



2022 Annual Drinking Water Quality Report
Facility No. 12-098-00001

April 18, 2023



Well Casing

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1.0 Introduction

The purpose of this report is to provide information on the monitoring and maintenance of the Town of Golden's water distribution system over the course of the last calendar year, as directed in the municipality's Interior Health Water System Operating Permit and mandated by the Drinking Water Protection Act.

The Drinking Water Quality Monitoring program generates data for the continuous trending of the community's water quality, as well as the performance of the entire distribution system in a reliable and systematic way. The program allows for potential health hazards to be quickly identified and corrected and for consumer enquiries to be accurately addressed in a timely manner.

Included in this document is:

- A brief introduction to the Town of Golden's water distribution system;
- 2022 consumption information;
- Drinking water monitoring and testing program information;
- A description of any major improvements made to the system within the last calendar year;
- A brief summary of planned initiatives for the current year; and,
- A summary of all water sample results collected in 2022.

The information contained herein collectively serves to confirm and verify the water system's continued performance in delivering a safe and sufficient supply of drinking water to the community.

2.0 Water Distribution System Overview

Groundwater Wells: Currently there are four production wells in operation with a rated total (100% or 24 hour) pumping capacity of 1333 Imperial Gallons per Minute (Igpm) or 101 Litres per second (Lps) providing water to a common distribution system. One well is located on the north side of the Kicking Horse River¹ and three are located on the south side. Best practices in well pump operation suggest that wells be designed to operate at a maximum of eighteen hours per day allowing for maintenance over the workday to occur for example. Based on this premise, the current actual total (75% or 18 hour) pumping capacity that should be relied upon is 1000 Igpm or 76 Lps.

Reservoirs: There are five reservoirs located at three distinct reservoir sites within the municipality. The total available reservoir storage capacity is 1,530,000 Igal or 6.96 Mega Litres (ML). The first site is located on the Northeast Bench, the second and third sites are both located on the Southeast Bench.

Pressure Zones: There are four pressure zones throughout the system. Two pressure zones service the NE Bench, one services the SE Bench, and the remainder of the community comprises the fourth pressure zone.

Distribution System: Pipe sizes range from 150mm to 300mm. The pipe network includes asbestos cement (AC), polyvinylchloride (PVC), yellow jacket ductile iron (YJDI), ductile iron (DI), cast iron (CI) and polyethylene (PE) types. There are about 170 fire hydrants included in an annual spring

¹ Well 6 (located on the north side of the Kicking Horse River) is permanently out of service and will be decommissioned. Loss of Well 6 has resulted in a pumping capacity loss of about 120 Igpm/9 Lps.

and fall maintenance program. Hydrant reports are required to be forwarded to operations staff each time a hydrant is used by the fire department. Hydrants are not typically used for filling tankards other than fire trucks; however occasionally select hydrants are used for the purposes of fire department training or filling the municipal water truck and street sweeper for street cleaning purposes.

13th Street Well: This well is not connected to the distribution system. It is used for non-potable water use by the municipality as well as authorized contractors.

Potable Bulk Water Filling Station: This facility serves as a potable filling station for authorized potable water haulers.

Consumption Stats:

Year	Total Annual Pumped		Date	Maximum Day Demand		Average Day Demand (estimated)	
	(lgal)	Increase/Decrease Over Prior Year		Volume Pumped	Increase/Decrease Over Prior Year	Volume Pumped	Increase/Decrease Over Prior Year
2012	196,502,771	5.8% decrease	Aug-17	1,075,222	4.8% increase	536,892	6.0% decrease
2013	220,261,364	12.1% increase	Aug-11	1,093,064	1.7% increase	603,056	12.3% increase
2014	228,361,075	3.7% increase	Jul-13	1,304,971	19.4% increase	625,232	3.7% increase
2015	223,125,807	2.3% decrease	Jul-05	1,325,686	1.6% increase	611,394	2.2% decrease
2016	240,422,993	7.8% increase	Aug-17	1,188,284	11.6% decrease	658,693	7.8% increase
2017	277,272,091	15.3% increase	Jul-09	1,434,451	20.7% increase	759,650	15.3% increase
2018	222,444,280	24.6% decrease	Jul-29	1,244,857	13.2% decrease	609,436	24.6% decrease
2019	213,660,331	4.1% decrease	Aug-11	1,107,329	12.4% decrease	585,371	4.1% decrease
2020	212,013,642	1.1% decrease	Aug-02	1,126,713	1.0% increase	580,859	1.0% decrease
2021	235,451,009	11.1% increase	Jun-29	1,373,824	21.9% increase	645,071	11.1% increase
2022	241,672,154	2.6% increase	Aug-19	1,242,672	10.6% decrease	662,115	2.6% increase

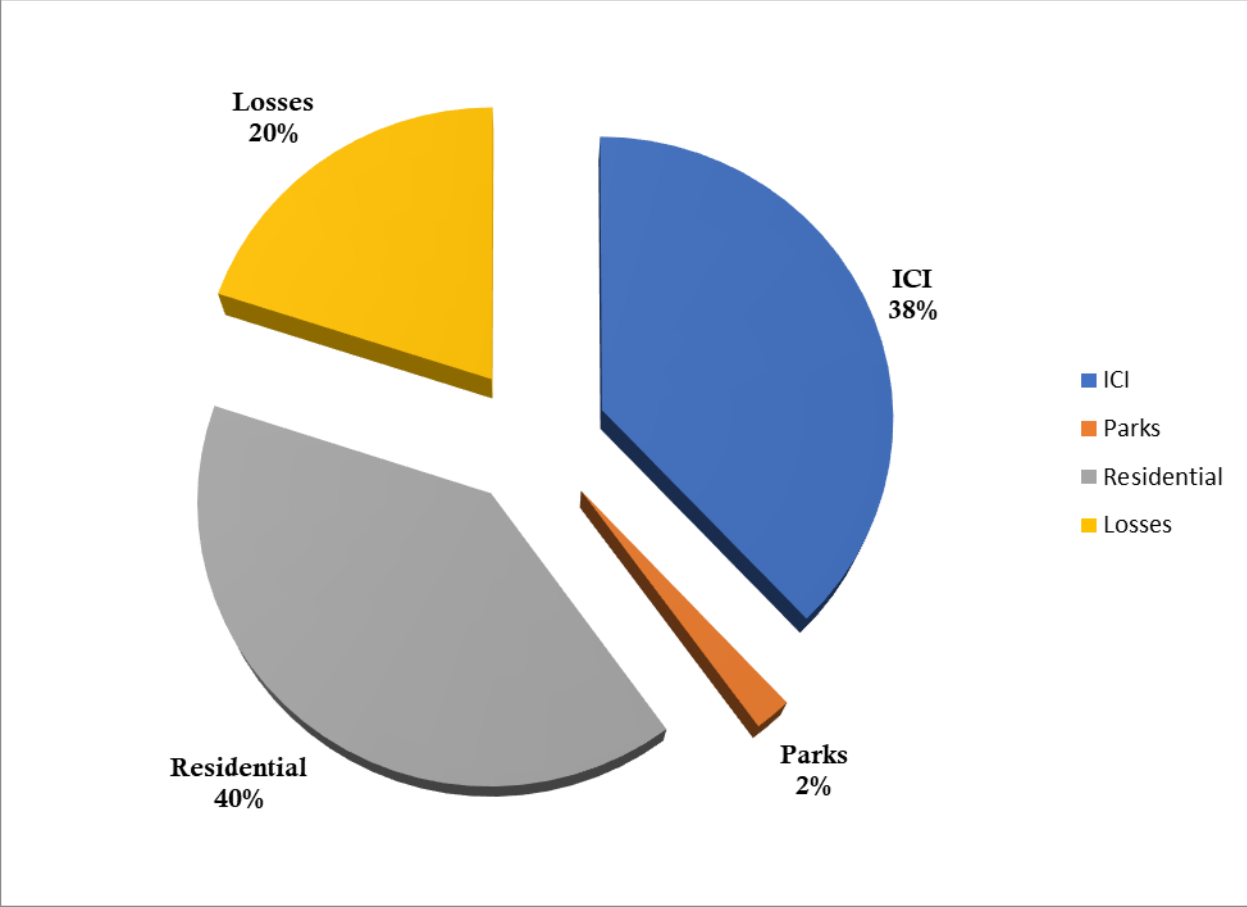
In 2022, Maximum Day demand (Max Day) decreased by 10.6%, while overall consumption increased by 2.6% from 2021. The 2022 Max Day figure is typically assumed to be reflective of residential and municipal irrigating as extensive irrigating on a given day would be a main contributor to Max Day demand. Weather conditions leading up to and occurring on the Max Day are thought to be a main factor influencing this demand figure as well. Certainly communications on conservation and Bylaw support will have also played a factor in terms of education and enforcement of bylaw sprinkling regulations to reduce off hour/day residential irrigating.

In 2022, Industrial, Commercial, Institutional (ICI) demand accounted for about 38.7% of the total water pumped, increasing by 2.8% over 2021 (in 2021 ICI demand was recorded as 35.9% of the total water pumped).

Municipal parks demand accounted for about 1.7% of the total water pumped, a reduction of 0.2% over 2021 (in 2021 municipal irrigation demand was recorded as 1.9% of the total water pumped).

The remaining portion of the total volume pumped, represented as 59.6%, is in large part residential demand; of that percentage about 20%² is considered attributable to system losses through leakage and other unaccounted for water usage (such as fire flow demand or municipal and contractor usage from hydrants for example). Therefore, approximately 39.6% of the total water pumped is assumed to be residential demand, a reduction of 2.6% over 2021 (in 2021 residential demand was reported as being approximately 42.2% of the total water pumped).

² Based on the 2022 Total Pumped volume, 20% represents about 132,423 Igpd or about 92 Igpm. There should be an opportunity to refine this number through a community-wide public infrastructure leak detection program.



3.0 Testing and Monitoring Program

The water quality monitoring program includes source and distribution system monitoring.

Routine weekly samples are collected at each well head and at alternating reservoir sites. These samples are collected by Town of Golden staff and forwarded to a private lab for microbiological testing. Lab results along with consumption and turbidity are reported to the Public Health inspector on a monthly basis.

In 2022 a total of 260 samples were analyzed for total coliforms and E.coli. with three samples testing positive with total coliform counts of one or more, and two samples testing positive for Ecoli.

One TC>1 sample was related to a sample taken from the NE Yellow Reservoir, with the remainder of positive counts related to the Bears Paw Reservoir, resulting in a boil water advisory in May for the south bench area of the community.

As per schedule B of the Drinking Water Protection Act, the Town of Golden is required to analyze four samples per month (population less than 5000). To emphasize the commitment to providing safe drinking water the number of samples analyzed in 2022 averaged 22 per month.

The Town of Golden also conducts full spectrum analyses on each well source on an annual basis for physical and chemical parameters; these results are summarized in the appendix.

4.0 System Maintenance and Repairs

The Town of Golden has adopted an operations and maintenance (O&M) program that includes reservoir disinfections, draining, cleaning and inspections on an approximate 5-year cycle. In 2022, however, no reservoirs were inspected as all reservoirs with the exception of the Hypalon were inspected with a Remotely Operated Vehicle (ROV) in 2021. A new liner was installed in the Hypalon reservoir in 2019.

Hydrant inspections and maintenance, valve exercising, and dead-end main flushing occur on an annual basis.

In 2022, several well issues plagued regular operations, but each were addressed or are in the course of being addressed as follows:

- Well 2's motor was sent out for a rebuild due to an apparent bearing issue. The rebuilt motor was damaged beyond use in return transit and staff are now taking steps to have a new motor installed and tested;
- Well 3's standby generator governor failed resulting in no auto power transfer from the BC Hydro grid to generator power. Parts for the aged generator have proven to be very difficult to locate, but repairs are complete;
- Well 4's main building isolation valve was found to be leaking in late fall 2022. The well is not out of service and a repair will be scheduled this construction season;
- Well 5 has been experiencing apparent hydro service voltage fluctuations resulting in protective automatic shut-down. BC Hydro is actively monitoring power supply at this location after having installed a voltage monitoring/recording device with a possible solution unknown at this time;
- Well 6 has been permanently removed from service and a new well drilled onsite failed to produce water. With Council concurrence a new well site will be investigated to replace this well.

Current and historic maintenance records are available. The Town of Golden has a GIS Mapserver which is under continuous development and is intended to be used to access maintenance information by Systems staff. All of the Town's visible water infrastructure (i.e. water main valves, fire hydrant service valves and fire hydrants) were surveyed by Global Position Satellite (GPS) and added to the mapping data base.

5.0 System Improvements and Updates

Well 6 Status:



Well 6 remained non-operational in 2022.

A new well at the Well 6 site was drilled in 2022 and tested in early 2023 but proved to sustainably yield very little water.

Work has ceased on further development of the new well in favour of researching other possible well sites south of the Kicking Horse River in 2023.

New Infrastructure:

In 2022, a 200mm AC watermain was replaced with approximately 180m of 250 PVC pipe within the 600 block of 9th Avenue North. All existing ICI service connections were renewed to property line and two new hydrants were installed.

Supervisory Control and Data Acquisition (SCADA) Equipment, Radio Equipment and Programmable Logic Controller (PLC) System Upgrades:

2022 marked the third year of a five-year program to undertake upgrades to all water system SCADA infrastructure including associated communications radio equipment, and PLC systems.

Metering:

In 2022 work continued with the replacement of non-radio frequency (RF) compatible water meters with approximately five units replaced and six units installed for new ICI accounts. Work continues with meter updating with priority given to meters which are difficult to access or where high hazard cross connection control can be addressed along with a meter update/retrofit.

Confined Space Entry Program Update:

In 2022 a safety consultant was engaged to renew and update the Town's Confined Space Entry Program. The update was undertaken to assure Worksafe compliance and worker safety when entering the numerous confined spaces associated with the water distribution system. The project was substantially completed in 2022.

Source Protection Plan:

Work transferred to Urban Systems (USL) on source protection in 2022. USL now provides the annual update to the Municipal Water Supply Contingency Plan and provides sentry well monitoring support with lab analysis data review. USL is also available for ongoing contaminated site report reviews/guidance, as well as development reviews with groundwater resource impact potential on an as needed basis.

Emergency Response Plan (ERP):

The ERP is integral to the overarching Water Supply Contingency Plan. Both are reviewed annually with all contacts updated as necessary for delivery with this report to Interior Health.

Leak Detection Work:

In 2022, two main breaks occurred and were repaired. One was associated with construction of the 9th Avenue North construction project and one occurred in a utility right-of-way behind 1200 12th Street North (Travelodge Motel). Additionally, leak detection and repair work occurred at the Golden Municipal Campground along the sites fronting 9th Street South.

6.0 Operator Education and Training

The Town of Golden has an established training program that follows Environmental Operator Certification Program (EOCP) guidelines for required training and certification maintenance. Operators maintain EOCP certifications annually through a variety of EOCP accredited and relevant training opportunities typically available from a variety of sources.

EOCP Current Certification:

<i>Employee</i>	<i>Certification #</i>	<i>Level</i>
Alan Taylor - Systems Chief Operator	6101	WD-III, CCC Tester
Ryan Robison – Systems Operator	1000185	WD-I, CCC Tester

7.0 Cross Connection Control (CCC)

Both Systems operators are certified testers and carry out tests on all municipally owned backflow assemblies. The Town of Golden currently tests and tracks 34 backflow assembly devices (all testable devices) located on various Town owned/operated facilities.

The Town is able to confirm the proper device for any new construction according to hazard level. After construction, backflow devices installed in private buildings are added to our database so that we can track and record the testing history of each assembly installed within the Town.

The Town is a client of Maintenance Training Systems (MTS) and is using their FAST software for our CCC program. More information on this software can be found at:

<http://www.mtsinc.ca/index.php?m=public&p=software&s=fast&v=features>

Work continues with the CCC program with priority given to all high and prioritized medium-hazard service connections.

8.0 SCADA System

Within the Supervisory Control and Data Acquisition (SCADA) system numerous control parameters are in place allowing Town of Golden staff to make changes on an as-needed basis according to ongoing process changes. All trending is done on a daily basis and is in “real time”. Trending and reporting continues to be compiled into monthly and yearly reports.

The following facilities listings itemize all currently in-place SCADA control parameters.

SE Booster Station:

Discharge flow in GPM's as well as total flow
Discharge pressure
Room temperature
Reservoir Levels
Reservoir Hatch Intrusion alarm
Booster Pump Run Times
Flood alarm

NE Booster Station:

Discharge flow in GPM's
Room Temperature
Suction Pressure
Booster Pump Run Times
Reservoir Levels
Reservoir Hatch Intrusion alarm
Discharge Pressure
Flood alarm
Generator Run Status

Well Stations:

Flow totalizers in Gallons
Pump Run Times
Distribution system Pressure Transducers in "psi" at all wells
Level Transducers at Wells 4, 5, and 6
Room Temperatures
Flood alarms
Generator Run Status (where applicable)

Bulk Water Filling Station:

No flow, valve not closing
Room temperature
Flood alarm
Intrusion alarm
Power/communication failure

9.0 Events/Emergency Response

Over the course of 2022 two distribution system main breaks³ were identified and repaired.

Additionally, the south bench neighborhood of the community, supplied through the Bears paw Reservoir was put on a boil water advisory for five days in May as a result of repeated positive bacteriological test results. During this time the entire distribution system was chlorinated with well point sodium hypochlorite injection and clear results were ultimately returned by the lab. The cause of the positive results unfortunately was never determined.

³ One break was related to construction activities on 9th Avenue North

10.0 Recurring and 2023 Initiatives

- Commence the first year of a three-year community wide public-infrastructure distribution system leak detection program. Schedule repair work as needed;
- Continue with CCC Program and prioritize installs of back flow devices, concentrating first on those facilities with a high hazard rating. Replace existing water meters with new meters that use e-coders for totalizing and billing;
- Continue with public education campaign relating to source-to-tap education, water conservation tips and tricks, and education and enforcement relating to sprinkling bylaw regulations through proactive communications and active patrols;
- Continue with school classroom visits and/or systems tours by staff;
- Investigate a new well site south of the Kicking Horse River;
- Minor system upgrades and service repairs on an as-required basis;
- Continue to advance the Groundwater Protection Program; proceed with recommendations contained within the Groundwater Monitoring Plan, Protection Strategy, and Screening Study for Potential Groundwater at Risk of Pathogens (GARP) where and when practicable to do so;
- Continue in year four of a five-year program of updating the current telemetry radio system and SCADA hardware and software systems.

11.0 Sample Analysis Results

DATE	WELLS					RESERVOIRS/BOOSTER STATIONS			
	#2	#3	#4	#5	#6	NE (yellow)	NE (green)	BEARS PAW	SELKIRK BOOSTER
Jan 10	<1	<1	<1	<1	Offline		<1	<1	
Jan 17	<1	<1	<1	<1		<1		<1	
Jan 24	<1	<1	<1	<1			<1	<1	
Jan 31	<1	<1	<1	<1		<1		<1	
Feb 7	<1	<1	<1	<1			<1	<1	
Feb 14	<1	<1	<1	<1		<1		<1	
Feb 28	<1	<1	<1	<1			<1	<1	
Mar 7	<1	<1	<1	<1		<1		<1	
Mar 14	<1	<1	<1	<1			<1	<1	
Mar 21	<1	<1	<1	<1		<1		<1	
Mar 28	<1	<1	<1	<1			<1	<1	
Apr 4	<1	<1	<1	<1		<1		<1	
Apr 25	<1	<1	<1	<1			<1	<1	
May 2	<1	<1	<1	<1		<1		<1	
May 9	<1	<1	<1	<1			<1	<1	
May 16	<1	<1	<1	<1		<1		T-2, E-1	
May 19								T-25, E-4	<1
May 24	<1	<1	<1	<1			<1	<1	
May 25								<1	
May 26								<1	
May 30	<1	<1	<1	<1		<1		<1	
Jun 6	<1	<1	<1	<1			<1	<1	

Jun 13	<1	<1	<1	<1		<1		<1	
Jun 20	<1	<1	<1	<1			<1	<1	
Jun 27	<1	<1	<1	<1		<1		<1	
Jul 4	<1	<1	<1	<1			<1	<1	
Jul 11	<1	<1	<1	<1		<1		<1	
Jul 18	<1	<1	<1	<1			<1	<1	
Jul 25	<1	<1	<1	<1		<1		<1	
Aug 8	<1	<1	<1	<1			<1	<1	
Aug 15	<1	<1	<1	<1		<1		<1	
Aug 22	<1	<1	<1	<1			<1	<1	
Aug 29	<1	<1	<1	<1		<1		<1	
Sep 12	<1	<1	<1	<1			<1	No access	
Sep 26	<1	<1	<1	<1		<1		<1	
Oct 3	<1	<1	<1	<1			<1	<1	
Oct 17	<1	<1	<1	<1		T - 1<1		<1	
Oct 24	<1	<1	<1	<1			<1	<1	
Oct 31	<1	<1	<1	<1		<1		<1	
Nov 7	<1	<1	<1	<1		<1		<1	
Nov 14	<1	<1	<1	<1			<1	<1	
Nov 21	<1	<1	<1	<1		<1		<1	
Nov 28	<1	<1	<1	<1			<1	<1	
Dec 5	<1	<1	<1	<1		<1		<1	
Dec 12	Offline	<1	<1	<1			<1	<1	
Dec 19	Offline	<1	<1	<1		<1		<1	

12.0 Turbidity Analysis (NTU)

DATE	WELL#2	WELL#3	WELL#4	WELL#5	WELL#6
Jan 10	0.06	0.07	0.05	0.06	offline
Jan 17	0.08	0.05	0.06	0.05	
Jan 31	0.05	0.05	0.07	0.05	
Feb 14	0.06	0.06	0.06	0.06	
Feb 28	0.07	0.06	0.05	0.06	
Mar 7	0.05	0.05	0.06	0.05	
Mar 14	0.05	0.06	0.06	0.05	
Mar 21	0.05	0.05	0.06	0.06	
Mar 28	0.06	0.07	0.07	0.05	
Apr 4	0.05	0.06	0.06	0.06	
Apr 11	0.05	0.06	0.07	0.06	
May 2	0.05	0.05	0.06	0.05	
May 9	0.06	0.05	0.06	0.06	
May 16	0.06	0.06	0.06	0.06	
May 24	0.06	0.07	0.07	0.05	
May 30	0.05	0.05	0.06	0.05	
Jun 6	0.06	0.06	0.06	0.05	
Jun 13	0.06	0.05	0.06	0.05	
Jun 20	0.05	0.06	0.06	0.06	
Jun 27	0.06	0.06	0.06	0.06	

Jul 4	0.05	0.06	0.06	0.05	
Jul 11	0.06	0.06	0.06	0.06	
Jul 18	0.06	0.06	0.07	0.06	
Aug 8	0.05	0.05	off	0.05	
Aug 15	0.07	0.06	off	0.06	
Aug 22	0.06	0.05	0.05	0.06	
Aug 29	0.06	0.06	0.06	0.05	
Sept 12	0.06	0.06	0.06	0.05	
Sept 26	0.05	0.07	0.06	0.06	
Oct 3	0.05	0.05	0.06	0.06	
Oct 17	0.06	0.06	0.06	0.06	
Oct 24	0.06	0.06	0.06	0.05	
Oct 31	0.05	0.05	0.06	0.05	
Nov 14	0.05	0.06	0.06	0.06	
Nov 21	0.05	0.05	off	0.06	
Nov 28	0.06	0.06	0.06	0.07	
Dec 5	0.06	0.06	0.07	0.05	
Dec 12	off	0.07	0.07	0.05	
Dec 19	off	0.05	0.06	0.06	
Average	0.06	0.06	0.06	0.06	
Hi	0.08	0.07	0.07	0.07	
Low	0.05	0.05	0.05	0.05	

13.0 Summary

The Town of Golden has worked with Interior Health Officials since 2002 to develop and maintain a water quality monitoring program that exceeds the Drinking Water Regulation. The Town will continue with this monitoring program as part of its commitment to deliver a safe potable water supply to the community.

This report will be posted on the Town of Golden’s website for public information following receipt by Council.

Respectfully,



Chris Cochran, AScT,
 Director of Public Works

Attachment

Drinking Water Package - ALS Environmental

Well #2	2016	2017	2018	2019	2020	2021	2022	RDL	Units	GCDWQ
Year	2016	2017	2018	2019	2020	2021	2022	RDL	Units	GCDWQ
Misc. Inorganics										
Fluoride (F)	0.09	0.09	0.09	0.070	0.068	0.065	0.086	0.02	mg/L	1.5
ANIONS										
Nitrite (N)	<0.005	<0.005	<0.010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	mg/L	1
Calculated Parameters										
Total Hardness (CaCO3)	147	142		138	158	153	144	0.50	mg/L	
Nitrate (N)	0.25	0.24	0.21	0.22	0.209	0.222	0.252	0.005	mg/L	10
Misc. Inorganics										
Alkalinity (Total as CaCO3)	130	141	130	142	134	141	144	1.0	mg/L	
Alkalinity (PP as CaCO3)	<0.5	<1.0	<1.0	<2.0	<2.0	<1.0	<1.0	2.0	mg/L	
Bicarbonate (HCO3)	159	172	160	142	134	141	144	1.0	mg/L	
Carbonate (CO3)	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.5	mg/L	
Hydroxide (OH)	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.5	mg/L	
Anions										
Dissolved Sulphate (SO4)	19.8	19.7	20	18.5	18.2	16.4	18.3	0.3	mg/L	500
Dissolved Chloride (Cl)	9.8	8.4	11	10.4	8.08	8.75	11.4	0.5	mg/L	250
MISCELLANEOUS										
True Colour	<5	<5	<2	<5	<5.0	<5.0	<5.0	5.0	TCU	15
Nutrients										
Nitrate plus Nitrite (N)	0.25	0.24	0.21	0.216	0.209	0.222	0.252	0.005	mg/L	
Physical Properties										
Conductivity	308	314	310	303	295	306	303	2.0	uS/cm	
pH	8	8.2	8.2	8.15	8.11	8.09	7.92	0.1	pH Units	7.0-10.5
Physical Properties										
Total Dissolved Solids	186	156	200	174	189	158	186	20	mg/L	500
Turbidity	0.1	0.3	<0.1	<0.1	<0.10	<0.10	<0.10	0.1	NTU	1
Total Metals by Atomic Spectroscopy										
Total Aluminum (Al)	<0.003	0.012	0.012	0.0041	0.0039	<0.0030	0.0044	0.003	mg/L	0.1
Total Antimony (Sb)	<0.0005	<0.0005	<0.0006	<0.0001	<0.00010	<0.00010	<0.00010	0.0001	mg/L	0.006
Total Arsenic (As)	<0.0001	<0.0001	<0.0002	<0.0001	<0.00010	<0.00010	<0.00010	0.0001	mg/L	0.01
Total Barium (Ba)	0.054	0.054		0.0552	0.0553	0.0572	0.0554	0.0001	mg/L	1
Total Boron (B)	<0.05	<0.05		<0.010	<0.010	<0.010	<0.010	0.01	mg/L	5
Total Cadmium (Cd)	<0.00001	<0.00001	0.00003	<0.000005	<0.0000050	<0.0000050	<0.0000050	0.000005	mg/L	0.005
Total Chromium (Cr)	<0.001	<0.001	<0.001	0.00019	38.0	<0.00050	<0.00050	0.0001	mg/L	0.05
Total Cobalt (Co)	<0.0005	<0.0002	<0.0003	<0.00010	0.00018	<0.00010	<0.00010	0.00010	mg/L	
Total Copper (Cu)	0.0007	0.0011	0.0009	0.00112	<0.00010	0.00127	0.00106	0.00050	mg/L	1
Total Iron (Fe)	<0.005	<0.005		<0.010	0.00108	<0.010	<0.010	0.010	mg/L	0.3
Total Lead (Pb)	<0.0002	<0.0002	<0.0002	0.000056	<0.00005	<0.000050	<0.000050	0.000050	mg/L	0.01
Total Manganese (Mn)	<0.001	<0.001		<0.00010	<0.00010	<0.00010	<0.00010	0.00010	mg/L	0.05
Total Mercury (Hg)	<0.00001	<0.00001	<0.0020	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000050	mg/L	0.001
Total Molybdenum (Mo)	<0.001	<0.001	0.00076	0.000575	0.000614	0.000673	0.000651	0.000050	mg/L	
Total Nickel (Ni)	<0.001	<0.001	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	0.00050	mg/L	
Total Selenium (Se)	<0.0001	<0.0001	<0.0002	<0.000050	<0.000050	<0.000050	<0.000050	0.000050	mg/L	0.05
Total Silver (Ag)	<0.00002	<0.00002	<0.0001	<0.000010	<0.000010	<0.000010	<0.000010	0.000010	mg/L	
Total Uranium (U)	0.0005	0.0005	0.00054	0.000481	0.000540	0.000511	0.000453	0.000010	mg/L	0.02
Total Vanadium (V)	<0.005	<0.005	<0.001	<0.00050	<0.00050	<0.00050	<0.00050	0.00050	mg/L	
Total Zinc (Zn)	<0.005	<0.005	<0.003	<0.0030	<0.0030	<0.0030	<0.0030	0.0030	mg/L	5
Total Calcium (Ca)	35.4	34.9		32.7	38.0	35.9	36.5	0.050	mg/L	
Total Magnesium (Mg)	14.2	13.4		13.7	15.2	15.4	13.7	0.0050	mg/L	
Total Potassium (K)	0.54	0.55		0.562	0.535	0.572	0.554	0.050	mg/L	
Total Sodium (Na)	6.4	5.9		6.74	6.46	7.38	8.26	0.050	mg/L	200
Total Sulphur (S)	6.3	6.7		6.01	6.56	6.63	6.87	0.50	mg/L	

Maximum Acceptable Concentration

Interim Maximum Allowable Concentration

Operation Guideline

Aesthetic Objective

RDL - Reported Detection Limit

mg/L - Milligrams Per Litre

TCU - True Colour Unit

mS/cm - Microsiemens Per Centimeter

NTU - Nephelometric Colour Unit

Well #3										
Year	2016	2017	2018	2019	2020	2021	2022	RDL	Units	GCDWQ
Misc. Inorganics										
Fluoride (F)	0.09	0.09	0.10	0.071	0.069	0.064	0.086	0.02	mg/L	1.5
ANIONS										
Nitrite (N)	<0.005	<0.005	<0.010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	mg/L	1
Calculated Parameters										
Total Hardness (CaCO3)	165	165		163	184	178	186	0.50	mg/L	
Nitrate (N)	0.54	0.55	0.61	0.589	0.636	0.550	0.633	0.005	mg/L	10
Misc. Inorganics										
Alkalinity (Total as CaCO3)	149	152	150	159	151	162	156	1.0	mg/L	
Alkalinity (PP as CaCO3)	<0.5	<1.0	<1.0	<2.0	<2.0	<1.0	<1.0	2.0	mg/L	
Bicarbonate (HCO3)	182	185	180	159	151	162	156	1.0	mg/L	
Carbonate (CO3)	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.5	mg/L	
Hydroxide (OH)	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.5	mg/L	
Anions										
Dissolved Sulphate (SO4)	19.1	18.1	20.0	18.4	18.9	17.8	19.1	0.3	mg/L	500
Dissolved Chloride (Cl)	12	13	19	15.3	15.4	15.2	15.9	0.5	mg/L	250
MISCELLANEOUS										
True Colour	<5	9.2	<2	<5	<5.0	<5.0	<5.0	5.0	TCU	15
Nutrients										
Nitrate plus Nitrite (N)	0.54	0.55	0.61	0.589	0.636	0.550	0.633	0.005	mg/L	
Physical Properties										
Conductivity	346	349	360	303	347	358	344	2.0	uS/cm	
pH	8.1	8.3	8.1	8.20	8.18	8.10	7.99	0.1	pH Units	7.0-10.5
Physical Properties										
Total Dissolved Solids	182	182	220	189	181	182	195	20	mg/L	500
Turbidity	<0.1	0.26	<0.1	<0.1	<0.10	<0.10	<0.10	0.1	NTU	1
Total Metals by Atomic Spectroscopy										
Total Aluminum (Al)	<0.003	0.011	0.004	0.0049	0.0030	<0.0030	0.0038	0.003	mg/L	0.1
Total Antimony (Sb)	<0.0005	<0.0005	<0.0006	<0.0001	<0.00010	<0.00010	<0.00010	0.0001	mg/L	0.006
Total Arsenic (As)	<0.0001	<0.0001	<0.0002	<0.0001	<0.00010	<0.00010	<0.00010	0.0001	mg/L	0.01
Total Barium (Ba)	0.118	0.117		0.1290	0.127	0.144	0.126	0.0001	mg/L	1
Total Boron (B)	<0.05	<0.05		<0.010	<0.010	<0.010	<0.010	0.01	mg/L	5
Total Cadmium (Cd)	<0.00001	<0.00001	<0.00002	<0.000005	<0.0000050	<0.0000050	<0.0000050	0.000005	mg/L	0.005
Total Chromium (Cr)	<0.001	<0.001	<0.0010	0.00057	0.00055	0.00050	<0.00050	0.0001	mg/L	0.05
Total Cobalt (Co)	<0.0005	<0.0002	<0.0003	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	mg/L	
Total Copper (Cu)	0.0006	0.0009	0.0009	0.00132	0.00061	0.00097	0.00083	0.00050	mg/L	1
Total Iron (Fe)	<0.005	<0.005		<0.010	<0.010	<0.010	<0.010	0.010	mg/L	0.3
Total Lead (Pb)	<0.0002	<0.0002	<0.0002	0.000065	<0.000050	<0.000050	<0.000050	0.000050	mg/L	0.01
Total Manganese (Mn)	<0.001	<0.001		<0.00010	<0.00010	<0.00010	<0.00010	0.00010	mg/L	0.05
Total Mercury (Hg)	<0.00001	<0.00001	<0.00020	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000050	mg/L	0.001
Total Molybdenum (Mo)	<0.001	<0.001	0.001	0.000573	0.000590	0.000631	0.000662	0.000050	mg/L	
Total Nickel (Ni)	<0.001	<0.001	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	0.00050	mg/L	
Total Selenium (Se)	<0.0001	<0.0001	<0.0002	<0.000050	<0.000050	<0.000050	<0.000050	0.000050	mg/L	0.05
Total Silver (Ag)	<0.00002	<0.00002	<0.0001	<0.000010	3.16	<0.000010	<0.000010	0.000010	mg/L	
Total Uranium (U)	0.0007	0.0007	0.00070	0.000656	0.000693	0.000666	0.000611	0.000010	mg/L	0.02
Total Vanadium (V)	<0.005	<0.005	0.0014	<0.00050	<0.00050	<0.00050	<0.00050	0.00050	mg/L	
Total Zinc (Zn)	<0.005	<0.005	<0.003	<0.0030	<0.0030	<0.0030	<0.0030	0.0030	mg/L	5
Total Calcium (Ca)	31.5	31.3		30.8	34.8	33.5	35.7	0.050	mg/L	
Total Magnesium (Mg)	20.9	21.2		20.8	23.6	22.8	23.4	0.0050	mg/L	
Total Potassium (K)	0.73	0.73		0.817	0.852	0.761	0.843	0.050	mg/L	
Total Sodium (Na)	7.2	7.0		9.85	11.0	9.82	10.10	0.050	mg/L	200
Total Sulphur (S)	6.1	6.4		6.17	6.79	7.17	7.93	0.50	mg/L	

Maximum Acceptable Concentration

Interem Maximum Allowable Concentration

Operation Guideline

Asthetic Objective

RDL - Reported Detection Limit

mg/L - Milligrams Per Litre

TCU - True Colour Unit

mS/cm - Microsiemens Per Centimeter

NTU - Nephelometric Colour Unit

Well #4										
Year	2016	2017	2018	2019	2020	2021	2022	RDL	Units	GCDWQ
Misc. Inorganics										
Fluoride (F)	0.06	0.06		0.036	0.041	0.037	0.051	0.02	mg/L	1.5
ANIONS										
Nitrite (N)	<0.005	<0.005	<0.03	<0.0010	<0.0010	<0.0010	<0.0010	0.001	mg/L	1
Calculated Parameters										
Total Hardness (CaCO3)	383	396		420	424	411	434	0.50	mg/L	
Nitrate (N)	1.44	1.64	7.8	1.76	1.75	1.73	1.74	0.005	mg/L	10
Misc. Inorganics										
Alkalinity (Total as CaCO3)	338	356	370	362	351	358	360	1.0	mg/L	
Alkalinity (PP as CaCO3)	<0.5	<1.0	<1.0	<2.0	<2.0	<1.0	<1.0	2.0	mg/L	
Bicarbonate (HCO3)	412	434	450	362	351	358	360	1.0	mg/L	
Carbonate (CO3)	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.5	mg/L	
Hydroxide (OH)	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.5	mg/L	
Anions										
Dissolved Sulphate (SO4)	41.5	42.8	41	39.2	39.7	38.1	40.8	0.3	mg/L	500
Dissolved Chloride (Cl)	97	110	110	101.0	99.5	98.7	108.0	0.5	mg/L	250
MISCELLANEOUS										
True Colour	<5	17.3	2.2	<5	<5.0	<5.0	<5.0	5.0	TCU	15
Nutrients										
Nitrate plus Nitrite (N)	1.44	1.64	1.8	1.760	1.75	1.73	1.74	0.005	mg/L	
Physical Properties										
Conductivity	959	1050	1000	968	922	984	980	2.0	uS/cm	
pH	7.77	8.26	7.9	7.95	8.14	8.04	7.79	0.1		7.0-10.5
Physical Properties										
Total Dissolved Solids	506	580	560	544	557	494	585	20	mg/L	500
Turbidity	0.15	1.03	<0.1	0.17	0.12	<0.10	<0.10	0.1	NTU	1
Total Metals by Atomic Spectroscopy										
Total Aluminum (Al)	<0.003	0.010	0.0035	<0.003	<0.0030	<0.0030	<0.0030	0.003	mg/L	0.1
Total Antimony (Sb)	<0.0005	<0.0005	<0.0006	<0.0001	<0.00010	<0.00010	<0.00010	0.0001	mg/L	0.006
Total Arsenic (As)	<0.0001	<0.0001	<0.0002	<0.0001	<0.00010	<0.00010	<0.00010	0.0001	mg/L	0.01
Total Barium (Ba)	0.21	0.24	0.2290	0.209	0.245	0.222	0.2001	0.0001	mg/L	1
Total Boron (B)	<0.05	<0.05		0.014	0.012	0.014	0.013	0.01	mg/L	5
Total Cadmium (Cd)	<0.00001	<0.00001	<0.00002	<0.000005	<0.0000050	<0.0000050	<0.0000050	0.000005	mg/L	0.005
Total Chromium (Cr)	<0.001	<0.001	<0.001	0.00012	0.00012	<0.00050	<0.00050	0.0001	mg/L	0.05
Total Cobalt (Co)	<0.0005	<0.0002	<0.0003	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	mg/L	
Total Copper (Cu)	0.0012	0.0016	0.0023	0.00654	0.00250	0.00338	0.00304	0.00050	mg/L	1
Total Iron (Fe)	<0.005	<0.005		<0.010	<0.010	<0.010	<0.010	0.010	mg/L	0.3
Total Lead (Pb)	<0.0002	<0.0002	<0.0002	0.000697	0.000314	0.000401	0.000263	0.000050	mg/L	0.01
Total Manganese (Mn)	<0.001	<0.001		<0.00010	<0.00010	<0.00010	0.00010	0.00010	mg/L	0.05
Total Mercury (Hg)	<0.00001	<0.00001	<0.0020	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000050	mg/L	0.001
Total Molybdenum (Mo)	<0.001	<0.001	<0.0002	0.000243	0.000173	0.000235	0.000178	0.000050	mg/L	
Total Nickel (Ni)	<0.001	<0.001	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	0.00050	mg/L	
Total Selenium (Se)	<0.0001	<0.0001	<0.0002	0.000101	<0.000050	0.000111	0.000069	0.000050	mg/L	0.05
Total Silver (Ag)	<0.00002	<0.00002	<0.0001	<0.000010	<0.000010	<0.000010	<0.000010	0.000010	mg/L	
Total Uranium (U)	0.0012	0.0013	0.0014	0.00128	0.00124	0.00118	0.00111	0.000010	mg/L	0.02
Total Vanadium (V)	<0.005	<0.005	0.001	<0.00050	<0.00050	<0.00050	<0.00050	0.00050	mg/L	
Total Zinc (Zn)	<0.005	<0.005	0.005	0.0217	0.0121	0.0143	0.0127	0.0030	mg/L	5
Total Calcium (Ca)	85.4	89.7		95.1	97.8	93.1	100.0	0.050	mg/L	
Total Magnesium (Mg)	41.2	41.7		44.3	43.7	43.4	44.7	0.0050	mg/L	
Total Potassium (K)	1.89	1.96		2.02	1.89	1.91	2.06	0.050	mg/L	
Total Sodium (Na)	51.1	59.0		62.0	59.8	61.0	71.0	0.050	mg/L	200
Total Sulphur (S)	14.1	15.5		14.6	14.8	14.8	17.1	0.50	mg/L	

Maximum Acceptable Concentration

Interem Maximum Allowable Concentration

Operation Guidline

Asthetic Objective

RDL - Reported Detection Limit

mg/L - Milligrams Per Litre

TCU - True Colour Unit

mS/cm - Microsiemens Per Centimeter

NTU - Nephelometric Colour Unit

Well #5										
Year	2016	2017	2018	2019	2020	2021	2022	RDL	Units	GCDWQ
Misc. Inorganics										
Fluoride (F)	0.09	0.09		0.065	0.067	0.063	0.083	0.02	mg/L	1.5
ANIONS										
Nitrite (N)	<0.005	<0.005	<0.033	<0.0010	<0.0010	<0.0010	<0.0010	0.001	mg/L	1
Calculated Parameters										
Total Hardness (CaCO3)	182	174		177	199	199	192	0.50	mg/L	
Nitrate (N)	0.45	0.52	2.1	0.497	0.520	0.552	0.482	0.005	mg/L	10
Misc. Inorganics										
Alkalinity (Total as CaCO3)	162	168	160	174	172	192	174	1.0	mg/L	
Alkalinity (PP as CaCO3)	<0.5	<1.0	<1.0	<2.0	<2.0	<1.0	<1.0	2.0	mg/L	
Bicarbonate (HCO3)	198	205	190	174	172	192	174	1.0	mg/L	
Carbonate (CO3)	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.5	mg/L	
Hydroxide (OH)	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.5	mg/L	
Anions										
Dissolved Sulphate (SO4)	22.6	21.2	23	20.8	21.3	20.3	21.6	0.3	mg/L	500
Dissolved Chloride (Cl)	14	15	16	17.0	18.0	21.3	16.4	0.5	mg/L	250
MISCELLANEOUS										
True Colour	<5	5		<5	<5.0	<5.0	<5.0	5.0	TCU	15
Nutrients										
Nitrate plus Nitrite (N)	0.45	0.52	0.47	0.497	0.52	0.552	0.482	0.005	mg/L	
Physical Properties										
Conductivity	382	390	390	391	374	433	369	2.0	uS/cm	
pH	8.06	8.29	8.13	8.23	8.20	8.16	7.99	0.1		7.0-10.5
Physical Properties										
Total Dissolved Solids	206	200	190	222	218	214	216	20	mg/L	500
Turbidity	<0.1	0.3		<0.1	<0.10	<0.10	<0.10	0.1	NTU	1
Total Metals by Atomic Spectroscopy										
Total Aluminum (Al)	<0.003	0.012	0.005	0.0088	0.0036	<0.0030	<0.0030	0.003	mg/L	0.1
Total Antimony (Sb)	<0.0005	<0.0005	<0.0006	<0.0001	<0.00010	<0.00010	<0.00010	0.0001	mg/L	0.006
Total Arsenic (As)	<0.0001	<0.0001	<0.0002	<0.0001	<0.00010	<0.00010	<0.00010	0.0001	mg/L	0.01
Total Barium (Ba)	0.073	0.076		0.0762	0.0796	0.0834	0.0779	0.0001	mg/L	1
Total Boron (B)	<0.05	<0.05		<0.010	<0.010	<0.010	<0.010	0.01	mg/L	5
Total Cadmium (Cd)	<0.00001	<0.00001	<0.00002	<0.000005	<0.0000050	<0.0000050	<0.0000050	0.000005	mg/L	0.005
Total Chromium (Cr)	<0.001	<0.001	<0.001	0.00033	0.00038	<0.00050	<0.00050	0.0001	mg/L	0.05
Total Cobalt (Co)	<0.0005	<0.0002	<0.0003	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	mg/L	
Total Copper (Cu)	0.0006	0.0007	0.0007	0.00142	0.00062	0.00129	0.00054	0.00050	mg/L	1
Total Iron (Fe)	<0.005	<0.010		0.011	<0.010	<0.010	<0.010	0.010	mg/L	0.3
Total Lead (Pb)	<0.0002	<0.0002	<0.0002	0.000057	<0.000050	<0.000050	<0.000050	0.000050	mg/L	0.01
Total Manganese (Mn)	<0.001	<0.001		0.00012	<0.00010	<0.00010	<0.00010	0.00010	mg/L	0.05
Total Mercury (Hg)	<0.00001	<0.00001	<0.00020	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000050	mg/L	0.001
Total Molybdenum (Mo)	<0.001	<0.001	0.0005	0.000528	0.000502	0.000773	0.000545	0.000050	mg/L	
Total Nickel (Ni)	<0.001	<0.001	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	0.00050	mg/L	
Total Selenium (Se)	<0.0001	<0.0001	<0.0002	0.000055	<0.000050	0.000069	<0.000050	0.000050	mg/L	0.05
Total Silver (Ag)	<0.00002	<0.00002	<0.0001	<0.000010	<0.000010	<0.000010	<0.000010	0.000010	mg/L	
Total Uranium (U)	0.0006	0.0006	0.00063	0.00058	0.000570	0.000600	0.000542	0.000010	mg/L	0.02
Total Vanadium (V)	<0.005	<0.005	0.002	<0.00050	<0.00050	<0.00050	<0.00050	0.00050	mg/L	
Total Zinc (Zn)	<0.005	<0.005	<0.003	0.0038	<0.0030	<0.0030	<0.0030	0.0030	mg/L	5
Total Calcium (Ca)	42.6	41.0		40.9	45.1	45.9	46.0	0.050	mg/L	
Total Magnesium (Mg)	18.3	17.3		18.3	21.1	20.5	18.7	0.0050	mg/L	
Total Potassium (K)	0.92	0.91		0.98	1.01	1.04	0.977	0.050	mg/L	
Total Sodium (Na)	9.66	9.23		10.6	12.1	13.7	12.2	0.050	mg/L	200
Total Sulphur (S)	7.6	6.4		7.04	7.03	8.20	9.04	0.50	mg/L	

Maximum Acceptable Concentration

Interem Maximum Allowable Concentration

Operation Guideline

Asthetic Objective

RDL - Reported Detection Limit

mg/L - Milligrams Per Litre

TCU - True Colour Unit

mS/cm - Microsiemens Per Centimeter

NTU - Nephelometric Colour Unit