



National Guide to Sustainable
Municipal Infrastructure
(InfraGuide)



SECURING CALGARY'S WATER SUPPLY IN THE FACE OF EXPLOSIVE POPULATION GROWTH

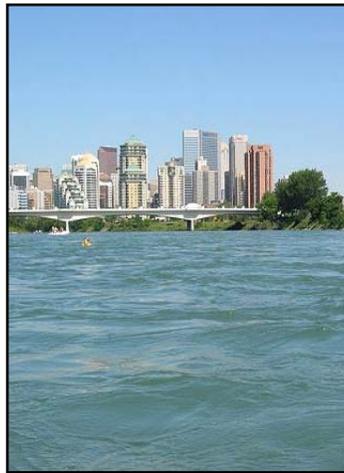
City of Calgary staff presented Council with a clear path forward to meet the water supply challenge. They developed a plan that ensures sustainability of Calgary's water supply while accommodating the City's anticipated future growth.

SUMMARY

When the Northwest Mounted Police founded Calgary at the confluence of the Bow and Elbow rivers in 1875, they understood the importance of water to the health of the community. They could not have foreseen, however, that adding some oil into the mix would lead to the explosive growth that saw the population in Calgary increase to more than 950,000 in 2005. If the impact of this growth on water use is not managed well, the long-term sustainability of Calgary's water supply will be threatened.

City of Calgary staff presented Council with a clear path forward to meet the water supply challenge. They developed a plan that ensures sustainability of Calgary's water supply while accommodating the City's anticipated future growth. The results of their work is captured in the City of Calgary's "Water Efficiency Plan", a plan with a sustainability goal called "30 in 30", where in 30 years, the target reduction of the average water consumed by each person in Calgary will be 30 percent.

The team did not start from scratch, but built upon a number of successful water demand programs already in place, including leak detection, water metering, seasonal water use campaigns, and youth education. In addition, increasing public awareness, interest from elected officials, and knowledge within the Water Division all contributed to providing the right environment to take a truly strategic approach to managing water demand.



City of Calgary staff also had a number of key resources at

their disposal to ensure the Water Efficiency Plan was comprehensive and applied all the best water demand techniques in the industry. One resource was the InfraGuide best practice publication "Demand Management." This publication complemented staff experience by providing guidance in developing the plan and was especially helpful in validating the City's demand management framework, summarizing management strategies, and providing definitions and references.



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"InfraGuide reinforced that we are on the right track. We certainly referenced our use of InfraGuide's best practices in our reports to City Council."

Nancy Stalker,
City of Calgary Water Resources Department

The City's new Water Efficiency Plan goal was endorsed by Council in December 2005. The Plan provides a framework for the City's water conservation efforts and outlines the scope, purpose, and potential water savings of its programs. Ultimately, the implementation of the Plan will ensure the long-term sustainability of Calgary's water supply and protect its safety.

BACKGROUND

The City of Calgary in southern Alberta is currently home to 956,078¹ residents. Its population has increased steadily in the past 25 years, experiencing a significant growth spurt during the past five years. During the past four years alone, the City grew by about 17,000 people (about 10,000 new homes) every year. The explosive growth is largely a result of Alberta's strong economy, driven by the petroleum industry as well as agriculture, tourism, and high-tech industries.

To quench the City's thirst, its water utility extracts water from the Bow and Elbow rivers before treating and distributing it to its residents, institutions, and commercial and industrial customers. Water conservation is not new to many of the City's customers. In 1991 the City of Calgary initiated its first customer oriented water conservation program. The program was designed to install water meters for all residents. At the time, only 22 percent of residential water users had meters. The remaining 78 percent were charged a flat rate for municipal water.



Studies had clearly shown that metered households typically use 20 to 50 percent less water than those charged a flat rate, and the amount of wastewater they produce is reduced by 10 percent.² These facts convinced Council that the program merited implementation. The public however, was not as easily convinced. It took years of effort and an active public participation strategy to turn the tide of public opinion in the City's favour. As of May 2006, meters are installed in 78 percent of residential homes and the City expects all residential water users to be metered by 2014.

The water utility also developed other programs designed to manage water demand including a system leak detection program, a water main replacement program, water audits for industrial, commercial and institutional (ICI) customers, youth outreach programs and a toilet rebate program for single family residential homes. In recent years, City staff and Council have been working hard to consolidate all programs, under a comprehensive strategy that ensures the long-term sustainability of its water supply.

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1. As of April 2005. City of Calgary municipal census.

2. Federation of Canadian Municipalities. 1999. "Towards Sustainability: Municipal Infrastructure and Water Efficiency". By Sheila Keating-Nause. In Forum, Winter 1999, Vol 23 #1/2, p.34.



still room to reduce water use. That reduction, however, would mean that residents had to change some of their water use habits as well as their plumbing fixtures. The table on the left shows how current per capita consumption and the “30 in 30” consumption goal compare with consumption in other major municipalities.

Survey results showed that 96 percent of residents considered water efficiency to be important. Unfortunately, the same survey showed that only 24 percent of those residents were willing to act. This suggested that although there was a good opportunity to harness positive public opinion, it would be difficult to change the ways that Calgarians use water.

Other challenges may arise in the future. The potential impact of development and climate change on the Bow and Elbow River watersheds, for example, will be important factors to monitor closely.

CHALLENGE

The staff’s challenge was three-fold: find a meaningful way to represent sustainability of the water supply, pull together all the elements of demand management into a comprehensive strategy that would enable the City’s rapid development to continue, and call the public into action.

There was no commonly understood vision against which to measure progress, no comprehensive strategy documented to reach the vision and no explicit set of parameters against which each specific program’s contribution was measured and prioritized. Everyone agreed there was a need for a common vision for sustainability, a clear strategy to get there and a consistent way to measure progress along the way.

The public provided a different type of challenge. Water demand had come down considerably from the 800 litres per capita per day that was consumed in the early 1980s, through improved water system maintenance and leakage control. With consumption at 500 litres per capita per day across the City on average between 2002 and 2004 there was

SOLUTION

The City’s Water Efficiency Plan captures Council and staff’s common, shared vision of having a well-protected, sustainable water supply for the City of Calgary, which accommodates the City’s anticipated future growth. The plan also describes the key “30 in 30” sustainability goal which the utility will use to continue to move toward that vision and encapsulates all the programs that will contribute to reaching the goal. A 30-year period was chosen to align with a City led, community owned initiative to create a long-range vision for a sustainable city—a project called *imagineCALGARY*.

Reaching “30 in 30”, will mean the average gross per capita water consumption will have to be reduced 30 percent to 350 litres per person per day from the current 500 in 30 years.

CITY-WIDE PER CAPITA CONSUMPTION (LITRES/CAPITA/DAY)

- Canadian Cities over 500,000 614
- Calgary 500
- Calgary “30 in 30” goal 350

PER CAPITA RESIDENTIAL CONSUMPTION (LITRES/CAPITA/DAY)

- Canada (not metered) . . . 433
- United States 382
- Calgary 340
- Canada (metered) 288
- Calgary “30 in 30” goal 240
- United Kingdom . . 147



This will offset the anticipated 50 percent growth that Calgary will experience during that same time. **Figure 1** shows Calgary's continuum of program strategies that have been brought together under the umbrella of the Water Efficiency Plan and will contribute to reaching the vision of sustainability.

The Plan includes a comprehensive framework for tracking and reporting on water consumption, and distribution and the sustainability of resources. It outlines the scope, purpose, and potential water savings of each of its programs, identifies criteria for prioritizing and selecting water saving behaviours and technologies, reflects the City's triple bottom line policy and enables good management of the City's water conservation efforts.

To measure customer demand for its water, the City tracks a number of key consumption measures. To measure supply, the City is increasing the number of locations where production and distribution flows are metered. The text framed on the right shows the types of measures being used. These measures are then used to check progress against the vision of reducing per capita demand by 30 percent over 30 years and reported back to Council on a yearly basis.

Tracking public attitudes and influencing public behaviours are imperative to reaching the City's sustainability goal. Municipal staff have developed and implemented public awareness and education campaigns to raise



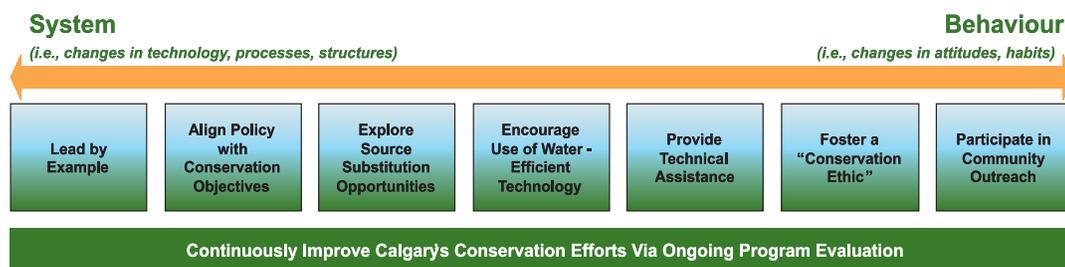
awareness about the importance of water efficiency and describe the responsibility each Calgarian has to reduce water usage. Programs show the effectiveness of low water use techniques and technologies such as low flow toilets (that use six litres per flush or less). These programs are used to build and foster a culture of sustainability.

With the Water Efficiency Plan, City staff will provide regular updates to Council on the overall sustainability goal for water instead of reporting on individual specific water efficiency programs. This will make more efficient use of Council's time and help foster a holistic approach to water efficiency.

SUPPLY AND DEMAND MEASURES USED TO TRACK WATER EFFICIENCY

- Total annual system demand (total water volume delivered, in a year to all customers and for all purposes)
- Average daily demand (average water volume delivered each day)
- Per capita demand in one day (average water volume delivered per person, expressed typically as either gross or residential)
- Annual peak day demand (highest water volume delivered in one day)
- Maximum day per capita demand (highest water volume consumed by the average person in one day)

Figure 1: Calgary's Water Efficiency Strategies



HOW INFRAGUIDE WAS USED IN THE SOLUTION

City of Calgary staff first consulted the InfraGuide Environmental Protocols best practice, Demand Management in 2002 while conducting research for the City's Water Efficiency Plan. A number of areas in the publication provided staff with immediate value:

- **Policy and Planning**, helped develop a policy to authorize and enable a demand management strategy, review existing policies to assess their alignment with demand management approaches, and set goals and plan the demand management strategy based on the priorities of the community and the municipality.
- **Current Practices** outlines the strengths and weaknesses of various demand management strategies, emphasizes the importance of implementing a range of strategies at any given time to reach an overall demand management goal, and describes a variety of demand management strategies and measures in seven main categories (communication and education, technical assistance, pricing, financial incentives/disincentives, regulation, market transformation and structural change).
- **Emerging Practices** outlines three innovative approaches: integrated resource planning; greater consideration for substitutions of services provided and the interrelationships between them.
- **Glossary and References** provided further information and complimentary resources on demand management and reaffirmed that the City had already reviewed key resources on the subject.

All these areas are represented in the Water Efficiency Plan. The Plan contains vision statements on the protection of the environment, conservation of natural resources, promotion of economic viability, and ensuring



social equity. It also describes a number of innovative programs such as offering toilet rebates for multifamily social housing buildings. These programs contribute environmental, social and economic value to the City's triple bottom line.

The best practices publication also confirmed that the City had considered the most relevant resources on demand management and incorporated them into the Water Efficiency Plan.

VALUE AND BENEFITS TO THE CLIENT

The InfraGuide best practice Demand Management provided a number of valuable benefits to water department staff and other city stakeholders. To the water department and its staff, it:

- was used in developing the framework to structure the Water Efficiency Plan;
- included ideas on innovative demand management practices and how they can be reviewed, compared, introduced, measured and managed;
- re-affirmed that the water efficiency programs the City had already undertaken were providing significant contributions to the sustainability vision;
- helped make certain that operating dollars were focussed on the highest value conservation measure; and

Emerging Practices outlines three innovative approaches: integrated resource planning; greater consideration for substitutions of services provided and the interrelationships between them.





- described ways to minimize the future water system operating and capital costs because of:
 - Stabilization of demand, which minimizes stress on the water system
 - predictability of demand, which enables improved planning, stabilize water delivery and anticipate future demands

For the City's customers, the publication also made their benefits clear.

- *Economic benefits* will be achieved through the reduction of costs for all customers and the improved capacity to accommodate growth and economic development to drive prosperity.

- *Environmental benefits* will be achieved through the reduction of water demand, which in turn will reduce stress on waterways by minimizing abstraction and reducing the volume of treated wastewater returned back to the environment. In addition, reduced treatment and pumping of water and wastewater will require less energy to be used and less process chemicals to be consumed, further reducing the resulting environmental impacts.
- *Social benefits* will be achieved because of the increased affordability of water for all customers, the reduced incidence of inconvenient emergency water restrictions, and increased customer awareness of the value of water resources.
- The *final benefit* the InfraGuide publication contributed to Calgary's plan is the concept of the "culture of sustainability." It describes how to build an enhanced social and environmental consciousness into a community in a way that can have widespread and long-term benefits for a municipality. All these concepts and benefits were incorporated into the City of Calgary's Water Efficiency Plan.

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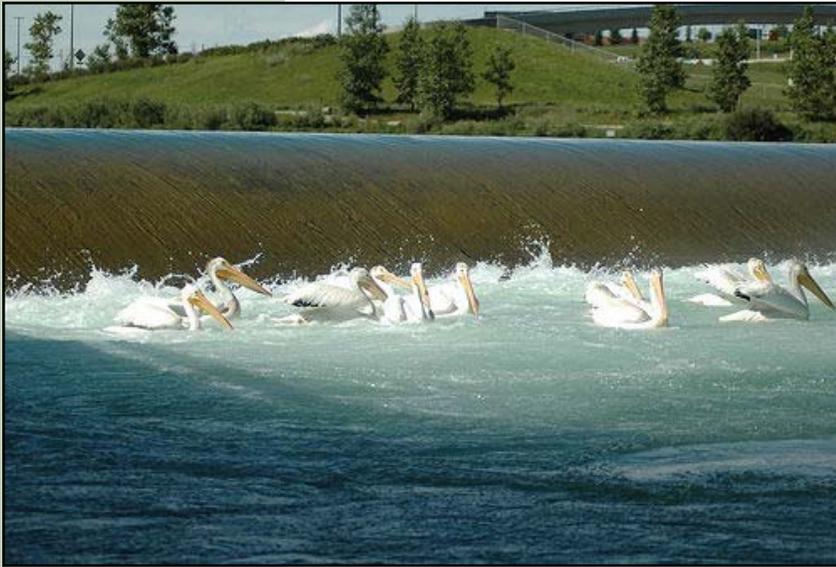
TESTIMONIALS

"InfraGuide helped us organize structure and process around our existing water efficiency initiatives working towards water sustainability."
 Paul Fesko, City of Calgary Water Resources Department

"The best practice guide helps us identify and create a continuum of strategies we use in order to achieve our "30 in 30" water conservation goal."
 Nancy Stalker, City of Calgary Water Resources Department

"Although I had a strong background in public education and outreach, I was fairly new to the utility and demand management. The reference sections of the best practice, assured me that I had covered key resources on the subject."
 Nancy Stalker, City of Calgary Water Resources Department





All municipalities across North America facing the challenge of ensuring the long-term sustainability of their water supply can look to Calgary's InfraGuide-supported methodology for demand management and draw on a wealth of practical knowledge that can be applied in their own community.



CONCLUSION

All municipalities across North America facing the challenge of ensuring the long-term sustainability of their water supply can look to Calgary's InfraGuide-supported methodology for demand management and draw on a wealth of practical knowledge that can be applied in their own community. The comprehensive, holistic approach to water efficiency represented in Calgary's Water Efficiency Plan has helped their community take the next bold step toward sustainability. The water efficiency programs are on the way to the "30 in 30" sustainability goal.



LESSONS LEARNED

An integrated, horizontal approach to managing the City's water resources will address challenges concerning the effective management of water resources and infrastructure. Supported by InfraGuide's best practice publications and InfraGuide's national network of infrastructure professionals, local practitioners have the tools at their disposal to ensure sustainable municipal infrastructure is delivered.

NEXT STEPS

The City of Calgary is undergoing reorganization, where the potable water and storm and wastewater departments are being combined. The goal of this union is to ensure a more integrated approach to the management of the City's water resources. Potential future enhancements of the Water Efficiency Plan include consideration of other demand management measures such as grey water recycling and incorporating energy intensity and greenhouse gas emissions as an evaluation criterion. The strategies identified in the Water Efficiency Plan will also be considered for other water and pollution prevention programs.



CASE STUDY TEMPLATE

InfraGuide is always interested in knowing how municipalities have used these best practices in their effort to build sustainable futures for their communities. If you have an interesting case study that you would like to share with us, please use the following template and email it to us at <infraguide@nrc-cnrc.gc.ca>.

DESCRIPTION

Provide a brief description of the organization or municipality and describe the scope of the project (in a few sentences).

THE CHALLENGE

Discuss the challenge faced by the municipality. What problem(s) you had to overcome (one paragraph).

THE SOLUTION

What InfraGuide Best Practices were used to overcome the challenge(s) and describe how

the best practice(s) helped you overcome these challenge(s)? If possible, describe what quantitative and qualitative measures were used to assess the project. Against what benchmark was the success of the project measured? (This section can include tables and figures.)



THE VALUE

What are the benefits of the value-added and tangible results that were derived from using InfraGuide best practice(s)?

TESTIMONIAL

Provide brief testimonials that support the use of InfraGuide best practices.

ABOUT INFRAGUIDE

A Network of Excellence

InfraGuide is a national network of experts and a growing collection of best practice publications for core infrastructure—offering the best in Canadian experience and knowledge of core infrastructure. With our founders—the **Federation of Canadian Municipalities**, the **National Research Council** and **Infrastructure Canada**, and our founding member the **Canadian Public Works Association**—we help municipalities make informed, smart decisions that sustain our quality of life. By gathering and synthesizing the best Canadian experience and knowledge, InfraGuide helps municipalities get the maximum return on every dollar they spend on infrastructure—while being mindful of the social and environmental implications of their decisions.

Volunteer technical committees and working groups—with the assistance of consultants and other stakeholders—are responsible for the research and publication of the best practices. This is a system of shared knowledge, shared responsibility and shared benefits. We urge you to become a part of the InfraGuide Network of Excellence.

PLEASE JOIN US

Contact **InfraGuide** toll-free at 1-866-330-3350 or visit our Web site at <www.infraguide.ca> for more information. We look forward to working with you.

INFRAGUIDE PROJECT INFORMATION

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Our products:

- Best Practice Publications
- Case Studies
- Knowledge Products
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InfraGuide Best Practices

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