

# **Real-Time Water Quality Report**

# Waterford River at Kilbride (NF02ZM0009)

Deployment Period December 12, 2022 to January 20, 2023



Government of Newfoundland & Labrador Department of Environment & Climate Change Water Resources Management Division Waterford River at Kilbride, Newfoundland and Labrador

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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 (NF02ZM0009). Water Survey Canada operates the hydrometric component of this station. Due to differences in protocols, Water Survey Canada hydrometric data is quality controlled on a less frequent basis than water quality data. The hydrometric data shown in this report is provisional and has not undergone quality control checks. Corrected hydrometric data can be obtained at <u>https://wateroffice.ec.gc.ca/</u> or upon request to Water Survey Canada.

The purpose of the real-time water quality station is to monitor, process and publish real-time water quality data. The 70km<sup>2</sup> watershed is semi-urban and consists of urban areas, forest, waterbodies, wetland, barren lands and open areas. The urban areas encompass residential, agricultural, commercial and industrial areas and transportation corridors, which can heavily influence water quality parameters throughout the year.

This deployment report discusses water quality related events occurring at this station from the instrument deployment on December 12, 2022, until removal on January 20, 2023.



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. WSC is responsible for QA/QC of water quantity data. Corrected stage and streamflow data can be obtained upon request to WSC.

	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 1: Instrument Performance Ranking classifications for deployment and removal.

It should be noted that the temperature sensor on any sonde is the most important. All other parameters can be divided into subgroups of: temperature dependent, temperature compensated and temperature independent. Due to the temperature sensor's location on the sonde, the entire sonde must be at a constant temperature before the temperature sensor will stabilize. The values may take some time to climb to the appropriate reading; if a reading is recorded to early it may not accurately portray the water body.

#### Waterford River at Kilbride, Newfoundland and Labrador

#### Table 2: Instrument performance rankings for Waterford River at Kilbride

			Comparison Ranking						
Station Date		Action	Temperature	perature pH Conductivity I		Dissolved Oxygen	Turbidity		
		Deployment	Excellent	Good	Excellent	Excellent	Good		
Waterford Dec 12, 20 River @ Kilbride		Grab Sample # 1731	N/A	Good	Good	N/A	Good		
	Jan 20, 2023	Removal	Excellent	Poor	Good	Good	Poor		

Upon deployment, all sensors ranked 'Excellent' and 'Good' when compared to the QA/QC sonde.

All measured grab sample (#2022-1731-00-SI-SP) parameters collected upon deployment ranked 'Good' in comparison to the field sonde.

Upon removal of the instrument, after a 38-day deployment, the parameters ranked 'Excellent' and 'Good' against the QA/QC sonde with exception of pH and turbidity which ranked 'Poor'. Based on a review of the data, this is likely due to sensor drift and a buildup of sediment around both of these sensors.

## DATA INTERPRETATION

#### Water Temperature

Water temperature ranged from 2.64 °C to 5.66 °C during this deployment period (Figure 2).

The water temperature was variable throughout the deployment period with an overall decreasing trend as fall progressed into winter and air temperatures cooled correspondingly.

During high stage events, the water temperature often increased for a short period due to the addition of warmer precipitation, as seen on December 14<sup>th</sup> and January 14<sup>th</sup>.

Water temperature values display a natural diurnal pattern with temperatures increasing during the day and decreasing overnight. The magnitude of variation was influenced by daily air temperature fluctuations as well as precipitation events.

Please note the stage data is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request to WSC.

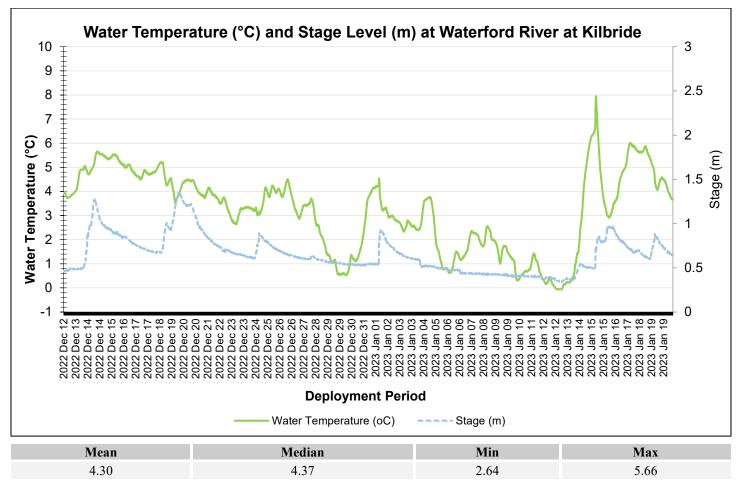


Figure 2: Water temperature (°C) and Stage (m) values at Waterford River at Kilbride

#### pН

Throughout the deployment period, pH baseline values were stable, with a range between 6.22 pH units and 7.37 pH units, a mean of 6.86 and median of 6.75 pH units (Figure 3).

Waterford River pH values remained within the CCME guidelines for the protection of aquatic life throughout the duration of the deployment period with exception to December 15<sup>th</sup> when pH decreased temporarily below the minimum guideline due to a significant precipitation event before returning to background levels.

A steady increasing trend after a large stage increase December 18<sup>th</sup> may indicate sensor drift for the remainder of the deployment. This would explain the 'poor' performance ranking upon removal at the end of the deployment.

Please note the stage data is raw data. It has not been corrected for backwater effect. WSC is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request to WSC.

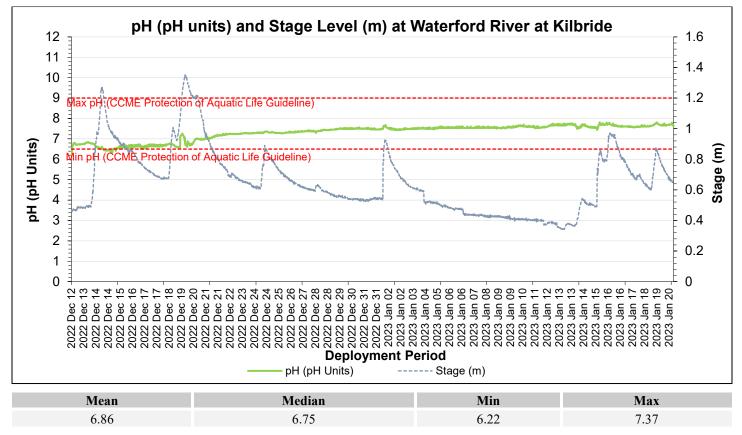


Figure 3: pH (pH units) and stage level (m) values at Waterford River at Kilbride.

#### Specific Conductivity & Total Dissolved Solids

Conductivity levels showed a slight overall increasing trend through the deployment, influenced heavily by stage increases (Figure 4). The conductivity levels were within 309  $\mu$ S/cm and 1420  $\mu$ S/cm. TDS (a calculated value) ranged from 0.2010 g/L to 0.9230 g/L.

Early in the deployment period, conductivity levels decreased during high stage events as the system was diluted by the extra water. As winter approached, high stage events corresponded to spikes in conductivity as salt applied to nearby roadways enters the water as runoff during precipitation events. This events are high in magnitude, but short lived. Given the location, the river is highly influenced by urban roads, residential housing and pedestrian traffic.

Please note that the stage data is raw. It is not corrected for backwater effect. WSC is responsible for QA/QC of water quantity data. Corrected data can be obtained upon request to WSC.

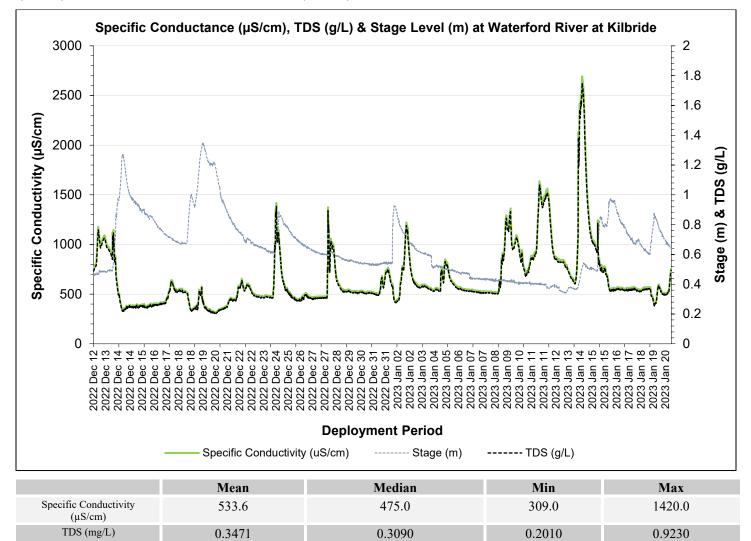


Figure 4: Specific conductivity (µS/cm), TDS (g/mL) and stage (m) values at Waterford River at Kilbride.

#### **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.

The water quality instrument measures dissolved oxygen (mg/L) with the dissolved oxygen probe. The instrument then calculates percent saturation (% Sat) taking into account the water temperature.

During the deployment, dissolved oxygen concentration levels range within a minimum of 11.90 mg/L to a maximum of 13.15 mg/L. The percent saturation (%) levels for dissolved oxygen ranged within 94% to 99.8% saturation (Figure 5). Dissolved oxygen concentration increased slightly throughout the deployment as water temperatures continued cooling into winter. Sudden decreases in dissolved oxygen such as January 1<sup>st</sup> and 15<sup>th</sup> are associated with higher-than-normal water temperatures. Dissolved oxygen values increased again as water temperatures cooled.

Dissolved oxygen concentrations remained above the Guidelines for Other Life Stages (6.5 mg/L) and Early life stages (9.5mg/L) throughout the deployment period.

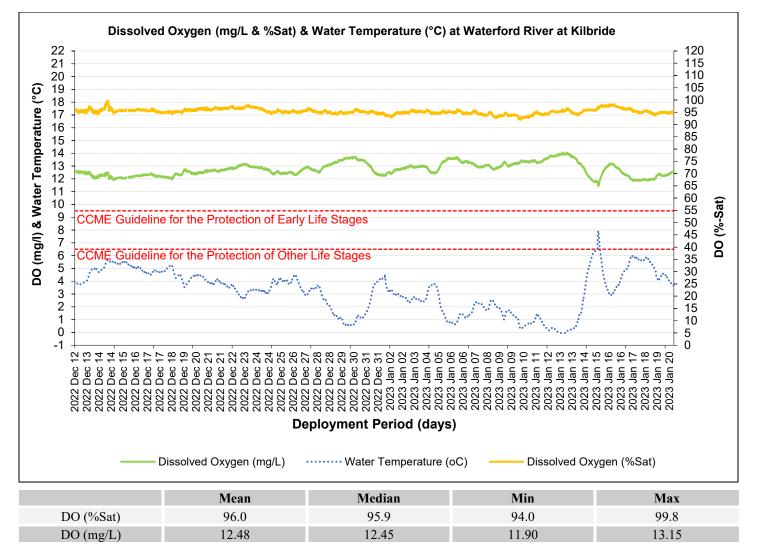


Figure 5: Dissolved Oxygen (mg/L & Percent Saturation) values at Waterford River at Kilbride.

#### Turbidity

Due to the lodging of sediment and organic matter within the sonde casing after the December 13-14, 2022 precipitation event, turbidity data is considered erroneous and statistical analysis was not completed for this parameter. This also explains the 'poor' performance ranking of the sensor upon removal.

Please note the stage data is raw. It has not been corrected for backwater effect. Corrected hydrometric data can be obtained at <u>https://wateroffice.ec.gc.ca/</u> or upon request to Water Survey Canada.

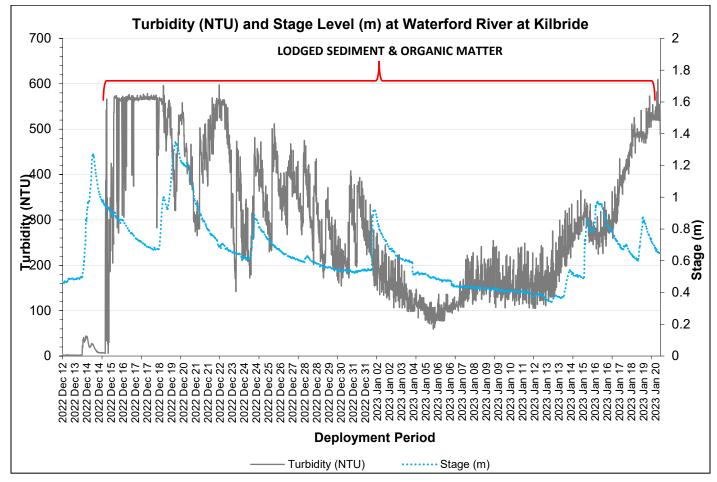


Figure 6: Turbidity (NTU) and stage (m) values at Waterford River at Kilbride.

#### Stage and Precipitation

Please note the stage data graphed below is raw data. It has not been corrected for backwater effect. Corrected hydrometric data can be obtained at <a href="https://wateroffice.ec.gc.ca/">https://wateroffice.ec.gc.ca/</a> or upon request to Water Survey Canada.

Stage is an estimation of water level at the station and can explain some of the events that are occurring with other parameters (i.e. specific conductivity, DO, turbidity). Stage will generally increase during rainfall events as depicted in Figure 7, but may stage might not increase if precipitation falls as snow.

During the deployment period, the stage values range from 0.34 m to 1.36 m. The larger peaks in stage correspond with substantial rainfall events.

Precipitation data was collected by Environment Canada's St. John's West Climate station. Daily Total Precipitation ranges for the deployment period were a minimum of 0.0 mm and a maximum of 26.1 mm on January 15, 2023.

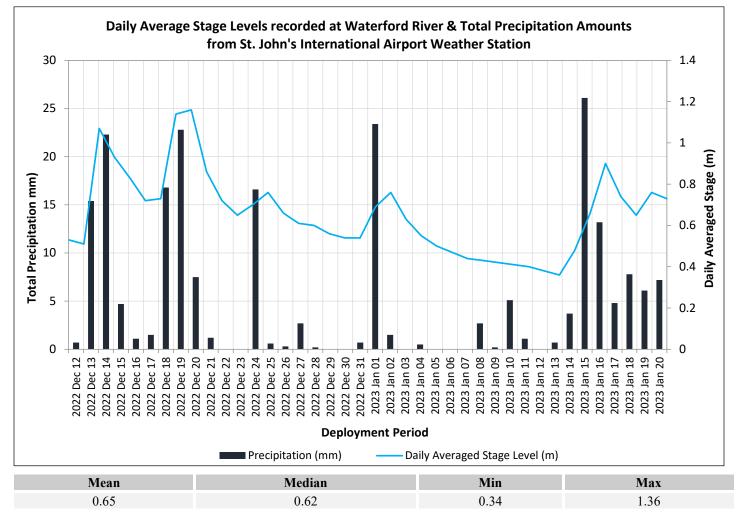
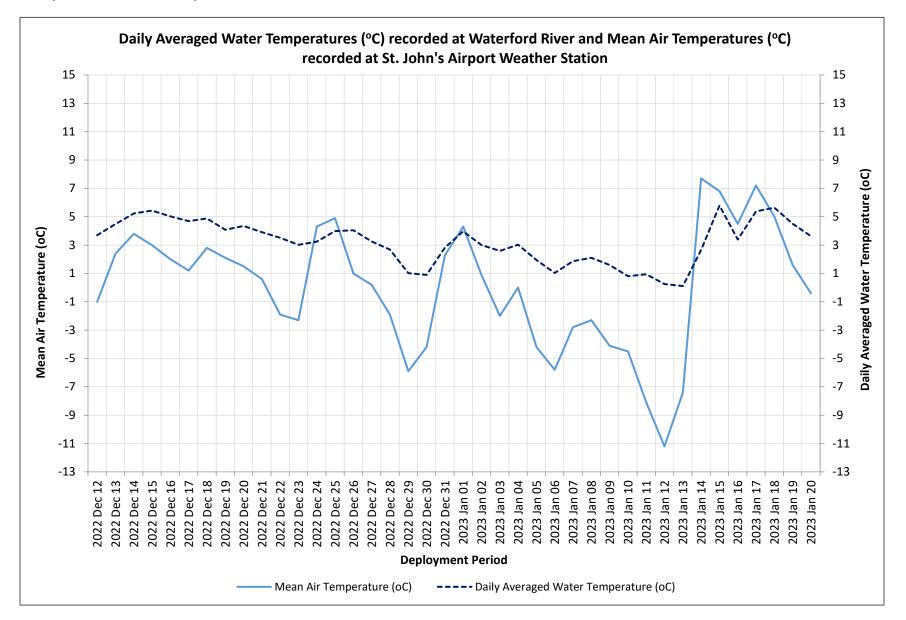


Figure 7: Daily average stage (m) values recorded at Waterford River at Kilbride and daily total precipitation (mm) from St. John's West Climate Station.

### APPENDIX A : MEAN DAILY AIR TEMPERATURE AND AVERAGE WATER TEMPERATURE



## APPENDIX B : QA/QC GRAB SAMPLE FIELD RESULTS



NL Department of Environment, Climate Change and Municipalities Site Location: WATERFORD RIVER @ KILBRIDE Your P.O. #: 220028978-6 Sampler Initials: LB

Sulphate (SO4)Image: SO4N/A2022/12/22LKH8419394Total Alkalinity (Total as CaCO3)Image: So4N/A2022/12/22NGI8416670ColourImage: So4So5TCUN/A2022/12/23TGO8419157Dissolved Fluoride (F-)Image: So4ND0.10mg/LN/A2022/12/22NGI8416671Total Kjeldahl Nitrogen (TKN)Image: So4ND0.10mg/L2022/12/212022/12/22RTY8416307Nitrate + Nitrite (N)Image: So4ND0.050mg/LN/A2022/12/22TGO8419165Nitrite (N)Image: So4ND0.010mg/LN/A2022/12/22TGO8419165Nitrogen (Ammonia Nitrogen)Image: So4ND0.050mg/LN/A2022/12/22TGO8419165	Sample Details/Parameters	Α	Result	RDL	UNITS	Extracted	Analyzed	Ву	Batch
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Sulphate (SO4)-111mg/rN/A2021/22KH8419394Total Akalinity (Total as CaCO3)-152.0mg/kN/A2021/22NG841670Colour-205.07.0N/A2021/122NG841670Dissolved Fluoride (F-)-ND0.10mg/kN/A2021/122NG841670Total Kjeldahl Nitrogen (TKN)-ND0.10mg/k2021/1272021/122RV841630Nitrate Nitrite (N)-ND0.000mg/kN/A2021/127TGO841573Nitrogen (Ammonia Nitrogen)-ND0.000mg/kN/A2021/127RV841631Otal Organic Carbon (C)-3.40.50mg/kN/A2021/127RV841531Total Organic Carbon (C)-3.50.001mg/kN/A2021/127RV841531Total Suspended Solids0.0170.004mg/k2021/1272021/127RV841531Total Absepter Y OLD VAPOUR AA (WATER)<	Chloride (Cl-)	-	200	2.0	mg/L	N/A	2022/12/22	LKH	8419394
Total Akalinity (Total as CaCO3)-152.0mg/LN/A2021/22N/B841670Colour-205.0TCUN/A2021/22160841917Dissolved Fluoride (F-)-ND0.10mg/L2021/22170841631Distal Kildhil Nitrogen (TKN)-0.970.050mg/L1/A2021/22170841915Nitrat + Nitrite (N)-0.970.050mg/LN/A2021/22170841915Nitrat e Nitrite (N)-0.970.050mg/LN/A2021/22170841915Dissolved Organic Carbon (C)-3.40.50mg/LN/A2021/22180841660Dissolved Organic Carbon (C)-3.40.50mg/LN/A2021/22180841660Dissolved Organic Carbon (C)-3.40.50mg/L0.0122021/22180841660Dissolved Organic Carbon (C)3.40.50mg/L0.021/21180841660Dissolved Organic Carbon (C)9.4N/A2021/22180841660Dissolved Organic Carbon (C)9.4N/A2021/22180841660Dissolved Organic Carbon (C)9.4181521816Dissolved Organic Carbon (C)18169Dissolved Organic Carbon (C)	Bromide (Br-)	-	ND	1.0	mg/L	N/A	2022/12/22	LKH	8419394
Colour-205.0TCUN/A2021/27N/A841917Disolved Flooride (F-)-ND0.10mg/LN/A2021/2720780841671Total Kjeldahl Nitrogen (TKN)-ND0.00mg/LN/A2021/271008419165Nitrate + Nitrite (N)-0.970.500mg/LN/A2021/271008419165Nitrate + Nitrite (N)-0.970.500mg/LN/A2021/271008419165Nitrogen (Ammonia Nitrogen)-0.0620.500mg/LN/A2021/27160841573Disolved Organic Carbon (C)-3.50.500mg/LN/A2021/27160841573Total Organic Carbon (C)-3.50.0170.004mg/L2021/21100841583Total Suspended Solids-0.0170.004mg/L2021/212021/228/C841583Total Mercury (Hg)-0.0170.004mg/L2021/212021/228/C841583Mata-0.0520.0050mg/L2021/212021/228/C841583Total Mercury (Hg)-0.0520.0050mg/L2021/218/L841583Total Alernour (Al)-0.0520.0050mg/L2021/218/L841583Total Alernour (Al)-0.0520.0050mg/L2021/211/L8/L841583Total Alernour (Hg)-	Sulphate (SO4)	-	18	1.0	mg/L	N/A	2022/12/22	LKH	8419394
Dissolved Fluoride (F-)-ND0.10mg/LV/A202/1/2/2NG8416371Total Kjeldahl Nitrogen (TKN)-ND0.10mg/L202/1/2/2202/1/2/2RTV8416307Nitrate Nitrite (N)-0.970.050mg/LN/A202/1/2/2TG08419165Nitrogen (Ammonia Nitrogen)-0.0620.050mg/LN/A202/1/2/2TG0841579Dissolved Organic Carbon (C)-3.40.50mg/LN/A202/1/2/2RSL8415813Total Organic Carbon (C)-3.50.50mg/LN/A202/1/2/2RSL8416802PHOkosphorus-0.0670.004mg/L202/1/2/1202/1/2/2SKL8416802Total Posphorus-1.41.0mg/L202/1/2/1202/1/2/2SKL8416802Turbidity-0.650.10NTUN/A202/1/2/2SKL8416804MEALENTS BY COLVAPOUR AA (WATER)ND0.0003Mg/L202/1/2/1202/1/2/2SKL8416802Total Alminom (Al)ND0.0050mg/L202/1/2/1202/1/2/2SKL8416802Total Alminom (Al)Total Alminom (Al) </td <td>Total Alkalinity (Total as CaCO3)</td> <td>-</td> <td>15</td> <td>2.0</td> <td>mg/L</td> <td>N/A</td> <td>2022/12/22</td> <td>NGI</td> <td>8416670</td>	Total Alkalinity (Total as CaCO3)	-	15	2.0	mg/L	N/A	2022/12/22	NGI	8416670
Total kjeldahl Nitrogen (TKN)-ND0.10mg/L202/1/21202/1/22RT814301Nitrate + Nitrite (N)-0.970.050mg/LN/A202/1/27TG08419165Nitrogen (Ammonia Nitrogen)-ND0.010mg/LN/A202/1/27TG08419163Dissolved Organic Carbon (C)-0.0620.050mg/LN/A202/1/22RS18416313Total Organic Carbon (C)-3.50.50mg/LN/A202/1/22RS18416303Total Organic Carbon (C)-3.50.50mg/L0.022/1/21202/1/22RS18416303Total Suspended Solids7.31-PHN/A202/1/22RS18416303Total Marcury (Hg)1.41.0mg/L202/1/21202/1/22RS18416303Metals1.41.0mg/L202/1/21202/1/22RS18416303Total Marcury (Hg)1.41.0mg/L202/1/21202/1/22A808416303Total Aluminum (Al)Total Aluminum (Sb)	Colour	-	20	5.0	TCU	N/A	2022/12/23	TGO	8419157
Nitrate + Nitrite (N)-0.970.050mg/LN/A2022/12/2TGO8419165Nitrite (N)-ND0.010mg/LN/A2022/12/2TGO8419166Nitrogen (Ammonia Nitrogen)-0.0620.050mg/LN/A2022/12/2RSL8419813Dissolved Organic Carbon (C)-3.50.50mg/LN/A2022/12/2RSL8416813Total Organic Carbon (C)-3.50.50mg/LN/A2022/12/2RSL8416803Distolved Organic Carbon (C)-7.31DHN/A2022/12/2SPC8416374Total Organic Carbon (C)-0.0170.004mg/L2022/12/2V2NGL8416803Total Suspended Solids-1.41.0mg/L2022/12/2V2NGL8416803MERCURY BY COLD VAPOUR AA (WATER)ND0.00013mg/L2022/12/2Z022/12/2AND841652MetalsND0.00001mg/L2022/12/2Z022/12/2HY841529Total Aluminum (Al)ND0.0000mg/L2022/12/2Z022/12/2HY841529Total Aluminum (Al)ND0.0010mg/L2022/12/1JYY841529Total Aluminum (Al)-ND0.0010mg/L2022/12/1JYY841529Total Assein (AS)-ND0.0010mg/L2022/12/1JYY841529<	Dissolved Fluoride (F-)	-	ND	0.10	mg/L	N/A	2022/12/22	NGI	8416671
Nirtire (N)ND0.010mg/LN/A2022/12/2TGO8419161Nirtogen (Ammonia Nitrogen)0.0620.050mg/LN/A2022/12/2RSL841583Dissolved Organic Carbon (C)3.40.50mg/LN/A2022/12/2RSL841583Total Organic Carbon (C)3.50.50mg/LN/A2022/12/2RSL841580Dissolved Organic Carbon (C)0.0170.004mg/L2022/12/22022/12/2RSL841660Distol Phosphorus0.0170.004mg/L2022/12/22022/12/2RMK841660Total Suspended Solids1.41.0mg/L2022/12/22022/12/2A008418564Metalsmg/L2022/12/22022/12/2A008418564Metalsmg/L2022/12/22022/12/2A008418564Total Aluminum (Al) <td< td=""><td>Total Kjeldahl Nitrogen (TKN)</td><td>-</td><td>ND</td><td>0.10</td><td>mg/L</td><td>2022/12/21</td><td>2022/12/22</td><td>RTY</td><td>8416307</td></td<>	Total Kjeldahl Nitrogen (TKN)	-	ND	0.10	mg/L	2022/12/21	2022/12/22	RTY	8416307
Nitrogen (Ammonia Nitrogen)0.0620.050mg/LN/A2022/12/2R5L841573Dissolved Organic Carbon (C)3.40.50mg/LN/A2022/12/2R5L8416813Total Organic Carbon (C)3.50.50mg/LN/A2022/12/2R5L8415802pH7.31pHN/A2022/12/2NGI8415602Total Posphorus0.0170.004mg/L2022/12/12021/22SPC8416302Total Suspended Solids0.650.10NTUN/A2022/12/2RMK8415292Mercury BY COLD VAPOUR AA (WATER)ND0.00013mg/L2022/12/22021/22FJO8415594MetalsND0.00013mg/L2022/12/122022/12/2FJO8415594Total Alercury (Hg)ND0.00013mg/L2022/12/22022/12/2FJO841559Total Alerninum (Al)0.0520.050mg/L2022/12/12022/12/1HY841529Total Arsenic (As)Total Arsenic (As)ND0.0010mg/L2022/12/192022/12/1JHY841529Total Arsenic (As)ND0.0010mg/L2022/12/192021/12/1JHY841529Total Arsenic (As)ND0.0010mg/L2022/12/192021/12	Nitrate + Nitrite (N)	-	0.97	0.050	mg/L	N/A	2022/12/27	TGO	8419165
Dissolved Organic Carbon (C)-3.40.50mg/LN/A2022/12/22RSL8416813Total Organic Carbon (C)-3.50.50mg/LN/A2022/12/22RSL8415802pH-7.31pHN/A2022/12/212022/12/22SPC8416360Total Phosphorus-0.0170.004mg/L2022/12/122022/12/23SPC841637Total Suspended Solids-1.41.0mg/L2022/12/192022/12/23RMK8411292Turbidity-0.650.10NTUN/A2022/12/24A/A8418564MERCURY BY COLD VAPOUR AA (WATER)ND0.000013mg/L2022/12/26P/D8421667ELEMENTS BY ICP/MS (WATER)Metals-0.0520.050mg/L2022/12/26P/D841559 <td>Nitrite (N)</td> <td>-</td> <td>ND</td> <td>0.010</td> <td>mg/L</td> <td>N/A</td> <td>2022/12/22</td> <td>TGO</td> <td>8419166</td>	Nitrite (N)	-	ND	0.010	mg/L	N/A	2022/12/22	TGO	8419166
Total Organic Carbon (C)-3.50.50mg/LN/A2022/12/22RSL8415802pHN/A2022/12/212022/12/22NGI8416600Total Phosphorus-0.0170.004mg/L2022/12/12022/12/23RML8416301Total Suspended Solids-1.41.0mg/L2022/12/12022/12/2RML8418561Turbidity-0.6550.10NTUN/A2022/12/2AO8418561MERCURY BY COLD VAPOUR AA (WATER)ND0.00013mg/L2022/12/262022/12/26FJO8421651Dotal Mercury (Hg)ND0.00013mg/L2022/12/262022/12/26FJO8421651ELEMENTS BY ICP/MS (WATER) <td>Nitrogen (Ammonia Nitrogen)</td> <td>-</td> <td>0.062</td> <td>0.050</td> <td>mg/L</td> <td>N/A</td> <td>2022/12/21</td> <td>TGO</td> <td>8415793</td>	Nitrogen (Ammonia Nitrogen)	-	0.062	0.050	mg/L	N/A	2022/12/21	TGO	8415793
pHN/A2022/12/2NGI841660Total Phosphorus0.0170.004mg/L2022/12/22022/12/2SPC841637Total Suspended Solids1.41.0mg/L2022/12/32022/12/2AMX841850Turbidity0.650.10NTUN/A2022/12/2AM2841856MERCURY BY COLD VAPOUR AA (WATER)841856Metals8421667Total Mercury (Hg)842167ELEMENTS BY ICP/MS (WATER)8421667Metals8421667Total Aluminum (Al)0.0520.00001mg/L2022/12/92022/12/1JHY8411529Total Arsenic (As)8411529Total Barium (Ba)0.0180.0010mg/L2022/12/92022/12/1JHY8411529Total Cadmium (Ca)8411529Total Garom (Ba)0.000210.0001mg/L2022/12/92022/12/1JHY8411529Total Cadmium (Ca)8411529Total Garom (Ba) <td>Dissolved Organic Carbon (C)</td> <td>-</td> <td>3.4</td> <td>0.50</td> <td>mg/L</td> <td>N/A</td> <td>2022/12/22</td> <td>RSL</td> <td>8416813</td>	Dissolved Organic Carbon (C)	-	3.4	0.50	mg/L	N/A	2022/12/22	RSL	8416813
Total Phosphorus-0.0170.004mg/L2022/12/212022/12/22SPC8416374Total Suspended Solids-1.41.0mg/L2022/12/32022/12/3RMK8411292Turbidity-0.650.10NTUN/A2022/12/2A00841856MERCURY BY COLD VAPOUR AA (WATER) Metals-ND0.000013mg/L2022/12/262022/12/26FJO841657ELEMENTS BY ICP/MS (WATER) Metals-ND0.000013mg/L2022/12/292022/12/26FJO8421667Total Aluminum (Al)-0.0520.0050mg/L2022/12/192022/12/10JHY8411529Total Aluminum (Sb)-ND0.0010mg/L2022/12/192022/12/11JHY8411529Total Asenic (As)-ND0.0101mg/L2022/12/192022/12/11JHY8411529Total Asenic (As)-0.01080.0010mg/L2022/12/192022/12/11JHY8411529Total Asenic (As)-0.000210.00010mg/L2022/12/192022/12/11JHY8411529Total Calcium (Cd)ND0.0010mg/L2022/12/192022/12/11JHY8411529Total Calcium (Cd)ND0.0010mg/L2022/12/192022/12/11JHY8411529Total Calcium (Cd)ND0.0010mg/L2022/12/192022/12/11JHY8411529	Total Organic Carbon (C)	-	3.5	0.50	mg/L	N/A	2022/12/22	RSL	8415802
Total Suspended Solids-1.41.0mg/L2022/12/92022/12/2RMK8411292Turbidity-0.650.10NTUN/A2022/12/2A0841856MERCURY BY COLD VAPOUR AA (WATER) MetalsND0.00001mg/L2022/12/262022/12/26FJ841567ELEMENTS BY ICP/MS (WATER) MetalsND0.00001mg/L2022/12/162022/12/26FJ8411521Total Aluminum (Al)-0.0520.0050mg/L2022/12/192022/12/10JH8411521Total Aluminum (Ba)-0.0520.0050mg/L2022/12/192022/12/10JH8411521Total Asenic (As)-0.0180.0010mg/L2022/12/192022/12/10JH8411521Total Adminum (Cd)-0.0180.0010mg/L2022/12/192022/12/10JH8411521Total Asenic (As)-0.0180.0010mg/L2022/12/192022/12/10JH8411521Total Cadium (Cd)ND0.0010mg/L2021/192021/12/10JH8411521Total Cadium (Cd)ND0.0010mg/L2021/192021/12/10JH8411521Total Cadium (Cd)ND0.0010mg/L2021/192021/12/10JH8411521Total Cadium (Cd)ND0.0010mg/L2021/192021/12/10JH8411521<	pH	-	7.31		рН	N/A	2022/12/22	NGI	8416660
Turbidity0.650.10NTUN/A2022/12/2A0841854MERCURY BY COLD VAPOUR AA (WATER)<	Total Phosphorus	-	0.017	0.004	mg/L	2022/12/21	2022/12/22	SPC	8416374
MERCURY BY COLD VAPOUR AA (WATER) MetalsImage Not and the second se	Total Suspended Solids	-	1.4	1.0	mg/L	2022/12/19	2022/12/23	RMK	8411292
MetalsImage: Section of the section of th	Turbidity	-	0.65	0.10	NTU	N/A	2022/12/22	AA0	8418564
Total Mercury (Hg)-NDND0.00013mg/L2022/12/62022/12/6FJO8421667ELEMENTS BY ICP/MS (WATER)8411529Total Aluminum (Al)-0.0520.0050mg/L2022/12/92022/12/1JHY8411529Total Antimony (Sb)ND0.0010mg/L2022/12/92022/12/1JHY8411529Total Arsenic (As)-0.0180.0010mg/L2022/12/92022/12/1JHY8411529Total Barium (Ba)-0.0180.0010mg/L2022/12/92022/12/1JHY8411529Total Cadmium (Cd)-0.000210.000210.00010mg/L2022/12/192022/12/11JHY8411529Total Cadium (Ca)0.000210.00101mg/L2022/12/192022/12/11JHY8411529Total Cadium (Ca)0.000210.00010mg/L2022/12/192022/12/11JHY8411529Total Cadium (Ca)0.000210.00010mg/L2022/12/192022/12/11JHY8411529Total Cadium (Ca)M0.000210.00010mg/L2022/12/192022/12/11JHY8411529Total Cadium (Ca)M0.00101mg/L2022/12/192022/12/11JHY8411529Total Cadroum (Cr)-M0.0018 <td>MERCURY BY COLD VAPOUR AA (WATER)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	MERCURY BY COLD VAPOUR AA (WATER)								
ELEMENTS BY ICP/MS (WATER) MetalsImage: Section of the section of t	Metals								
MetalsIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncomeIncom	Total Mercury (Hg)	-	ND	0.000013	mg/L	2022/12/26	2022/12/26	FJO	8421667
Total Aluminum (Al)-0.0520.0050mg/L2022/12/192022/12/10JHY8411529Total Antimony (Sb)-ND0.0010mg/L2022/12/192022/12/10JHY8411529Total Arsenic (As)-ND0.0010mg/L2022/12/192022/12/10JHY8411529Total Barium (Ba)-0.0180.0010mg/L2022/12/192022/12/10JHY8411529Total Boron (B)-ND0.0500mg/L2022/12/192022/12/10JHY8411529Total Cadmium (Cd)-0.0000210.000010mg/L2022/12/192022/12/10JHY8411529Total Cadium (Ca)1440.100mg/L2022/12/192022/12/10JHY8411529Total Chromium (Cr)ND0.00180.00100mg/L2022/12/192022/12/10JHY8411529Total Copper (Cu)ND0.00180.00100mg/L2022/12/192022/12/10JHY8411529Total Iron (Fe)0.0180.0050mg/L2022/12/192022/12/10JHY8411529Total Lead (Pb)0.150.0505mg/L2022/12/192022/12/10JHY8411529Total Lead (Pb)ND0.0050mg/L2022/12/192022/12/10JHY8411529	ELEMENTS BY ICP/MS (WATER)								
Total Antimony (Sb)-ND0.0010mg/L2022/12/192022/12/1JHY8411529Total Arsenic (As)-ND0.0010mg/L2022/12/192022/12/11JHY8411529Total Barium (Ba)-0.0180.0010mg/L2022/12/192022/12/11JHY8411529Total Boron (B)-ND0.050mg/L2022/12/192022/12/11JHY8411529Total Cadmium (Cd)-0.0000210.000010mg/L2022/12/192022/12/11JHY8411529Total Calcium (Ca)-140.10mg/L2022/12/192022/12/11JHY8411529Total Chromium (Cr)-ND0.00180.0010mg/L2022/12/192022/12/11JHY8411529Total Copper (Cu)-0.0180.0050mg/L2022/12/192022/12/11JHY8411529Total Iron (Fe)-0.0180.0050mg/L2022/12/192022/12/11JHY8411529Total Lead (Pb)-ND0.0050mg/L2022/12/192022/12/11JHY8411529	Metals								
Total Arsenic (As)-ND0.0010mg/L2022/12/192022/12/21JHY8411529Total Barium (Ba)-0.0180.0010mg/L2022/12/192022/12/21JHY8411529Total Boron (B)-ND0.0500mg/L2022/12/192022/12/21JHY8411529Total Cadmium (Cd)-0.0000210.000010mg/L2022/12/192022/12/21JHY8411529Total Calcium (Ca)-140.10mg/L2022/12/192022/12/21JHY8411529Total Chromium (Cr)-ND0.0010mg/L2022/12/192022/12/21JHY8411529Total Copper (Cu)ND0.0010mg/L2022/12/192022/12/21JHY8411529Total Iron (Fe)-0.0150.0050mg/L2022/12/192022/12/21JHY8411529Total Lead (Pb)ND0.0050mg/L2022/12/192022/12/21JHY8411529	Total Aluminum (Al)	-	0.052	0.0050	mg/L	2022/12/19	2022/12/21	JHY	8411529
Total Barium (Ba)-0.0180.0010mg/L2022/12/92022/12/1JHY8411529Total Boron (B)-ND0.0500mg/L2022/12/92022/12/1JHY8411529Total Cadmium (Cd)-0.0000210.000010mg/L2022/12/92022/12/1JHY8411529Total Calcium (Ca)-140.10mg/L2022/12/92022/12/1JHY8411529Total Chromium (Cr)-ND0.0010mg/L2022/12/92022/12/1JHY8411529Total Copper (Cu)ND0.0010mg/L2022/12/92022/12/1JHY8411529Total Iron (Fe)0.0150.0050mg/L2022/12/92022/12/1JHY8411529Total Lead (Pb)ND0.0050mg/L2022/12/92022/12/1JHY8411529Total Lead (Pb)ND0.0050mg/L2022/12/92022/12/1JHY8411529	Total Antimony (Sb)	-	ND	0.0010	mg/L	2022/12/19	2022/12/21	JHY	8411529
Total Boron (B). ND0.050mg/L2022/12/192022/12/21JHY8411529Total Cadmium (Cd). 0.000010. 0.000010mg/L2022/12/192022/12/10JHY8411529Total Calcium (Ca). 140.10mg/L2022/12/192022/12/21JHY8411529Total Chromium (Cr). ND0.0010mg/L2022/12/192022/12/21JHY8411529Total Copper (Cu). 0.00180.0050mg/L2022/12/192022/12/21JHY8411529Total Iron (Fe). 0.150.050mg/L2022/12/192022/12/21JHY8411529Total Lead (Pb). ND0.0050mg/L2022/12/192022/12/21JHY8411529	Total Arsenic (As)	-	ND	0.0010	mg/L	2022/12/19	2022/12/21	JHY	8411529
Total Cadmium (Cd)-0.0000210.000010mg/L2022/12/192022/12/21JHY8411529Total Calcium (Ca)-140.10mg/L2022/12/192022/12/21JHY8411529Total Chromium (Cr)-ND0.0010mg/L2022/12/192022/12/21JHY8411529Total Copper (Cu)-0.00180.0050mg/L2022/12/192022/12/21JHY8411529Total Iron (Fe)-0.150.050mg/L2022/12/192022/12/21JHY8411529Total Lead (Pb)-ND0.0050mg/L2022/12/192022/12/21JHY8411529	Total Barium (Ba)	-	0.018	0.0010	mg/L	2022/12/19	2022/12/21	JHY	8411529
Total Calcium (Ca)   -   14   0.10   mg/L   2022/12/19   2022/12/21   JHY   8411529     Total Chromium (Cr)   -   ND   0.0010   mg/L   2022/12/19   2022/12/21   JHY   8411529     Total Copper (Cu)   -   0.0018   0.0050   mg/L   2022/12/19   2022/12/21   JHY   8411529     Total Iron (Fe)   -   0.15   0.050   mg/L   2022/12/19   2022/12/21   JHY   8411529     Total Lead (Pb)   -   ND   0.0050   mg/L   2022/12/19   2022/12/21   JHY   8411529	Total Boron (B)	-	ND	0.050	mg/L	2022/12/19	2022/12/21	JHY	8411529
Total Chromium (Cr)   -   ND   0.0010   mg/L   2022/12/19   2022/12/21   JHY   8411529     Total Copper (Cu)   -   0.0018   0.00050   mg/L   2022/12/19   2022/12/21   JHY   8411529     Total Iron (Fe)   -   0.155   0.050   mg/L   2022/12/19   2022/12/21   JHY   8411529     Total Lead (Pb)   -   ND   0.0050   mg/L   2022/12/19   2022/12/21   JHY   8411529	Total Cadmium (Cd)	-	0.000021	0.000010	mg/L	2022/12/19	2022/12/21	JHY	8411529
Total Copper (Cu)   -   0.0018   0.00050   mg/L   2022/12/19   2022/12/21   JHY   8411529     Total Iron (Fe)   -   0.15   0.050   mg/L   2022/12/19   2022/12/21   JHY   8411529     Total Lead (Pb)   -   ND   0.0050   mg/L   2022/12/19   2022/12/21   JHY   8411529	Total Calcium (Ca)	-	14	0.10	mg/L	2022/12/19	2022/12/21	JHY	8411529
Total Iron (Fe) - 0.15 0.050 mg/L 2022/12/19 2022/12/21 JHY 8411529   Total Lead (Pb) - ND 0.00050 mg/L 2022/12/19 2022/12/21 JHY 8411529	Total Chromium (Cr)	-	ND	0.0010	mg/L	2022/12/19	2022/12/21	JHY	8411529
Total Lead (Pb) - ND 0.00050 mg/L 2022/12/19 2022/12/21 JHY 8411529	Total Copper (Cu)	-	0.0018	0.00050	mg/L	2022/12/19	2022/12/21	JHY	8411529
	Total Iron (Fe)	-	0.15	0.050	mg/L	2022/12/19	2022/12/21	JHY	8411529
Total Magnesium (Mg) - 2.2 0.10 mg/L 2022/12/19 2022/12/21 JHY 8411529	Total Lead (Pb)	-	ND	0.00050	mg/L	2022/12/19	2022/12/21	JHY	8411529
	Total Magnesium (Mg)	-	2.2	0.10	mg/L	2022/12/19	2022/12/21	JHY	8411529

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NL Department of Environment, Climate Change and Municipalities Site Location: WATERFORD RIVER @ KILBRIDE Your P.O. #: 220028978-6 Sampler Initials: LB

Sample Details/Parameters	Α	Result	RDL	UNITS	Extracted	Analyzed	Ву	Batch
UPC872 WATERFORD RIVER @								
KILBRIDGE								
Sampling Date 2022/12/12 13:28								
Matrix W								
Sample # 2022-1731-00-SI-SP								
Registration # SA-0000								
ELEMENTS BY ICP/MS (WATER)								
Metals								
Total Manganese (Mn)	-	0.10	0.0020	mg/L	2022/12/19	2022/12/21	JHY	8411529
Total Nickel (Ni)	-	ND	0.0020	mg/L	2022/12/19	2022/12/21	JHY	8411529
Total Phosphorus (P)	-	ND	0.10	mg/L	2022/12/19	2022/12/21	JHY	8411529
Total Potassium (K)	-	2.0	0.10	mg/L	2022/12/19	2022/12/21	JHY	8411529
Total Selenium (Se)	-	ND	0.00050	mg/L	2022/12/19	2022/12/21	JHY	8411529
Total Sodium (Na)	-	120	0.10	mg/L	2022/12/19	2022/12/21	JHY	8411529
Total Strontium (Sr)	-	0.050	0.0020	mg/L	2022/12/19	2022/12/21	JHY	8411529
Total Uranium (U)	-	ND	0.00010	mg/L	2022/12/19	2022/12/21	JHY	8411529
Total Zinc (Zn)	-	0.011	0.0050	mg/L	2022/12/19	2022/12/21	JHY	8411529