GOLDEN
Kicking Horse Country

2013 Drinking Water Quality Annual Report
Facility No. 12-098-00001

June 03, 2014

Table of Contents **Page**

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, 2013 consumption information, the drinking water monitoring and testing program, and major improvements made to the system within the last calendar year. A summary of all water sample analyses results collected in 2013 is also provided. 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 (Igpm) 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 <u>not</u> used for filling tankards other than Fire Trucks.

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:

2013:

Total volume of water pumped – 220,261,364 Igal. (12.1% increase over 2012)
Peak Day – August 11; 1,093,064 Igal (16.6% 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)

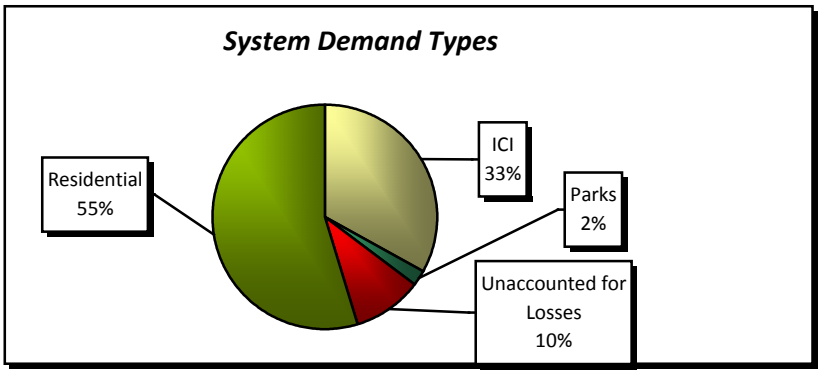
2011:

Total volume of water pumped - 208,623,333 Igal. (19.8% reduction over 2010)
Peak Day - July 6; 1,026,018 Igal (31.2% reduction over 2010)
Ave. Day Demand (Estimated) – 571,180 Igpd (19.8% reduction over 2010 estimate)

2010:

The total water pumped - 260,028,292 Igal.
Peak Day - July 25, 1,490,318 Igal
Average Day Demand (Estimated) - 711,919 Igal

The increase in total volume of water pumped in 2013 as compared to 2012 and the increase in Peak Day demand are significant at 12.1% and 16.6% respectively. The increase is thought to be primarily linked to residential irrigating and municipal irrigating to a lesser extent. Industrial, Commercial, Institutional (ICI) demand accounted for about 33.4% of the total water pumped in 2013 (a 3.2% decrease from 2012) and municipal parks represent approximately 2.3% of the total. The remaining portion of the total volume pumped, represented as 64.3%, is in large part residential demand; of that percentage about 10% is considered leakage and other unaccounted for water usage. Therefore approximately 50-55% of the total water pumped is attributable to residential demand. Logically then the demand increase measured in 2013 may be linked to residential usage habits relating to irrigation.



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 2013 a total of 270 samples were analyzed for total coliforms and E.coli. Of the 270 samples analyzed two samples were positive with a 1-count of total coliforms, one sample was positive with a 2-count and one sample was positive with a 4-count.
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 2013 was approximately twenty two (22) per month on average.

The Town of Golden also conducts full spectrum analyses on each source on an annual basis for physical and chemical parameters, as 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.

In 2013, one service leak was discovered and repaired on 12th Street South.

Current and historic maintenance records are available. Monthly operations reports on the water system are provided to Interior Health (IH). The Town of Golden has developed 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 5 Rehabilitation:

The Well 5 100 kW diesel genset, purchased in 2012, was installation in spring 2013. As Well 5 is the highest production well on the distribution system south of the Kicking Horse River, this addition provides excellent large-volume pumping redundancy to the system in the event of a power outage.

NE Reservoir Complex:

A Grid Bee submersible mixer was added to the "yellow" 139,000 Igal reservoir to improve water quality by reducing water stagnation and shot circuiting in the tank.

Distribution Network:

A new mainline valve was installed on the north side of the Kicking Horse River watermain crossing on 9th Avenue North to improve our ability to isolate and keep in service the north downtown core in the event of a problem with the river crossing.

Hydrants:

Two additional fire hydrants were installed, one each in a commercial/industrial area on 10th Avenue North as well as a residential area on 6th Street South. In each case locations were selected with the Fire Chief to improve area hydrant coverage.

Metering/Cross Connection Control:

In 2013 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 approximately 30 more industrial/commercial/institutional (ICI) facilities. In addition to the 30 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 towards completing Well Protection Toolkit Steps 4 and 5 (maintenance) as follows:

Step 4 "Develop Management Strategies": Work included finalizing the ***Municipal Groundwater Supply Protection Strategy Report.***

In support of finalizing the Supply Protection Strategy Report, a private well survey was completed in the community and included identification of 75 private wells and earth energy systems. Of the 75 identified, 48 were surveyed, 12 were confirmed to no longer exist, and 15 could not be located according to available well registration data.

Step 5 "Develop Contingency Plans": All contact information contained within the ***Municipal Water Supply Contingency Plan Report*** is updated on an annual basis.

Emergency Response Plan (ERP):

The ERP is now integral to the overarching Water Supply Contingency Plan. Both will be reviewed annually with all contacts updated as necessary. The ERP updated to 2014 is appended for reference. The larger Golder Municipal Water Supply Contingency Plan Report is available upon request.

6.0 Operator Education and Training

The Town of Golden has established a training program that follows EOCP guidelines for required training. Operators have been qualifying to write exams as per EOCP guidelines on an ongoing basis; although no exams were written in 2013, "maintenance credits" will continue to be earned as necessary to maintain current certification levels.

EOCP Current Certification:

Employee	***Certification #***	***Level***
Lorne Pickering	3879	WD-III CCC Tester
Alan Taylor	6101	WD-II CCC Tester

7.0 Cross Connection Control (CCC)

Two of our staff members 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 2013 the Town of Golden advanced its CCC program and installed backflow devices on an additional 25 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
Well Stations:
Flow totalizers in Gallons
Pump Run Times
Pressure Transducers in "psi" at all wells
Room Temperatures
Flood alarms

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 May a service leak to a residential property was discovered and repaired on 12th Street South.

No main breaks occurred in 2013 and no reservoir cleaning was carried out in 2013.

Beginning in March, intermittent and recurring electrical service issues caused considerable damage to various electrical components and the motor starter rendering Well 6 inoperable for a period of about six weeks. In September, due to a recurring loss of pump prime, a suspected failed in-line check valve was replaced. It was discovered upon well pump column pipe removal that the cause of loss of prime was perforations in the steel column pipe near the check valve. A well camera inspection was conducted while the submersible pump was removed and the well screens were found to be in good condition.

10.0 Future Plans for 2014

- Select distribution system zone and conduct night flow analysis for leak detection (fall);
- 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 about and enforcement of sprinkling regulations. Include elementary school classroom visits by staff and newspaper advertising;
- Minor system upgrades and service repairs on an as-required basis;
- Continue to advance the Groundwater Protection Program including addressing private well's that have been indentified as having a high hazard potential to the aquifer; develop a municipal water supply monitoring and evaluation program; and, plan for implementation of Groundwater Protection Strategy.

11.0 Sample Analysis Results

DATE	WELL#2	WELL#3	WELL#4	WELL#5	WELL#6	NE RES (yellow)	NE RES	BEARS RES.
Jan 7/2013	<1	<1	<1		<1		<1	<1
Jan 14/2013	<1	<1	<1	<1	<1		<1	<1
Jan 21/2013	<1	<1	<1	<1	<1	<1		<1
Jan 28/2013	<1	<1	<1	<1	<1		<1	<1
Feb 4/2013	<1	<1	<1	off line	<1	<1		<1
Feb 11/2013	<1	<1	<1	<1	<1		<1	<1
Feb 25/2013	<1	<1	<1	<1	<1	<1		<1
Mar 4/2013	<1	<1	<1	<1	<1		<1	<1
Mar 11/2013	<1	<1	<1	<1	<1	<1		<1
Mar 18/2013	<1	<1	<1	<1	<1	<1		<1
Mar 25/2013	<1	<1	<1	<1	off	<1		<1
April 8/2013	<1	<1	<1	<1	off		<1	<1
April 15/2013	<1	<1	<1	<1	off	<1		<1
April 22/2013	<1	<1	<1	<1	off		<1	<1
April 29/2013	<1	<1	<1	<1	off	<1		<1
May 6/2013	<1	<1	<1	<1	off		<1	<1
May 13/2013	<1	<1	<1	<1	<1	<1		<1
May 27/2013	<1	<1	<1	<1	off		<1	<1
June 3/2013	<1	<1	<1	<1	off	<1		<1
June 10/2013	<1	<1	<1	<1	off		<1	<1
June 17/2013	<1	<1	<1	<1	off	<1		<1
June 24/2013	<1	<1	<1	<1	off		<1	<1
July 8/2013	<1	<1	<1	<1	off	<1		<1
July 15/2013	<1	<1	<1	<1	<1		<1	<1
July 22/2013	<1	<1	<1	<1	<1	<1		<1
July 29/2013	<1	<1	<1	<1	<1		<1	<1
Aug 12/2013	<1	<1	<1	<1	<1	T-4 E<1		<1
Aug 19/2013	<1	<1	<1	<1	<1	<1		<1
Aug 26/2013	<1	<1	<1	<1	off		<1	<1
Sept 9/2013	<1	<1	<1	<1	off	<1		<1
Sept 16/2013	<1	<1	<1	off line	off		<1	<1
Sept 23/2013	<1	<1	<1	<1	off	<1		<1
Sept 30/2013	<1	<1	<1	<1	off	<1		<1
Oct 7/2013	<1	<1	<1	<1	off		T-1 E<1	<1
Oct 21/2013	<1	<1	<1	<1	off	<1		<1
Oct 28/2013	<1	<1	<1	<1	off		T-1 E<1	<1
Nov 4/2013	<1	<1	<1	<1	off	T-2 E<1		<1
Nov 18/2013	<1	<1	<1	<1	<1	<1		<1
Nov 25/2013	<1	<1	<1	<1	<1	<1		<1
Dec 2/2013	<1	<1	<1	<1	<1		<1	<1
Dec 9/2013	<1	<1	<1	<1	<1	<1		<1
Dec 16/2013	<1	<1	<1	<1	<1		<1	<1

12.0 Turbidity Analysis (NTU)

DATE	WELL#2	WELL#3	WELL#4	WELL#5	WELL#6
Jan 8	0.08	0.09	0.09	0.08	0.09
Jan 14	0.06	0.09	0.06	0.08	0.09
Jan 28	0.09	0.09	0.08	0.07	0.09
Feb 4	0.09	0.09	0.07	off line	0.1
Mar 4	0.08	0.09	0.07	0.05	0.1
Mar 11	0.09	0.08	0.08	0.1	0.09
Mar 18	0.08	0.06	0.06	0.06	0.08
Mar 25	0.08	0.08	0.08	0.08	off
April 8	0.07	0.05	0.05	0.08	off
April 15	0.05	0.06	0.06	0.05	off
April 22	0.07	0.06	0.06	0.05	off
April 29	0.06	0.06	0.06	0.06	off
May 6	0.05	0.05	0.05	0.05	off
May 13	0.05		0.05	0.05	0.12
May 27	0.06	0.06	0.05	0.05	off
June 3	0.05	0.06	0.06	0.06	off
June 10	0.06	0.05	0.06	0.06	off
June 17	0.07	0.08	0.06	0.06	off
June 24	0.09	0.06	0.06	0.07	off
July 8	0.06	0.09	0.09	0.09	0.1
July 15	0.06	0.07	0.07	0.07	0.09
July 22	0.06	0.05	0.06	0.08	0.08
July29	0.07	0.06	0.07	0.07	0.09
Aug 12	0.07	0.07	0.07	0.06	0.11
Aug 19	0.07	0.07	0.07	0.06	0.47
Aug 26	0.05	0.07	0.07	0.05	off
Sept 9	0.06	0.06	0.08	0.09	off
Sept 16	0.06	0.05	0.07	off line	off
Sept 23	0.06	0.06	0.08	0.1	off
Sept 30	0.06	0.08	0.08	0.07	off
Oct 7	0.07	0.07	0.07	0.06	off
Oct 21	0.08	0.06	0.06	0.06	off

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.

Chris Cochran, AScT, Manager of Operations

Drinking Water Package - Maxxam Analytical

Well #2									
Year	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**RDL**	**Units**	**GCDWQ**
Misc. Inorganics									
Fluoride (F)	0.1	0.11	0.11	0.09	0.10	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	mg/L	3.2
Calculated Parameters									
Total Hardness (CaCO3)	139	138	143	154	141	143	0.5	mg/L	500
Nitrate (N)	0.17	0.18	0.19	0.24	0.26	0.26	0.02	mg/L	45
Misc. Inorganics									
Alkalinity (Total as CaCO3)	120	130	130	130	129	126	0.5	mg/L	
Alkalinity (PP as CaCO3)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	mg/L	
Bicarbonate (HCO3)	150	160	150	150	152	154	0.5	mg/L	
Carbonate (CO3)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	mg/L	
Hydroxide (OH)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	mg/L	
Anions									
Dissolved Sulphate (SO4)	18	16	18	17	15	16.3	0.5	mg/L	<500
Dissolved Chloride (Cl)	1.8	4.7	4.7	10	7.5	9	0.5	mg/L	<250
MISCELLANEOUS									
True Colour	<5	<5	<5	<5	<5	5	5	TCU	<15
Nutrients									
Nitrate plus Nitrite (N)	0.17	0.18	0.19	0.24	0.26	0.26	0.02	mg/L	
Physical Properties									
Conductivity	260	282	282	298	296	302	1	uS/cm	
pH	8.1	8.2	8.3	7.94	8.37	8.26		pH Units	6.5-8.5
Physical Properties									
Total Dissolved Solids	140	130	160	150	170	150	10	mg/L	<500
Turbidity	0.4	0.1	0.1	<0.1	<0.1	<0.1	0.1	NTU	1
Total Metals by ICPMS									
Total Aluminum (Al)	0.002	0.004	<0.003	<0.003	<0.003	<0.003	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	0.025
Total Barium (Ba)	0.047	0.047	0.049	0.056	0.052	0.053	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	<0.0005	0.0005	mg/L	
Total Copper (Cu)	0.001	0.0006	0.0005	0.0008	0.007	0.0008	0.0002	mg/L	<1.0
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	<0.00002	<0.00002	<0.00002	<0.00005	<0.00005	0.00005	mg/L	0.001
Total Molybdenum (Mo)	<0.005	<0.005	<0.005	<0.005	<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	0.01
Total Silver (Ag)	<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	0.0001	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	<5.0
Total Calcium (Ca)	35.5	34.1	35.2	38	34.2	35.1	0.05	mg/L	
Total Magnesium (Mg)	12.4	12.9	13.4	14.3	13.6	13.4	0.05	mg/L	
Total Potassium (K)	0.5	0.47	0.52	0.6	0.55	0.57	0.05	mg/L	
Total Sodium (Na)	2.04	3.4	3.92	6.23	5.00	6.01	0.05	mg/L	<200
Total Sulphur (S)	7	6	7	7	6	5.5	3	mg/L	

Well #3									
Year	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**RDL**	**Units**	**GCDWQ**
Misc. Inorganics									
Fluoride (F)	0.11	0.11	0.11	0.1	0.10	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	mg/L	3.2
Calculated Parameters									
Total Hardness (CaCO3)	164	157	169	177	152	165	0.5	mg/L	500
Nitrate (N)	0.38	0.38	0.37	0.44	0.49	0.5	0.02	mg/L	45
Misc. Inorganics									
Alkalinity (Total as CaCO3)	150	150	150	140	150	145	0.5	mg/L	
Alkalinity (PP as CaCO3)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	mg/L	
Bicarbonate (HCO3)	180	180	180	180	176	177	0.5	mg/L	
Carbonate (CO3)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	mg/L	
Hydroxide (OH)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	mg/L	
Anions									
Dissolved Sulphate (SO4)	17	16	19	17	17.3	18.1	0.5	mg/L	<500
Dissolved Chloride (Cl)	11	9.9	9.8	12	25	12	0.5	mg/L	<250
MISCELLANEOUS									
True Colour	<5	<5	<5	<5	<5	5	5	TCU	<15
Nutrients									
Nitrate plus Nitrite (N)	0.38	0.38	0.37	0.44	0.49	0.5	0.02	mg/L	
Physical Properties									
Conductivity	330	338	329	339	398	346	1	uS/cm	
pH	8.2	8.2	8.3	8.01	8.43	8.28		pH Units	6.5-8.5
Physical Properties									
Total Dissolved Solids	170	160	170	180	218	202	10	mg/L	<500
Turbidity	0.1	0.2	0.1	<0.1	<0.1	<0.1	0.1	NTU	1
Total Metals by ICPMS									
Total Aluminum (Al)	0.003	0.002	<0.003	<0.003	<0.003	<0.003	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	0.025
Total Barium (Ba)	0.109	0.102	0.11	0.124	0.11	0.012	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	<0.0005	0.0005	mg/L	
Total Copper (Cu)	0.0014	0.0019	0.0015	0.0015	0.0008	0.0007	0.0002	mg/L	<1.0
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	<0.00002	<0.00002	<0.00002	<0.00005	<0.00005	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	0.01
Total Silver (Ag)	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0.00002	mg/L	
Total Uranium (U)	0.0007	0.0007	0.0007	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	mg/L	
Total Zinc (Zn)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	mg/L	<5.0
Total Calcium (Ca)	33.1	30.6	32.7	34.3	29.1	32.6	0.05	mg/L	
Total Magnesium (Mg)	19.8	19.6	21.1	22.1	19.3	20.3	0.05	mg/L	
Total Potassium (K)	0.75	0.62	0.66	0.85	0.84	0.76	0.05	mg/L	
Total Sodium (Na)	6.67	5.8	6.1	7.77	15.5	7.3	0.05	mg/L	<200
Total Sulphur (S)	7	6	7	7	7	5	3	mg/L	

Well #4									
Year	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**RDL**	**Units**	**GCDWQ**
Misc. Inorganics									
Fluoride (F)	0.06	0.06	0.06	0.05	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	3.2
Calculated Parameters									
Total Hardness (CaCO3)	420	380	405	399	344	370	0.5	mg/L	500
Nitrate (N)	1.3	1.19	1.12	1.29	1.37	1.46	0.02	mg/L	45
Misc. Inorganics									
Alkalinity (Total as CaCO3)	340	340	270	310	302	312	0.5	mg/L	
Alkalinity (PP as CaCO3)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	mg/L	
Bicarbonate (HCO3)	410	410	330	380	356	380	0.5	mg/L	
Carbonate (CO3)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	mg/L	
Hydroxide (OH)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	mg/L	
Anions									
Dissolved Sulphate (SO4)	39	37	40	32	33	39.4	0.5	mg/L	<500
Dissolved Chloride (Cl)	67	74	78	120	59	72	0.5	mg/L	<250
MISCELLANEOUS									
True Colour	<5	5	<5	<5	<5	<5	5	TCU	<15
Nutrients									
Nitrate plus Nitrite (N)	1.3	1.19	1.12	1.29	1.37	1.46	0.02	mg/L	
Physical Properties									
Conductivity	860	902	824	841	804	869	1	uS/cm	
pH	7.9	8	8.1	7.87	8.39	8.21			6.5-8.5
Physical Properties									
Total Dissolved Solids	510	480	460	440	508	486	10	mg/L	<500
Turbidity	0.1	0.2	0.1	<0.1	<0.1	<0.1	0.1	NTU	1
Total Metals by ICPMS									
Total Aluminum (Al)	<0.001	0.004	<0.003	<0.003	<0.003	<0.003	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	0.025
Total Barium (Ba)	0.205	0.182	0.199	0.199	0.185	0.196	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	<0.0005	0.0005	mg/L	
Total Copper (Cu)	0.0011	0.0007	0.0008	0.0011	0.0008	0.0011	0.0002	mg/L	<1.0
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	<0.00002	<0.00002	<0.00002	<0.00005	<0.00005	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	0.01
Total Silver (Ag)	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0.00002	mg/L	
Total Uranium (U)	0.0013	0.0013	0.0013	0.0011	0.0011	0.0012	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	<5.0
Total Calcium (Ca)	103	90.2	96	95.9	80.8	87.8	0.05	mg/L	
Total Magnesium (Mg)	39.4	37.5	40.2	38.8	34.7	36.5	0.05	mg/L	
Total Potassium (K)	1.89	1.69	1.82	1.88	1.59	1.69	0.05	mg/L	
Total Sodium (Na)	41.3	42.6	44.5	41.6	37.7	40.4	0.05	mg/L	<200
Total Sulphur (S)	15	12	16	15	13	13.4	3	mg/L	

Well #5									
Year	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**RDL**	**Units**	**GCDWQ**
Misc. Inorganics									
Fluoride (F)	0.09	0.10	0.10	0.09	0.10	0.10	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	3.2
Calculated Parameters									
Total Hardness (CaCO3)	200	180	183	190	161	178	0.5	mg/L	500
Nitrate (N)	0.52	0.50	0.41	0.36	0.40	0.50	0.02	mg/L	45
Misc. Inorganics									
Alkalinity (Total as CaCO3)	170	170	160	150	158	157	0.5	mg/L	
Alkalinity (PP as CaCO3)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	mg/L	
Bicarbonate (HCO3)	200	200	200	190	185	191	0.5	mg/L	
Carbonate (CO3)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	mg/L	
Hydroxide (OH)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	mg/L	
Anions									
Dissolved Sulphate (SO4)	20	21	19	20	19	21.3	0.5	mg/L	<500
Dissolved Chloride (Cl)	17	15	12	13	15	15	0.5	mg/L	<250
MISCELLANEOUS									
True Colour	<5	<5	<5	<5	<5	<5	5	TCU	<15
Nutrients									
Nitrate plus Nitrite (N)	0.52	0.50	0.41	0.36	0.40	0.50	0.02	mg/L	
Physical Properties									
Conductivity	390	395	355	357	380	386	1	uS/cm	
pH	8.1	8.2	8.3	7.85	8.43	8.23			6.5-8.5
Physical Properties									
Total Dissolved Solids	220	200	190	190	230	238	10	mg/L	<500
Turbidity	0.1	0.2	<0.1	0.2	<0.1	<0.1	0.1	NTU	1
Total Metals by ICPMS									
Total Aluminum (Al)	<0.001	0.005	<0.003	<0.003	<0.003	<0.003	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	0.025
Total Barium (Ba)	0.078	0.068	0.07	0.076	0.066	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	0.0002	<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	<0.0005	0.0005	mg/L	
Total Copper (Cu)	0.0017	0.0014	0.0007	0.0023	0.0009	0.0013	0.0002	mg/L	<1.0
Total Iron (Fe)	<0.005	<0.005	<0.005	0.0021	<0.005	<0.005	0.005	mg/L	<0.3
Total Lead (Pb)	<0.0002	<0.0002	<0.0002	0.0003	<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	<0.00002	<0.00002	<0.00002	<0.00005	<0.00005	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	0.01
Total Silver (Ag)	<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	0.0006	0.0005	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	mg/L	
Total Zinc (Zn)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	mg/L	<5.0
Total Calcium (Ca)	49.6	43.2	43.8	46.8	38.2	42.9	0.05	mg/L	
Total Magnesium (Mg)	18.4	17.6	17.9	17.7	15.9	17.2	0.05	mg/L	
Total Potassium (K)	0.97	0.91	0.92	0.96	0.82	0.95	0.05	mg/L	
Total Sodium (Na)	10.4	9.45	8.36	8.27	8.98	9.42	0.05	mg/L	<200
Total Sulphur (S)	8	8	7	8	8	7	3	mg/L	

Well #6									
Year	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**RDL**	**Units**	**GCDWQ**
Misc. Inorganics									
Fluoride (F)	0.06	0.07	0.06	0.05	0.06	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	3.2
Calculated Parameters									
Total Hardness (CaCO3)	349	293	317	346	289	292	0.5	mg/L	500
Nitrate (N)	0.93	0.76	0.88	1.17	0.99	0.9	0.02	mg/L	45
Misc. Inorganics									
Alkalinity (Total as CaCO3)	290	280	290	280	266	272	0.5	mg/L	
Alkalinity (PP as CaCO3)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	mg/L	
Bicarbonate (HCO3)	350	340	350	340	313	332	0.5	mg/L	
Carbonate (CO3)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	mg/L	
Hydroxide (OH)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	mg/L	
Anions									
Dissolved Sulphate (SO4)	24	22	27	25	23.4	24.6	0.5	mg/L	<500
Dissolved Chloride (Cl)	27	22	22	32	25	25	0.5	mg/L	<250
MISCELLANEOUS									
True Colour	<5	<5	<5	<5	<5	5	5	TCU	<15
Nutrients									
Nitrate plus Nitrite (N)	0.93	0.76	0.88	1.17	0.99	0.90	0.02	mg/L	
Physical Properties									
Conductivity	630	612	575	644	601	628	1	uS/cm	
pH	8	8	8.1	7.88	8.41	8.26			6.5-8.5
Physical Properties									
Total Dissolved Solids	360	300	310	350	376	359	10	mg/L	<500
Turbidity	0.2	0.3	0.2	0.1	<0.1	0.1	0.1	NTU	1
Total Metals by ICPMS									
Total Aluminum (Al)	<0.001	0.001	<0.003	<0.003	<0.003	<0.003	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	0.025
Total Barium (Ba)	0.138	0.116	0.128	0.143	0.128	0.129	0.001	mg/L	1
Total Boron (B)	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.05	0.05	mg/L	5
Total Cadmium (Cd)	0.00002	<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	<0.0005	0.0005	mg/L	
Total Copper (Cu)	0.0023	0.0003	0.0004	0.0007	0.0009	0.0013	0.0002	mg/L	<1.0
Total Iron (Fe)	0.008	0.015	0.016	0.025	0.013	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	mg/L	0.01
Total Manganese (Mn)	0.001	<0.001	<0.001	<0.001	<0.001	0.0013	0.001	mg/L	<0.05
Total Mercury (Hg)	<0.00002	<0.00002	<0.00002	<0.00002	<0.00005	<0.00005	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	0.01
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	0.001	0.001	0.0010	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	<5.0
Total Calcium (Ca)	95.2	77.8	84.3	91.6	74.9	76.2	0.05	mg/L	
Total Magnesium (Mg)	27.1	23.9	25.9	28.6	24.9	24.7	0.05	mg/L	
Total Potassium (K)	0.96	0.79	0.87	1.01	0.85	0.852	0.05	mg/L	
Total Sodium (Na)	15.1	12.2	13	16.3	13.1	14	0.05	mg/L	<200
Total Sulphur (S)	9	8	9	9	8	806	3	mg/L	

Maximum Acceptable Concentration
Interem Max 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