



2017 Annual Drinking Water Quality Report
Facility No. 12-098-00001

June 8, 2018



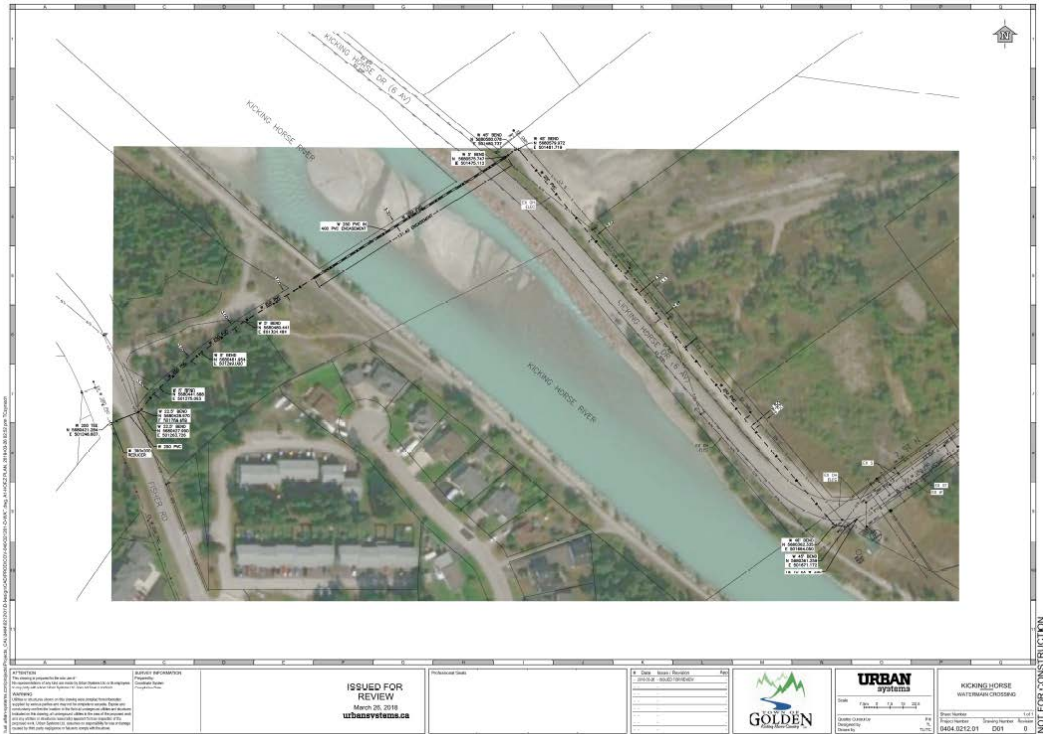
Reservoir Remote Operated Vehicle (ROV) Inspections



Well 4 Structure Replacement



Hypalon Reservoir Liner Replacement Planning



Proposed Kicking Horse River Watermain Crossing

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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;
- 2017 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 2017.

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: There are 5 wells with a combined total pumping capacity of 1650 Imperial Gallons per Minute (Igal) or 125 Litres per second (Lps) providing water to a common distribution system. Two wells are located on the north side of the Kicking Horse River and three are located on the south side.

Reservoirs: There are 5 reservoirs located at 3 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 in the North East Bench, the second and third sites are both located on the South East Bench.

Pressure Zones: There are 4 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 143 fire hydrants included in an annual spring and fall maintenance program. Hydrant reports are forwarded on 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 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.

Consumption Stats:

2017:

Total volume of water pumped – 277,272,091 Igal. (15.3% increase over 2016)
Peak Day – July 9; 1,434,451 Igal (20.7% increase over 2016)
Ave. Day Demand (Estimated) – 759,650 Igpd (15.3% increase over 2016 estimate)

2016:

Total volume of water pumped – 240,422,993 Igal. (7.8% increase over 2015)
Peak Day – August 17; 1,188,284 Igal (11.6% decrease over 2015)
Ave. Day Demand (Estimated) – 658,693 Igpd (7.8% increase over 2015 estimate)

2015:

Total volume of water pumped – 223,125,807 Igal. (2.3% decrease over 2014)
Peak Day – July 5; 1,325,686 Igal (1.6% increase over 2014)
Ave. Day Demand (Estimated) – 611,394 Igpd (2.2% decrease over 2014 estimate)

2014:

Total volume of water pumped – 228,361,075 Igal. (3.7% increase over 2013)
Peak Day – July 13; 1,304,971 Igal (19.4% increase over 2013)
Ave. Day Demand (Estimated) – 625,232 Igpd (3.7% increase over 2013 estimate)

2013:

Total volume of water pumped – 220,261,364 Igal. (12.1% increase over 2012)
Peak Day – August 11; 1,093,064 Igal (1.7% increase over 2012)
Ave. Day Demand (Estimated) – 603,056 Igpd (12.3% increase over 2012 estimate)

2012:

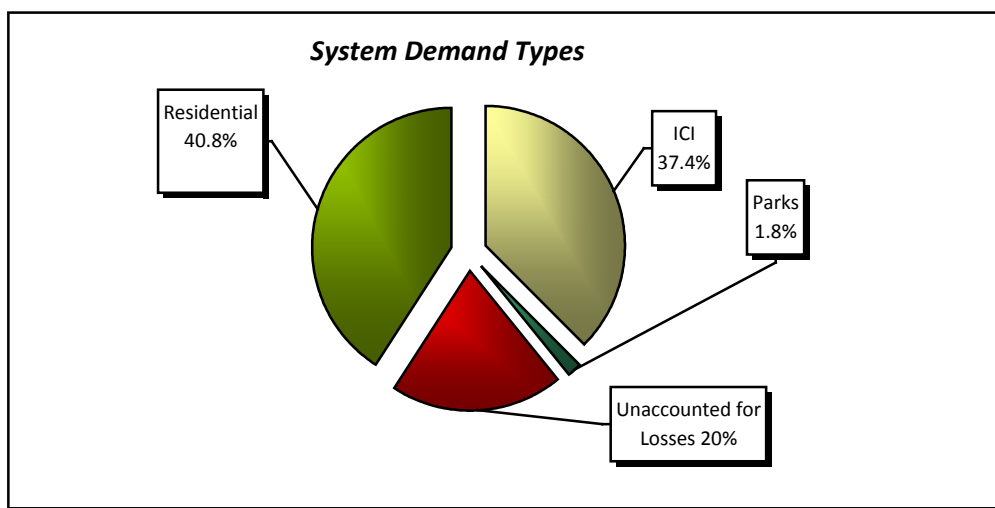
Total volume of water pumped – 196,502,771 Igal. (5.8% reduction over 2011)
Peak Day – August 17; 1,075,222 Igal (4.8% increase over 2011)
Ave. Day Demand (Estimated) – 536,892 Igpd (6.0% reduction over 2011 estimate)

Peak Day demand increased by 20.7% in 2017, while overall consumption increased by 15.3% as compared to 2016. The Peak Day figure is assumed to be reflective of residential and municipal irrigating as extensive irrigating on a given day would be a main contributor to Peak Day consumption. Weather conditions leading up and occurring on the Peak Day is thought to be a main factor influencing this demand figure. The overall consumption increase is believed to be primarily due to several system service connection leaks discovered and repaired throughout the construction season.

In 2017, Industrial, Commercial, Institutional (ICI) demand accounted for about 37.4% of the total water pumped (in 2016 ICI demand was recorded as being 36.7% of the total water pumped; overall, 2017 ICI demand increased 0.7% as compared to 2016).

Municipal parks represent approximately 1.8% of the total water pumped (in 2016 municipal irrigation demand was recorded as being 2.0% of the total water pumped; overall, 2017 irrigation demand decreased by 0.2% as compared to 2016).

The remaining portion of the total volume pumped, represented as 60.8%, is in large part residential demand; of that percentage about 20% is considered attributable to leakage and other unaccounted for water usage. Therefore, approximately 40.8% of the total water pumped is residential demand (in 2016 residential demand was reported as being approximately 39.3% of the total water pumped; overall, 2017 residential demand is assumed to have increased by approximately 1.5%).



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 the individual 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 2017 a total of 241 samples were analyzed for total coliforms and E.coli. with one sample testing positive with a total coliform count greater than one (1). The TC>1 sample was related to a sample set taken following inspection and cleaning of the Gunite Reservoir. As per schedule B of the Drinking Water Protection Act, the Town of Golden is required to analyze four (4) samples per month. To emphasize the Town of Golden's commitment to providing safe drinking water the number of samples analyzed in 2017 was approximately twenty (20) per month on average.

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 annual reservoir disinfections, reservoir draining and cleaning on an approximate 5-year cycle, annual hydrant inspections, maintenance and flushing, valve exercising, and dead end main flushing.

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

Well 4 Structure Replacement:

Well 4, the second highest production well on the distribution system, is located north of the Kicking Horse River. Mechanical rehabilitation was completed in spring 2016. On May 5, 2017 the cinder block building was backed into by a transport truck, effectively writing off the structure. Fortunately the recent mechanical upgrades were not damaged, but electrical and control systems did require partial replacement, and electrical code upgrades were addressed with the structure replacement.

Kicking Horse River Watermain Crossing:

Planning of a second river watermain crossing commenced in 2017, with design and tender specifications to be complete in 2018, and construction tentatively planned for 2019. The initiative is being pursued in the interest of system risk reduction (increased distribution system redundancy) as well as to preemptively provide increased water supply to developable lands adjacent to Fisher Road. The municipality will endeavor to pursue appropriate granting for this project and may defer construction until a suitable funding program is available.

Hypalon Reservoir Relining:

Planning for replacement of the Hypalon Reservoir liner and potentially the floating roof commenced in 2017, with design and tender specifications to be complete in 2018, and construction tentatively planned for 2019. Presently the reservoir liner leaks and repeated attempts at repairing the leaks have been unsuccessful.

Reservoir Remotely Operated Vehicle (ROV) Inspections:

In 2017 all storage reservoirs except the Hypalon Reservoir were interior inspected while in service through the use of an ROV. Tank cleaning and minor ventilation repair works ensued on the Gunitite Reservoir following the inspection, with all other reservoirs found to be clean and in good operating condition.

Metering/Cross Connection Control:

In 2017 work continued with the replacement of non-radio frequency (RF) compatible water meters. Meters were either retrofitted with new RF register heads or completely replaced in nine (9) industrial/commercial/institutional (ICI) facilities. In addition to the nine meters, for each meter upgrade or new install, premise-isolation cross connection control devices were also installed according to assessed cross connection hazard level. 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.

Source Protection Plan:

Work continued with Golder and Associates on source protection in 2017.

Golder provides the annual update to the Municipal Water Supply Contingency Plan, and provides sentry well monitoring support with lab analysis data review. Golder is also available for ongoing contaminated site report reviews, as well as development reviews with groundwater resource impact potential on an as needed basis.

Emergency Response Plan (ERP):

The ERP is now integral to the overarching Water Supply Contingency Plan. Both are reviewed annually with all contacts updated as necessary. The Municipal Water Supply Contingency Plan Report is appended for information.

Leak Detection Work:

Leak detection work continued in 2017 in order to trace a repair leaks to address a measured loss of approximately 100 Igpm. Over the course of the construction season this resulted in repairs to five service connections on the public side of property line as well as identification of one private side service leak that was repaired by the home owner.

6.0 Operator Education and Training

The Town of Golden has an established training program that follows EOCP guidelines for required training and certification maintenance. Operators maintain EOCP certifications through a variety of EOCP accredited and relevant training opportunities typically available on an annual basis.

EOCP Current Certification:

<i>Employee</i>	<i>Certification #</i>	<i>Level</i>
Lorne Pickering - Public Works Foreman	3879	WD-III, CCC Tester
Alan Taylor - Systems Chief Operator	6101	WD-III, CCC Tester
Ryan Robison – Systems Operator		CCC Tester

7.0 Cross Connection Control (CCC)

Both Systems operators are certified tester's 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.

It is policy that the Town confirms the proper device for any new construction. 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 with 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>

In 2017 the Town of Golden advanced its CCC program and installed or replaced existing backflow devices on an additional nine (9) ICI service connections. 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. 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)

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.

9.0 Events/Emergency Response

In 2017 (during the construction season) five service leaks were detected and repaired and one private side service leak was detected and reported to the property owner for repair. No main breaks occurred in 2017.

The Hypalon Reservoir located at the Selkirk Reservoir Complex, found to have a minor leak in 2014, continues to leak at high storage levels. Replacement of the Hypalon liner is planned for 2019.

10.0 Plans for 2018

- Continue to conduct leak detection work as needed;
- Continue with CCC Program and prioritize installs of back flow devices, concentrating first on those facilities with a high hazard rating. Remove and 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, education and enforcement relating to sprinkling regulations through newspaper advertising, and potentially social media and the Town website;
- Possible elementary school classroom visits and/or systems tours by staff;
- Conduct an extended duration pump test at Well 6 to confirm aquifer recharge rate, proceed with well screen acid treatment, and confirm final station pumping capacity;
- 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 and Groundwater Protection Strategy where and when practicable to do so;
- Finalize the Screening Study for Potential Groundwater at Risk of Containing Pathogens (GARP).

11.0 Sample Analysis Results

DATE	WELLS					RESERVOIRS		
	#2	#3	#4	#5	#6	NE (yellow)	NE (green)	BEARS PAW
Jan 9		<1	<1	<1	<1		<1	<1
Jan 16		<1	<1	<1	<1	<1		<1
Jan 23		<1	<1	<1	<1		<1	<1
Jan 30		<1	<1	<1	<1	<1		<1
Feb 6		<1	<1	<1	<1		<1	<1
Feb 20		<1	<1	<1	<1	<1		<1

Feb 27		<1	<1	<1	<1		<1	<1
Mar 6		<1	<1	<1	<1	<1		<1
Mar 13		<1	<1	<1	<1		<1	<1
Mar 20	<1	<1	<1	<1	<1	<1		<1
Mar 27	<1	<1	<1	<1	<1		<1	<1
April 3	<1	<1	<1	<1	<1	<1		<1
April 24	<1	<1	<1	<1	<1		<1	<1
May 1	<1	<1	<1	<1	<1	<1		<1
May 8	<1	<1	offline	<1	<1		<1	<1
May 15	<1	<1		<1	<1	<1		<1
May 29	<1	<1		<1	<1		<1	<1
Jun 12	<1	<1		<1	<1	<1		<1
Jun 19	<1	<1		<1	<1		<1	<1
Jun 26	<1	<1		<1	<1	<1		<1
Jul 10	<1	<1		<1	<1		<1	<1
Jul 17	<1	<1		<1	<1	<1		<1
Jul 31	<1	<1		<1	<1		<1	<1
Aug 14	<1	<1		<1	<1	<1		<1
Aug 21	<1	<1		<1	<1		<1	<1
Aug 28	<1	<1		<1	<1	<1		<1
Sept 11	<1	<1		<1	<1		<1	<1
Sept 18	<1	<1		<1	<1	<1		<1
Sept 25	<1	<1		<1	<1		<1	<1
Oct 2	<1	<1		<1	<1	<1		<1
Oct 16	<1	<1		<1	<1		<1	<1
Oct 23	<1	<1		<1	<1	<1		<1
Oct 30	<1	<1		<1	<1		<1	<1
Nov 6	<1	<1		<1	<1	<1		<1
Nov 20	<1	<1	<1	<1	<1		<1	<1
Nov 27	<1	<1	<1	<1	<1	<1		<1
Dec 11	<1	<1	<1	<1	<1	<1		<1
Dec 18	<1	<1	<1	<1	<1		<1	<1

Reservoir Cleaning		
	Gunite 1	Gunite 2
May 19	TC<1 E<1	TC >1 E<1
May 23	TC<1 E<1	TC<1 E<1

12.0 Turbidity Analysis (NTU)

DATE	WELL#2	WELL#3	WELL#4	WELL#5	WELL#6
Jan 9		0.09	0.08	0.07	0.1
Jan 16		0.09	0.08	0.08	0.09
Jan 23		0.07	0.09	0.07	0.1
Jan 30		0.09	0.09	0.08	0.09
Feb 6		0.09	0.09	0.09	0.09
Feb 20		0.08	0.09	0.09	0.1
Feb 27		0.08	0.08	0.08	0.11

Mar 6		0.07	0.08	0.07	0.1
Mar 13		0.08	0.08	0.08	0.11
Mar 20	0.09	0.09	0.08	0.08	0.1
Mar 27	0.09	0.09	0.09	0.08	0.12
April 3	0.1	0.09	0.07	0.08	0.1
Apr 24	0.08	0.09	0.08	0.07	0.09
May 1	0.08	0.08	0.07	0.09	0.12
May 8	0.09	0.08	offline	0.08	0.11
May 15	0.1	0.09		0.08	0.1
May 29	0.08	0.09		0.09	0.1
Jun 12	0.07	0.08		0.07	0.09
Jun 19	0.09	0.09		0.09	0.1
Jun 26	0.1	0.1		0.09	0.1
July 10	0.09	0.09		0.09	0.1
July 17	0.08	0.08		0.07	0.09
July 31	0.08	0.09		0.08	0.1
Aug 14	0.1	0.07		0.09	0.11
Aug 21	0.09	0.07		0.08	0.1
Aug 28	0.09	0.09		0.09	0.09
Sep 11	0.09	0.08		0.09	0.1
Sep 18	0.08	0.08		0.07	0.11
Sep 25	0.09	0.07		0.09	0.13
Oct 2	0.1	0.09		0.08	0.09
Oct 16	0.08	0.09		0.09	0.1
Oct 23	0.09	0.08		0.07	0.1
Oct 30	0.09	0.07		0.07	0.09
Nov 6	0.1	0.09		0.08	0.09
Nov 20	0.09	0.09	0.11	0.09	0.1
Nov 27	0.08	0.09	0.13	0.09	0.11
Dec 4	0.09	0.09	0.1	0.09	0.11
Dec 11	0.08	0.08	0.11	0.08	0.09
Dec 18	0.09	0.09	0.1	0.08	0.1
Average	0.09	0.08	0.09	0.08	0.10
Hi	0.10	0.10	0.13	0.09	0.13
Low	0.07	0.07	0.07	0.07	0.09

13.0 Summary

The Town of Golden has worked with local Health Officials since 2002 to develop 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 consumers.

This report will be posted on the Town of Golden’s website for public information after it has been received by Council for information.

Respectfully,

Chris Cochran, ASCT, Manager of Operations

Drinking Water Package - Maxxum Analytical

Well #2										
Year	2011	2012	2013	2014	2015	2016	2017	RDL	Units	GCDWQ
Misc. Inorganics										
Fluoride (F)	0.09	0.10	0.09	0.09	0.08	0.09	0.09	0.01	mg/L	1.5
ANIONS										
Nitrite (N)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	mg/L	1
Calculated Parameters										
Total Hardness (CaCO3)	154	141	143	130	148	147	142	0.5	mg/L	
Nitrate (N)	0.24	0.26	0.26	0.2	0.27	0.25	0.24	0.02	mg/L	10
Misc. Inorganics										
Alkalinity (Total as CaCO3)	130	129	126	127	121	130	141	0.5	mg/L	
Alkalinity (PP as CaCO3)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	0.5	mg/L	
Bicarbonate (HCO3)	150	152	154	155	148	159	172	0.5	mg/L	
Carbonate (CO3)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	0.5	mg/L	
Hydroxide (OH)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	0.5	mg/L	
Anions										
Dissolved Sulphate (SO4)	17	15	16.3	16	16	19.8	19.7	0.5	mg/L	500
Dissolved Chloride (Cl)	10	7.5	9	6	11	9.8	8.4	0.5	mg/L	250
MISCELLANEOUS										
True Colour	<5	<5	5	<5	<5	<5	<5	5	TCU	15
Nutrients										
Nitrate plus Nitrite (N)	0.24	0.26	0.26	0.2	0.27	0.25	0.24	0.02	mg/L	
Physical Properties										
Conductivity	298	296	302	286	312	308	314	1	uS/cm	
pH	7.94	8.37	8.26	8.21	8.3	8	8.2		pH Units	7.0-10.5
Physical Properties										
Total Dissolved Solids	150	170	150	198	192	186	156	10	mg/L	500
Turbidity	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.3	0.1	NTU	1
Total Metals by ICPMS										
Total Aluminum (Al)	<0.003	<0.003	<0.003	<0.004	<0.003	<0.003	0.012	0.003	mg/L	0.1
Total Antimony (Sb)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	mg/L	0.006
Total Arsenic (As)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	mg/L	0.01
Total Barium (Ba)	0.056	0.052	0.053	0.047	0.053	0.054	0.054	0.001	mg/L	1
Total Boron (B)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	mg/L	5
Total Cadmium (Cd)	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.01	mg/L	0.005
Total Chromium (Cr)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	mg/L	0.05
Total Cobalt (Co)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	0.0005	mg/L	
Total Copper (Cu)	0.0008	0.007	0.0008	0.001	0.001	0.0007	0.0011	0.0002	mg/L	1
Total Iron (Fe)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	mg/L	0.3
Total Lead (Pb)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	mg/L	0.01
Total Manganese (Mn)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	mg/L	0.05
Total Mercury (Hg)	<0.00002	<0.00005	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001	0.00005	mg/L	0.001
Total Molybdenum (Mo)	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	mg/L	
Total Nickel (Ni)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	mg/L	
Total Selenium (Se)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	mg/L	0.05
Total Silver (Ag)	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0.00002	mg/L	
Total Uranium (U)	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0001	mg/L	0.02
Total Vanadium (V)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	mg/L	
Total Zinc (Zn)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	mg/L	5
Total Calcium (Ca)	38	34.2	35.1	31.5	35.7	35.4	34.9	0.05	mg/L	
Total Magnesium (Mg)	14.3	13.6	13.4	12.5	14.3	14.2	13.4	0.05	mg/L	
Total Potassium (K)	0.6	0.55	0.57	0.46	0.56	0.54	0.55	0.05	mg/L	
Total Sodium (Na)	6.23	5.00	6.01	3.72	7.3	6.4	5.9	0.05	mg/L	200
Total Sulphur (S)	7	6	6	7	6.3	6.3	6.7	3	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	2011	2012	2013	2014	2015	2016	2017	RDL	Units	GCDWQ	
Misc. Inorganics											
Fluoride (F)	0.1	0.10	0.09	0.09	0.08	0.09	0.09	0.01	mg/L	1.5	
ANIONS											
Nitrite (N)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	mg/L	1	
Calculated Parameters											
Total Hardness (CaCO3)	177	152	165	158	167	165	165	0.5	mg/L		
Nitrate (N)	0.44	0.49	0.5	0.53	0.54	0.54	0.55	0.02	mg/L	10	
Misc. Inorganics											
Alkalinity (Total as CaCO3)	140	150	145	148	139	149	152	0.5	mg/L		
Alkalinity (PP as CaCO3)	<0.5	<0.5	<0.5	<0.5	1.24	<0.5	<1.0	0.5	mg/L		
Bicarbonate (HCO3)	180	176	177	181	167	182	185	0.5	mg/L		
Carbonate (CO3)	<0.5	<0.5	<0.5	<0.5	1.49	<0.5	<1.0	0.5	mg/L		
Hydroxide (OH)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	0.5	mg/L		
Anions											
Dissolved Sulphate (SO4)	17	17.3	18.1	15.4	16.7	19.1	18.1	0.5	mg/L	500	
Dissolved Chloride (Cl)	12	25	12	19	12	12	13	0.5	mg/L	250	
MISCELLANEOUS											
True Colour	<5	<5	5	<5	<5	<5	9.2	5	TCU	15	
Nutrients											
Nitrate plus Nitrite (N)	0.44	0.49	0.5	0.53	0.54	0.54	0.55	0.02	mg/L		
Physical Properties											
Conductivity	339	398	346	377	349	346	349	1	uS/cm		
pH	8.01	8.43	8.28	8.2	8.3	8.1	8.3		pH Units	7.0-10.5	
Physical Properties											
Total Dissolved Solids	180	218	202	196	216	182	182	10	mg/L	500	
Turbidity	<0.1	<0.1	<0.1	0.1	0.1	<0.1	0.26	0.1	NTU	1	
Total Metals by ICPMS											
Total Aluminum (Al)	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.011	0.003	mg/L	0.1	
Total Antimony (Sb)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	mg/L	0.006	
Total Arsenic (As)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	mg/L	0.01	
Total Barium (Ba)	0.124	0.11	0.012	0.125	0.121	0.118	0.117	0.001	mg/L	1	
Total Boron (B)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	mg/L	5	
Total Cadmium (Cd)	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.01	mg/L	0.005	
Total Chromium (Cr)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	mg/L	0.05	
Total Cobalt (Co)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	0.0005	mg/L		
Total Copper (Cu)	0.0015	0.0008	0.0007	0.0006	0.001	0.0006	0.0009	0.0002	mg/L	1	
Total Iron (Fe)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	mg/L	0.3	
Total Lead (Pb)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	mg/L	0.01	
Total Manganese (Mn)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	mg/L	0.05	
Total Mercury (Hg)	<0.00002	<0.00005	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001	0.00002	mg/L	0.001	
Total Molybdenum (Mo)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	mg/L		
Total Nickel (Ni)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	mg/L		
Total Selenium (Se)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	mg/L	0.05	
Total Silver (Ag)	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0.00002	mg/L		
Total Uranium (U)	0.0006	0.0006	0.0006	0.0007	0.0007	0.0007	0.0007	0.0001	mg/L	0.02	
Total Vanadium (V)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	mg/L		
Total Zinc (Zn)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	mg/L	5	
Total Calcium (Ca)	34.3	29.1	32.6	30.4	33.2	31.5	31.3	0.05	mg/L		
Total Magnesium (Mg)	22.1	19.3	20.3	19.9	20.4	20.9	21.2	0.05	mg/L		
Total Potassium (K)	0.85	0.84	0.76	0.75	0.79	0.73	0.73	0.05	mg/L		
Total Sodium (Na)	7.77	15.5	7.3	12.1	7.6	7.2	7.0	0.05	mg/L	200	
Total Sulphur (S)	7	7	5	7	6.5	6.1	6.4	3	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 #4										
Year	2011	2012	2013	2014	2015	2016	2017	RDL	Units	GCDWQ
Misc. Inorganics					OFFLINE					
Fluoride (F)	0.05	0.06	0.06	0.06		0.06	0.06	0.01	mg/L	1.5
ANIONS										
Nitrite (N)	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005	0.005	mg/L	1
Calculated Parameters										
Total Hardness (CaCO3)	399	344	370	344		383	396	0.5	mg/L	
Nitrate (N)	1.29	1.37	1.46	1.42		1.44	1.64	0.02	mg/L	10
Misc. Inorganics										
Alkalinity (Total as CaCO3)	310	302	312	323		338	356	0.5	mg/L	
Alkalinity (PP as CaCO3)	<0.5	<0.5	<0.5	<0.5		<0.5	<1.0	0.5	mg/L	
Bicarbonate (HCO3)	380	356	380	395		412	434	0.5	mg/L	
Carbonate (CO3)	<0.5	<0.5	<0.5	<0.5		<0.5	<1.0	0.5	mg/L	
Hydroxide (OH)	<0.5	<0.5	<0.5	<0.5		<0.5	<1.0	0.5	mg/L	
Anions										
Dissolved Sulphate (SO4)	32	33	39.4	33.8		41.5	42.8	0.5	mg/L	500
Dissolved Chloride (Cl)	120	59	72	78		97	110	0.5	mg/L	250
MISCELLANEOUS										
True Colour	<5	<5	<5	<5		<5	17.3	5	TCU	15
Nutrients										
Nitrate plus Nitrite (N)	1.29	1.37	1.46	1.42		1.44	1.64	0.02	mg/L	
Physical Properties										
Conductivity	841	804	869	896		959	1050	1	uS/cm	
pH	7.87	8.39	8.21	8		7.77	8.26			7.0-10.5
Physical Properties										
Total Dissolved Solids	440	508	486	490		506	580	10	mg/L	500
Turbidity	<0.1	<0.1	<0.1	<0.1		0.15	1.03	0.1	NTU	1
Total Metals by ICPMS										
Total Aluminum (Al)	<0.003	<0.003	<0.003	<0.003		<0.003	0.010	0.003	mg/L	0.1
Total Antimony (Sb)	<0.0005	<0.0005	<0.0005	<0.0005		<0.0005	<0.0005	0.0005	mg/L	0.006
Total Arsenic (As)	<0.0001	<0.0001	<0.0001	<0.0001		<0.0001	<0.0001	0.0001	mg/L	0.01
Total Barium (Ba)	0.199	0.185	0.196	0.179		0.21	0.24	0.001	mg/L	1
Total Boron (B)	<0.05	<0.05	<0.05	<0.05		<0.05	<0.05	0.05	mg/L	5
Total Cadmium (Cd)	<0.00001	<0.00001	<0.00001	<0.00001		<0.00001	<0.00001	0.01	mg/L	0.005
Total Chromium (Cr)	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	0.001	mg/L	0.05
Total Cobalt (Co)	<0.0005	<0.0005	<0.0005	<0.0005		<0.0005	<0.0002	0.0005	mg/L	
Total Copper (Cu)	0.0011	0.0008	0.0011	0.0008		0.0012	0.0016	0.0002	mg/L	1
Total Iron (Fe)	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005	0.005	mg/L	0.3
Total Lead (Pb)	<0.0002	<0.0002	<0.0002	<0.0002		<0.0002	<0.0002	0.0002	mg/L	0.01
Total Manganese (Mn)	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	0.001	mg/L	0.05
Total Mercury (Hg)	<0.00002	<0.00005	<0.00005	<0.00001		<0.00001	<0.00001	0.00002	mg/L	0.001
Total Molybdenum (Mo)	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	0.001	mg/L	
Total Nickel (Ni)	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	0.001	mg/L	
Total Selenium (Se)	<0.0001	<0.0001	0.0001	0.0001		<0.0001	<0.0001	0.0001	mg/L	0.05
Total Silver (Ag)	<0.00002	<0.00002	<0.00002	<0.00002		<0.00002	<0.00002	0.00002	mg/L	
Total Uranium (U)	0.0011	0.0011	0.0012	0.0011		0.0012	0.0013	0.0001	mg/L	0.02
Total Vanadium (V)	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005	0.005	mg/L	
Total Zinc (Zn)	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005	0.005	mg/L	5
Total Calcium (Ca)	95.9	80.8	87.8	81.4		85.4	89.7	0.05	mg/L	
Total Magnesium (Mg)	38.8	34.7	36.5	34.3		41.2	41.7	0.05	mg/L	
Total Potassium (K)	1.88	1.59	1.69	1.48		1.89	1.96	0.05	mg/L	
Total Sodium (Na)	41.6	37.7	40.4	38.8		51.1	59.0	0.05	mg/L	200
Total Sulphur (S)	15	13	13	13		14.1	15.5	3	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	2011	2012	2013	2014	2015	2016	2017	RDL	Units	GCDWQ
Misc. Inorganics										
Fluoride (F)	0.09	0.10	0.10	0.10	0.08	0.09	0.09	0.01	mg/L	1.5
ANIONS										
Nitrite (N)	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	0.005	mg/L	1
Calculated Parameters										
Total Hardness (CaCO3)	190	161	178	169	181	182	174	0.5	mg/L	
Nitrate (N)	0.36	0.40	0.50	0.45	0.46	0.45	0.52	0.02	mg/L	10
Misc. Inorganics										
Alkalinity (Total as CaCO3)	150	158	157	156	150	162	168	0.5	mg/L	
Alkalinity (PP as CaCO3)	<0.5	<0.5	<0.5	<0.5	0.83	<0.5	<1.0	0.5	mg/L	
Bicarbonate (HCO3)	190	185	191	190	181	198	205	0.5	mg/L	
Carbonate (CO3)	<0.5	<0.5	<0.5	<0.5	1	<0.5	<1.0	0.5	mg/L	
Hydroxide (OH)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	0.5	mg/L	
Anions										
Dissolved Sulphate (SO4)	20	19	21.3	19.5	18.8	22.6	21.2	0.5	mg/L	500
Dissolved Chloride (Cl)	13	15	15	14	14	14	15	0.5	mg/L	250
MISCELLANEOUS										
True Colour	<5	<5	<5	<5	<5	<5	5	5	TCU	15
Nutrients										
Nitrate plus Nitrite (N)	0.36	0.40	0.50	0.45	0.46	0.45	0.52	0.02	mg/L	
Physical Properties										
Conductivity	357	380	386	373	379	382	390	1	uS/cm	
pH	7.85	8.43	8.23	8.17	8.32	8.06	8.29			7.0-10.5
Physical Properties										
Total Dissolved Solids	190	230	238	198	228	206	200	10	mg/L	500
Turbidity	0.2	<0.1	<0.1	<0.1	0.14	<0.1	0.3	0.1	NTU	1
Total Metals by ICPMS										
Total Aluminum (Al)	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.012	0.003	mg/L	0.1
Total Antimony (Sb)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	mg/L	0.006
Total Arsenic (As)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	mg/L	0.01
Total Barium (Ba)	0.076	0.066	0.076	0.069	0.074	0.073	0.076	0.001	mg/L	1
Total Boron (B)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	mg/L	5
Total Cadmium (Cd)	0.0002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.01	mg/L	0.005
Total Chromium (Cr)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	mg/L	0.05
Total Cobalt (Co)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	0.0005	mg/L	
Total Copper (Cu)	0.0023	0.0009	0.0013	0.0008	0.0006	0.0006	0.0007	0.0002	mg/L	1
Total Iron (Fe)	0.0021	<0.005	<0.005	<0.005	<0.005	<0.005	<0.010	0.005	mg/L	0.3
Total Lead (Pb)	0.0003	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	mg/L	0.01
Total Manganese (Mn)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	mg/L	0.05
Total Mercury (Hg)	<0.00002	<0.00005	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001	0.00002	mg/L	0.001
Total Molybdenum (Mo)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	mg/L	
Total Nickel (Ni)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	mg/L	
Total Selenium (Se)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	mg/L	0.05
Total Silver (Ag)	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0.00002	mg/L	
Total Uranium (U)	0.0006	0.0005	0.0006	0.0006	0.0006	0.0006	0.0006	0.0001	mg/L	0.02
Total Vanadium (V)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	mg/L	
Total Zinc (Zn)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	mg/L	5
Total Calcium (Ca)	46.8	38.2	42.9	41.1	43.6	42.6	41.0	0.05	mg/L	
Total Magnesium (Mg)	17.7	15.9	17.2	16.1	17.4	18.3	17.3	0.05	mg/L	
Total Potassium (K)	0.96	0.82	0.95	0.82	0.92	0.92	0.91	0.05	mg/L	
Total Sodium (Na)	8.27	8.98	9.42	8.26	9.46	9.66	9.23	0.05	mg/L	200
Total Sulphur (S)	8	8	7	7	7.1	7.6	6.4	3	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 #6	2011	2012	2013	2014	2015	2016	2017	RDL	Units	GCDWQ
Year	2011	2012	2013	2014	2015	2016	2017			
Misc. Inorganics										
Fluoride (F)	0.05	0.06	0.05	0.05	0.05	0.05	0.05	0.01	mg/L	1.5
ANIONS										
Nitrite (N)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	mg/L	1
Calculated Parameters										
Total Hardness (CaCO3)	346	289	292	300	323	339	319	0.5	mg/L	
Nitrate (N)	1.17	0.99	0.9	0.93	1.1	1.4	1.5	0.02	mg/L	10
Misc. Inorganics										
Alkalinity (Total as CaCO3)	280	266	272	285	277	313	294	0.5	mg/L	
Alkalinity (PP as CaCO3)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	0.5	mg/L	
Bicarbonate (HCO3)	340	313	332	347	337	382	359	0.5	mg/L	
Carbonate (CO3)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	0.5	mg/L	
Hydroxide (OH)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	0.5	mg/L	
Anions										
Dissolved Sulphate (SO4)	25	23.4	24.6	24.6	24	27.4	27.3	0.5	mg/L	500
Dissolved Chloride (Cl)	32	25	25	27	28	31	40	0.5	mg/L	250
MISCELLANEOUS										
True Colour	<5	<5	5	<5	<5	<5	<5	5	TCU	15
Nutrients										
Nitrate plus Nitrite (N)	1.17	0.99	0.90	0.93	1.10	1.37	1.50	0.02	mg/L	
Physical Properties										
Conductivity	644	601	628	638	664	712	702	1	uS/cm	
pH	7.88	8.41	8.26	7.98	8.26	7.79	8.26			7.0-10.5
Physical Properties										
Total Dissolved Solids	350	376	359	352	396	408	394	10	mg/L	500
Turbidity	0.1	<0.1	0.1	<0.1	0.15	0.13	0.34	0.1	NTU	1
Total Metals by ICPMS										
Total Aluminium (Al)	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.011	0.003	mg/L	0.1
Total Antimony (Sb)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	mg/L	0.006
Total Arsenic (As)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	mg/L	0.01
Total Barium (Ba)	0.143	0.128	0.129	0.13	0.14	0.16	0.15	0.001	mg/L	1
Total Boron (B)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	mg/L	5
Total Cadmium (Cd)	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.01	mg/L	0.005
Total Chromium (Cr)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	mg/L	0.05
Total Cobalt (Co)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	0.0005	mg/L	
Total Copper (Cu)	0.0007	0.0009	0.0013	0.0014	0.0014	0.001	0.001	0.0002	mg/L	1
Total Iron (Fe)	0.025	0.013	0.010	0.008	0.01	0.009	<0.005	0.005	mg/L	0.3
Total Lead (Pb)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	mg/L	0.01
Total Manganese (Mn)	<0.001	<0.001	0.0013	<0.001	<0.001	<0.001	<0.001	0.001	mg/L	0.05
Total Mercury (Hg)	<0.00002	<0.00005	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001	0.00002	mg/L	0.001
Total Molybdenum (Mo)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	mg/L	
Total Nickel (Ni)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	mg/L	
Total Selenium (Se)	0.0001	0.0001	0.0001	0.0001	0.0001	<0.0001	0.0001	0.0001	mg/L	0.05
Total Silver (Ag)	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0.00002	mg/L	
Total Uranium (U)	0.001	0.001	0.0010	0.0011	0.0011	0.0011	0.0011	0.0001	mg/L	0.02
Total Vanadium (V)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	mg/L	
Total Zinc (Zn)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	mg/L	5
Total Calcium (Ca)	91.6	74.9	76.2	78.6	83.4	87.3	84.2	0.05	mg/L	
Total Magnesium (Mg)	28.6	24.9	24.7	25.1	27.8	29.5	26.5	0.05	mg/L	
Total Potassium (K)	1.01	0.85	0.852	0.795	0.89	0.92	0.94	0.05	mg/L	
Total Sodium (Na)	16.3	13.1	14	13	16.2	17.5	18.8	0.05	mg/L	200
Total Sulphur (S)	9	8	9	8	8.4	8.7	8.4	3	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