



Ymir Water System

2021 Quartz Creek Flow and Water Quality Monitoring Report

Flow and Turbidity Quarterly Report

Date of Report:	23 March 2022
Reporting Period:	2021 Year End Report 14 Oct 2021 to 19 Jan 2022
Owner:	Regional District of Central Kootenay
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1. Quartz Creek Flow Monitoring

1.1 Reporting Period

The reporting for this report is Fourth Quarter 2021 and includes data from 01 January 2021 to 19 Jan 2022. See prior years reporting for additional data and flow monitoring information.

1.2 Flow Monitoring Weir

In 2019 a flow monitoring weir was installed on Quartz Creek at the intake for the Ymir water system with funding provided by BC Timber Sale and the water service. Funding for current monitoring and reporting is provided by ATCO Wood Products Ltd. and the Regional District owned Ymir water service.

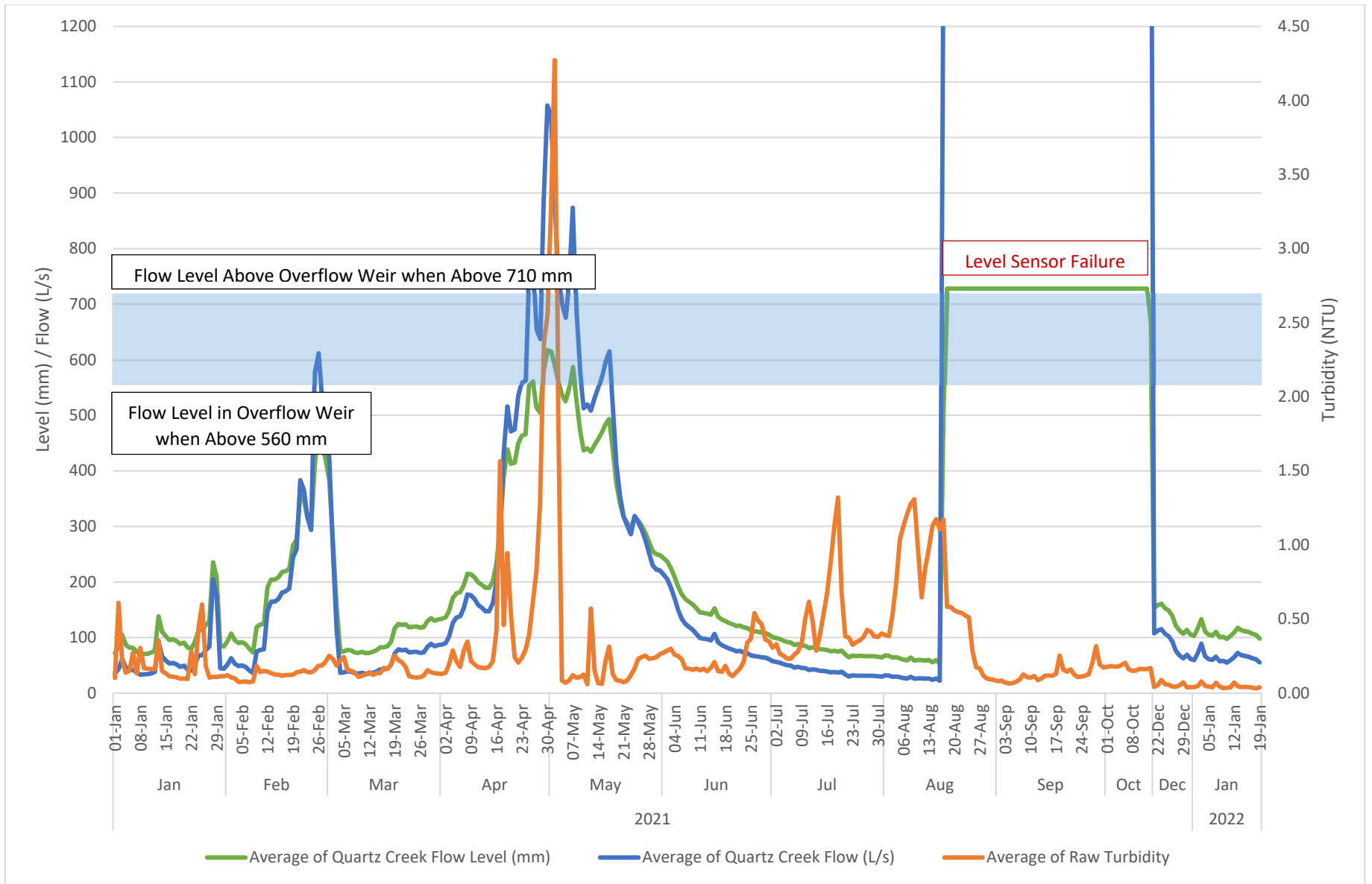
The Kindsvater-Carter Formula was adopted to calculate flow through the sharp crested aluminum weir installed in the concrete water system intake weir. Flow depth through the aluminum flow monitoring weir is measured by an ultrasonic level transmitter. The aluminum weir will measure flows up to about 560 mm or 742 L/s, above this level the concrete intake weir will overtop. Wing plates were added to the ends of the concrete weir to accommodate higher peak flows of up to 710 mm or 1,515 L/s.

1.3 Reporting Period Data Quality

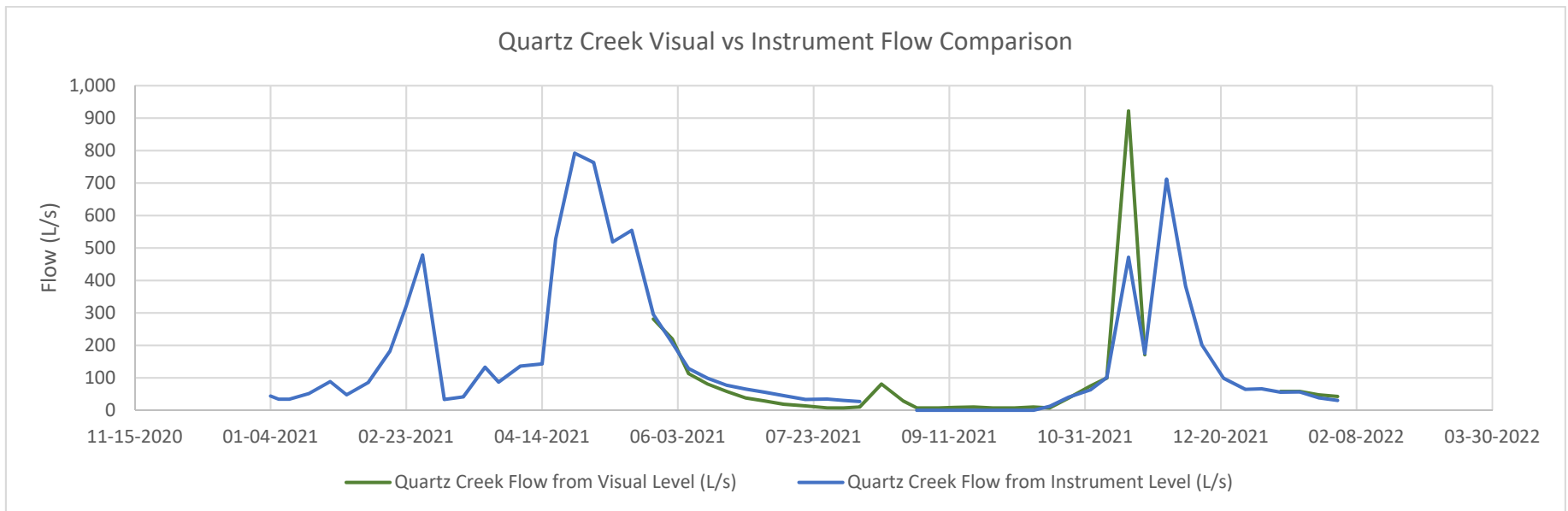
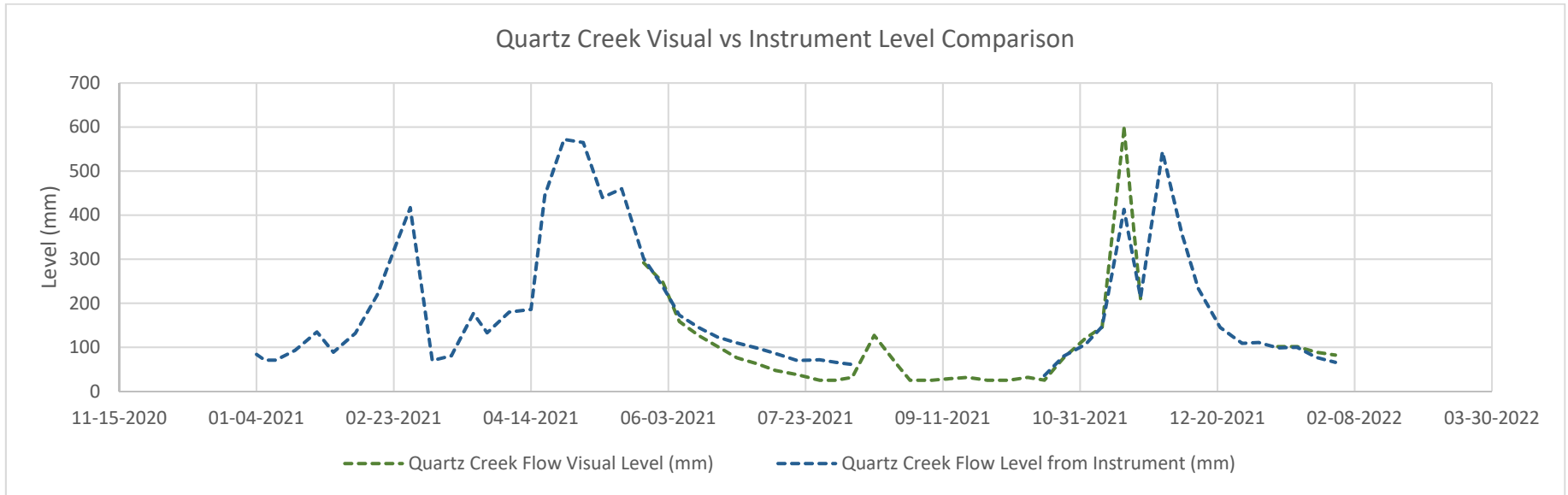
The level sensor failed for a second time on 17 August 2021. The sensor was warranted by the supplier and the new sensor was installed on 13 October 2021. The lowest flow level for the period was recorded immediately before the sensor failure.

1.4 Flow Graphs

The Quartz Creek level and flow data is provided in 15 minute intervals, which is too much data to chart. The digital flow data is provided in a separate Excel file. An Excel pivot table was used to present the following daily average weir flow level, creek flows and turbidity data.



When the level sensor failed, visual flow level readings were recorded about once per week. The following charts provide a comparison of instrument level recordings versus visual level recordings, and the associated calculated flows rates.



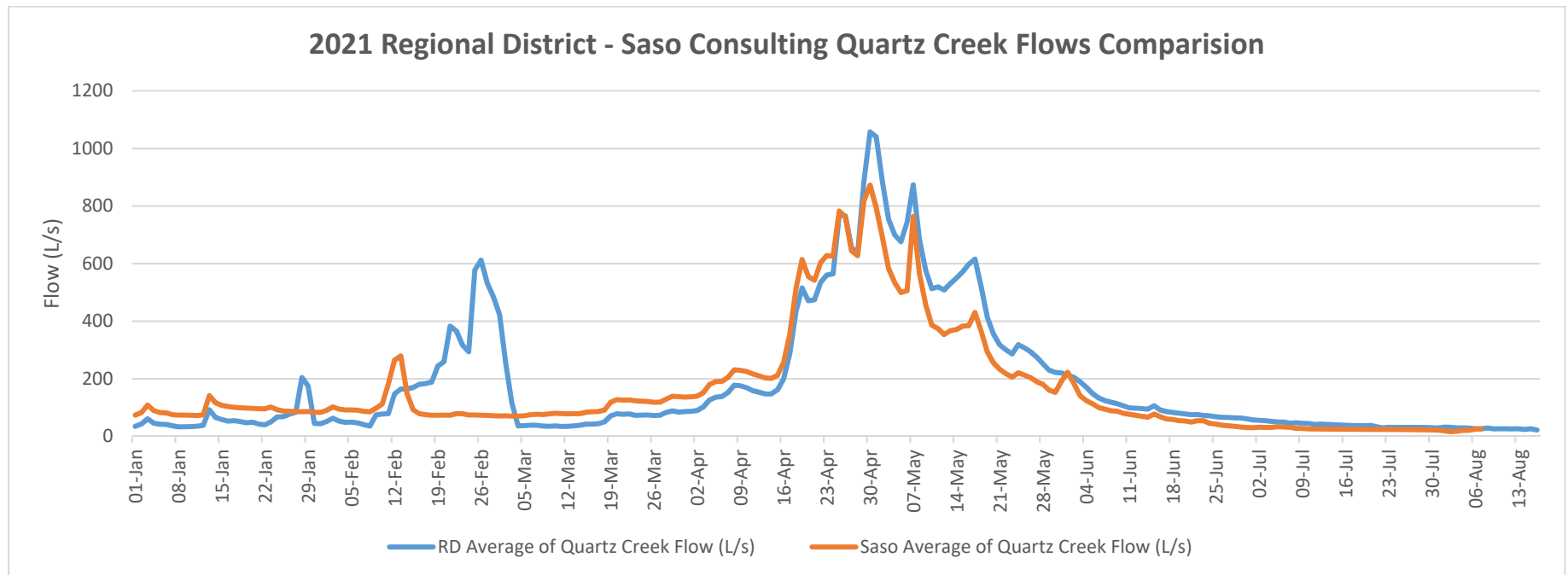
The following table provides the minimum and maximum average daily weir flow level and creek flows for the reporting period.

	Quartz Creek Flow Level (mm)	Quartz Creek Flow (L/s)	Date
Min	25	7.6	See Note 1
Max	618	1,057	30 Apr 2021

Note 1: The lowest flow levels recorded for the monitoring period occurred during the level sensor failure period and were observed visually. A 1 inch (25 mm) flow level was recorded on 28 July, 03 August, 30 August, 07 September, 27 September, 05 October, and 18 October 2021.

1.5 Regional District Saso Consulting Flow Monitoring Data Comparison

Saso Consulting is also monitoring Quartz Creek flows above the Regional District Ymir water system intakes. The following chart provides a comparison of the average daily 2021 flow monitoring data up to the point of Regional District level sensor failure.



The Regional District and Saso flow data correlates reasonably well, particularly at lower flow rates, considering the flow data is based on different flow monitoring approaches. Regional District flows are calculated based on flow levels through a flow monitoring weir and Saso flows are calculated based on flow levels through a natural creek section.

The Regional District flows differ from Saso flows in that the Regional District flows do not include flows diverted to the Ymir water treatment plant. Daily average treatment plant flows are relatively insignificant compared to creek flows during low water system demand periods.

Flow results vary around February 2021. This can possibly be attributed to creek or flow monitoring weir area icing.

Up to about the end of April Regional District flows were generally lower than Saso flows. From the end of April to the beginning of July Regional District flows were higher than Saso flows. Flow rate correlated well from the beginning of July to the beginning of August.

2. Quartz Creek Water Quality Monitoring

The Regional District is monitoring the following water quality parameters in association with the Quartz Creek Flow and Water Quality Monitoring initiative.

Water Quality Monitoring Parameter	Description	Desired Frequency
Raw Water Turbidity	Online turbidity meter	15 minutes
pH	Manual testing	When Technician on Site
Treated Water Bacteriological	Total Coliforms, E.coli & Fecal Coliform	Weekly
Raw Water Bacteriological	Total Coliforms, E.coli & Fecal Coliform	Bi-weekly
Raw Water Full Comprehensive	Chemical and physical parameters based on Guidelines for Canadian Drinking Water Quality	Quarterly
Treated Water THM & HAA	Trihalomethanes (THMs) and haloacetic acids (HAAs)	Quarterly

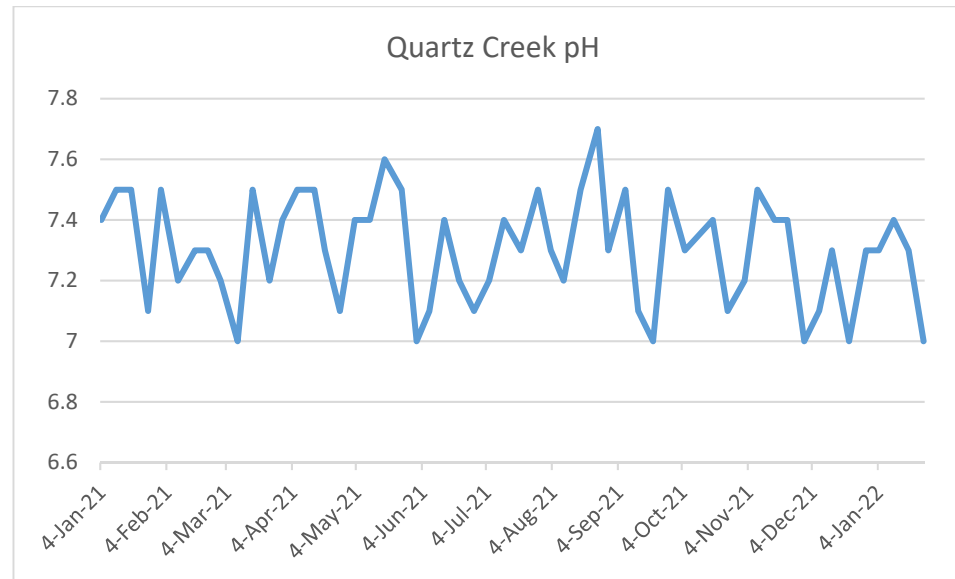
2.1 Raw Water Turbidity

Raw water turbidity is monitored online in the treatment plant.

Raw water turbidity is presented on the flow charts in the previous section. The maximum daily average turbidity for the reporting period was 4.27 NTU recorded on 02 May 2021, during freshet.

2.2 pH

pH is hand measured when water technicians are onsite at the Ymir water treatment plant. The following chart provides the pH test results for the monitoring period. pH varied from 7.0 to 7.7 during the monitoring period. The slight variations do not appear to correlate with seasons or flow rates.



2.3 Treated Water Bacteriological

A treated water sample is taken weekly for Total Coliforms, and E.coli bacteria testing. Testing is provided by the BC Centre for Disease Control through Interior Health. Only adverse sample results are reported to the Regional District. There has been no adverse treated water sample results during the monitoring period.

2.4 Raw Water Bacteriological

A raw water sample is taken bi-weekly for Total Coliforms, E.coli and Fecal Coliform bacteria testing. Testing is conducted by Passmore Laboratory Ltd. Sample test results for the monitoring period are summarized in the following table.

Sample Date	Total Coliform (Colony Count per 100 ml)	E.coli (Colony Count per 100 ml)	Fecal Coliforms (Colony Count per 100 ml)
2021-01-04	17	Less than 1	Less than 1
2021-01-18	4	Less than 1	Less than 1
2021-02-01	2	Less than 1	Less than 1
2021-02-17	2	Less than 1	Less than 1
2021-03-01	8	Less than 1	Less than 1
2021-03-16	3	Less than 1	Less than 1
2021-03-29	10	Less than 1	Less than 1
2021-04-14	10	Less than 1	Less than 1
2021-05-12	2	Less than 1	Less than 1
2021-05-31	8	Less than 1	Less than 1
2021-06-01	16	Less than 1	Less than 1
2021-06-08	41	Less than 1	Less than 1
2021-06-22	21	Less than 1	Less than 1
2021-07-21	58	Less than 1	1
2021-08-03	Less than 1	Less than 1	2
2021-08-17	70	30	31
2021-09-01	23	Less than 1	Less than 1
2021-09-14	37	Less than 1	Less than 1
2021-09-28	23	Less than 1	Less than 1
2021-10-12	15	Less than 1	Less than 1
2021-10-26	10	Less than 1	Less than 1
2021-09-11	14	Less than 1	Less than 1
2021-11-30	50	Less than 1	Less than 1
2021-07-12	5	Less than 1	Less than 1
2021-12-21	2	Less than 1	Less than 1
2022-01-04	23	Less than 1	Less than 1

2.5 Raw Water Full Comprehensive

Raw Water Full Comprehensive test results are summarized in the following table.

Sample Date	Comments
2019-07-26	Test results within Canadian Drinking Water Quality Guidelines.
2019-10-22	Total Coliform count of 11. All other test results within Canadian Drinking Water Quality Guidelines.
2019-12-09	Test results within Canadian Drinking Water Quality Guidelines.
2020-03-30	Test results within Canadian Drinking Water Quality Guidelines.
2020-07-28	Total Coliform count of 71. Test results within Canadian Drinking Water Quality Guidelines.
2020-10-19	Test results within Canadian Drinking Water Quality Guidelines.
2021-01-27	Test results within Canadian Drinking Water Quality Guidelines.
2021-04-06	Test results within Canadian Drinking Water Quality Guidelines.
2021-07-05	Test results within Canadian Drinking Water Quality Guidelines.
2021-10-27	Test results within Canadian Drinking Water Quality Guidelines.
2020-01-28	Test results within Canadian Drinking Water Quality Guidelines.

2.6 Treated Water THM & HAA

Some studies have identified a potential link between disinfection byproducts, primarily trihalomethanes (THMs) and haloacetic acids (HAAs) and certain forms of cancer. Disinfection byproducts can be formed when chlorine reacts with source water that has higher levels of organic material.

Guidelines for Canadian Drinking Water Quality: Guideline Technical Document – Trihalomethanes, April 2009 addendum, identifies the maximum acceptable concentration (MAC) for trihalomethanes (THMs) in drinking water as 0.100 mg/L (100 µg/L) based on a locational running annual average of a minimum of quarterly samples taken at the point in the distribution system with the highest potential THM levels. The maximum acceptable concentration (MAC) for bromodichloromethane (BDCM) in drinking water is 0.016 mg/L (16 µg/L) monitored at the point in the distribution system with the highest potential THM levels.

Guidelines for Canadian Drinking Water Quality: Guideline Technical Document – Haloacetic Acids, 2008 identifies the maximum acceptable concentration (MAC) for total haloacetic acids in drinking water at 0.08 mg/L (80 µg/L) based on a locational running annual average of a minimum of quarterly samples taken in the distribution system.

Sample test results for the monitoring period are summarized in the following table.

Sample Date	Total Trihalomethanes (mg/L)	Bromodichloromethane (mg/L)	Total Haloacetic Acids (mg/L)
2019-01-28	0.0109	< 0.0010	0.00774
2019-07-17	0.0207	< 0.0010	0.0145
2020-06-18	0.0227	< 0.0010	0.0205
2020-09-21	0.0118	< 0.0010	0.0106
2021-01-04	0.0188	< 0.0010	0.0130
2021-04-06	0.0179	< 0.0010	0.0140
2021-06-14	0.0206	< 0.0010	0.0110
2021-09-13	0.0198	< 0.0010	0.0150

Sample results are below Guidelines for Canadian Drinking Water Quality guideline maximum acceptable concentrations.

Appendix A

Quartz Creek Flow Monitoring Weir Formula