

**Provincial Regulation 170/03  
Annual and Summary Report  
For the Period  
January 1 to December 31, 2008  
For the City of Guelph Well Supply and  
Gazer Mooney Sub-Division Distribution System**

***Submitted to:***

***Guelph City Council  
And Township of Guelph/Eramosa  
Prepared by: The City of Guelph Waterworks Division of the  
Environmental Services Department***

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# **GUELPH WATERWORKS DIVISION**

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**SECTION 1  
EXECUTIVE SUMMARY**

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## Section 1 Executive Summary

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This report is submitted to satisfy Schedule 22 of Ontario Regulation 170/03 (O.Reg. 170/03, Schedule 22) requirement to prepare and distribute a Summary Report. According to this regulation, the Summary Report must contain the following information:

- List the requirements of the Safe Drinking Water Act, the regulations, the system's approval and any order that the system failed to meet at any time during the period covered by the report and specify the duration of the failure;
- For each failure, describe the measures that were taken to correct the failure;
- A summary of the quantities and flow rates of the water supplied during the period covered by the report, including monthly average and maximum daily flows, and daily instantaneous peak flow rates; and
- A comparison of the actual flows to the rated capacity and flow rates approved in the system's approval.

As well, this report is submitted to satisfy the Section 11 of Ontario Regulation 170/03 (O. Reg. 170/0, S. 11) requirement to prepare and distribute an Annual Report. According to this regulation, the Annual Report must contain the following information:

- A brief description of the water system;
- A list of water treatment chemicals used;
- A summary of the most recent water test results required under O. Reg. 170/03 or an approval;
- A summary of adverse test results and other issues including corrective actions taken; and
- A description of major expenses incurred to install, repair or replace equipment.

The Guelph Water Supply (hereafter known as the Guelph Waterworks System) is owned by the Corporation of the City of Guelph and is operated by the staff of the Guelph Waterworks Division of the Environmental Services Department (hereafter known as Guelph Waterworks). The Guelph Water System Supplies water to approximately 120,000 people within the City of Guelph and the Gazer Mooney Subdivision Distribution System (hereafter known as the Gazer Mooney System). The Gazer Mooney System serves approximately 200 people and is owned by the Township of Guelph/Eramosa and is operated by Guelph Waterworks. Water is supplied to the Gazer Mooney System from the Guelph Waterworks System. These systems are principally regulated by the Province of Ontario and the Ministry of the Environment (MOE) via the application of both the Ontario Water Resources Act and its (14) attendant regulations as well as the Safe Drinking Water Act and its (12) attendant regulations. Municipal water systems in Ontario are amongst the most regulated water systems in North America.

This report is prepared and submitted to meet the regulatory requirements for both the Guelph Water System and the Gazer Mooney System

Section 2 of this report contains a brief description of the drinking water systems.

## Treatment

In 2008, all water provided in the Guelph Waterworks System and the Gazer Mooney System was treated in a fashion consistent with Ontario Ministry of the Environment (MOE) standards using approved treatment chemicals. – specifically sodium hypochlorite and sodium silicate. Sodium Hypochlorite was used as a disinfection chemical and sodium silicate was used as a iron sequestration chemical. Additionally water from the Emma well, Water St. Well, and water passing through F.M. Woods Pumping Station was also disinfected with ultra-violet light (UV) treatment as per the regulatory requirements for those stations.

In 2008, there were six instances in the Guelph Water System in which Ultraviolet Disinfection values momentarily dropped below the regulatory limit. The Wellington Dufferin Guelph Health Unit and the Ministry of the Environment were informed and no further action was required by the City of Guelph. During these momentary UV drops disinfection was maintained by hypochlorination.

In 2008 for both the Gazer Mooney System and the Guelph Waterworks System all contact times for disinfection by sodium hypochlorite were achieved and all system free chlorine residuals were above the regulatory minimums.

## Sampling

In 2008, over 23,600 microbiological, chemical and physical quality tests were performed on treated water supplied by Guelph Waterworks including water supplied to the Gazer Mooney System. All samples were collected by certified Guelph Waterworks System operators following industry standard and Ministry of the Environment (MOE) protocols. Analyses were performed by these same operators and by accredited independent laboratories on water samples collected throughout the water systems (supply and distribution).

In 2008, all water supplied to consumers met or bettered all health-related Ontario Drinking Water Standards.

Of the 8,777 treated water bacteriological analyses performed on treated water, four tests or 0.045 percent indicated the presence of adverse indicator bacteria (see Table I). When re-sampled, the results did not confirm any water quality deterioration. At no time was E. coli detected in the Guelph Water System treated drinking water or the Gazer Mooney System treated drinking water.

In total 14,909 chemical and physical analyses were performed

- Of the thirty-two sodium samples taken in the Guelph Waterworks System, twenty-seven showed reportable levels of sodium (>20mg/L) that were below the Aesthetic guideline of 200 mg/L(see Table I).
- Under the amendment 15.1 of Ontario Regulation 170/03 (O.Reg 170/03) which governs the provision of drinking water in both the City of Guelph and the Gazer Mooney Subdivision, lead sampling was required to be completed in residential locations (private

plumbing), non-residential locations (private plumbing) and locations within the public distribution system. This regulated program is known as the Community Lead Testing Program. The required sampling specifies that a certain number of samples be taken in each type of location in specified time periods throughout the year using a specific sampling protocol. The number of samples that are required is determined by the population that the water system serves. The time periods are identified as a winter period extending from December 15 until April 15 and a non-winter period extending from June 15 to October 15. The first sampling period began on December 15, 2007 and is known as round 1. The second period began on June 15, 2008 and is known as round 2.

- In round 1 of the regulated community lead testing program for the Guelph Waterworks System, 267 samples were analyzed for lead., Of the 230 samples taken on private plumbing, 27 samples showed a value of lead above 0.01mg/L. Of the 37 samples taken from the public distribution system for the Community Lead testing program, zero samples showed a level of lead above 0.01mg/L.
  - In round 1 of the regulated community lead testing program for the Gazer Mooney System, 24 samples were analyzed for lead., Of the 24 samples taken on private plumbing, 0 samples showed a value of lead above 0.01mg/L. Of the 2 samples taken from the public distribution system for the Community Lead testing program, none of the samples showed a level of lead above 0.01mg/L.
  - In round 2 of the regulated community lead testing program for the Guelph Waterworks System, 270 samples were analyzed for lead., Of the 234 samples taken on private plumbing, 36 samples showed a value of lead above 0.01mg/L. Of the 36 samples taken from the public distribution system for the Community Lead testing program, zero samples showed a level of lead above 0.01mg/L.
  - In round 2 of the regulated community lead testing program for the Gazer Mooney System, 22 samples were analyzed for lead. Of the 22 samples taken on private plumbing, 0 samples showed a value of lead above 0.01mg/L. Of the 2 samples taken from the public distribution system for the Community Lead testing program, 1 sample showed a level of lead above 0.01mg/L. Subsequent resampling DID NOT confirm the presence of lead above the regulatory limit of 0.01mg/L.
- In a separate monitoring program, 3 samples of the public distribution system water from the Guelph Waterworks System indicated lead values above the regulatory guideline of 0.01mg/L, but subsequent resampling DID NOT confirm the presence of lead above the regulatory limit of 0.01mg/L.

All other chemical sampling met regulatory requirements for their specific chemical parameters.

In 2008, Guelph Waterworks operated and maintained all water supply and distribution systems in such a manner that water supplied to all consumers serviced by the system met the requirements of the Safe Drinking Water Act, 2002. All operation and maintenance duties were performed by certified, adequately trained operators.

In 2008, operation and major maintenance of the water supply and distribution system was accomplished with \$8.1million in funding from the operating budget and \$15 million in capital funding.

In 2008, Guelph Waterworks complied with the requirements of the Consolidated Certificate of Approval (CC of A). It was noted during the Annual MOE inspection for 2007/2008 that there were some discrepancies in descriptions of the CC of A when compared to onsite equipment. These discrepancies will be corrected early in 2009. All water supplied to customers met or exceeded regulatory water quality standards.

#### **MOE Annual Inspection and Compliance with Acts and Regulations – Guelph Waterworks System**

In 2008, Guelph Waterworks had 4 instances of non-compliance with Ministry of the Environment regulations regarding drinking water as indicated by the Annual MOE Inspection Report. As a result the Guelph Waterworks System received a final inspection score of 91.75%. No orders were issued. The four noted instances of non-compliance included:

1. A single monthly raw water turbidity sample at Carter Wells was not completed – The MOE was informed. There was no health impact and no further action was required
2. During Annual MOE inspection it was noted that there were some inconsistencies in the CC of A descriptions. These description updates will be completed by Guelph Waterworks early in 2009 with the application for a Drinking Water Works Permit or by an application to amend the CC of A
3. It was noted that the values of sodium, an aesthetic parameter, were not reported to the Spill Action Center (SAC) within the five year regulatory window. The sodium values had been reported to Wellington Dufferin Guelph Public Health (WDGPH) and the MOE local offices annually through the annual report. Results were subsequently reported to SAC – no further action was required
4. Due to delays in infrastructure upgrades, continuous recording of parameters at four facilities was not completed for a portion of the 2008 reporting period. At all times during this period continuous monitoring was in place, disinfection requirements were met and continuous alarm protections were in place. The health of the public was not affected and the information recording infrastructure is currently in place. – no further action was required

#### **MOE Annual Inspection and Compliance with Acts and Regulations – Gazer Mooney System**

In 2008, Waterworks had one instance of non-compliance with Ministry of the Environment regulations regarding drinking water. Direction was given that an addendum to the annual report be issued to correct the instance of non compliance. As a result the Gazer Mooney System received a final inspection score of 98.84%. No orders were issued. Noted instances of non-compliance included:

1. The annual report contained a “statement” regarding the scheduling requirements for bacteriological sampling that was found to be an incorrect interpretation of the appropriate section of O.Reg 170/03. The Inspector issued direction that an addendum that corrected the “statement” be published and added to all issued copies of the Annual Report. The addendum was issued by October 31, 2008 as per the direction.

All samples for Gazer Mooney were collected and analysed as per the regulatory requirements.

Copies of the Provincial Regulation 170/03 Annual and Summary Report for the Period January 1 to December 31, 2008 can be obtained at the following locations:

- Woods Station, 29 Waterworks Place (519-837-5627);
- The main branch of the Guelph Public Library;
- City Clerk's Office, City Hall, 59 Carden Street and
- Electronically on the City's website, [www.guelph.ca/waterworks](http://www.guelph.ca/waterworks).
- The Offices of the Township of Guelph Eramosa, 8348 Wellington Road 124 Rockwood

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**SECTION 2**  
**INTRODUCTION**



## Section 2 Introduction

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The mission of the City of Guelph Waterworks is to provide customers and the community with valued service through responsible water resource management. Waterworks provides and promotes reliable, cost effective systems for the safe production and delivery of consistently high quality water.

Guelph Waterworks is a municipally owned and operated water utility first established in 1879. The source of Guelph's drinking water is a series of 19 groundwater wells and a shallow groundwater collector system. Guelph's water supply and distribution system is comprised of the following infrastructure:

- 6 kilometres of 1,067 mm diameter water supply aqueduct;
- 5 underground storage reservoirs with a combined capacity of 48,000 cubic metres;
- 3 water towers with a combined capacity of 11,300 cubic metres;
- 600 kilometres of buried water main ranging in diameter from 100 mm to 900 mm;
- Approximately 3,700 watermain valves;
- Approximately 2,450 fire hydrants; and
- Approximately 37,200 water services and water meters.

This Guelph Waterworks System distribution infrastructure (including water mains, valves, fire hydrants, services, and meters) includes serves approximately 120,000 people within the City of Guelph and approximately 200 people in the Gazer Mooney System.

The replacement cost of the entire system is estimated to be \$327 million (un-inflated 2001) or approximately \$3,000 per capita. The 2008 Operating Budget and Capital Budget contained expenditures totalling \$ 23.1 million. All Guelph Waterworks System operations and capital projects are funded directly from the sale of water.

In 2008, a total of 17.75 million cubic metres of water was pumped and treated. Unaccounted for water (pumped from sources but not metered at an end user) totalled approximately 12 percent of all water pumped. The average daily water demand was 48,492 cubic metres. The highest daily use of water occurred on April 16 when 58,440 cubic metres of water was pumped. This is 8.18 percent higher than the maximum pumpage day of 2007.

In 2008, over 23,600 treated water microbiological and chemical quality tests were performed by certified operators and accredited, licensed laboratories on water samples collected throughout the water system. In all cases, the drinking water supplied to all customers was confirmed safe and was better than all Ontario and Canadian health-related guidelines.

## Regulatory Changes

In response to an outbreak of *Escherichia (E. coli):O157* in Walkerton, the Ontario Provincial Ministry of the Environment (MOE) announced Operation Clean Water and enacted the Safe Drinking Water Act (the Act) in 2002. The Act prescribes strict, mandatory requirements for testing and treatment of all municipal drinking water, and actions necessary when standards are not met. The regulation also identifies accountability for drinking water safety and supports the consumer's right to timely and accurate reporting of water quality information.

The Act has impacted Guelph Waterworks and its customers in the following ways:

- Previously, Guelph Waterworks relied on regular bacteriological testing to determine the chlorine levels required for disinfection of our various groundwater supplies. Minimum, prescribed levels of chlorine must now be added to all water supplies and maintained in all water distributed to customers. Customers have noticed and commented on the increased chlorine taste and odour in Guelph's water. Waterworks is working with the Ministry of the Environment to safely minimize chlorine use;
- The additional chlorine in Guelph's water is reacting with natural iron and manganese in the groundwater to create more frequent episodes of discoloured water for customers. Waterworks has increased watermain cleaning activities to limit these incidents and is planning water treatment upgrades to remove these minerals from our well supplies;
- Additional sampling and testing, and the generation of both this Summary Report and an Annual Report are required by the legislation;
- All water systems must follow minimum disinfection standards. This involves upgrades to system infrastructure including chemical systems, control and monitoring systems, and storage reservoirs;
- System upgrades have resulted in decreased system capacity in the short term as existing supplies undergo treatment upgrades to comply with new legislation. In 2008 Guelph Waterworks completed a number of supply facility upgrades including the reconstruction of the Carte Wells facility and the upgrades to the Glen Collector System to ensure compliance with regulations;
- Schedule 22 and Section 11 of Regulation 170/03 requires Guelph Waterworks to produce and distribute this annual Summary Report. Copies will be available for customers at Woods Station at 29 Waterworks Place, at the main branch of the Guelph Public Library and also at the City Clerk's office in City Hall, 59 Carden Street. An electronic copy of the report will also be available on the City's web site at [www.guelph.ca/waterworks](http://www.guelph.ca/waterworks).
- Under the amendment 15.1 of Ontario Regulation 170/03 (O.Reg 170/03) which governs the provision of drinking water in both the Guelph Water System and the Gazer Mooney System, lead sampling was required to be completed in residential locations (private plumbing), non-residential locations (private plumbing) and locations within the distribution

system. This regulated program is known as the Community Lead Testing Program. The required sampling specifies that for each system a certain number of samples be taken in each type of location in specified time periods throughout the year using a specific sampling protocol. The number of samples that are required is determined by the population that the water system serves. The time periods are identified as a winter period extending from December 15 until April 15 and a non-winter period extending from June 15 to October 15. The first sampling period began on December 15, 2007 and is known as round 1. The second period began on June 15, 2008 and is known as round 2.

Water rates have been increased significantly to pay for these activities and upgrades with the goal of providing a more secure water supply.

On October 30, 2007 the MOE issued a Consolidated Certificate of Approval (CC of A) 8929-77MHN9 which was in effect until February 13, 2008 when an amended CC of A 5825-7APLWY was issued. The CC of A acts as a license for water supply and distribution operations and sets out a schedule of mandatory facility upgrades to comply with the Act. In the current CC of A all listed major disinfection and treatment upgrades have been completed.

The Guelph water system is currently licensed as a MOE Class IV Water Distribution and Supply Sub-System. In 2008, 40 water operators and staff were licensed to operate and maintain the water system.

Figure A shows the locations of water supply facilities that were active in 2008.

Figure B shows the location of the Gazer/Mooney distribution system.

Figure A - 2008 Active Water Supply Facilities

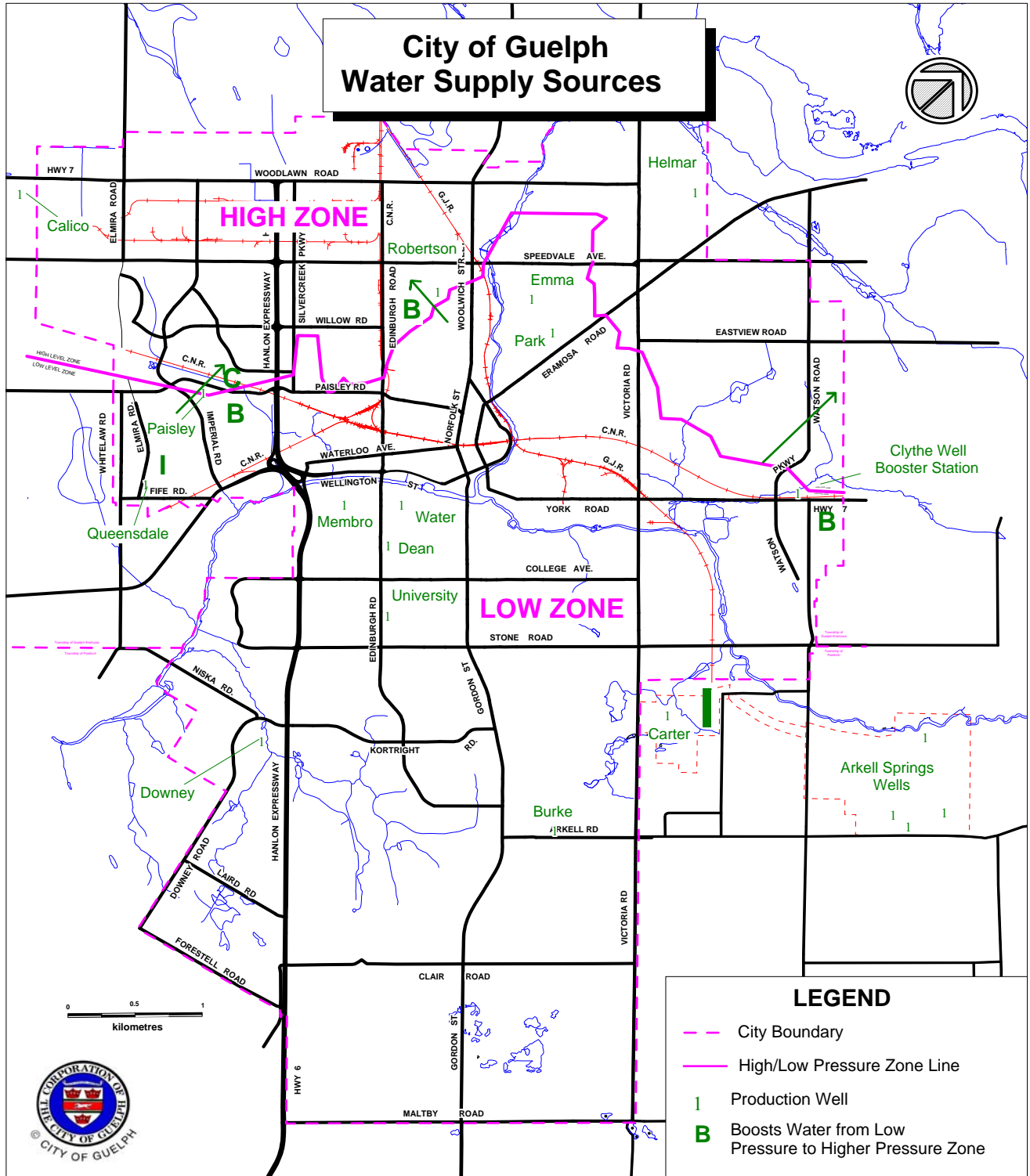
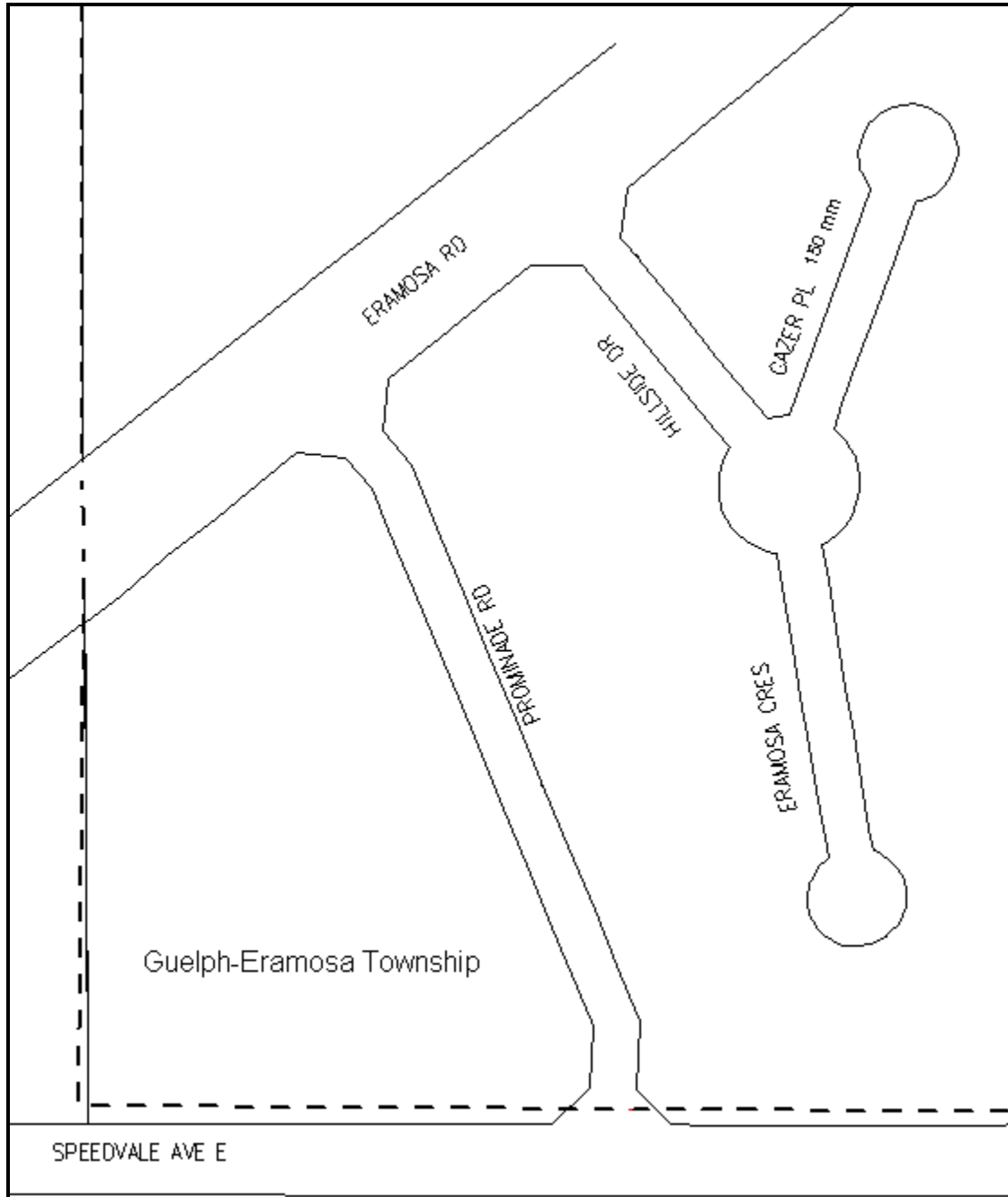


Figure B 2008 Gazer/Mooney Distribution System



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**SECTION 3**  
**WATER TREATMENT SUMMARY**

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## Section 3 Water Treatment Summary

This section describes the type and amount of drinking water treatment chemicals used in 2008.

In 2008, chlorine in the form of a 12 percent sodium hypochlorite solution was added to disinfect all water supplied to consumers. Liquid sodium silicate was also added to all water supplied from the Helmar and Queensdale wells to control high levels of naturally occurring iron and manganese. Through the act of sequestration, sodium silicate prevents this iron and manganese from precipitating when the water is treated and thereby prevents discoloured water. All treatment chemicals are rated for use in potable water.

In 2008, there were no periods of abnormal use of sodium hypochlorite or sodium silicate.

Tables A and B below summarize sodium hypochlorite and sodium silicate use at each supply facility in 2008.

<b>Table A - 2008 Sodium Hypochlorite Usage and Chlorine Dosage</b>				
<b>FACILITY</b>	<b>12 % SODIUM HYPOCHLORITE kg/Day<sup>a</sup></b>	<b>WATER PRODUCED Cubic Metres/Day<sup>a</sup></b>	<b>CHLORINE DOSE mg/L<sup>a</sup></b>	<b>PURPOSE</b>
Woods	351.2	23,813	1.77	Well water disinfection
Helmar	28.4	816	4.17	Well water disinfection
Park	78.1	5,898	1.59	Well water disinfection
Burke	80.8	5,385	1.80	Well water disinfection
Downey	51.2	3,939	1.56	Well water disinfection
Membro	36.5	3,291	1.33	Well water disinfection
Queensdale	20.8	763	3.26	Well water disinfection
Water	16.3	1,528	1.28	Well water disinfection
Dean	14.5	1,274	1.37	Well water disinfection
University	18.9	1,683	1.35	Well water disinfection
Calico	10.3	757	1.63	Well water disinfection
Emma	41.1	2,540	1.94	Well water disinfection
Clythe	0.0	3,214	0.00	Re-chlorination
Paisley	47.7	5,895	0.97	Re-chlorination & well water disinfection
Robertson	0.0	5,602	0.00	Re-chlorination

mg/L - milligrams per litre. Equivalent to parts per million.  
a - Average

**Table B - 2008 Sodium Silicate Usage and Dosage**

<b>FACILITY</b>	<b>SODIUM SILICATE kg/Day<sup>a</sup></b>	<b>WATER PRODUCED Cubic Metres/Day<sup>a</sup></b>	<b>SILICATE DOSE mg/L<sup>a</sup></b>	<b>PURPOSE</b>
Helmar	14.7	816	5.16	Iron control
Queensdale	14.0	763	5.26	Iron control

mg/L - milligrams per litre. Equivalent to parts per million.  
<sup>a</sup> Average based on days in operation

**SECTION 4**  
**SUMMARY OF WATER TEST RESULTS**

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## **Section 4 Summary of Water Test Results**

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This section summarizes water quality test results required by the Ontario Drinking-Water System Regulation 170/03 for the period January to December 2008.

In 2008, all water supplied to consumers met or bettered all health-related Ontario Drinking Water Standards. Of the 8,777 treated water bacteriological analyses performed on treated water, four tests or 0.045 percent indicated the presence of adverse indicator bacteria (see Table I). When re-sampled, the results did not confirm any water quality deterioration. At no time was *E. coli* detected in the systems' treated drinking water.

### **Sampling**

In 2008, over 23,600 microbiological, chemical and physical quality tests were performed on treated water supplied by Guelph Waterworks including water to the Gazer Mooney System. All samples were collected by certified Waterworks operators following industry standard and Ministry of the Environment (MOE) protocols. Analyses were performed by these same operators and by accredited independent laboratories on water samples collected throughout the water systems (supply and distribution).

In 2008, all water supplied to consumers met or bettered all health-related Ontario Drinking Water Standards.

Of the 8,777 treated water bacteriological analyses performed on treated water, four tests or 0.045 percent indicated the presence of adverse indicator bacteria (see Table I). When re-sampled, the results did not confirm any water quality deterioration. At no time was *E. coli* detected in the Guelph Water System treated drinking water or the Gazer Mooney System treated drinking water.

In total 14,909 chemical and physical analyses were performed

- Of the thirty-two sodium samples taken in the Guelph Waterworks System, twenty-seven showed reportable levels of sodium (>20mg/L) that were below the Aesthetic guideline of 200 mg/L(see Table I).
- Under the amendment 15.1 of Ontario Regulation 170/03 (O.Reg 170/03) which governs the provision of drinking water in both the City of Guelph and the Gazer Mooney Subdivision, lead sampling was required to be completed in residential locations (private plumbing), non-residential locations (private plumbing) and locations within the distribution system. This regulated program is known as the Community Lead Testing Program, the results of which are reported to both the participants and the MOE in a separate report. The required sampling specifies that a certain number of samples be taken in each type of location in specified time periods throughout the year using a specific sampling protocol. The number of samples that are required is determined by the population that the water system serves. The time periods are identified as a winter period extending from December 15 until April 15 and a non-winter period extending from June 15 to October 15. The first sampling period began on December 15, 2007 and is known as round 1. The second period began on June 15, 2008 and is known as round 2.

- In round 1 of the regulated community lead testing program for the Guelph Waterworks System, 267 samples were analyzed for lead., Of the 230 samples taken on private plumbing, 27 samples showed a value of lead above 0.01mg/L. Of the 37 samples taken from the public distribution system for the Community Lead testing program, zero samples showed a level of lead above 0.01mg/L.
- In round 1 of the regulated community lead testing program for the Gazer Mooney System, 22 samples were analyzed for lead., Of the 20 samples taken on private plumbing, 0 samples showed a value of lead above 0.01mg/L. Of the 2 samples taken from the public distribution system for the Community Lead testing program, none of the samples showed a level of lead above 0.01mg/L.
- In round 2 of the regulated community lead testing program for the Guelph Waterworks System, 270 samples were analyzed for lead., Of the 234 samples taken on private plumbing, 36 samples showed a value of lead above 0.01mg/L. Of the 36 samples taken from the public distribution system for the Community Lead testing program, zero samples showed a level of lead above 0.01mg/L.
- In round two of the regulated community lead testing program for the Gazer Mooney System, 22 samples were analyzed for lead., Of the 20 samples taken on private plumbing, 0 samples showed a value of lead above 0.01mg/L. Of the 2 samples taken from the public distribution system for the Community Lead testing program, 1 sample showed a level of lead above 0.01mg/L. Subsequent resampling DID NOT confirm the presence of lead above 0.1 mg/L.

In a separate monitoring program, four samples of the public distribution system water from the Guelph Waterworks System indicated lead values above the regulatory limit of 0.01mg/L, but subsequent resampling DID NOT confirm the presence of lead above the regulatory limit in the public distribution system.

All other chemical sampling met regulatory requirements for their specific chemical parameters

In 2008, Waterworks operated and maintained all water supply and distribution systems in such a manner that water supplied to all consumers serviced by the system met the requirements of the Safe Drinking Water Act, 2002. All operation and maintenance duties were performed by certified, adequately trained operators.

The following Tables C1 through H2 provide a summary of 2008 laboratory and process parameter results. In general, Guelph Waterworks System water quality test results also pertain to the water provided to the Gazer Mooney System water distribution system although some specific testing is performed within the Gazer Mooney System

A confirmed adverse sample requires two consecutive samples, where both results are consistent and demonstrate non-compliance with a legislative water quality guideline. Adverse sample results are always resampled for confirmation due to the potential for false positive results inherent in any water sampling program.

**TABLE C1 - 2008 Guelph Water System Supply Bacteriological Results Summary**

Parameter	O.D.W.S.	Total Samples	Confirmed Adverse Samples	Detects**	Range	Typical Source of Contaminant
Total Coliform count/100mL	0*	672	0	1 <sup>A</sup>	0 - 10	Indicates possible presence of fecal matter
E.Coli count/100mL	0*	672	0	0	N/A	Definite indicator of fecal matter
Heterotrophic Plate Count count/100mL	500 <sup>C</sup>	669	N/A	86	0 - 320	Indicator of water quality deterioration
Background Count 200 cfu/100mL	200 <sup>C</sup>	672	N/A	17	0 - >201	Indicator of water quality deterioration
Raw Water Bacti Tests <sup>B</sup>	N/A	3,333	N/A	N/A	N/A	Indicator of Environmental Water Quality

O.D.W.S - Regulation 169/03 Ontario Drinking Water Standards

N/A - Not Applicable

mL – millilitre

\* Indicator of Adverse Water Quality if presence confirmed in treated water.

\*\* Detect does not automatically equal adverse. Confirmation samples, when taken, were compliant except in raw samples where resampling does not apply.

A – see Table I , # 11.

B – raw water bacteriological tests include tests for E.Coli, Total Coliform, Background Bacteria and Heterotrophic Plate Count. Raw water quality is monitored for information on source water quality. Data for raw water is not individually reported.

C - Operational guideline only – reporting not required.

**TABLE C2 - 2008 Gazer Mooney System Bacteriological Results Summary**

Parameter	O.D.W.S.	Total Samples	Confirmed Adverse Samples	Detects**	Range	Typical Source of Contaminant
Total Coliform count/100mL	0*	55	0	0	N/A	Indicates possible presence of fecal matter
E.Coli count/100mL	0*	55	0	0	N/A	Definite indicator of fecal matter
Heterotrophic Plate Count count/100mL	500 <sup>A</sup>	54	0	11	0 - 4	Indicator of water quality deterioration
Background Count 200 cfu/100mL	200 <sup>A</sup>	55	0	3	0 - 29	Indicator of water quality deterioration

O.D.W.S - Regulation 169/03 Ontario Drinking Water Standards

N/A - Not Applicable

mL – millilitre

\* Indicator of Adverse Water Quality if Confirmed in Treated Water.

\*\* Detect does not equal adverse. Confirmation samples, when taken, were compliant.

A - Operational guideline only – reporting not required.

**TABLE D - 2008 Guelph Water System Distribution Bacteriological Results Summary**

Parameter	O.D.W.S.	Total Samples	Confirmed Adverse Samples	Detects**	Range	Typical Source of Contaminant
Total Coliform count/100mL	0*	1,788	0	1 <sup>B</sup>	0 - 2	Indicates possible presence of Pathogenic organisms
E.Coli count/100mL	0*	1,788	0	0	N/A	Definite indicator of fecal matter
Heterotrophic Plate Count count/100mL	500 <sup>A</sup>	737	N/A	116	0 - 180	Indicator of water quality deterioration
Background Counts 200 cfu/100mL	200 <sup>A</sup>	1,788	N/A	68	0 - 230	Indicator of water quality deterioration

O.D.W.S - Regulation 169/03 Ontario Drinking Water Standards

N/A - Not Applicable

mL – millilitre

\* Indicator of Adverse Water Quality if Confirmed in Treated Water.

\*\* Detect does not equal adverse. Confirmation samples were compliant.

A - Operational guideline only – reporting not required .

B – See Table I, # 3.

**TABLE E1 - 2008 Guelph Water System Supply & Distribution Process  
Parameter Results Summary**

Parameter	O.D.W.S.	Total Samples	Confirmed Adverse Samples	Average	Range	Health Exceedences	Notes
Treated Turbidity in Supply (NTU) <sup>a</sup>	1	365	N/A	0.14	0.05 – 0.31	NO	Indicator of particles in water
Raw Turbidity in Supply (NTU)	N/A	209	N/A	0.19	0.05 - 2.89	NO	Indicator of particles in water
Free Chlorine in Supply (mg/L)	0.06 - 4.0	4402	0	0.77	0.20 – 1.75	NO	MOE recommends 0.2 mg/L to maintain microbiological quality
Free Chlorine in Distribution (mg/L)	0.06 - 4.0	4191	0	0.71	0.17 – 1.21	NO	MOE recommends 0.2 mg/L to maintain microbiological quality

O.D.W.S - Regulation 169/03 Ontario Drinking Water Standards.

NTU - Nephelometric Turbidity Units.

mg/L – milligrams per litre. Equivalent to parts per million.

Note: above results are based on manual measurements. Continuous monitoring data is not captured in this report .

**Table E2 - 2008 Gazer Mooney System Process Parameter Results Summary**

<b>Parameter</b>	<b>O.D.W.S.</b>	<b>Total Samples</b>	<b>Confirmed Adverse Samples</b>	<b>Average</b>	<b>Range</b>	<b>Health Exceedences</b>	<b>Notes</b>
Free Chlorine in Distribution (mg/L)	0.06-4.0	366	0	0.56	0.35 - 0.87	NO	MOE recommends 0.2 mg/L to maintain microbiological quality

O.D.W.S. - Regulation 169/03 Ontario Drinking Water Standards  
 mg/L - milligrams per litre. Equivalent to parts per million

**TABLE F - 2008 Reg. 170/03 Guelph Water System Schedule 23 Results**

Parameter	O.D.W.S. mg/L	Total Samples	Samples Above Detection	Average mg/L	Range mg/L	Health Exceedance	Typical Source of Contaminant
Antimony	0.006	4	4	0.0011	0.0009 – 0.0015	NO	Natural Component of Water
Arsenic	0.025	4	0	N/A	N/A	NO	Natural Component of Water
Barium	1	4	4	0.059	0.055 – 0.062	NO	Natural Component of Water
Boron	5	4	4	0.068	0.058 – 0.081	NO	Natural Component of Water
Cadmium	0.005	4	0	N/A	N/A	NO	Natural Component of Water
Chromium	0.05	4	0	N/A	N/A	NO	Natural Component of Water
Mercury*	0.001	0	N/A	N/A	N/A	NO	Rare in Groundwater
Selenium	0.01	4	0	N/A	N/A	NO	Natural Component of Water
Uranium	0.1	4	4	0.0021	0.0019 – 0.0021	NO	Natural Component of Water

O.D.W.S - Regulation 169/03 Ontario Drinking Water Standards.

N/A – not applicable

mg/L - milligrams per litre. Equivalent to parts per million.

< - less than

\* Mercury sampling required once every 3 years - not required in this reporting period.

**TABLE G - 2008 Reg. 170/03 Guelph Water System Schedule 24  
Results Summary**

Parameter	O.D.W.S. (mg/L)	Total Samples	Samples Above Detection	Average mg/L	Range mg/L	Health Exceedance
Benzene	0.005	58	0	N/A	N/A	NO
Carbon Tetrachloride	0.005	58	0	N/A	N/A	NO
Chlorobenzene (monochlorobenzene)	0.08	58	0	N/A	N/A	NO
1,2-Dichlorobenzene	0.02	58	0	N/A	N/A	NO
1,4-Dichlorobenzene	0.005	58	0	N/A	N/A	NO
1,2-Dichloroethane* (1,1-dichloroethane)	0.005					NO
1,1-Dichloroethylene (Vinylidene Chloride)	0.014	58	0	N/A	N/A	NO
Dichloromethane	0.05	58	0	N/A	N/A	NO
Tetrachloroethylene (perchloroethylene)	0.03	58	3	0.0001	0 - 0.0001	NO
Trichloroethylene	0.005	58	20	0.001	0 - 0.0026	NO
Vinyl Chloride	0.002	58	0	N/A	N/A	NO
O.D.W.S - Regulation 169/03 Ontario Drinking Water Standards N/A – not applicable mg/L - milligrams per litre. Equivalent to parts per million < - less than * 1,2-Dichloroethane only done every 3 years						

**Table H1 - 2008 Guelph Water System Supply Miscellaneous Water Quality Results Summary**

<b>Parameters</b>	<b>O.D.W.S. mg/L</b>	<b>Total Samples</b>	<b>Samples Above Detection</b>	<b>Average mg/L</b>	<b>Range mg/L</b>	<b>Health Exceedance</b>
Treated Water - Nitrate	10	54	39	0.9	0 - 4.9	NO
Treated Water - Nitrite	1.0	54	0	N/A	N/A	NO
Lead in Distribution System	0.01	88	37	0.0013	0 - 0.022 <sup>B</sup>	NO
Lead in Private Plumbing	N/A	537	199	0.0041	0.000 - 0.045	NO <sup>C</sup>
Trihalomethanes in Distribution System	0.1	4	4	0.0354	0.0193 - 0.0483	NO
Sodium	20 and 200 <sup>A</sup>	32	32	51	11 - 130	NO

O.D.W.S - Regulation 169/03 Ontario Drinking Water Standards.

< - less than

mg/L - milligrams per litre. Equivalent to parts per million.

A - sodium levels above 20mg/L are reportable to the MOE every five years. Maximum allowable at any time as an aesthetic objective is 200mg/L.

B –samples which indicated a lead value above the ODWS were re-samples and re-sampling did not confirm that the value was above the ODWS – see table I.

C – According to the WDGPH unit pregnant women and young children should avoid use of water containing lead above 0.01 mg/L.

**TABLE H2 - 2008 Gazer Mooney System Miscellaneous Water Quality Results Summary**

<b>Parameter</b>	<b>O.D.W.S. mg/L</b>	<b>Total Samples</b>	<b>Samples Above Detection</b>	<b>Average mg/L</b>	<b>Range mg/L</b>	<b>Health Exceedance</b>
Lead in Distribution System	0.01	9	6	0.0045	0 – 0.035	NO <sup>A</sup>
Lead in Private Plumbing	N/A	46	41	0.0018	0 – 0.0026	NO <sup>B</sup>
Trihalomethanes in Distribution System	0.1	4	4	0.0306	0.0226 – 0.0469	NO

O.D.W.S - Regulation 169/03 Ontario Drinking Water Standards.

N/A – not applicable

mg/L - milligrams per litre. Equivalent to parts per million.

A - samples which indicated a lead value above the ODWS were re-samples and re-sampling did not confirm that the value was above the ODWS – see table I.

B – According to the WDGPH unit pregnant women and young children should avoid use of water containing lead above 0.01 mg/L.

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**SECTION 5**  
**SUMMARY OF ADVERSE TEST RESULTS**  
**AND CORRECTIVE ACTIONS**

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## Section 5 Summary of Adverse Test Results and Corrective Actions

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This section summarizes adverse water quality test results and incidents, and corresponding corrective actions taken for the period January to December 2008.

Schedule 15.1 and 16 of the Drinking-Water Systems Regulation 170/03 prescribes the reporting procedures that must be followed when adverse water quality is observed or detected during routine testing. Waterworks contract laboratories must notify the MOE, the Wellington-Dufferin-Guelph Public Health (WDGPH), and the Waterworks Supervisor of the adverse result by phone. The Waterworks Supervisor must then again notify both by phone and in writing, the MOE and WDGPH of the adverse result and the conditions of operation at the time of sampling. If applicable, the Supervisor will then implement corrective actions such as resampling, increasing the chlorine dose, isolating a source, or flushing the system. Waterworks must then report the results of the corrective actions taken to both the MOE and WDGPH within seven days of the issue resolution.

When an adverse bacteriological or chemical result is detected, the first “corrective” action required under Schedule 17 of Regulation 170/03 is the resampling and testing of the source with the adverse result. It is the nature of both microbiological and chemical analysis to occasionally have false-positive results. If additional confirmatory adverse results are not detected, then routine monitoring resumes.

### Guelph Well Supply Summary of Adverse Results and Corrective Actions

In 2008 a total of 26 sample results were classified as adverse according to legislation or Waterworks policy (see Table I):

- Of the thirty-two sodium samples taken in the Guelph Waterworks System, twenty-seven showed reportable levels of sodium (>20mg/L) that were below the Aesthetic guideline of 200 mg/L(see Table I).
- Two samples initially indicated Total Coliform above the regulatory guideline (follow up sampling DID NOT confirm the presence of Total Coliform bacteria above the regulatory guideline);
- Two samples initially indicated results as “overgrown” and could not be evaluated. In the cases where a sample result is overgrown the result is considered as an adverse (follow up sampling DID NOT confirm the presence of bacteria above the regulatory guideline); and
- Three samples for lead in the Guelph Water System distribution system indicated a value for lead above 0.010 mg/L (max = 0.010). Subsequent resampling values did not confirm the initial result.
  - Six instances occurred where UV dosing dropped momentarily below the regulatory minimum of 40mJ/cm<sup>2</sup> at F.M Woods Station the Guelph Water System. The Wellington Dufferin Guelph Health Unit and the Ministry of the Environment were informed and no further action was required by the City of Guelph.

### **Gazer Mooney Distribution System Summary of Adverse Results and Corrective Actions**

- 1 sample for lead in the distribution system indicated a value for lead above 0.010 mg/L (max = 0.010). Subsequent resampling vales DID NOT confirm the initial result.

More detailed information on adverse results is provided in the following Table I.

**Table I - 2008 Summary of Adverse Test Results and Corrective Actions  
- Guelph Water System**

<b>#</b>	<b>Date</b>	<b>Location</b>	<b>Description</b>	<b>Corrective Action</b>	<b>Resample Results Good</b>
1	Feb-21	F.M. Woods Station	UV dosage below allowable limit of 24 mJ/cm <sup>2</sup>	Health Unit and MOE notified	Yes
2	Apr-15	Robertson Booster Station	Lead exceedence of 14 ug/L (ODWS = 10 ug/L)	Health Unit and MOE notified. Resampled at location, & up and down stream	Yes
3	May-22	F.M. Woods Station	2cfu of Total Coliforms (Max ODWS = 0 cfu)	Health Unit and MOE notified. Resampled at location, & up and down stream	Yes
4	Jun-20	F.M. Woods Station	UV dosage below allowable limit of 24 mJ/cm <sup>2</sup>	Health Unit and MOE notified	Yes
5	Jun-27	F.M. Woods Station	UV dosage below allowable limit of 24 mJ/cm <sup>2</sup>	Health Unit and MOE notified	Yes
6	Jul-9	F.M. Woods Station	UV dosage below allowable limit of 24 mJ/cm <sup>2</sup>	Health Unit and MOE notified	Yes
7	Jul-9	F.M. Woods Station	UV dosage below allowable limit of 24 mJ/cm <sup>2</sup>	Health Unit and MOE notified	Yes

ODWS. – Regulation 169 Ontario Drinking Water Standards  
 cfu = colony forming units  
 mg/L – milligrams per litre  
 ug/L – micrograms per litre  
 mj/cm<sup>2</sup> – millijoules per centimetre square  
 Note 1 – Sodium levels above 20mg/L are reportable to the MOE every five years. Maximum allowable at any time as anaesthetic objective is 200mg/L. Reporting times vary from location to location based on the concentration of sodium within the source waters – all other sources have been reported within the last 5 years

**Table I - 2008 Summary of Adverse Test Results and Corrective Actions  
(continued)**

	<b>Date</b>	<b>Location</b>	<b>Description</b>	<b>Corrective Action</b>	<b>Resample Results Good</b>
8	Jul-16	Hydrant H21-026	Lead exceedence of 22 ug/L (ODWS = 10 ug/L)	Health Unit and MOE notified. Resampled at location, up & down stream. Also at Woods Station source raw & treated.	Yes
9	Jul-28	F.M. Woods Station	UV dosage below allowable limit of 24 mJ/cm <sup>2</sup>	Health Unit and MOE notified	Yes
10	Aug-8	Hydrant H21-026	Lead exceedence of 15 ug/L (ODWS = 10 ug/L)	Health Unit and MOE notified. Resampled at location.	Yes
11	Aug-12	Membro Well	10cfu of Total Coliforms (Max ODWS = 0 cfu)	Health Unit and MOE notified. Resampled at location, & up and down stream	Yes
12	Aug-12	University Well	Overgrown	Health Unit and MOE notified. Resampled at location, & up and down stream	Yes
13	Aug-12	Queensdale Well	Overgrown	Health Unit and MOE notified. Resampled at location, & up and down stream	Yes
14	Nov-28	13 Sources <sup>A</sup>	Sodium exceedences - above 20 mg/L	Health Unit and MOE notified. Resampled at location.	Yes
<b>2008 Summary of Adverse Test Results and Corrective Actions Gazer Mooney System</b>					
14	Aug -15	Hydrant H16-038 <b>Gazer Mooney</b>	Lead exceedence of 35 ug/L (ODWS = 10 ug/L)	Health Unit and MOE notified. Resampled at location.	Yes
<p>ODWS. – Regulation 169 Ontario Drinking Water Standards                      cfu = colony forming units                      mg/L – milligrams per litre                      ug/L – micrograms per litre                      mj/cm<sup>2</sup> – millijoules per centimetre square                      Note 1 – Sodium levels above 20mg/L are reportable to the MOE every five years. Maximum allowable at any time as an aesthetic objective is 200mg/L. Reporting times vary from location to location based on the concentration of sodium within the source waters – all other sources have been reported within the last 5 years.                      A- See Section 9 Table K for details.</p>					

**SECTION 6**  
**SUMMARY OF MAINTENANCE**

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## **Section 6 Summary of Maintenance**

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This section summarizes the 2008 major operating and capital expenses incurred to maintain the water supply and distribution system.

The Waterworks Division of the Environmental Services Department is responsible for the supply and distribution of potable water to the citizens of Guelph. Water quality objectives established by the MOE are achieved through a combination of groundwater protection initiatives, disinfection of water from 19 groundwater wells and the maintenance of a distribution network consisting of almost 600 km of watermain. All Waterworks revenue is derived directly from the sale of water to customers.

The water programs and services described below contribute to the Waterworks and Wastewater vision:

“We will be a recognized leader in municipal water management, moving forward consistently at the forefront of our industry and setting a standard for others to follow.”

### **Regulatory Compliance**

In February 2002, the Ministry of the Environment (MOE) issued a Consolidated Certificate of Approval (CC of A) to Waterworks based on the findings of the *2001 Engineers Report*. The CC of A outlines the following requirements that have direct budgetary impact:

#### **A) Completion of Disinfection Upgrades in 2008**

Disinfection upgrades to the City’s water supply system have been substantially completed in 2008. Funding for these upgrades is split equally between the municipality, province and federal government with the City portion forecast at approximately \$6 million.

#### **B) Completion of Groundwater Under the Direct Influence of Surface Water (GUDI) Compliance Treatment Study and Potential Treatment Upgrades**

In July of 2002, the City completed and submitted for MOE review a GUDI study of five water sources. In August 2006, a revised CC of A was received listing additional treatment upgrades and a compliance schedule. The upgrades have been completed. These upgrades cost an additional \$16 million and have received Provincial and Federal support for a portion of this cost.

## Operating Budget Highlights and Sustaining Infrastructure

The Waterworks mission supports sustaining infrastructure to ensure reliable service. Over 80 percent of the water system is underground.

In 2008, Waterworks budgeted \$3.9 million and \$4.2 million to operate and maintain the water distribution and supply systems respectively.

The following maintenance activities were funded by the Waterworks Operating budget in 2008:

- Repair of 51 watermain breaks;
- Addition of 9.28 kilometres of new watermain;
- Replacement of 12 valves;
- Addition of 95 watermain valves;
- Repair of 53 fire hydrants;
- Addition of 50 hydrants;
- Addition of 724 new services;
- Removal of X services;
- Replacement of 1521 water meters,
- Installation of 724 new water meters and removal of 7 water meters from demolished properties;
- Flushing and swabbing 57 kilometres of watermain.
- Completion of Carter Well Upgrades;
- Completion of Glenn Collector System Upgrades and;
- Paisley Booster Station Refurbishment

No major maintenance was undertaken in the Gazer Mooney System except flushing and annual hydrant checks.

**SECTION 7  
COMPLIANCE WITH TERMS AND  
CONDITIONS OF THE CONSOLIDATED  
CERTIFICATE OF APPROVAL**

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## Section 7 Compliance with Terms and Conditions of the Consolidated Certificate of Approval

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Guelph Waterworks operated under two Consolidated Certificates of Approval (CC of A). CC of A 8929-77MHN9 (October 30, 2008) and 5825-7APLWY

A copy of the most recent CC of A is included as Appendix A of this report.

In 2008, Guelph Waterworks complied with all terms and conditions of each of the CCs of A. The following section briefly summarizes Waterworks' compliance with the main terms and conditions as listed in the various CCs of A.

### *Certificate of Approval Part 1 – Drinking-Water System Description*

The first section of the CC of A describes the various parts of the drinking water system operated by the City.

### *Certificate of Approval Part 2 – Definitions and Information*

This section of the CC of A provides standard MOE definitions of terms used in the CC of A.

### *Certificate of Approval Part 3 - General*

In 2008, Waterworks informed contractors working on the water supply and distribution systems of the requirements of regulations and legislation related to the work being conducted.

In accordance with Part 3 – General, Guelph Waterworks operated the drinking water system in accordance with the *Safe Drinking-Water Act, 2002*. Over 23,600 water quality tests were performed on Guelph drinking water in 2008. The results demonstrate that Guelph public distribution system water is safe, and are summarized in tables provided in Section 4 of this report. As well, Guelph Waterworks had valid Permits to Take Water for all municipal water supplies at the rates listed in the CC of A.

A copy of the CC of A was “kept in a conspicuous place so that it [was] available for reference by all persons responsible for all or part of the operation of the approved drinking-water system”.

All records required by or related in accordance with the CC of A have been, and are being retained for five years in a convenient location. Waterworks continues to maintain all records and information related to water quality monitoring, sampling and analyzing programs for a minimum period of five years.

#### ***Certificate of Approval Part 4 – Performance***

In accordance with Part 4 – Performance, Guelph Waterworks ensured that distribution flows did not exceed the maximum flow rates as set out in the CC of A, *Table 4.1: Rated Capacities*.

In accordance with Part 4.4 – Performance, Guelph Waterworks ensured that in 2008 the UV disinfection equipment operated at Emma and Water wells provided a minimum dose of 40 mJ/cm<sup>2</sup> at all times, and 24 mJ/cm<sup>2</sup> at F.M. During six incidents at F.M. Woods Pumping Station in the Guelph Water System, the UV dosage dropped momentarily below the minimum requirement as outlined by the CC of A. Disinfection by hypochlorination was maintained during these times.

#### ***Certificate of Approval Part 5 – Monitoring and Recording***

In accordance with Part 5 – Monitoring and Recording, Guelph Waterworks operated and maintained devices to measure flow rate and daily quantity of water being supplied from each source. All flow measuring devices were checked and calibrated in accordance with the manufacturer's instructions. In 2008, Waterworks verified the accuracy of each flow measuring device.

In 2008, Waterworks recorded total daily flows at each water supply. This information is provided in summary tables included in Appendix B of this report.

In accordance with Part 5.5 – Monitoring and Recording, Guelph Waterworks collected UV performance and flow data at the frequency outlined in the CC of A.

In accordance with Part 5.6 – Monitoring and Recording, Guelph Waterworks collected Arkell recharge and collector water quality data as mandated by the CC of A.

#### ***Certificate of Approval Part 6 – Operations and Maintenance***

In accordance with Part 6 – Operations and Maintenance, Guelph Waterworks ensured that all chemicals used in the operation of the drinking water system met all applicable standards set by the American Water Works Association (AWWA) and the American National Standards Institute (ANSI) safety criteria standards NSF/60 and NSF/61.

With regard to new stock, materials and infrastructure, Waterworks ensured that all new equipment, materials and chemicals comply with the AWWA and ANSI standards.

As well, an up-to date operations manual including all information required by the CC of A was maintained and available for reference by all persons responsible for all or part of the operation of the approved drinking-water system. As part of the operations manual, Waterworks maintained documentation and procedures for responding to customer complaints.

Waterworks maintained procedures for receiving, responding to, and documenting customer complaints. Staff received customer complaints and entered relevant information into the complaints database. This database allowed management to track and resolve issues and review trends in complaint information.

In 2008, a total of 443 complaints were recorded in the complaints database for both the Guelph Water System and the Gazer Mooney System. Many of these complaints were related to discoloured water caused by disruption of sediment in water mains. The following Table J summarizes the types of complaints received in 2006. "Other" refers to customer inquires related to health concerns, water meters and general information requests.

<b>TABLE J - 2008 Customer Water Quality Complaints Summary</b>		
<b>Number</b>	<b>Complaint Type</b>	<b>Complaint Group</b>
91	Water is Yellow, Brown, Black, White, Sandy	Appearance
5	Water Tastes of Chlorine, Sulphur, Metal, Stale	Taste/Odour
74	Water Pressure	Pressure
92	Meters, Hydrants, Other	Leaks
51	Watermain Breaks/service leaks	Suspected Main Breaks
130	Request for Shut Offs and Turn Ons, Inquiries, Other	Miscellaneous

Additionally, up-to-date Process and Instrumentation Diagrams and as-constructed drawings for the drinking water system were kept on site at each drinking water facility.

In 2008, Guelph Waterworks continued to follow written standard operating procedures for the notification of both the MOE and local health unit in the event of adverse water quality as defined by the Drinking Water Systems regulation.

Further, Guelph Waterworks continued to develop the Waterworks Emergency Plan to support the overall City of Guelph Emergency Plan. Staff training was provided on standard operating procedures related to incident and emergency response.

As well, Guelph Waterworks ensured the availability of adequate equipment and materials to assist with incident and emergency response.

*Certificate of Approval Part 7 – Future Alterations*

In 2008, there were no applicable terms and references included in Part 7 – Future Alterations

*Certificate of Approval Part 8 – Studies and Upgrades Required*

As required by condition 8.3 of the current CC of A, the installation of enhanced disinfection upgrades for the Carter Wells and Arkell Glen collector system commenced in 2004. These upgrades were completed in 2008.

As required by condition 8.5 (i) of the previous CC of A, the installation of backflow prevention devices on reservoir overflows was completed in October 2004. Re-chlorination system upgrades at Paisley Pumping Station and Robertson Booster Pumping Station were completed in October and November 2004 respectively.

The control system facility upgrades were completed by the mandatory deadline (December 31, 2006) to provide minimum functionality and alarming. The installation of further enhancements to the system is ongoing.

The correction of deficiencies with the Arkell Glenn Collectors was completed after the installation of the Arkell Glenn Collectors flow diversion chamber in 2008. The flow diversion chamber was constructed as part of the enhanced disinfection upgrade of the Arkell Glenn Collectors.

The interim measures listed in conditions 8.6 and 8.6.1 of the current CC of A to ensure enhanced disinfection at the Arkell Glenn Collectors and Carter Wells were maintained in 2008.

**SECTION 8  
NON-COMPLIANCE WITH TERMS  
AND CONDITIONS OF THE CONSOLIDATED CERTIFICATE OF  
APPROVAL AND REGULATIONS**

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## **Section 8 Non-Compliance with Terms and Conditions of the Certificate of Approval and Regulations**

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This section of the Summary Report consists of a short description of issues of non-compliance with the terms and conditions as listed in the CC of A and with applicable provincial regulations.

Based on regulatory requirements, and including the results of the 2008 Ministry of the Environment inspection of Guelph Waterworks, there were 5 instances of regulatory non-compliance related to water quality sampling documentation and reporting. Four Incidents occurred in the Guelph Well Supply System and one instance occurred in the Gazer Mooney Subdivision Distribution System

### **MOE Annual Inspection and Compliance with Acts and Regulations – Guelph Waterworks System**

In 2008, Guelph Waterworks had 4 instances of non-compliance with Ministry of the Environment regulations regarding drinking water as indicated by the Annual MOE Inspection Report. In addition there were six instances where a disinfection requirement outline in the CC of A was not met. As a result the Guelph Waterworks System received a final inspection score of 91.75%. No orders were issued. Noted instances of non-compliance included:

1. A single monthly raw water turbidity sample at Carter Wells was not completed – The MOE was informed. There was no health impact and no further action was required
2. During Annual MOE inspection it was noted that in that there were some inconsistencies in the CC of A descriptions. These description updates will be completed by Guelph Waterworks early in 2009 with the application for a Drinking Water Works Permit or by an application to amend the CC of A
3. It was noted that the values of sodium, an aesthetic parameter, were not reported to the Spill Action Center (SAC) within the five year regulatory window. The sodium values had been reported to Wellington Dufferin Guelph Public Health (WDGPH) and the MOE local offices annually through the annual report. Results were subsequently reported to SAC – no further action was required
4. Due to delays infrastructure upgrades continuous recording of parameters at four facilities was not completed for a portion of the 2008 reporting period. At all times during this period continuous monitoring was in place, disinfection requirements were met and continuous alarm protections were in place. The health of the public was not affected and the information recording infrastructure is currently in place. – no further action was required
5. In 2008, there were six instances in which Ultraviolet Disinfection values momentarily dropped below the regulatory limit. The Wellington Dufferin Guelph Health Unit and the Ministry of the Environment were informed and no further action was required by the City of Guelph. During these momentary UV drops disinfection was maintained by hypochlorination.

## **MOE Annual Inspection and Compliance with Acts and Regulations – Gazer Mooney System**

In 2008, Guelph Waterworks had one instance of non-compliance with Ministry of the Environment regulations regarding a statement in the 2007 Annual and Summary Report. Direction was given that an addendum to the annual report be issued to correct the instance of non compliance. As a result the Gazer Mooney System received a final inspection score of 98.84%. No orders were issued. Noted instances of non-compliance included:

1. The Annual Report contained a “statement” regarding the scheduling requirements for bacteriological sampling that was found to be an incorrect interpretation of the appropriate section of O.Reg 170/03. The Inspector issued direction that an addendum that corrected the “statement” be published and added to all issued copies of the Annual Report. The addendum was issued by October 31, 2008 as per the direction. All samples for Gazer Mooney System were collected and analysed as per the regulatory requirements.

**SECTION 9**  
**SUMMARY OF SODIUM ANALYTICAL RESULTS**

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## Section 9 Summary of Sodium Analytical Results

Guelph Waterworks is required to periodically report to the Wellington-Dufferin-Guelph Public Health Unit (WDGPH) the sodium sampling results for all facilities. This information has been incorporated into this Summary Report in order to effectively disseminate this information to all Waterworks customers and other interested parties. The MOE requires that sodium sampling be conducted every five years for all points of entry into the water distribution system. The maximum results of the 2008 sampling are included in Table K.

<b>Table K – Guelph Waterworks System Maximum Sodium Results</b>	
<u>Facility</u>	2008 Maximum Sodium Concentration (mg/L)
Burkes Well (treated)	26
Downey Well (treated)	52
University Well (treated)	75
Dean Well (treated)	110
Membro Well (treated)	130
Water Street Well (treated)	92
Paisley Station	55
Queensdale Well (treated)	36
Calico Well (treated)	26
Helmar Well (treated)	28
Park Wells (combined, treated)	110
Emma Well (treated)	60
F.M.Woods Station (treated)	21

**Note:** Sodium values are reportable every five years when values are above 20mg/L. Reporting times to the Ministry of the Environment varies from location to location based on the time of the last report and the value of sodium in the source water. Sodium is measured for operational purposes on an annual frequency at all sources – as per above values above 20mg/L do not necessarily require additional reporting.

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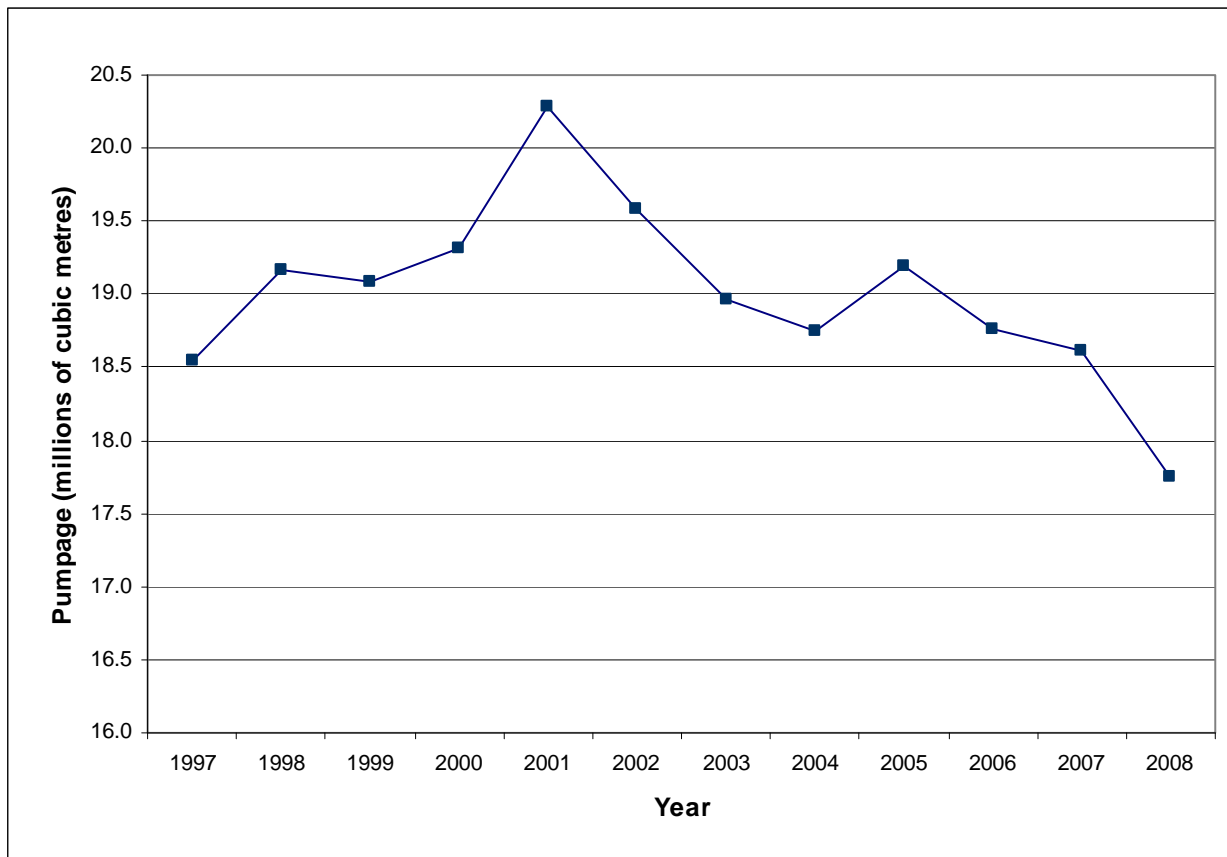
**SECTION 10**  
**SUMMARY OF QUANTITY OF WATER SUPPLIED**

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## Section 10 Summary of Quantity of Water Supplied

In 2008, 19 water supplies were operated to satisfy customer water demand. A total of 17.75 million cubic metres of water was pumped to the water distribution system. This total represents approximately a 4.4% percent decrease from the previous year's total. A graph showing the ten year trend in total water pumpage is shown in Figure C.

**Figure C - Ten Year Trend of Total Annual Water Pumpage**



In 2008, a total of 17.75 million cubic metres of water was pumped and treated. Lost water totalled approximately 12 percent of all water pumped. The average daily water demand was 48,492 cubic metres. The highest daily use of water occurred on April 16 when 58,440 cubic metres of water was pumped. This is 8.18 percent lower than the maximum pumpage day of 2007.

Tables L to N located in Appendix B detail 2008 monthly pumpage summaries from all active water supplies. Table X in Appendix C details 2008 monthly maximum instantaneous flow from all active water supplies.

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**APPENDIX A**  
**CONSOLIDATED CERTIFICATE OF APPROVAL**

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**Back Page of CC of A**

**APPENDIX B**  
**2008 MONTHLY PUMPAGE SUMMARIES**



**Table L - 2008 Monthly Pumpages (m<sup>3</sup>) for Wells (Before Treatment) as Governed by Permits to Take Water**

		Park	Calico	Downey	Burkes	University	Dean	Queensdale	Water
PTTW Values (m <sup>3</sup> /day)		10300	5237	5237	6547	3300	2300	5237	3400
January	Average	5342	733	3933	5490	1753	1346	221	1202
	Maximum	5813	810	4139	5712	1928	1479	807	2188
	Total	165596	22730	121931	170179	54356	41714	6842	37251
February	Average	5699	699	4001	5454	1598	1333	715	1299
	Maximum	6586	769	4016	5507	1930	1490	896	1850
	Total	165282	20274	116041	158160	46356	38658	20735	37667
March	Average	6570	661	3979	5441	1715	1338	635	1697
	Maximum	6684	915	4012	5505	1780	1369	836	1881
	Total	203655	20501	123364	168658	53164	41470	19687	52614
April	Average	5899	673	4001	5397	1731	1034	771	1665
	Maximum	6927	939	4023	5480	1987	1374	872	2093
	Total	176962	20181	120019	161913	51939	31009	23119	49942
May	Average	4661	805	3977	5451	1723	820	712	1299
	Maximum	5277	822	4008	5487	1778	1323	839	1968
	Total	144495	24958	123278	168975	53420	25432	22073	40264
June	Average	4819	763	3916	5374	1695	1280	775	1389
	Maximum	5315	844	3994	5477	1827	1373	874	1957
	Total	144556	22904	117476	161228	50860	38395	23249	41676
July	Average	6240	738	3561	5420	1529	1254	747	1433
	Maximum	6694	846	3977	5463	1712	1304	784	2021
	Total	193455	22890	110380	168035	47388	38869	23160	44415
August	Average	6286	820	3380	5431	1436	1243	746	367
	Maximum	6632	873	3875	5454	1668	1376	807	2059
	Total	194857	25405	104780	168348	44524	38539	23113	11390
September	Average	6419	780	4050	5367	1633	1256	733	132
	Maximum	6491	821	4326	5448	1740	1346	804	597
	Total	192562	23413	121513	161017	48977	37689	21975	3953
October	Average	6509	768	4211	5308	1288	1244	717	1442
	Maximum	6575	832	4241	5381	1960	1302	818	1970
	Total	201766	23811	130537	164552	39927	38576	22232	44687
November	Average	6354	767	4069	5267	1855	1229	821	919
	Maximum	6561	803	4231	5370	1931	1331	897	1822
	Total	190626	23023	122058	158018	55657	36881	24620	27557
December	Average	5968	771	4199	5222	1815	1206	832	1371
	Maximum	6208	793	4227	5254	1877	1234	880	2085
	Total	185003	23888	130168	161868	56271	37372	25802	42489
Totals (year)	Average	5898	749	3939	5385	1647	1215	701	1186
	Maximum	6927	939	4326	5712	1987	1490	897	2188
	Total	2158815	273978	1441545	1970951	602839	444604	256607	433905

**Table L – 2008 Monthly Pumpages (m<sup>3</sup>) for Wells (Before Treatment) as Governed by Permits to Take Water (continued)**

		<b>Emma</b>	<b>Membro</b>	<b>Helmar</b>	<b>Paisley</b>	<b>Carters</b>	<b>Arkell 1</b>	<b>Arkell 6</b>	<b>Arkell 7</b>
<b>PTTW Values (m<sup>3</sup>/day)</b>		<b>3100</b>	<b>6050</b>	<b>3273</b>	<b>3200</b>	<b>7856</b>	<b>3273</b>	<b>19640</b>	<b>19640</b>
January	Average	2673	3260	861	0	0	865	5630	5642
	Maximum	2820	4167	1026	0	0	1666	6275	6177
	Total	82865	101046	26688	0	0	26806	174516	174887
February	Average	2697	3872	798	0	0	949	5552	5272
	Maximum	2853	4161	1023	0	0	1495	6301	6209
	Total	78227	112288	23150	0	0	27525	161007	152889
March	Average	2428	3023	785	0	0	866	4904	5435
	Maximum	2797	3711	802	0	0	1123	6136	6155
	Total	75282	93704	24340	0	0	26833	152027	168475
April	Average	2816	3105	817	0	3263	540	3650	2480
	Maximum	2883	3859	833	0	5908	1265	5566	5653
	Total	84480	93141	24523	0	97878	16193	109491	74393
May	Average	2774	2398	801	1151	1796	432	2963	2933
	Maximum	2884	3580	841	1248	3814	1307	5092	5332
	Total	85989	74328	24843	35692	55672	13384	91846	90938
June	Average	2722	2534	784	1194	1965	372	2387	2834
	Maximum	2861	3558	842	1224	3552	1289	5752	4284
	Total	81656	76027	23518	35834	58958	11145	71595	85008
July	Average	2449	2906	785	1171	2220	860	3148	2779
	Maximum	2790	3735	846	1187	4996	1284	5372	4769
	Total	75925	90098	24331	36308	68811	26667	97577	86135
August	Average	1835	2599	366	1170	1791	665	3129	3239
	Maximum	2657	3559	832	1194	4038	1280	5020	4701
	Total	56878	80573	11341	36284	55514	20630	97007	100422
September	Average	2089	3358	0	1190	3371	790	3363	2710
	Maximum	2650	3420	0	1204	5320	1278	5322	4537
	Total	62672	100731	0	35690	101130	23700	100886	81291
October	Average	1607	3063	0	1199	3371	730	3193	3232
	Maximum	2795	3598	0	1205	5835	1276	4629	5934
	Total	49812	94967	0	37166	104515	22631	98981	100183
November	Average	1589	3627	0	1176	2897	887	3931	3838
	Maximum	2802	3966	0	1196	5647	1374	5982	6059
	Total	47662	108813	0	35292	86898	26620	117940	115131
December	Average	1591	2691	0	891	3377	806	3442	3878
	Maximum	2741	3702	0	1174	5885	1271	5097	6046
	Total	49319	83413	0	27618	104683	24974	106691	120206
Totals (year)	Average	2270	3030	499	765	2006	730	3769	3688
	Maximum	2884	4167	1026	1248	5908	1666	6301	6209
	Total	830767	1109129	182734	279884	734059	267108	1379564	1349958

**Table L – 2008 Monthly Pumpages (m<sup>3</sup>) for Wells (Before Treatment)  
as Governed by Permits to Take Water (continued)**

		<b>Arkell 8</b>	<b>Arkell Collectors</b>	<b>Recharge</b>
<b>PTTW Values (m<sup>3</sup>/day)</b>		<b>19640</b>	<b>25000</b>	<b>9092</b>
January	Average	5749	5376	0
	Maximum	6370	6260	0
	Total	178224	166649	0
February	Average	5226	5289	0
	Maximum	6300	6110	0
	Total	151550	153368	0
March	Average	5307	5816	0
	Maximum	6210	8152	0
	Total	164510	180308	0
April	Average	4986	10023	2244
	Maximum	5980	14647	8870
	Total	149580	300676	67331
May	Average	2420	14545	5036
	Maximum	5640	17770	8870
	Total	75010	450902	156125
June	Average	2035	15574	7183
	Maximum	4300	17887	8767
	Total	61050	467227	215481
July	Average	2100	13582	5625
	Maximum	4510	16146	8508
	Total	65108	421053	174389
August	Average	1753	14619	7646
	Maximum	4270	15785	8267
	Total	54340	453203	237016
September	Average	3590	13438	7482
	Maximum	5330	14143	8333
	Total	107690	403146	224445
October	Average	3073	10409	6715
	Maximum	4800	12881	8092
	Total	95260	322678	208152
November	Average	4108	6849	3492
	Maximum	6000	11147	8092
	Total	123229	205457	104746
December	Average	3984	4362	0
	Maximum	6350	8456	0
	Total	123500	135207	0
Totals (year)	Average	3686	10000	3791
	Maximum	6370	17887	8870
	Total	1349051	3659874	1387685

**Table M – 2008 Monthly Pumpages (m<sup>3</sup>) for Treated Water as per The Consolidated Certificate of Approval**

		Park	Calico	Downey	Burkes	University	Dean	Queensdale	Water
PTTW Values (m <sup>3</sup> /day)		10300	5237	5237	6547	3300	2300	5237	3400
January	Average	5342	733	3933	5490	1753	1346	221	1202
	Maximum	5813	810	4139	5712	1928	1479	807	2188
	Total	165596	22730	121931	170179	54356	41714	6842	37251
February	Average	5699	699	4001	5454	1598	1333	715	1299
	Maximum	6586	769	4016	5507	1930	1490	896	1850
	Total	165282	20274	116041	158160	46356	38658	20735	37667
March	Average	6570	661	3979	5441	1715	1338	635	1697
	Maximum	6684	915	4012	5505	1780	1369	836	1881
	Total	203655	20501	123364	168658	53164	41470	19687	52614
April	Average	5899	673	4001	5397	1731	1034	771	1665
	Maximum	6927	939	4023	5480	1987	1374	872	2093
	Total	176962	20181	120019	161913	51939	31009	23119	49942
May	Average	4661	805	3977	5451	1723	820	712	1299
	Maximum	5277	822	4008	5487	1778	1323	839	1968
	Total	144495	24958	123278	168975	53420	25432	22073	40264
June	Average	4819	763	3916	5374	1695	1280	775	1389
	Maximum	5315	844	3994	5477	1827	1373	874	1957
	Total	144556	22904	117476	161228	50860	38395	23249	41676
July	Average	6240	738	3561	5420	1529	1254	747	1433
	Maximum	6694	846	3977	5463	1712	1304	784	2021
	Total	193455	22890	110380	168035	47388	38869	23160	44415
August	Average	6286	820	3380	5431	1436	1243	746	367
	Maximum	6632	873	3875	5454	1668	1376	807	2059
	Total	194857	25405	104780	168348	44524	38539	23113	11390
September	Average	6419	780	4050	5367	1633	1256	733	132
	Maximum	6491	821	4326	5448	1740	1346	804	597
	Total	192562	23413	121513	161017	48977	37689	21975	3953
October	Average	6509	768	4211	5308	1288	1244	717	1442
	Maximum	6575	832	4241	5381	1960	1302	818	1970
	Total	201766	23811	130537	164552	39927	38576	22232	44687
November	Average	6354	767	4069	5267	1855	1229	821	919
	Maximum	6561	803	4231	5370	1931	1331	897	1822
	Total	190626	23023	122058	158018	55657	36881	24620	27557
December	Average	5968	771	4199	5222	1815	1206	832	1371
	Maximum	6208	793	4227	5254	1877	1234	880	2085
	Total	185003	23888	130168	161868	56271	37372	25802	42489
Totals (year)	Average	5898	749	3939	5385	1647	1215	701	1186
	Maximum	6927	939	4326	5712	1987	1490	897	2188
	Total	2158815	273978	1441545	1970951	602839	444604	256607	433905

**Table M – 2008 Monthly Pumpages (m<sup>3</sup>) for Treated Water as per The Consolidated Certificate of Approval (continued)**

		<b>Emma</b>	<b>Membro</b>	<b>Helmar</b>	<b>Paisley</b>	<b>Carters</b>	<b>Arkell 1</b>	<b>Arkell 6</b>	<b>Arkell 7</b>
<b>PTTW Values (m<sup>3</sup>/day)</b>		<b>3100</b>	<b>6050</b>	<b>3273</b>	<b>3200</b>	<b>7856</b>	<b>3273</b>	<b>19640</b>	<b>19640</b>
January	Average	2673	3260	861	0	0	865	5630	5642
	Maximum	2820	4167	1026	0	0	1666	6275	6177
	Total	82865	101046	26688	0	0	26806	174516	174887
February	Average	2697	3872	798	0	0	949	5552	5272
	Maximum	2853	4161	1023	0	0	1495	6301	6209
	Total	78227	112288	23150	0	0	27525	161007	152889
March	Average	2428	3023	785	0	0	866	4904	5435
	Maximum	2797	3711	802	0	0	1123	6136	6155
	Total	75282	93704	24340	0	0	26833	152027	168475
April	Average	2816	3105	817	0	3263	540	3650	2480
	Maximum	2883	3859	833	0	5908	1265	5566	5653
	Total	84480	93141	24523	0	97878	16193	109491	74393
May	Average	2774	2398	801	1151	1796	432	2963	2933
	Maximum	2884	3580	841	1248	3814	1307	5092	5332
	Total	85989	74328	24843	35692	55672	13384	91846	90938
June	Average	2722	2534	784	1194	1965	372	2387	2834
	Maximum	2861	3558	842	1224	3552	1289	5752	4284
	Total	81656	76027	23518	35834	58958	11145	71595	85008
July	Average	2449	2906	785	1171	2220	860	3148	2779
	Maximum	2790	3735	846	1187	4996	1284	5372	4769
	Total	75925	90098	24331	36308	68811	26667	97577	86135
August	Average	1835	2599	366	1170	1791	665	3129	3239
	Maximum	2657	3559	832	1194	4038	1280	5020	4701
	Total	56878	80573	11341	36284	55514	20630	97007	100422
September	Average	2089	3358	0	1190	3371	790	3363	2710
	Maximum	2650	3420	0	1204	5320	1278	5322	4537
	Total	62672	100731	0	35690	101130	23700	100886	81291
October	Average	1607	3063	0	1199	3371	730	3193	3232
	Maximum	2795	3598	0	1205	5835	1276	4629	5934
	Total	49812	94967	0	37166	104515	22631	98981	100183
November	Average	1589	3627	0	1176	2897	887	3931	3838
	Maximum	2802	3966	0	1196	5647	1374	5982	6059
	Total	47662	108813	0	35292	86898	26620	117940	115131
December	Average	1591	2691	0	891	3377	806	3442	3878
	Maximum	2741	3702	0	1174	5885	1271	5097	6046
	Total	49319	83413	0	27618	104683	24974	106691	120206
Totals (year)	Average	2270	3030	499	765	2006	730	3769	3688
	Maximum	2884	4167	1026	1248	5908	1666	6301	6209
	Total	830767	1109129	182734	279884	734059	267108	1379564	1349958

**Table M – 2008 Monthly Pumpages (m<sup>3</sup>) for Treated Water as per The Consolidated Certificate of Approval (continued)**

		Arkell 8	Arkell Collectors	Recharge	Paisley Discharge	Clythe	F.M. Woods
<b>PTTW Values (m<sup>3</sup>/day)</b>		<b>19640</b>	<b>25000</b>	<b>9092</b>	<b>13738</b>	<b>5443</b>	<b>65000</b>
January	Average	5749	5376	0	4022	3207	20691
	Maximum	6370	6260	0	5880	3861	25480
	Total	178224	166649	0	124690	99425	641420
February	Average	5226	5289	0	4187	3199	19847
	Maximum	6300	6110	0	5470	3737	23350
	Total	151550	153368	0	121420	92768	575560
March	Average	5307	5816	0	4226	3225	19864
	Maximum	6210	8152	0	7330	3725	23670
	Total	164510	180308	0	131010	99972	615790
April	Average	4986	10023	2244	4191	3259	22453
	Maximum	5980	14647	8870	5770	3847	29680
	Total	149580	300676	67331	125740	97760	673590
May	Average	2420	14545	5036	4130	3245	22569
	Maximum	5640	17770	8870	6300	3869	28050
	Total	75010	450902	156125	128020	100587	699630
June	Average	2035	15574	7183	4460	3117	22874
	Maximum	4300	17887	8767	6490	3984	28420
	Total	61050	467227	215481	133790	93523	686210
July	Average	2100	13582	5625	4389	3173	22012
	Maximum	4510	16146	8508	5790	3702	27000
	Total	65108	421053	174389	136050	98365	682370
August	Average	1753	14619	7646	4441	3121	22116
	Maximum	4270	15785	8267	5720	3607	26230
	Total	54340	453203	237016	137660	96756	685590
September	Average	3590	13438	7482	4261	3931	23852
	Maximum	5330	14143	8333	6760	5293	29125
	Total	107690	403146	224445	127830	117930	715550
October	Average	3073	10409	6715	3997	3432	21109
	Maximum	4800	12881	8092	7790	3892	26650
	Total	95260	322678	208152	123910	106405	654390
November	Average	4108	6849	3492	3516	3414	19663
	Maximum	6000	11147	8092	4060	3856	21930
	Total	123229	205457	104746	105480	102430	589890
December	Average	3984	4362	0	3364	3471	18278
	Maximum	6350	8456	0	5170	3732	23020
	Total	123500	135207	0	104270	107600	566620
Totals (year)	Average	3686	10000	3791	4098	3316	21275
	Maximum	6370	17887	8870	7790	5293	29680
	Total	1349051	3659874	1387685	1499870	1213521	7786610

**APPENDIX C**  
**2008 MONTHLY MAXIMUM INSTANTANEOUS FLOW**  
**SUMMARIES**

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**Table N – 2008 Monthly Flows (l/s) for Wells (Before Treatment) as Governed by Permits to Take Water**

		Park	Calico	Downey	Burkes	University	Dean	Queensdale	Water
<b>PTTW Values (m<sup>3</sup>/day)</b>		<b>178.8</b>	<b>90.9</b>	<b>90.9</b>	<b>75.8</b>	<b>57.3</b>	<b>39.4</b>	<b>60.6</b>	<b>59.0</b>
January	Average	61.8	8.5	45.5	63.5	20.3	15.6	2.6	13.9
	Maximum	67.3	9.4	47.9	66.1	22.3	17.1	9.3	25.3
February	Average	66.0	8.1	46.3	63.1	18.5	15.4	8.3	15.0
	Maximum	76.2	8.9	46.5	63.7	22.3	17.2	10.4	21.4
March	Average	76.0	7.7	46.1	63.0	19.8	15.5	7.4	19.6
	Maximum	77.4	10.6	46.4	63.7	20.6	15.8	9.7	21.8
April	Average	68.3	7.8	46.3	62.5	20.0	12.0	8.9	19.3
	Maximum	80.2	10.9	46.6	63.4	23.0	15.9	10.1	24.2
May	Average	53.9	9.3	46.0	63.1	19.9	9.5	8.2	15.0
	Maximum	61.1	9.5	46.4	63.5	20.6	15.3	9.7	22.8
June	Average	55.8	8.8	45.3	62.2	19.6	14.8	9.0	16.1
	Maximum	61.5	9.8	46.2	63.4	21.1	15.9	10.1	22.7
July	Average	72.2	8.5	41.2	62.7	17.7	14.5	8.6	16.6
	Maximum	77.5	9.8	46.0	63.2	19.8	15.1	9.1	23.4
August	Average	72.8	9.5	39.1	62.9	16.6	14.4	8.6	4.3
	Maximum	76.8	10.1	44.8	63.1	19.3	15.9	9.3	23.8
September	Average	74.3	9.0	46.9	62.1	18.9	14.5	8.5	1.5
	Maximum	75.1	9.5	50.1	63.1	20.1	15.6	9.3	6.9
October	Average	75.3	8.9	48.7	61.4	14.9	14.4	8.3	16.7
	Maximum	76.1	9.6	49.1	62.3	22.7	15.1	9.5	22.8
November	Average	73.5	8.9	47.1	61.0	21.5	14.2	9.5	10.6
	Maximum	75.9	9.3	49.0	62.2	22.3	15.4	10.4	21.1
December	Average	69.1	8.9	48.6	60.4	21.0	14.0	9.6	15.9
	Maximum	71.9	9.2	48.9	60.8	21.7	14.3	10.2	24.1
Totals (year)	Average	68.3	8.7	45.6	62.3	19.1	14.1	8.1	13.7
	Maximum	80.2	10.9	50.1	66.1	23.0	17.2	10.4	25.3

**Table N – 2008 Monthly Flows (l/s) for Wells (Before Treatment) as Governed by Permits to Take Water (continued)**

		Emma	Membro	Helmar	Paisley Well	Carters	Arkell 1	Arkell 6	Arkell 7
<b>PTTW Values (m<sup>3</sup>/day)</b>		<b>53.8</b>	<b>105.0</b>	<b>37.9</b>	<b>55.6</b>	<b>136.4</b>	<b>37.9</b>	<b>228.3</b>	<b>228.3</b>
January	Average	30.9	37.7	10.0	0.0	0.0	10.0	65.2	65.3
	Maximum	32.6	48.2	11.9	0.0	0.0	19.3	72.6	71.5
February	Average	31.2	44.8	9.2	0.0	0.0	11.0	64.3	61.0
	Maximum	33.0	48.2	11.8	0.0	0.0	17.3	72.9	71.9
March	Average	28.1	35.0	9.1	0.0	0.0	10.0	56.8	62.9
	Maximum	32.4	43.0	9.3	0.0	0.0	13.0	71.0	71.2
April	Average	32.6	35.9	9.5	0.0	37.8	6.2	42.2	28.7
	Maximum	33.4	44.7	9.6	0.0	68.4	14.6	64.4	65.4
May	Average	32.1	27.8	9.3	13.3	20.8	5.0	34.3	34.0
	Maximum	33.4	41.4	9.7	14.4	44.1	15.1	58.9	61.7
June	Average	31.5	29.3	9.1	13.8	22.7	4.3	27.6	32.8
	Maximum	33.1	41.2	9.7	14.2	41.1	14.9	66.6	49.6
July	Average	28.3	33.6	9.1	13.6	25.7	10.0	36.4	32.2
	Maximum	32.3	43.2	9.8	13.7	57.8	14.9	62.2	55.2
August	Average	21.2	30.1	4.2	13.5	20.7	7.7	36.2	37.5
	Maximum	30.8	41.2	9.6	13.8	46.7	14.8	58.1	54.4
September	Average	24.2	38.9	0.0	13.8	39.0	9.1	38.9	31.4
	Maximum	30.7	39.6	0.0	13.9	61.6	14.8	61.6	52.5
October	Average	18.6	35.5	0.0	13.9	39.0	8.4	37.0	37.4
	Maximum	32.3	41.6	0.0	13.9	67.5	14.8	53.6	68.7
November	Average	18.4	42.0	0.0	13.6	33.5	10.3	45.5	44.4
	Maximum	32.4	45.9	0.0	13.8	65.4	15.9	69.2	70.1
December	Average	18.4	31.1	0.0	10.3	39.1	9.3	39.8	44.9
	Maximum	31.7	42.8	0.0	13.6	68.1	14.7	59.0	70.0
Totals (year)	Average	26.3	35.1	5.8	8.9	23.2	8.4	43.6	42.7
	Maximum	33.4	48.2	11.9	14.4	68.4	19.3	72.9	71.9

**Table N – 2008 Monthly Flows (l/s)for Wells (Before Treatment) as Governed by Permits to Take Water (continued)**

		<b>Arkell 8</b>	<b>Arkell Collectors</b>	<b>Recharge</b>
<b>PTW Values (m<sup>3</sup>/day)</b>		<b>228.3</b>	<b>433.3</b>	<b>157.9</b>
January	Average	66.5	62.2	0.0
	Maximum	73.7	72.5	0.0
February	Average	60.5	61.2	0.0
	Maximum	72.9	70.7	0.0
March	Average	61.4	67.3	0.0
	Maximum	71.9	94.4	0.0
April	Average	57.7	116.0	26.0
	Maximum	69.2	169.5	102.7
May	Average	28.0	168.3	58.3
	Maximum	65.3	205.7	102.7
June	Average	23.6	180.3	83.1
	Maximum	49.8	207.0	101.5
July	Average	24.3	157.2	65.1
	Maximum	52.2	186.9	98.5
August	Average	20.3	169.2	88.5
	Maximum	49.4	182.7	95.7
September	Average	41.5	155.5	86.6
	Maximum	61.7	163.7	96.4
October	Average	35.6	120.5	77.7
	Maximum	55.6	149.1	93.7
November	Average	47.5	79.3	40.4
	Maximum	69.4	129.0	93.7
December	Average	46.1	50.5	0.0
	Maximum	73.5	97.9	0.0
Totals (year)	Average	42.7	115.7	43.9
	Maximum	73.7	207.0	102.7

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