GUELPH WATERWORKS
2002 ANNUAL WATER QUALITY AND PRODUCTION REPORT

1. Introduction

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

This report provides accurate and reliable information on 2002 water production and quality. Sharing this information is an important part of our mission.

Drinking water is a limited natural resource. Pressures on available water supplies increase as Guelph's water demand increases. Today, all of Guelph's readily available, high quality groundwater is fully utilized. Together, we must do our utmost to conserve and protect every drop of this valuable resource.

2. Is Our Water Safe to Drink?

Yes. In 2002, over 20,000 tests were performed for more than 100 regulated substances (Table 1). In all cases, the drinking water supplied to our customers was safe and better than all Ontario and Canadian health-related guidelines for chemical and microbiological quality.

Table 1 Summary of Water Supply and Distribution System 2002 Water Quality Sample Results

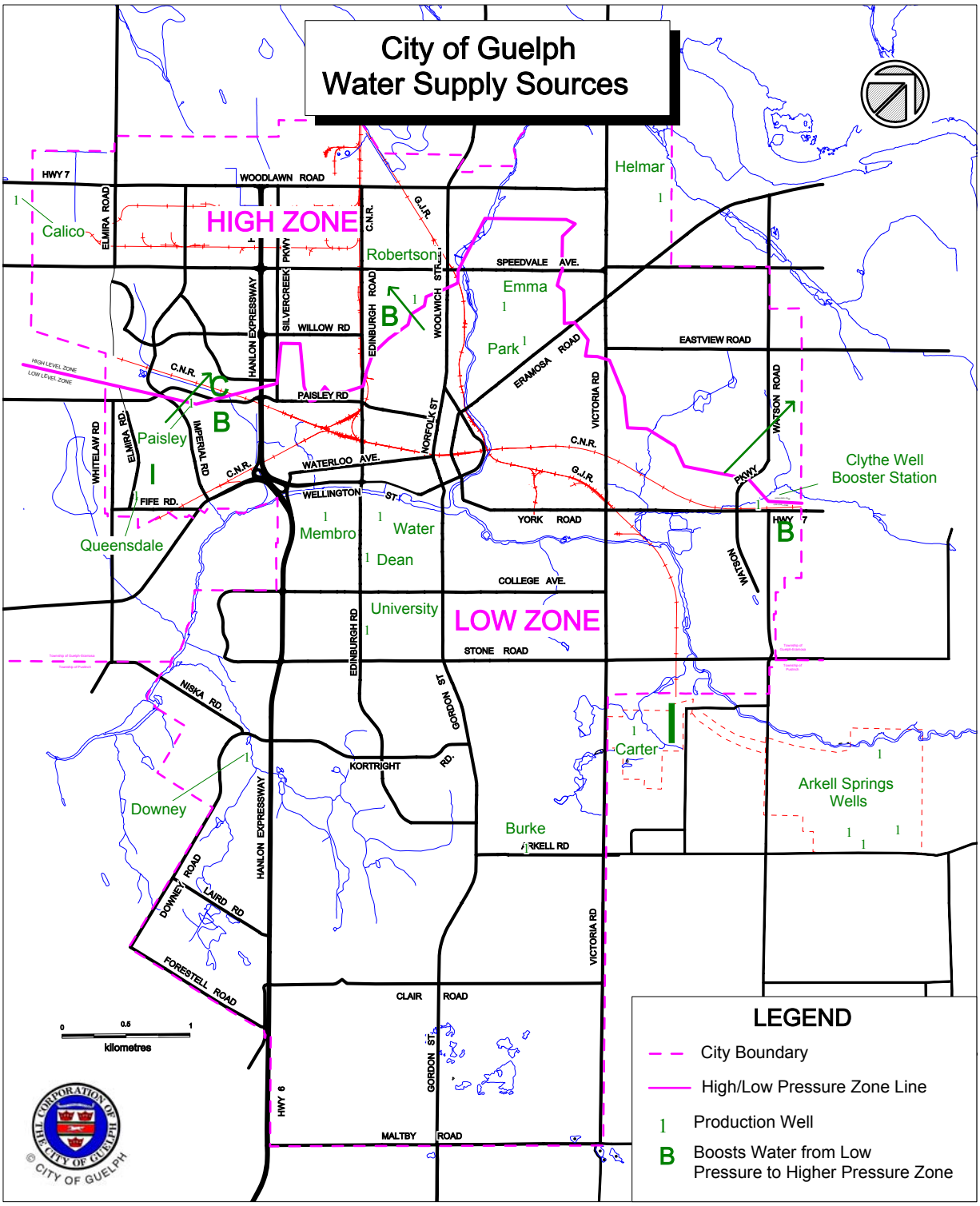
Parameter Group	Sample Tests	Number of Times Confirmed Test Did Not Meet Health-Related Standard
Bacteriological	2,107	0
Chemical	19,677	0
Total	21,784	0

Analysis was performed by the following accredited laboratories: Philip Analytical, MDS and Enviro-Test Laboratories.

3. Where Does Our Water Come From?

In 2002, Guelph's drinking water came from the Arkell spring grounds collector system and 19 wells that extract water from a high quality, natural, underground bedrock formation known as the Amabel aquifer. Fifty percent of the water consumed in Guelph is pumped from 13 wells scattered throughout the city (Figure 1). The remaining water originates from the Arkell spring grounds, an extensive well field located outside Guelph's southeast border in Puslinch Township. The Arkell spring grounds has been the major source of drinking water for the City of Guelph since 1908. This part of the Eramosa/Blue Springs watershed is essential to Guelph's existing and future water supply.

Figure 1


City of Guelph
Water Supply Sources
HIGH ZONE
LOW ZONE
Calico
Helmar
Robertson
Emma
Park
Paisley
Clythe Well
Booster Station
Queensdale
Membro
Water
Dean
University
Carter
Arkell Springs
Wells
Burke
Downey
HWY 7
WOODLAWN ROAD
ELMIRA ROAD
SILVERCREEK PKWY
HANLON EXPRESSWAY
EDINBURGH ROAD
WOOLWICH ST.
SPEEDVALE AVE.
WILLOW RD
EASTVIEW ROAD
ERAMOSA ROAD
VICTORIA RD
WATSON ROAD
PKWY.
C.N.R.
G.J.R.
PAISLEY RD
IMPERIAL RD
WHITELAW RD
NORFOLK ST
WATERLOO AVE.
WELLINGTON ST.
FIFE RD.
YORK ROAD
COLLEGE AVE.
STONE ROAD
NISKA RD.
GORDON ST
KORTRIGHT RD.
ARKELL RD
DOWNEY ROAD
LAIRD RD
FORESTELL ROAD
CLAIR ROAD
MALTBY ROAD
HWY 6
0 0.5 1
kilometres
© CITY OF GUELPH
LEGEND
City Boundary
High/Low Pressure Zone Line
1 Production Well
B Boosts Water from Low Pressure to Higher Pressure Zone

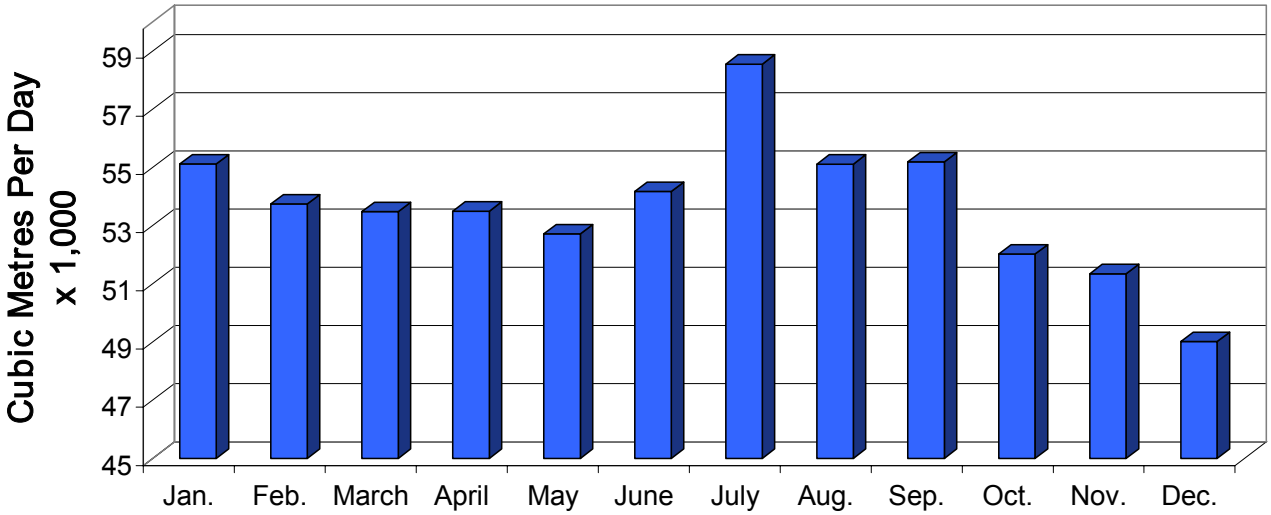
4. How Much Water Is Consumed In Guelph?

In 2002, Guelph produced, on average, 53,662 cubic metres of drinking water each day from the same water resource that provided 8,000 cubic metres daily in 1910 - a daily volume of 53,662 cubic metres equals two metres (or more than six feet) of water over the Stone Road mall parking lot.

An additional 60,000 cubic metres of water is held temporarily in storage reservoirs to provide fire protection and accommodate early morning and evening peak water demands.

In 2002, 19.6 million cubic metres of drinking water was supplied to Guelph customers. Figure 2 shows monthly water demand. In the summer, average monthly water demand is higher than at other times of the year due to outdoor water use. The highest quantity of water used in 2002 was on July 16, when 70,568 cubic metres of water was consumed. This rate of water use could not be sustained and resulted in a water ban being imposed. Immediately after the water ban was initiated, water consumption declined 15% to a more sustainable level. This enabled the city to meet the Ministry of the Environment request to Grand River water utilities for a 20% reduction in water use due to the multi-year drought conditions and the resulting low water levels measured in the Grand River watershed.

Figure 2 2002 Monthly Average Water Demand



On five days in July, water consumption exceeded the actual drought capacity of 63,000 cubic metres per day. With the current multi-year dry, hot weather, city wells operate continuously at close to their maximum rated capacity. Long term pumping can not be increased without exceeding the natural rate at which water is returned to the ground by precipitation. Recognizing this limitation, Waterworks is presently implementing a water supply enhancement strategy to make more water available through optimizing existing supplies and developing new wells.

Water demand has increased in the city and Waterworks must operate all available wells to satisfy the higher water demand. This includes a few standby wells with less desirable aesthetic quality. A long term planning process is in place to install treatment systems to remove natural iron, manganese and hydrogen sulfide so that all municipal wells provide drinking water that is acceptable to our customers.

While the price of drinking water will increase as water treatment facilities are installed, the cost to treat and bring standby wells that were not used in the past on-line is considerably less than the cost to find and develop new water.

5. How Is Our Water Treated?

Since all the water we produce satisfies health-related drinking water standards, we don't perform extensive water treatment. All we do is disinfect the water by adding chlorine to kill disease causing bacteria and other microbes that could make you ill. We also add sodium silicate at a low dosage of 3 mg/L (equals 3 parts of silicate in 1 million parts of water) at the Queensdale and Helmar wells to minimize water discoloration caused by iron.

In August 2000, the Ministry of the Environment promulgated the new Ontario Drinking Water Protection Regulation 459. One of the requirements of the new regulation is that all water utilities must maintain a minimum free chlorine level of 0.2 mg/L (equals 0.2 parts of chlorine in 1 million parts of water) throughout the water distribution system. This required increase in free chlorine residual to 0.2 mg/L means that each customer can now detect chlorine in their tap water. This poses no risk to public health. Rather, the provincial government's intent is to ensure that all water utilities provide safe drinking water at all times to their customers.

6. How Is Our Water Monitored?

To ensure that Guelph's water was safe to drink in 2002, over 20,000 microbiological and chemical quality tests were carried out on water samples collected throughout the water system. Certified water operators inspect each water facility on a daily basis and submit water samples to accredited laboratories that analyze the water and report the results.

The Ontario Ministry of the Environment receives all of the results and double checks the quality of the city's drinking water at selected locations.

7. What Were The Results Of The 2002 Monitoring Program?

Guelph's drinking water is safe. The entire water supply met or exceeded all health-related Ontario Drinking Water Standards. Of the 2,107 bacteriological tests performed, only six samples, or 0.3 percent, showed the presence of adverse indicator bacteria or high general bacteria counts. Indicator bacteria are not disease causing but show potential for a bacterial problem. None of these incidents, when resampled, showed any

persistent deterioration of water quality. At no time was E. coli detected in Guelph's drinking water. This illustrates the excellent quality of Guelph's drinking water (Table 1).

The nearly 20,000 analytical results for inorganic, organic and radiological parameters also surpassed all health-related Ontario Drinking Water Standards (Table 2).

In Table 3, water quality results are compared with the Ontario aesthetic and operational drinking water standards. Hardness and total dissolved solids (TDS) are the only parameters that consistently exceeded the levels prescribed by the Ontario Ministry of Environment. These parameters measure the mineral content of groundwater. Groundwater by its nature has a high natural mineral content. This contributes to the pleasant taste of Guelph drinking water and has no adverse effect on public health.

As mentioned above, we treat well water with silicate at Queensdale and Helmar to control water discoloration caused by elevated iron levels. It is possible that in the future, water from these wells will have to be filtered to remove iron. This is being considered in the long term planning process.

Regulated substances that were measured but were not detected due to their extremely low concentration or absence in Guelph water are listed in Table 4.

Table 2 Health-Related Bacteriological Sample Results - 2002

Total Samples	Good Sample Results	Adverse Sample Results	Percent Adverse
2,107	2,101	6	0.3
Raw Samples	894		

Table 3 Chemical And Radiological Health-Related Water Quality Results - 2002

Parameter	Minimum Result	Maximum Result	Average Result	Standard Type	Maximum Acceptable Amount	Unit Of Measure
Arsenic	0.002	0.003	0.002	I.M.A.C.	0.025	mg/L
Barium	0.026	0.077	0.053	M.A.C.	1	mg/L
Boron	0.005	0.144	0.028	I.M.A.C.	5	mg/L
Cadmium	0.0001	0.0003	0.0001	M.A.C.	0.005	mg/L
Chromium	0.005	0.005	0.005	M.A.C.	0.05	mg/L
Cis-1,2-DCE	0.5	4	1.2	M.A.C.	70	ug/L
Fluoride	0.1	0.4	0.2	M.A.C.	1.5	mg/L
Lead	0.0005	0.0091	0.0006	M.A.C.	0.01	mg/L
Mercury	0.00005	0.00005	0.00005	M.A.C.	0.001	mg/L
Nitrate	0.2	3.1	1.2	M.A.C.	10	mg/L
Nitrite	0.2	0.2	0.2	M.A.C.	1	mg/L
Selenium	0.002	0.002	0.002	M.A.C.	0.01	mg/L
TCE	0.1	3.9	0.9	M.A.C.	50	ug/L
Trihalomethanes	0.1	33	8.0	M.A.C.	100	ug/L
Turbidity	0.01	0.97	0.2	M.A.C.	1	NTU
Uranium	0.0004	0.0032	0.001	M.A.C.	0.1	mg/L
Radium -226	0.03	0.31	0.09	M.A.C.	0.6	Bq/L

Table 4 Aesthetic-Related Water Quality Results - 2002

Parameter	Minimum Result	Maximum Result	Average Result	Standard Type	Maximum Acceptable Amount	Unit Of Measure
Alkalinity	239	338	285	O.S	500	mg/L
Aluminum	0.005	*0.291	0.009	O.S	0.1	mg/L
Chloride	16	201	87	A.S	250	mg/L
Free Chlorine	0.09	1.4	0.49	A.S	4	mg/L
Color	3	3	3	A.S	5	TCU
Copper	0.0005	0.48	0.010	A.S	1	mg/L
DOC	0.2	2.6	1.2	A.S	5	mg/L
Hardness	293	591	426	O.S	100	mg/L
Iron	0.03	0.5	0.07	A.S	0.3	mg/L
Manganese	0.005	0.045	0.010	A.S	0.05	mg/L
pH	6.98	8.16	7.65	A.S	6.5-8.5	no unit
Sodium	6	92	38	A.S	200	mg/L
Sulphate	22	278	122	A.S	500	mg/L
TDS	360	1058	619	A.S	500	mg/L
Zinc	0.005	0.20	0.09	A.S	5	mg/L

* Lab anomaly
I.M.A.C. - Interim Maximum Accpetable Concentration
M.A.C. - Maximum Acceptable Concentration
mg/L - Milligrams per Litre
ug/L - Micrograms per Litre
NTU - Nephelometric Turbidity Units
Bq/L - Bequerels per Litre
Cis-1,2-DCE - Cis 1,2, Dichloroethylene
TCE - Trichloroethylene
DOC - Dissolved Organic Carbon
TDS - Total Dissolved Solids
O.S. - Operational Standard
A.S. - Aesthetic Standard
TCU - True Colour Unit

Table 5 Regulated Substances Not Detected

Alachlor	Dimethoate	Phorate
Aldicarb	1,2-Dichlorobenzene	Pichloram
Aldrin	1,4-Dichlorobenzene	PCB's
Antimony	DDT	Prometryne
Atrazine + metabolites	1,2-Dichloroethane	Simazine
Azinphos-methyl	Dichloromethane	Silver
Bendiocarb	2,4-Dichlorophenol	2,4,5-T
Benzene	2,4-D	Temephos
Benzo(a)pyrene	Diclofop-methyl	Terbufos
Beryllium	Dinoseb	Tetrachloroethylene
Bismuth	Diquat	Thallium
Bromoxynil	Ethylbenzene	Tin
Carbaryl	Glyphosate	Titanium
Carbofuran	Heptachlor	Toluene
Carbon Tetrachloride	Lindane	Triallate
Chlorobenzene	Malathion	2,3,6-Trichlorophenol
Chlordane	Methoxychlor	2,4,6-Trichlorophenol
Chlorpyrifos	Metolachlor	2,3,4,6-Tetrachlorophenol
Cobalt	Metribuzin	Trifluralin
Cyanazine	Nitrite	Vinyl Chloride
Cyanide	NTA	Xylenes
Diazinon	Paraquat	
Dicamba	Parathion	
Dieldrin	Pentachlorophenol	

8. What Were The Water System Highlights In 2002?

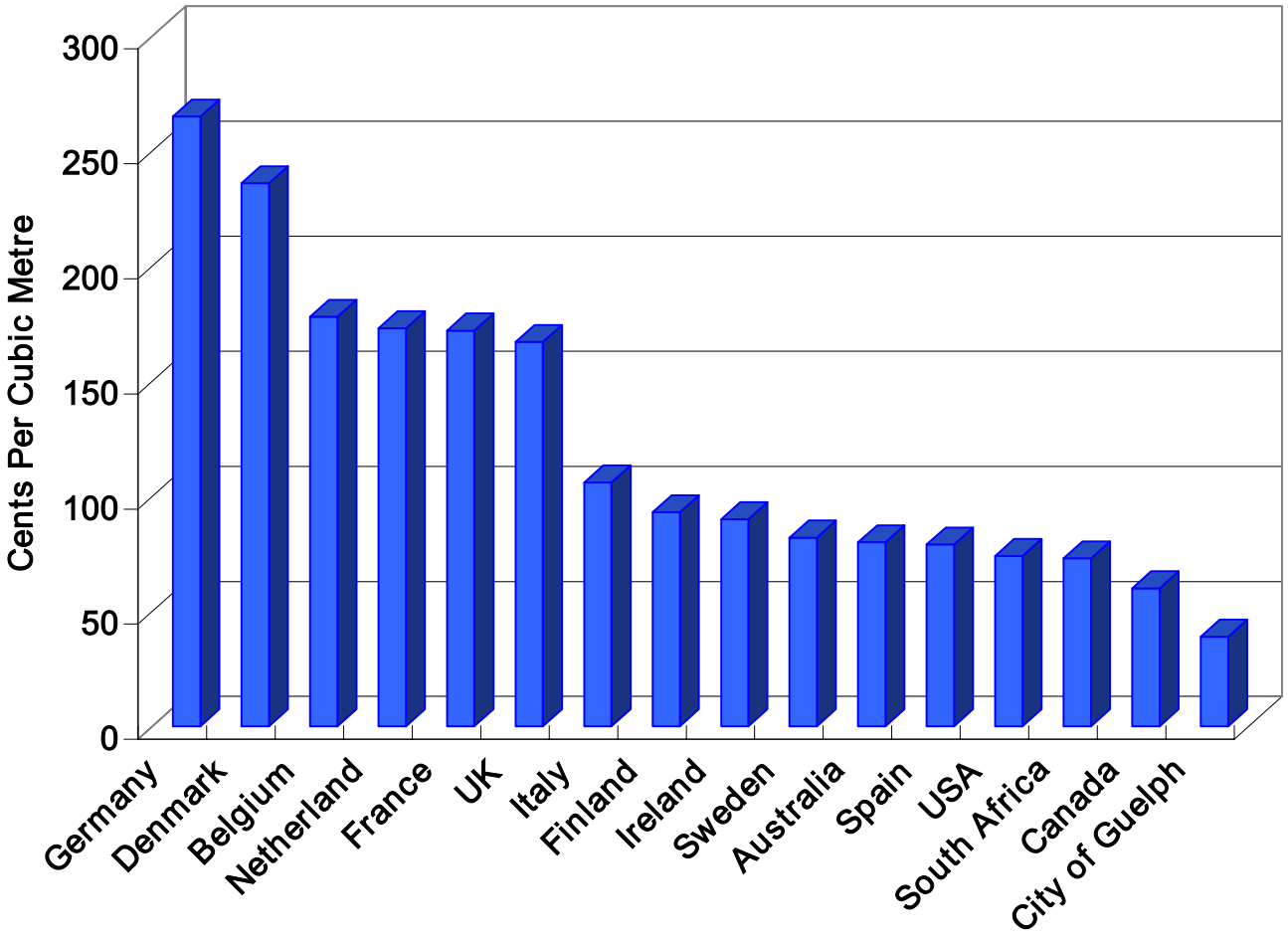
- Produced 19.6 million cubic metres of drinking water
- Operating cost of $87 per million litres of water treated
- Operating cost of $4,162 per kilometer of pipe for fully metered distribution system
- 0.3% of water tests showed adverse water quality or exceeded maximum acceptable concentrations
- Zero days when boil water advisory issued by Ministry of Health
- Repaired 0.06 water main breaks per kilometer of water main pipe
- Installed 1,002 new water metres
- Installed 7,600 metres of new water main
- Serviced and maintained 2,078 fire hydrants
- Repaired 51 water leaks and 31 watermain breaks
- 14% of water produced was not billed
- Continued water main swabbing program
- Responded to an increased number of chlorine complaints
- Continued the backflow prevention inspection program
- Continued Arkell water exploration and protection program

9. How Much Does Our Water Cost?

In 2002, Guelph's water rate continued to be one of the lowest in Canada and the world at $0.39 per cubic metre. That is much less than the average cost of water in Canada ($0.60 per cubic metre) and far below the cost of water in other countries of the world (Figure 3). Guelph's water rate will increase as a result of new provincial regulations. Nevertheless, the cost of drinking water in Guelph will remain one of the lowest in the world.

In 2002, a typical Guelph residential customer used 250 cubic metres of drinking water that cost $123 per year, or 34 cents per day, for basic service and water volume charges. That is over a thousand times lower than the cost for the same amount of commercial bottled water.

Figure 3 Drinking Water Average Cost



10. What Can I Do To Conserve Water?

Water is a precious, limited resource that must be protected and conserved so that there is sufficient water for the existing and future Guelph community. Everyone can play a part in reducing water use in their home, garden and workplace. Water conservation not only reduces a customer's water bill but also postpones the additional cost of obtaining more water.

In the summer, it is particularly important to reduce water consumption since outdoor water use creates an unsustainable increase in water consumption that can not be easily satisfied by the water system. Peak summer water demand does not reflect normal, daily water requirements. Nevertheless, Waterworks is expected to satisfy high short term water demands to protect the community in the event of a fire.

If we use water wisely, there will continue to be a satisfactory supply of high quality drinking water. Some helpful hints to conserve water are listed below:

- Install water saving devices such as low flow toilets, shower heads, and faucet aerators;
- Follow the alternate day lawn watering restrictions and only water your lawn, if necessary, at those times;
- Repair leaky faucets and plumbing. High water bills are caused by leaks and high outdoor water use;
- Take shorter showers and only use the dishwasher or washing machine with full loads;
- Don't let the water run when washing dishes or brushing your teeth; and
- Use rain barrels and consider landscape and plant watering alternatives that require less city water.

11. Emergency or Upset Conditions

There were no emergency or upset conditions during the past year. Water treatment processes functioned reliably at all times and chlorine was applied consistently at required concentrations.

12. Upcoming 2003 Plans to Improve Guelph's Water System

- Continue the increased chlorination and water testing programs required by the provincial Drinking Water Protection Regulation 459.
- Continue making the water supply infrastructure improvements required by provincial Drinking Water Protection Regulation 459.
- Complete the Arkell water exploration and protection program.
- Accelerate ongoing well rehabilitation and well and booster pump replacement programs.
- Intensify unaccounted for water program.
- Continue to swab water mains in select areas of the city.

13. How to Contact Us?

To get a copy of this report or to send your comments or questions, contact us at: Guelph Waterworks, 59 Carden Street, Guelph, Ontario or telephone by calling (519) 837-5627. Fax us (519) 822-8837 or email to waterworks@city.guelph.on.ca. You can also visit the City web site at www.city.guelph.on.ca/waterworks and search for Waterworks to review our reports.

City of Guelph Waterworks employees live with their families in Guelph and work diligently to provide reliable, high quality water to every customer's tap. We must all work together to conserve and protect Guelph's drinking water.

14. Glossary of Helpful Information

Some technical terms explained for our customers.

Aesthetic-Related Standard. Aesthetic standards are for substances that do not cause health problems but may make water taste or smell badly.

A.S. Short form for aesthetic standard. See explanation above.

Aquifer. A natural underground zone of water-bearing material (gravel, limestone) capable of providing a large supply of water.

Bq/L. Unit of radioactivity which expresses the rate of disintegration of a radionuclide.

Chlorine Residual. Waterworks adds chlorine to our drinking water to prevent the growth of harmful bacteria and other microbes. Chlorine residual is a measure of the amount of chlorine available in the water for disinfection.

Cis-1,2-DCE. Short form for cis 1,2-Dichloroethylene a synthetic organic compound.

DOC. Short form for dissolved organic carbon.

TCE. Short form for trichloroethylene a synthetic organic compound.

Groundwater. Groundwater is the supply of fresh water found beneath the earth's surface and stored in aquifers.

Health-Related Standard. These are the government regulations that prescribe the maximum concentrations of harmful compounds in municipal drinking water. In Ontario, these standards are contained in the 2000 Ontario Drinking Water Standards.

I.M.A.C. A health-related interim maximum acceptable concentration established for parameters when there is insufficient toxicological data to establish a maximum acceptable concentration with reasonable certainty.

M.A.C. A health-related maximum acceptable concentration established for parameters which, when present above that concentration, have known or suspected adverse health effects. When a chemical concentration in drinking water is below the maximum acceptable concentration, it is unlikely to cause adverse health effects in the most sensitive members of the population exposed over a lifetime.

mg/L. Parts per million, or milligrams, of a substance per liter of water.

N/A. Not applicable.

ND. Not detected.

NTU. Unit of measure for turbidity a measure of water clarity.

O.S. Short form for operational standard. See explanation below.

Operational Standard. Standard established by government for parameters that need to be controlled to ensure efficient treatment and distribution of drinking water.

TCU. True color units, a unit measure of water color.

µg/L. Parts per billion, or micrograms, of a substance per liter of water.