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, 2016 consumption information, drinking water monitoring and testing program information, a description of any major improvements made to the system within the last calendar year, and finally a brief summary of planned initiatives for the current year. A summary of all water sample analyses results collected in 2016 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> 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:

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)

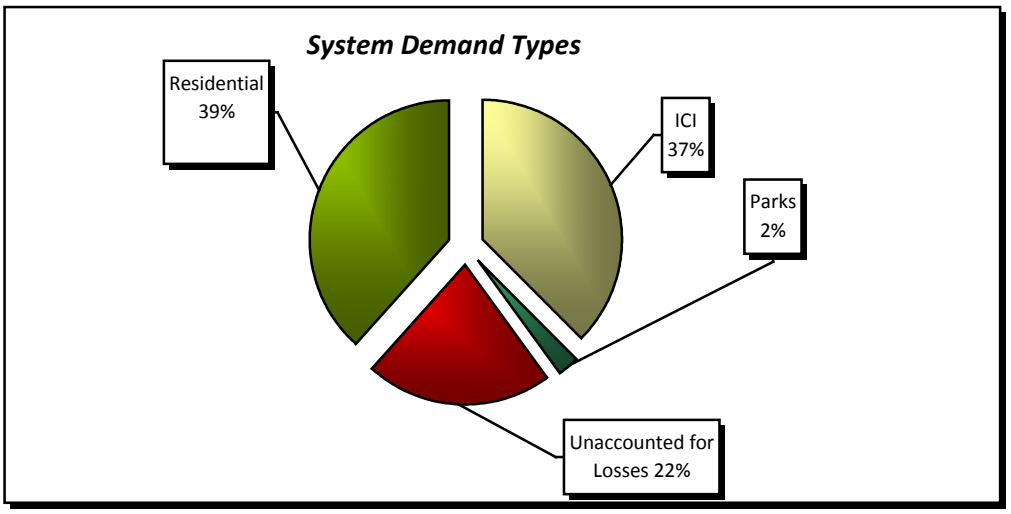
Peak Day demand decreased by 11.6% in 2016, while overall consumption increased by 7.8% as compared to 2015. The Peak Day figure is assumed to be reflective of residential and municipal irrigating as extensive irrigating on a given day would be a main contributor to Peak Day consumption. Weather conditions leading up and occurring on the Peak Day is thought to be a main factor influencing this demand figure.

In 2016, Industrial, Commercial, Institutional (ICI) demand accounted for about 36.7% of the total water pumped (in 2015 ICI demand was recorded as being 34.2% of the total water pumped; overall, 2016 ICI demand increased 7.2% as compared to 2015).

Municipal parks represent approximately 2.0% of the total water pumped (in 2015 municipal irrigation demand was recorded as being 2.5% of the total water pumped; overall, 2016 demand decreased by 12.9% as compared to 2015).

The remaining portion of the total volume pumped, represented as 61.3%, is in large part residential demand; of that percentage about 22% is considered attributable to leakage and other unaccounted for water usage (note that this figure has been adjusted from 2015 reporting of 10%).

Therefore, approximately 39.3% of the total water pumped is residential demand (in 2015 residential demand was reported as being approximately 54% of the total water pumped; overall, the 2016 demand calculation has been decreased by 14.7% as compared to 2015).



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 2016 a total of 283 samples were analyzed for total coliforms and E.coli. Of the 283 samples analyzed one sample was positive with a 1-count of total coliforms. The count was associated with a sample taken from the Bear's Paw 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 2016 was approximately twenty three (23) 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; 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 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 Rehabilitation:

Well 4 is the second highest production well on the distribution system and is located north of the Kicking Horse River. Mechanical rehabilitation carried over from 2015 was completed and the station improvements were commissioned in spring 2016. The work included camera inspection of the well, complete replacement of mechanical works including a new VFD controlled pump and motor, and minor electrical system and building renewals.

Well 6 Study:

Well 6, located north of the Kicking Horse River is the deepest and newest well in the well source infrastructure inventory, drawing water from the lower aquifer in Golden.

Difficulties encountered during construction of the well in 2000 resulting in partial grouting of bottom well screen, coupled with possible mineral encrustation of remaining well screens and sedimentation of the surrounding developed area outside of the screens, collectively, are through to have resulted in an overall reduction of potential well yield of approximately 49% over testing conducted prior to construction.

An initiative to investigate and try and recover lost capacity commenced in 2016 under the direction of Golder and Associates and more work remains to be done to prove-out some initial assumptions regarding the apparent lack of expected well capacity. Chemical treatment of the well is an option for removing encrustation and may be pursued as early as fall 2017. The preliminary findings Technical Memorandum from Golder is available for information on request.

NE Yellow Reservoir Re-roofing:

The NE Yellow Reservoir roof membrane and insulation were removed and replaced.

Metering/Cross Connection Control:

In 2016 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 29 industrial/commercial/institutional (ICI) facilities. In addition to the 29 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 2016.

A Screening Study for Potential Groundwater at Risk of Containing Pathogens (GARP) was completed in draft form in spring 2016 and submitted to Interior Health for information. The report was intended to be a proactive step on Golden's part to address updates made to the Provincial Ministry of Health guidance documents for determining GARP.

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 available for information upon request.

Night Flow Analysis (NFA):

Seasonal night flow analysis has been occurring in the community over the past few years and the process continues to be refined. In December 2016, NFA was conducted on the portion of the distribution system defined by the lower pressure zone, essentially including the entire distribution system with the exception of the NE and SE benches. The results of the NFA exercise indicate a potential loss of water due to leakage estimated at approximately 100 Igpm. Further leak detection work will commence early in 2017 in order to trace a repair leaks to address this measured loss.

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:

Employee	***Certification #***	***Level***
Lorne Pickering	3879	WD-III, CCC Tester
Alan Taylor	6101	WD-II, 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 2016 the Town of Golden advanced its CCC program and installed or replaced existing backflow devices on an additional 29 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
Pressure Transducers in "psi" at all wells
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 2016 (during the construction season) no service leaks were detected and repaired. No main breaks occurred in 2016.

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 scheduled for 2019.

10.0 Plans for 2017

- Identify sources of apparent 100 Igpm loss and repair found leaks;
- Continue to conduct seasonal night flow analysis for leak detection – fall 2017;
- 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 by staff;
- Conduct an extended duration pump test at Well 6 to confirm aquifer recharge rate and possibly proceed with well screen acid treatment;
- Conduct Remote Operated Vehicle (ROV) interior inspections of all reservoirs;
- 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) based on IH feedback.

11.0 Sample Analysis Results

DATE	WELL#2	WELL#3	WELL#4	WELL#5	WELL#6	NE RES (yellow)	NE RES (green)	BEARS PAW RES
Jan 4	<1	<1	Offline	<1	<1	<1		<1
Jan 11	<1	<1	Offline	<1	<1		<1	<1
Jan 18	<1	<1	Offline	<1	<1	<1		<1
Jan 25	<1	<1	Offline	<1	<1		<1	<1
Feb 01	<1	<1	Offline	<1	<1		<1	<1
Feb 08	No samples due to long weekend							
Feb 15	<1	<1	Offline	<1	<1		<1	<1
Feb 22	<1	<1	Offline	<1	<1	<1		<1
Feb 29	<1	<1	Offline	<1	<1		<1	<1
Mar 7	<1	<1	Offline	<1	<1	<1		<1
Mar 14	<1	<1	Offline	<1	<1		<1	<1
Mar 21	<1	<1	Offline	<1	<1	<1		<1
Mar 28	No samples due to long weekend							
April 4	<1	<1	<1	<1	<1	<1		<1
April 11	<1	<1	<1	<1	<1		<1	<1
April 18	No samples due to staffing							
April 26	<1	<1	<1	<1	<1	<1		<1
May 2	<1	<1	<1	<1	<1		<1	<1

May 9	<1	<1	<1	<1	<1	<1		<1
May 16	<1	<1	<1	<1	<1		<1	<1
May 23	No samples due to long weekend							
May 30	<1	<1	<1	<1	<1	<1		<1, TC 1
Jun 6	<1	<1	<1	<1	<1	<1		<1
Jun 13	<1	<1	<1	<1	<1		<1	<1
Jun 20	<1	<1	<1	<1	<1	<1		<1
Jun 27	No samples due to staffing							
Jul 4	<1	<1	<1	<1	<1		<1	<1
Jul 11	<1	<1	<1	<1	<1	<1		<1
Jul 18	<1	<1	<1	<1	<1		<1	<1
Jul 25	<1	<1	<1	<1	<1	<1		<1
Aug 1	No samples due to long weekend							
Aug 8	<1	<1	<1	<1	<1		<1	<1
Aug 15	<1	<1	<1	<1	<1	<1		<1
Aug 22	<1	<1	<1	<1	<1		<1	<1
Aug 29	<1	<1	<1	<1	<1	<1		<1
Sept 5	No samples due to long weekend							
Sept 12	<1	<1	<1	<1	<1		<1	<1
Sept 19	<1	<1	<1	<1	<1		<1	<1
Sept 26	<1	<1	<1	<1	<1		<1	<1
Oct 3	<1	<1	<1	<1	<1		<1	<1
Oct 10	No samples due to long weekend							
Oct 17	<1	<1	<1	<1	<1	<1		<1
Oct 24	<1	<1	<1	<1	<1		<1	<1
Oct 31	<1	<1	<1	<1	<1	<1		<1
Nov 7	<1	<1	<1	<1	<1		<1	<1
Nov 14	No samples due to long weekend							
Nov 21	<1	<1	<1	<1	<1		<1	<1
Nov 28	<1	<1	<1	<1	<1	<1		<1
Dec 5	<1	<1	<1	<1	<1		<1	<1
Dec 12	<1	<1	<1	<1	<1	<1		<1
Dec 19	<1	<1	<1	<1	<1		<1	<1

12.0 Turbidity Analysis (NTU)

DATE	WELL#2	WELL#3	WELL#4	WELL#5	WELL#6
Jan 5	0.09	0.09	Offline	0.07	0.09
Jan 12	0.09	0.09	Offline	0.08	0.09
Jan 18	0.08	0.09	Offline	0.08	0.10
Jan 25	0.10	0.09	Offline	0.10	0.09
Feb 1	0.09	0.09	Offline	0.09	0.10
Feb 15	0.09	0.07	Offline	0.08	0.10
Feb 22	0.09	0.07	Offline	0.09	0.09
Mar 7	0.08	0.09	Offline	0.08	0.10
Mar 14	0.08	0.09	Offline	0.08	0.10
Mar 21	0.09	0.08	Offline	0.08	0.09

April 4	0.08	0.07	0.09	0.09	0.10
Apr 11	0.09	0.09	0.08	0.09	0.10
April 25	0.08	0.08	0.09	0.09	0.09
May 2	0.08	0.08	0.08	0.08	0.08
May 9	0.09	0.08	0.09	0.09	0.09
May 16	0.10	0.09	0.09	0.09	0.11
May 30	0.09	0.07	0.07	0.07	0.09
Jun 6	0.09	0.09	0.09	0.09	0.10
Jun 13	0.08	0.08	0.08	0.08	0.10
Jun 20	0.08	0.07	0.09	0.09	0.11
July 4	0.08	0.09	0.09	0.07	0.08
July 11	0.07	0.09	0.09	0.08	0.09
July 18	0.08	0.08	0.08	0.07	0.10
July 25	0.09	0.09	0.07	0.07	0.09
Aug 8	0.07	0.09	0.09	0.10	0.11
Aug 15	0.09	0.08	0.09	0.09	0.10
Aug 22	0.08	0.06	0.08	0.08	0.10
Aug 29	0.09	0.07	0.07	0.10	0.10
Sep 12	0.09	0.09	0.09	0.07	0.09
Sep 19	0.10	0.09	0.07	0.08	0.09
Sep 26	0.08	0.09	0.09	0.07	0.09
Oct 3	0.09	0.08	0.08	0.09	0.11
Oct 17	0.07	0.09	0.09	0.07	0.09
Oct 24	0.09	0.07	0.08	0.07	0.09
Nov 8	0.09	0.07	0.09	0.08	0.09
Nov 29	0.09	0.08	0.08	0.08	0.09
Dec 5	0.08	0.09	0.08	0.07	0.09
Dec 19	0.09	0.08	0.07	0.07	0.08
Average	0.09	0.08	0.08	0.08	0.09
Hi	0.10	0.09	0.09	0.10	0.11
Low	0.07	0.06	0.07	0.07	0.08

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