitrogen Ammonia - water	2	N/A	2024/09/04	ATL SOP 00015	EPA 350.1 R2 m
Nitrogen - Nitrate + Nitrite	2	N/A	2024/09/05	ATL SOP 00016	USGS I-2547-11m
Nitrogen - Nitrite	2	N/A	2024/09/05	ATL SOP 00017	SM 24 4500-NO2- B m
Nitrogen - Nitrate (as N)	2	N/A	2024/09/06	ATL SOP 00018	ASTM D3867-16
pH (3)	2	N/A	2024/09/04	ATL SOP 00003	SM 24 4500-H+ B m
Calculated TDS (DW Pkg)	2	N/A	2024/09/05	N/A	Auto Calc
Total Kjeldahl Nitrogen in Water (1)	2	2024/09/03	2024/09/04	CAM SOP-00938	OMOE E3516 m
Organic carbon - Total (TOC) (2)	2	N/A	2024/09/03	ATL SOP 00203	SM 24 5310B m
Total Phosphorus (Colourimetric) (1)	2	2024/09/03	2024/09/03	CAM SOP-00407	SM 24 4500-P I
Total Suspended Solids	2	2024/09/03	2024/09/06	ATL SOP 00007	SM 24 2540D m
Turbidity	2	N/A	2024/09/05	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.

Your P.O. #: 224006869-3

Attention: Robert Richard Harvey

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

Your C.O.C. #: N/A, 2024-1717-00-SI-SP, 2024-1718-00-SI-SP

Report Date: 2024/09/06
Report #: R8309207
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C4Q9785
Received: 2024/08/29, 09:51

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Maryann Comeau, Customer Experience Supervisor/PM
Email: Maryann.COMEAU@bureauveritas.com
Phone# (902)420-0203 Ext:298

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Bureau Veritas Job #: C4Q9785
Report Date: 2024/09/06

NL Department of Environment, Climate Change and Municipalities
Your P.O. #: 224006869-3
Sampler Initials: LB

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
ABJQ56 PADDY'S POND @ OUTLET								
Sampling Date 2024/08/28 13:21								
Matrix W								
Sample # 2024-1717-00-SI-SP								
Registration # SA-0000								
RESULTS OF ANALYSES OF WATER								
Calculated Parameters								
Hardness (CaCO3)	-	7.3	1.0	mg/L	N/A	2024/09/04		9607761
Nitrate (N)	-	0.062	0.050	mg/L	N/A	2024/09/06		9607575
Total dissolved solids (calc., EC)	-	39	1.0	mg/L	N/A	2024/09/05		9607311
Inorganics								
Conductivity	-	71	1.0	uS/cm	N/A	2024/09/04	M2C	9615560
Chloride (Cl-)	-	15	1.0	mg/L	N/A	2024/09/04	LKH	9616599
Bromide (Br-)	-	ND	1.0	mg/L	N/A	2024/09/04	LKH	9616599
Sulphate (SO4)	-	1.2	1.0	mg/L	N/A	2024/09/04	LKH	9616599
Total Alkalinity (Total as CaCO3)	-	4.7	2.0	mg/L	N/A	2024/09/04	M2C	9615562
Colour	-	33	5.0	TCU	N/A	2024/09/05	EMT	9615546
Dissolved Fluoride (F-)	-	ND	0.10	mg/L	N/A	2024/09/04	M2C	9615563
Total Kjeldahl Nitrogen (TKN)	-	0.16	0.10	mg/L	2024/09/03	2024/09/04	RTY	9613859
Nitrate + Nitrite (N)	-	0.062	0.050	mg/L	N/A	2024/09/05	EMT	9615549
Nitrite (N)	-	ND	0.010	mg/L	N/A	2024/09/05	EMT	9615552
Nitrogen (Ammonia Nitrogen)	-	ND	0.050	mg/L	N/A	2024/09/04	MCN	9616207
Dup.Nitrogen (Ammonia Nitrogen)	-	0.068	0.050	mg/L	N/A	2024/09/04	MCN	9616207
Dissolved Organic Carbon (C)	-	5.3	0.50	mg/L	N/A	2024/09/04	ACK	9615698
Total Organic Carbon (C)	-	5.5	0.50	mg/L	N/A	2024/09/03	ACK	9613632
pH	-	6.73		pH	N/A	2024/09/04	M2C	9615556
Total Phosphorus	-	ND	0.004	mg/L	2024/09/03	2024/09/03	VKH	9611498
Total Suspended Solids	-	2.0	2.0	mg/L	2024/09/03	2024/09/06	DME	9613303
Turbidity	-	0.77	0.10	NTU	N/A	2024/09/05	M2C	9619376
MERCURY BY COLD VAPOUR AA (WATER)								
Metals								
Total Mercury (Hg)	-	ND	0.000013	mg/L	2024/09/05	2024/09/05	JEP	9615537
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Aluminum (Al)	-	0.066	0.0050	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Antimony (Sb)	-	ND	0.0010	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Arsenic (As)	-	ND	0.0010	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Barium (Ba)	-	0.0017	0.0010	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Boron (B)	-	ND	0.050	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Cadmium (Cd)	-	ND	0.000010	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Calcium (Ca)	-	1.9	0.10	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Chromium (Cr)	-	ND	0.0010	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Copper (Cu)	-	0.00055	0.00050	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Iron (Fe)	-	0.26	0.050	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Lead (Pb)	-	ND	0.00050	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Magnesium (Mg)	-	0.60	0.10	mg/L	2024/09/03	2024/09/03	JHY	9613131

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Bureau Veritas Job #: C4Q9785
Report Date: 2024/09/06

NL Department of Environment, Climate Change and Municipalities
Your P.O. #: 224006869-3
Sampler Initials: LB

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
ABJQ56 PADDY'S POND @ OUTLET Sampling Date 2024/08/28 13:21 Matrix W Sample # 2024-1717-00-SI-SP Registration # SA-0000								
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Manganese (Mn)	-	0.067	0.0020	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Nickel (Ni)	-	ND	0.0020	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Phosphorus (P)	-	ND	0.10	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Potassium (K)	-	0.35	0.10	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Selenium (Se)	-	ND	0.00050	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Sodium (Na)	-	11	0.10	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Strontium (Sr)	-	0.0064	0.0020	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Uranium (U)	-	ND	0.00010	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Zinc (Zn)	-	ND	0.0050	mg/L	2024/09/03	2024/09/03	JHY	9613131

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Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
ABJQ57 WATERFORD RIVER @ KILBRIDE								
Sampling Date 2024/08/28 14:08								
Matrix W								
Sample # 2024-1718-00-SI-SP								
Registration # SA-0000								
RESULTS OF ANALYSES OF WATER								
Calculated Parameters								
Hardness (CaCO3)	-	47	1.0	mg/L	N/A	2024/09/04		9607761
Nitrate (N)	-	0.77	0.050	mg/L	N/A	2024/09/06		9607575
Total dissolved solids (calc., EC)	-	370	1.0	mg/L	N/A	2024/09/05		9607311
Inorganics								
Conductivity	-	660	1.0	uS/cm	N/A	2024/09/04	M2C	9615560
Chloride (Cl-)	-	170	1.0	mg/L	N/A	2024/09/04	LKH	9616599
Bromide (Br-)	-	ND	1.0	mg/L	N/A	2024/09/04	LKH	9616599
Sulphate (SO4)	-	15	1.0	mg/L	N/A	2024/09/04	LKH	9616599
Total Alkalinity (Total as CaCO3)	-	24	2.0	mg/L	N/A	2024/09/04	M2C	9615562
Colour	-	15	5.0	TCU	N/A	2024/09/05	EMT	9615546
Dissolved Fluoride (F-)	-	ND	0.10	mg/L	N/A	2024/09/04	M2C	9615563
Total Kjeldahl Nitrogen (TKN)	-	0.20	0.10	mg/L	2024/09/03	2024/09/04	RTY	9613859
Nitrate + Nitrite (N)	-	0.77	0.050	mg/L	N/A	2024/09/05	EMT	9615549
Nitrite (N)	-	ND	0.010	mg/L	N/A	2024/09/05	EMT	9615552
Nitrogen (Ammonia Nitrogen)	-	ND	0.050	mg/L	N/A	2024/09/04	MCN	9616211
Dissolved Organic Carbon (C)	-	3.5	0.50	mg/L	N/A	2024/09/04	ACK	9615698
Total Organic Carbon (C)	-	3.9	0.50	mg/L	N/A	2024/09/03	ACK	9613669
pH	-	7.57		pH	N/A	2024/09/04	M2C	9615556
Total Phosphorus	-	0.009	0.004	mg/L	2024/09/03	2024/09/03	VKH	9611498
Total Suspended Solids	-	ND	2.0	mg/L	2024/09/03	2024/09/06	DME	9613303
Turbidity	-	0.67	0.10	NTU	N/A	2024/09/05	M2C	9619394
MERCURY BY COLD VAPOUR AA (WATER)								
Metals								
Total Mercury (Hg)	-	ND	0.000013	mg/L	2024/09/05	2024/09/05	JEP	9615537
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Aluminum (Al)	-	0.031	0.0050	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Antimony (Sb)	-	ND	0.0010	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Arsenic (As)	-	ND	0.0010	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Barium (Ba)	-	0.014	0.0010	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Boron (B)	-	ND	0.050	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Cadmium (Cd)	-	0.000013	0.000010	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Calcium (Ca)	-	15	0.10	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Chromium (Cr)	-	ND	0.0010	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Copper (Cu)	-	0.0017	0.00050	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Iron (Fe)	-	0.17	0.050	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Lead (Pb)	-	ND	0.00050	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Magnesium (Mg)	-	2.5	0.10	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Manganese (Mn)	-	0.037	0.0020	mg/L	2024/09/03	2024/09/03	JHY	9613131

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Report Date: 2024/09/06

NL Department of Environment, Climate Change and Municipalities
Your P.O. #: 224006869-3
Sampler Initials: LB

Sample Details/Parameters	A	Result	RDL	UNITS	Extracted	Analyzed	By	Batch
ABJQ57 WATERFORD RIVER @ KILBRIDE Sampling Date 2024/08/28 14:08 Matrix W Sample # 2024-1718-00-SI-SP Registration # SA-0000								
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Nickel (Ni)	-	ND	0.0020	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Phosphorus (P)	-	ND	0.10	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Potassium (K)	-	1.8	0.10	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Selenium (Se)	-	ND	0.00050	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Sodium (Na)	-	110	0.10	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Strontium (Sr)	-	0.058	0.0020	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Uranium (U)	-	ND	0.00010	mg/L	2024/09/03	2024/09/03	JHY	9613131
Total Zinc (Zn)	-	ND	0.0050	mg/L	2024/09/03	2024/09/03	JHY	9613131

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GENERAL COMMENTS

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

Package 1	17.7°C

Results relate only to the items tested.

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VALIDATION SIGNATURE PAGE

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

Cristina Carriere, Senior Scientific Specialist

Ernlie Publicover, Scientific Specialist

Louise Harding, Scientific Specialist

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