



2018 Annual Drinking Water Quality Report
Facility No. 12-098-00001

May 16, 2019



Well 6 Capacity Study



Hypalon Reservoir Liner Replacement Planning



Groundwater at Risk of Pathogens (GARP) Study



Services Trailer

Table of Contents	Page
Introduction	3
Water Distribution System Overview	3-4
Testing and Monitoring Program	5
System Maintenance and Repairs	5
System Improvements	5-7
Operator Education and Training	7
Cross Connection Control	7
SCADA System	7-8
Events/Emergency Response	9
Plans for 2019	8-9
Sample Analysis Results	9-10
Turbidity Analysis	10-11
Summary	11

Appendix:

Drinking Water Package - Maxxam Analytical

Attachments:

Municipal Water Supply Contingency Plan, 2019 Update

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;
- 2018 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 2018.

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 1478 Imperial Gallons per Minute (Igal) or 112 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:

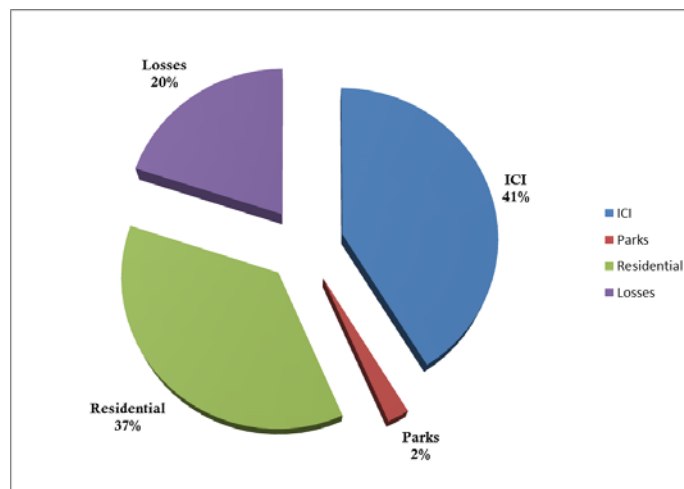
Year	Total Pumped		Date	Peak Day		Average Day (estimated)	
	(lgal)	Increase/Decrease Over Prior Year		Volume Pumped	Increase/Decrease Over Prior Year	Volume Pumped	Increase/Decrease Over Prior Year
2012	196,502,771	5.8% decrease	Aug-17	1,075,222	4.8% increase	536,892	6.0% decrease
2013	220,261,364	12.1% 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	209,944,280	24.3% decrease	Jul-29	1,244,857	13.2% decrease	575,190	24.3% decrease

In 2018, Peak Day demand decreased by 13.2%, while overall consumption decreased by 24.3% as compared to 2017. 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 are thought to be a main factor influencing this demand figure. Diligent leak detection and repair, and conservation awareness are believed to be contributing factors in the overall decrease.

In 2018, Industrial, Commercial, Institutional (ICI) demand accounted for about 41.2% of the total water pumped (in 2017 ICI demand was recorded as being 37.4% of the total water pumped; overall, the 2018 ICI demand component of total water pumped increased 3.9% as compared to 2017).

Municipal parks demand accounted for about 2.2% of the total water pumped (in 2017 municipal irrigation demand was recorded as being 1.8% of the total water pumped; overall, the 2018 irrigation component of total water pumped increased by 0.4% as compared to 2017).

The remaining portion of the total volume pumped, represented as 56.6%, is in large part residential demand; of that percentage about 20%¹ is considered attributable to leakage and other unaccounted for water usage. Therefore, approximately 36.6% of the total water pumped is residential demand (in 2017 residential demand was reported as being approximately 40.8% of the total water pumped; overall, 2018 residential demand is assumed to have decreased by approximately 4.2%).



¹ Based on the 2018 Total Pumped volume, 20% represents about 115,000 Igpd or about 80 Igpm.

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 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 2018 a total of 278 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 from the NE Yellow 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 commitment to providing safe drinking water the number of samples analyzed in 2018 exceeded twenty (20) per month.

The Town of Golden also conducts full spectrum analyses on each well source on an annual basis for physical and chemical parameters; there 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, reservoir draining, cleaning and Remotely Operated Vehicle (ROV) inspections on an approximate 5-year cycle; and, 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 6 Capacity Study:

In an effort to gain additional pumping capacity at this site, in September 2018, Well 6 was taken off-line and acid treated, which was followed by a program of "surging and bailing" carried out by a certified well contractor under professional oversight.

This exercise was done in an effort to obtain additional pumping capacity to ultimately address future need. While the acidization treatment of the well screens was successful, an extended duration pump test to determine additional capacity gain has been deferred pending resolution of a resulting turbidity issue.

Well 6 has remained offline and continues to be pumped intermittently to waste until consistently acceptable turbidity results are achieved after which the well will be returned to service and an extended duration pumping test will take place.

Kicking Horse River Watermain Crossing:

Planning of a second river watermain crossing continued in 2018, with design and tender specifications nearly complete at this time. 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 or development need arises.

Hypalon Reservoir Relining:

Design for the relining of the Hypalon Reservoir was completed to a tender ready status in 2018. The project was tendered in early 2019, awarded, and construction is scheduled to be complete by July 2019. Presently the reservoir liner leaks and repeated attempts at repairing the leaks have been unsuccessful. Work will include installation of a new liner and pipe connections, wall insulation and cover hardware. The existing cover will be reused.

Metering/Cross Connection Control:

In 2018 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 thirteen (13) industrial/commercial/institutional (ICI) facilities. 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 2018.

Golder produced a final version Screening Study for Potential Groundwater at Risk of Pathogens (GARP) in 2018.

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 fall 2017 and 2018 with repaired leaks equating to a measured loss of approximately 60 - 70 lpgm. Late in the fall of 2017 two service leaks were repaired that contributed to the 2018 decrease in total water pumped. Over the course of the 2018 construction

season, three service connection leaks were repaired and a significant continuous-flow soccer field irrigation leak was addressed. In total, six system leak repairs collectively contributed towards the overall measured demand reduction.

Services Trailer:

In 2018, a sixteen foot enclosed trailer was purchased specifically for increased efficiency in responding to service repairs, main breaks, and routine water system maintenance as appropriate.

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	1000185	WD-1, 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 2018 the Town of Golden advanced its CCC program and installed or replaced existing backflow devices on an additional thirteen (13) 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 fall 2017 and over the course of 2018 (during the construction season) six system leaks were detected and repaired. No main breaks occurred in 2018.

10.0 Plans for 2019

- 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;

- Confirm final station pumping capacity through an extended duration pump test at Well 6, once the station is returned to service.
- Plan and install a sentinel well within the 1-year capture zone of Well 6 following a return to service for Well 6.
- 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;
- Determine probable costs for updating the current telemetry radio system and SCADA hardware and software systems for future replacement.

11.0 Sample Analysis Results

DATE	WELLS					RESERVOIRS		
	#2	#3	#4	#5	#6	NE (yellow)	NE (green)	BEARS PAW
Jan 8	<1	<1	<1	<1	<1	<1		<1
Jan 15	<1	<1	<1	<1	<1		<1	<1
Jan 22	<1	<1	<1	<1	<1	<1		<1
Jan 29	<1	<1	<1	<1	<1		<1	<1
Feb 5	<1	<1	<1	<1	<1	<1		<1
Feb 19	<1	<1	<1	<1	<1		<1	<1
Feb 26	<1	<1	<1	<1	<1	<1		<1
Mar 5	<1	<1	<1	<1	<1		<1	<1
Mar 12	<1	<1	<1	<1	<1	<1		<1
Mar 19	<1	<1	<1	<1	<1		<1	<1
Mar 26	<1	<1	<1	<1	<1	<1		<1
Apr 9	<1	<1	<1	<1	<1		<1	<1
Apr 16	<1	<1	<1	<1	<1	<1		<1
Apr 23	<1	<1	<1	<1	<1		<1	<1
Apr 30	<1	<1	<1	<1	<1	<1		<1
May 7	<1	<1	<1	<1	<1		<1	<1
May 9								
May 14	<1	<1	<1	<1	<1	<1		<1
May 28	<1	<1	<1	<1	<1		<1	<1
June 4	<1	<1	<1	<1	<1	<1		<1
June 11	<1	<1	<1	<1	<1		<1	<1
June 18	<1	<1	<1	<1	<1	<1		<1
June 25	<1	<1	<1	<1	<1		<1	<1
July 9	<1	<1	<1	<1	<1	<1		<1
July 16	<1	<1	<1	<1	<1		<1	<1
July 23	<1	<1	<1	<1	<1	T-2 E<1		<1
July 30	<1	<1	<1	<1	<1	<1	<1	<1
Aug 13	<1	<1	<1	<1	<1	<1		<1
Aug 20	<1	<1	<1	<1	<1		<1	<1
Aug 27	<1	<1	<1	<1	<1	<1		<1

Sept 10	<1	<1	<1	<1	<1		<1	<1
Sept 17	<1	<1	<1	<1	offline	<1		<1
Sept 24	<1	<1	<1	<1			<1	<1
Oct 1	<1	<1	<1	<1		<1		<1
Oct 15	<1	<1	<1	<1			<1	<1
Oct 22	<1	<1	<1	<1		<1		<1
Oct 29	<1	<1	<1	<1			<1	<1
Nov 19	<1	<1	<1	<1		<1		<1
Nov 26	<1	<1	<1	<1			<1	<1
Dec 3	<1	<1	<1	<1		<1		<1
Dec 10	<1	<1	<1	<1			<1	<1
Dec 17	<1	<1	<1	<1		<1		<1

Reservoir Disinfection Post Inspection		
	Hypalon 1	Hypalon 2
May 9	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 8	0.09	0.08	0.09	0.07	0.1
Jan 15	0.08	0.07	0.08	0.07	0.09
Jan 22	0.08	0.08	0.08	0.07	0.09
Jan 29	0.09	0.08	0.08	0.08	0.09
Feb 5	0.16	0.13	0.14	0.13	0.12
Feb 19	0.1	0.07	0.06	0.06	0.12
Feb 26	0.06	0.06	0.07	0.05	0.23
Mar 5	0.07	0.06	0.06	0.06	0.11
Mar 12	0.06	0.05	0.05	0.06	0.08
Mar 19	0.05	0.05	0.05	0.07	0.07
Mar 26	0.05	0.06	0.07	0.05	0.05
Apr 9	0.07	0.08	0.07	0.06	0.14
Apr 30	0.1	0.06	0.07	0.09	0.07
May 7	0.06	0.05	0.08	0.05	0.07
May14	0.05	0.07	0.07	0.06	0.11
May 28	0.05	0.07	0.06	0.05	0.08
June 4	0.05	0.07	0.06	0.05	0.08
June 11	0.06	0.06	0.07	0.06	0.1
June 18	0.11	0.08	0.07	0.13	0.08
June 25	0.08	0.07	0.07	0.1	0.08
July 9	0.08	0.07	0.09	0.08	0.1
July 16	0.09	0.09	0.09	0.08	0.09
July 23	0.08	0.07	0.07	0.07	0.08
July 30	0.06	0.08	0.1	0.08	0.08
Aug 13	0.09	0.08	0.09	0.08	0.08
Aug 20	0.1	0.09	0.08	0.1	0.1
Aug 27	0.06	0.06	0.1	0.05	0.09

Sept 10	0.1	0.08	0.08	0.08	0.09
Sept 17	0.07	0.07	0.08	0.08	offline
Sept 24	0.08	0.07	0.12	0.07	
Oct 1	0.07	0.07	0.09	0.06	
Oct 15	0.07	0.08	0.06	0.11	
Oct 22	0.08	0.08	0.08	0.09	
Oct 29	0.07	0.06	0.08	0.07	
Nov 19	0.07	0.07	0.08	0.07	
Nov 26	0.08	0.08	0.12	0.11	
Dec 3	0.06	0.06	0.05	0.05	
Dec 10	0.06	0.07	0.07	0.07	
Dec 17	0.06	0.07	0.07	0.06	
Average	0.08	0.07	0.08	0.07	0.10
Hi	0.16	0.13	0.14	0.13	0.23
Low	0.05	0.05	0.05	0.05	0.05

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	2012	2013	2014	2015	2016	2017	2018	RDL	Units	GCDWQ
Misc. Inorganics										
Fluoride (F)	0.10	0.09	0.09	0.08	0.09	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	<0.010	0.005	mg/L	1
Calculated Parameters										
Total Hardness (CaCO3)	141	143	130	148	147	142		0.5	mg/L	
Nitrate (N)	0.26	0.26	0.2	0.27	0.25	0.24	0.21	0.02	mg/L	10
Misc. Inorganics										
Alkalinity (Total as CaCO3)	129	126	127	121	130	141	130	0.5	mg/L	
Alkalinity (PP as CaCO3)	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	<1.0	0.5	mg/L	
Bicarbonate (HCO3)	152	154	155	148	159	172	160	0.5	mg/L	
Carbonate (CO3)	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	<1.0	0.5	mg/L	
Hydroxide (OH)	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	<1.0	0.5	mg/L	
Anions										
Dissolved Sulphate (SO4)	15	16.3	16	16	19.8	19.7	20	0.5	mg/L	500
Dissolved Chloride (Cl)	7.5	9	6	11	9.8	8.4	11	0.5	mg/L	250
MISCELLANEOUS										
True Colour	<5	5	<5	<5	<5	<5	<2	5	TCU	15
Nutrients										
Nitrate plus Nitrite (N)	0.26	0.26	0.2	0.27	0.25	0.24	0.21	0.02	mg/L	
Physical Properties										
Conductivity	296	302	286	312	308	314	310	1	uS/cm	
pH	8.37	8.26	8.21	8.3	8	8.2	8.2		pH Units	7.0-10.5
Physical Properties										
Total Dissolved Solids	170	150	198	192	186	156	200	10	mg/L	500
Turbidity	<0.1	<0.1	<0.1	<0.1	0.1	0.3	<0.1	0.1	NTU	1
Total Metals by Atomic Spectroscopy										
Total Aluminum (Al)	<0.003	<0.003	<0.004	<0.003	<0.003	0.012	0.012	0.003	mg/L	0.1
Total Antimony (Sb)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0006	0.0005	mg/L	0.006
Total Arsenic (As)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	0.0001	mg/L	0.01
Total Barium (Ba)	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	mg/L	5
Total Cadmium (Cd)	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00003	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	<0.0002	<0.0003	0.0005	mg/L	
Total Copper (Cu)	0.007	0.0008	0.001	0.001	0.0007	0.0011	0.0009	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	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)	<0.00005	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001	<0.0020	0.00005	mg/L	0.001
Total Molybdenum (Mo)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00076	0.001	mg/L	
Total Nickel (Ni)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	0.001	mg/L	
Total Selenium (Se)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	0.0001	mg/L	0.05
Total Silver (Ag)	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.0001	0.00002	mg/L	
Total Uranium (U)	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00054	0.0001	mg/L	0.02
Total Vanadium (V)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	0.005	mg/L	
Total Zinc (Zn)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	0.005	mg/L	5
Total Calcium (Ca)	34.2	35.1	31.5	35.7	35.4	34.9		0.05	mg/L	
Total Magnesium (Mg)	13.6	13.4	12.5	14.3	14.2	13.4		0.05	mg/L	
Total Potassium (K)	0.55	0.57	0.46	0.56	0.54	0.55		0.05	mg/L	
Total Sodium (Na)	5.00	6.01	3.72	7.3	6.4	5.9		0.05	mg/L	200
Total Sulphur (S)	6	6	7	6.3	6.3	6.7		3	mg/L	

- Maximum Acceptable Concentration
- Interem 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	2012	2013	2014	2015	2016	2017	2018	RDL	Units	GCDWQ
Misc. Inorganics										
Fluoride (F)	0.10	0.09	0.09	0.08	0.09	0.09	0.10	0.01	mg/L	1.5
ANIONS										
Nitrite (N)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.010	0.005	mg/L	1
Calculated Parameters										
Total Hardness (CaCO3)	152	165	158	167	165	165		0.5	mg/L	
Nitrate (N)	0.49	0.5	0.53	0.54	0.54	0.55	0.61	0.02	mg/L	10
Misc. Inorganics										
Alkalinity (Total as CaCO3)	150	145	148	139	149	152	150	0.5	mg/L	
Alkalinity (PP as CaCO3)	<0.5	<0.5	<0.5	1.24	<0.5	<1.0	<1.0	0.5	mg/L	
Bicarbonate (HCO3)	176	177	181	167	182	185	180	0.5	mg/L	
Carbonate (CO3)	<0.5	<0.5	<0.5	1.49	<0.5	<1.0	<1.0	0.5	mg/L	
Hydroxide (OH)	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	<1.0	0.5	mg/L	
Anions										
Dissolved Sulphate (SO4)	17.3	18.1	15.4	16.7	19.1	18.1	20.0	0.5	mg/L	500
Dissolved Chloride (Cl)	25	12	19	12	12	13	19	0.5	mg/L	250
MISCELLANEOUS										
True Colour	<5	5	<5	<5	<5	9.2	<2	5	TCU	15
Nutrients										
Nitrate plus Nitrite (N)	0.49	0.5	0.53	0.54	0.54	0.55	0.61	0.02	mg/L	
Physical Properties										
Conductivity	398	346	377	349	346	349	360	1	uS/cm	
pH	8.43	8.28	8.2	8.3	8.1	8.3	8.1		pH Units	7.0-10.5
Physical Properties										
Total Dissolved Solids	218	202	196	216	182	182	220	10	mg/L	500
Turbidity	<0.1	<0.1	0.1	0.1	<0.1	0.26	<0.1	0.1	NTU	1
Total Metals by Atomic Spectroscopy										
Total Aluminum (Al)	<0.003	<0.003	<0.003	<0.003	<0.003	0.011	0.004	0.003	mg/L	0.1
Total Antimony (Sb)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0006	0.0005	mg/L	0.006
Total Arsenic (As)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	0.0001	mg/L	0.01
Total Barium (Ba)	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	mg/L	5
Total Cadmium (Cd)	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	0.01	mg/L	0.005
Total Chromium (Cr)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0010	0.001	mg/L	0.05
Total Cobalt (Co)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0003	0.0005	mg/L	
Total Copper (Cu)	0.0008	0.0007	0.0006	0.001	0.0006	0.0009	0.0009	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	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)	<0.00005	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001	<0.0020	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	<0.0005	0.001	mg/L	
Total Selenium (Se)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	0.0001	mg/L	0.05
Total Silver (Ag)	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.0001	0.00002	mg/L	
Total Uranium (U)	0.0006	0.0006	0.0007	0.0007	0.0007	0.0007	0.00070	0.0001	mg/L	0.02
Total Vanadium (V)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0014	0.005	mg/L	
Total Zinc (Zn)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	0.005	mg/L	5
Total Calcium (Ca)	29.1	32.6	30.4	33.2	31.5	31.3		0.05	mg/L	
Total Magnesium (Mg)	19.3	20.3	19.9	20.4	20.9	21.2		0.05	mg/L	
Total Potassium (K)	0.84	0.76	0.75	0.79	0.73	0.73		0.05	mg/L	
Total Sodium (Na)	15.5	7.3	12.1	7.6	7.2	7.0		0.05	mg/L	200
Total Sulphur (S)	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	2012	2013	2014	2015	2016	2017	2018	RDL	Units	GCDWQ
Misc. Inorganics				OFFLINE						
Fluoride (F)	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	<0.03	0.005	mg/L	1
Calculated Parameters										
Total Hardness (CaCO3)	344	370	344		383	396		0.5	mg/L	
Nitrate (N)	1.37	1.46	1.42		1.44	1.64	7.8	0.02	mg/L	10
Misc. Inorganics										
Alkalinity (Total as CaCO3)	302	312	323		338	356	370	0.5	mg/L	
Alkalinity (PP as CaCO3)	<0.5	<0.5	<0.5		<0.5	<1.0	<1.0	0.5	mg/L	
Bicarbonate (HCO3)	356	380	395		412	434	450	0.5	mg/L	
Carbonate (CO3)	<0.5	<0.5	<0.5		<0.5	<1.0	<1.0	0.5	mg/L	
Hydroxide (OH)	<0.5	<0.5	<0.5		<0.5	<1.0	<1.0	0.5	mg/L	
Anions										
Dissolved Sulphate (SO4)	33	39.4	33.8		41.5	42.8	41	0.5	mg/L	500
Dissolved Chloride (Cl)	59	72	78		97	110	110	0.5	mg/L	250
MISCELLANEOUS										
True Colour	<5	<5	<5		<5	17.3	2.2	5	TCU	15
Nutrients										
Nitrate plus Nitrite (N)	1.37	1.46	1.42		1.44	1.64	1.8	0.02	mg/L	
Physical Properties										
Conductivity	804	869	896		959	1050	1000	1	uS/cm	
pH	8.39	8.21	8		7.77	8.26	7.9			7.0-10.5
Physical Properties										
Total Dissolved Solids	508	486	490		506	580	560	10	mg/L	500
Turbidity	<0.1	<0.1	<0.1		0.15	1.03	<0.1	0.1	NTU	1
Total Metals by Atomic Spectroscopy										
Total Aluminum (Al)	<0.003	<0.003	<0.003		<0.003	0.010	0.0035	0.003	mg/L	0.1
Total Antimony (Sb)	<0.0005	<0.0005	<0.0005		<0.0005	<0.0005	<0.0006	0.0005	mg/L	0.006
Total Arsenic (As)	<0.0001	<0.0001	<0.0001		<0.0001	<0.0001	<0.0002	0.0001	mg/L	0.01
Total Barium (Ba)	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	mg/L	5
Total Cadmium (Cd)	<0.00001	<0.00001	<0.00001		<0.00001	<0.00001	<0.00002	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	<0.0002	<0.0003	0.0005	mg/L	
Total Copper (Cu)	0.0008	0.0011	0.0008		0.0012	0.0016	0.0023	0.0002	mg/L	1
Total Iron (Fe)	<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	mg/L	0.05
Total Mercury (Hg)	<0.00005	<0.00005	<0.00001		<0.00001	<0.00001	<0.00020	0.00002	mg/L	0.001
Total Molybdenum (Mo)	<0.001	<0.001	<0.001		<0.001	<0.001	<0.0002	0.001	mg/L	
Total Nickel (Ni)	<0.001	<0.001	<0.001		<0.001	<0.001	<0.0005	0.001	mg/L	
Total Selenium (Se)	<0.0001	0.0001	0.0001		<0.0001	<0.0001	<0.0002	0.0001	mg/L	0.05
Total Silver (Ag)	<0.00002	<0.00002	<0.00002		<0.00002	<0.00002	<0.0001	0.00002	mg/L	
Total Uranium (U)	0.0011	0.0012	0.0011		0.0012	0.0013	0.0014	0.0001	mg/L	0.02
Total Vanadium (V)	<0.005	<0.005	<0.005		<0.005	<0.005	0.001	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)	80.8	87.8	81.4		85.4	89.7		0.05	mg/L	
Total Magnesium (Mg)	34.7	36.5	34.3		41.2	41.7		0.05	mg/L	
Total Potassium (K)	1.59	1.69	1.48		1.89	1.96		0.05	mg/L	
Total Sodium (Na)	37.7	40.4	38.8		51.1	59.0		0.05	mg/L	200
Total Sulphur (S)	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	2012	2013	2014	2015	2016	2017	2018	RDL	Units	GCDWQ
Misc. Inorganics										
Fluoride (F)	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	<0.033	0.005	mg/L	1
Calculated Parameters										
Total Hardness (CaCO3)	161	178	169	181	182	174		0.5	mg/L	
Nitrate (N)	0.40	0.50	0.45	0.46	0.45	0.52	2.1	0.02	mg/L	10
Misc. Inorganics										
Alkalinity (Total as CaCO3)	158	157	156	150	162	168	160	0.5	mg/L	
Alkalinity (PP as CaCO3)	<0.5	<0.5	<0.5	0.83	<0.5	<1.0	<1.0	0.5	mg/L	
Bicarbonate (HCO3)	185	191	190	181	198	205	190	0.5	mg/L	
Carbonate (CO3)	<0.5	<0.5	<0.5	1	<0.5	<1.0	<1.0	0.5	mg/L	
Hydroxide (OH)	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	<1.0	0.5	mg/L	
Anions										
Dissolved Sulphate (SO4)	19	21.3	19.5	18.8	22.6	21.2	23	0.5	mg/L	500
Dissolved Chloride (Cl)	15	15	14	14	14	15	16	0.5	mg/L	250
MISCELLANEOUS										
True Colour	<5	<5	<5	<5	<5	5		5	TCU	15
Nutrients										
Nitrate plus Nitrite (N)	0.40	0.50	0.45	0.46	0.45	0.52	0.47	0.02	mg/L	
Physical Properties										
Conductivity	380	386	373	379	382	390	390	1	uS/cm	
pH	8.43	8.23	8.17	8.32	8.06	8.29	8.13			7.0-10.5
Physical Properties										
Total Dissolved Solids	230	238	198	228	206	200	190	10	mg/L	500
Turbidity	<0.1	<0.1	<0.1	0.14	<0.1	0.3		0.1	NTU	1
Total Metals by Atomic Spectroscopy										
Total Aluminum (Al)	<0.003	<0.003	<0.003	<0.003	<0.003	0.012	0.005	0.003	mg/L	0.1
Total Antimony (Sb)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0006	0.0005	mg/L	0.006
Total Arsenic (As)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	0.0001	mg/L	0.01
Total Barium (Ba)	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	mg/L	5
Total Cadmium (Cd)	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	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	<0.0002	<0.0003	0.0005	mg/L	
Total Copper (Cu)	0.0009	0.0013	0.0008	0.0006	0.0006	0.0007	0.0007	0.0002	mg/L	1
Total Iron (Fe)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.010		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	mg/L	0.05
Total Mercury (Hg)	<0.00005	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001	<0.0020	0.00002	mg/L	0.001
Total Molybdenum (Mo)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.001	mg/L	
Total Nickel (Ni)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	0.001	mg/L	
Total Selenium (Se)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	0.0001	mg/L	0.05
Total Silver (Ag)	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.0001	0.00002	mg/L	
Total Uranium (U)	0.0005	0.0006	0.0006	0.0006	0.0006	0.0006	0.00063	0.0001	mg/L	0.02
Total Vanadium (V)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.002	0.005	mg/L	
Total Zinc (Zn)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	0.005	mg/L	5
Total Calcium (Ca)	38.2	42.9	41.1	43.6	42.6	41.0		0.05	mg/L	
Total Magnesium (Mg)	15.9	17.2	16.1	17.4	18.3	17.3		0.05	mg/L	
Total Potassium (K)	0.82	0.95	0.82	0.92	0.92	0.91		0.05	mg/L	
Total Sodium (Na)	8.98	9.42	8.26	9.46	9.66	9.23		0.05	mg/L	200
Total Sulphur (S)	8	7	7	7.1	7.6	6.4		3	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 #6										
Year	2012	2013	2014	2015	2016	2017	2018	RDL	Units	GCDWQ
Misc. Inorganics							OFFLINE			
Fluoride (F)	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	mg/L	1
Calculated Parameters										
Total Hardness (CaCO3)	289	292	300	323	339	319		0.5	mg/L	
Nitrate (N)	0.99	0.9	0.93	1.1	1.4	1.5		0.02	mg/L	10
Misc. Inorganics										
Alkalinity (Total as CaCO3)	266	272	285	277	313	294		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)	313	332	347	337	382	359		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)	23.4	24.6	24.6	24	27.4	27.3		0.5	mg/L	500
Dissolved Chloride (Cl)	25	25	27	28	31	40		0.5	mg/L	250
MISCELLANEOUS										
True Colour	<5	5	<5	<5	<5	<5		5	TCU	15
Nutrients										
Nitrate plus Nitrite (N)	0.99	0.90	0.93	1.10	1.37	1.50		0.02	mg/L	
Physical Properties										
Conductivity	601	628	638	664	712	702		1	uS/cm	
pH	8.41	8.26	7.98	8.26	7.79	8.26				7.0-10.5
Physical Properties										
Total Dissolved Solids	376	359	352	396	408	394		10	mg/L	500
Turbidity	<0.1	0.1	<0.1	0.15	0.13	0.34		0.1	NTU	1
Total Metals by Atomic Spectroscopy										
Total Aluminum (Al)	<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	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)	0.128	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	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)	0.0009	0.0013	0.0014	0.0014	0.001	0.001		0.0002	mg/L	1
Total Iron (Fe)	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	mg/L	0.01
Total Manganese (Mn)	<0.001	0.0013	<0.001	<0.001	<0.001	<0.001		0.001	mg/L	0.05
Total Mercury (Hg)	<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	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)	0.001	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	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)	74.9	76.2	78.6	83.4	87.3	84.2		0.05	mg/L	
Total Magnesium (Mg)	24.9	24.7	25.1	27.8	29.5	26.5		0.05	mg/L	
Total Potassium (K)	0.85	0.852	0.795	0.89	0.92	0.94		0.05	mg/L	
Total Sodium (Na)	13.1	14	13	16.2	17.5	18.8		0.05	mg/L	200
Total Sulphur (S)	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

