

Changing Watering Restrictions Bylaws to Reflect Advancements in Irrigation Technologies:

The City of Calgary as a Case Study

Gillian Skeates, The City of Calgary Waterworks

Denis Gourdeau, The City of Calgary Parks

Abstract

In October 2001, The City of Calgary Waterworks took one of its two municipal water treatment plants offline. Unseasonably warm and dry conditions caused the city's demand for water to remain higher than expected due to ongoing residential landscape watering.

The emergency section of the water utility bylaw was invoked, mandating a ban on all outdoor water use. Recognizing that the existing bylaw primarily targeted the landscape industry, Waterworks undertook a review and update of the bylaw. Waterworks drew from the outdoor water use expertise of Calgary Parks in order to complete the revision. The updated bylaw reflects technological advancements in the irrigation industry and incorporates the Irrigation Association's draft Best Management Practices.

The paper highlights the old bylaw and discusses the processes, evaluations and decisions leading to the establishment of the new bylaw sections and a certified water managed property program for all utility customers.

Background

Calgary is located in the southern part of the province of Alberta, in Canada. It is situated 100 kilometres (60 miles) east of the Rocky Mountains and 300 kilometres (180 miles) north of the border between the United States and Canada. Calgary has a population of approximately 1,000,000 and covers an area of 722 square kilometres (278.5 square miles). The city is a major financial and commercial centre and is home to a variety of industries including Canada's oil and gas industry. Tourism also plays a large role in the economy of Calgary. The climate is semi-arid with an average of 400 millimetres (16 inches) of precipitation annually. The average frost-free period is from May 25 to September 15 (The Calgary Horticultural Society). For all of these reasons, in addition to generally variable weather, outdoor watering in Calgary is important in order to sustain plant life. The City of Calgary Parks has developed over 3000 public landscaped areas, more than 2000 are watered on a regular basis during the summer season.

Calgary has two sources of raw water, both surface sources. The Elbow River serves the Glenmore Water Treatment plant and the Bow River is the source for the Bearspaw Water Treatment Plant. In addition to this, The City of Calgary Waterworks operates 19 finished water storage reservoirs. These reservoirs have a combined holding capacity of 600 Megalitres (158.5 Million US Gallons), which is an appropriate volume for fire protection at any given time, and for acting as a buffer for days when demand outstrips plant production capacity. In 2001, average daily demand for all utility customers was 503 Megalitres (133.1 Million US Gallons) and peak day demand was 850 Megalitres (224.9 Million US Gallons). This is typical of the relationship between average and peak daily demands in Calgary.

Conditions/Situation

In October 2001, the Glenmore Water Treatment Plant was shut down for one month to complete a major infrastructure upgrade. The shutdown had been planned for a period in the fall when daily water demand was expected to be less than the production capacity of the Bearspaw Water Treatment Plant (Voss). An unseasonably warm, dry and long fall resulted in a higher than expected demand for water. Identifying that Bearspaw Water Treatment Plant would not be able to service the entire city at those levels of demand, Waterworks requested that utility customers voluntarily restrict their water use. A drop in demand did occur, however not to the degree that was required. In order to maintain the safety and integrity of the water system, mandatory watering restrictions were implemented from October 12 to November 15, 2001. Prior to this, mandatory restrictions had not been imposed since the early 1960's.

The emergency section of the Water Utility Bylaw did not provide any options for varying levels of restrictions. A total ban on outdoor water use was the only option available. From the bylaw:

“no person shall water any lawns, garden, yards or grounds or use a hose or other similar device to wash motor vehicles or the exteriors of houses or other buildings or for any other use during [periods of shortage]”(The City of Calgary Bylaw 22M82).

As a result, customers who were still using water for outdoor purposes were adversely affected by these restrictions.

The watering restrictions also impacted The City of Calgary Parks. Their Urban Forestry division could not continue its fall tree-watering program. Trees were still being watered well into October in order to mitigate the impacts of drought-like conditions in the area, and minimize tree losses, which could have been as high as \$3,000,000 (CDN), 1 percent of Calgary's tree inventory (Friesen).

Irrigation contractors who were still installing irrigation systems and landscapers who continued to plant in order to fulfill contracts both for The City and for residential and commercial customers could not use outdoor water to test systems or to maintain new plantings. It is estimated there were 50 acres of new landscaping under construction at the time.

Realizing the Need for Change

It was clear to Waterworks that there was a need to develop an updated watering restrictions strategy, communicate with customers in a more integrated fashion, and increase public education around the use of water resources. Furthermore, a member of Calgary's City Council requested that Waterworks consult with customer groups affected by the watering restriction in the fall of 2001, and bring forward amendments to the Water Utility Bylaw with respect to watering restrictions (The City of Calgary Motion NM2001-36). Minimizing the impacts on any one group of customers in the event of future watering restrictions was to be a key outcome of amending the bylaw. Partnering with Calgary Parks would help to identify ways that the irrigation industry has responded to increasingly scarce water and ways that new technology in landscape irrigation could be incorporated into a restrictions strategy.

In the summer of 2002, Waterworks again needed to curb customer demand. The review of the mandatory watering restriction policy was not yet complete and instead of burdening customers with a mandatory restriction per the inequitable existing bylaw, Waterworks requested that customers voluntarily reduce their water use. This experience reinforced the need to have a more flexible mandatory watering restriction strategy to accommodate customers who use water outdoors in the course of operating a business, and those who use highly efficient irrigation systems as well as those who need to water in order to establish new plantings.

Review Process

The review process began by examining watering restriction policies and current literature on the subject from across North America. The findings showed the following similarities among approaches to watering restrictions (Capital Regional District) (The City of Austin Texas):

1. Various stages of restrictions are typical. The stages become increasingly restrictive as conditions worsen. There is generally no expectation that implementation must be in the order of number; the stage that most appropriately provides a solution to the shortage is the stage that is implemented.
2. There are typically exemptions for specific conditions. For example, commercial and industrial customers, who would suffer financial hardship in the event that their water use is restricted, or who rely on the use of water for reasons of health and safety, would be exempt in the earlier stages. The watering of recently installed landscaping is typically exempt, also in earlier stages.
3. There are various methods of imposing watering restrictions. An odd/even-watering schedule is common, though another option is to implement restrictions based on larger geographic zones. For example, a watering restriction according to garbage day pickup, community, quadrant of the city or postal code zone is also commonly used.

Based on the experiences of other municipalities in implementing watering restrictions and subsequent research, there are advantages to the geographic zone watering approach. Zone watering increases the flexibility that the utility has over areas where water use will be restricted, as it breaks the area down into more than two groups and minimizes the number of customers who will water on any given day. It also brings about the desired effect of a reduction in demand. Experience has shown in other municipalities that odd/even-watering can result in increases in demand and artificial peaks (Gregg).

Customer Consultation

Many customers groups were consulted during this investigation into watering restriction amendments. Focus groups and meetings were held to present ideas for a revised approach and to solicit feedback and customer support for the revisions. The specific groups consulted included representatives from Community Associations on behalf of residential customers, the Calgary Horticultural Society, and commercial and industrial customers including representatives from the linen, car wash, and food and beverage industries. Also the Irrigation Association, the Building Owners and Managers Association, the Urban Development Institute, Landscape Alberta Nursery Trades Association and regional customers outside of city limits were consulted. The City of Calgary business units consulted included Parks, Roads, Fire Services and Recreation.

Residential customers stated that information from The City about watering restrictions should be communicated clearly, in a consistent and timely manner using an integrated strategy. Industrial and

commercial customers indicated that they would be unable to assist in the event of restrictions, as the cost of using water in their business has already motivated them to be as water efficient as possible. During shortages, landscapers and developers would be willing to help out, although they do require water for the purpose of establishing newly developed sites. When it is possible to provide advance notice of a watering restriction to these customers they would work with Waterworks to mitigate the impact. It is also critical to customer groups that The City of Calgary lead by example, and, when approached, business units were responsive and willing to co-operate. In most cases, internal and external stakeholders were pleased that they had been consulted with during the watering restriction review process.

Calgary Parks wanted some acknowledgement of users who are conservative with their water use throughout the irrigation season. Parks operates 430 locations that have centrally controlled irrigation systems installed, and those technologically advanced systems were treated in the same way as archaic systems that inherently waste water. Parks' centrally controlled irrigation systems use upwards of 44 percent less water than traditional systems (Gourdeau and Marter).

Proposed Changes

The proposed changes to the bylaw, which were approved by Calgary's City Council on September 9, 2002, include a four-staged approach where a schedule is established based on a geographic area. Watering according to postal code prefixes, on a one per seven-day schedule, allows more flexibility, can be used to isolate districts if the problem and restrictions are needed locally, and helps to bring about the desired reduction in demand. It also facilitates by-law enforcement.

The stages of restrictions were developed based on typical Calgary demand patterns, municipal water utility standards, typical Calgary climatic conditions and the Irrigation Association's draft Best Management Practices. They are used to progressively lower the city demand as the stage increased. Stages apply to all customers including residential, non-residential and The City of Calgary business units. Under this approach, specific activities are restricted for various groups of customers. Exemptions are granted for water uses that are required for the purpose of operating a business, or that protect the health and safety of the public.

Table 1: Restricted Activities during Periods of Shortage

Activity	Application Method	Stage One	Stage Two	Stage Three	Stage Four
Watering of gardens, trees and shrubs	Hand-held containers	Allowed	Allowed	Allowed	Complete ban on all activities listed in Activity column. The City of Calgary Waterworks instructs all customers to reduce water consumption inside and outside their homes and businesses.
Watering of gardens, trees and shrubs	Hose connected spring-loaded automatic shut-off devices	Allowed	Allowed	Not Allowed	
Watering of lawns, gardens, trees and shrubs	Irrigation through Tier One Water Managed System with certification from City	Allowed with certificate from City. Must reduce watering programs by 10%	Allowed with certificate from City. Must reduce watering programs by 20%	Allowed with certificate from City. Must reduce watering programs by 30%	
Watering of lawns, gardens, trees and shrubs	Irrigation through Tier Two Water Managed Systems with certification from City	Allowed with certificate from City. Must reduce watering programs by 15%	Allowed with certificate from City. Must reduce watering programs by 25%	Allowed with certificate from City. Must reduce watering programs by 35%	
Watering of New Plantings (sod or seed) with reasonable evidence of recent installation: <i>Sod within 21 days</i> <i>Seed within 45 days</i>	Any	Allowed	Allowed	Allowed	
Watering of lawns, gardens, trees and shrubs	Irrigation with hose-connected sprinkler or Non Water Managed Irrigation System	Based on postal code prefix One day per week 2 hours per day within the hours of 4-7 am, 9-11 am or 10-12 pm	Based on postal code prefix One day per week 1 hour per day within the hours of 4-7 am, 9-11 am or 10-12 pm	Not Allowed	

No customer is allowed to use water in fountains and other decorative or recreational features, throughout the stages of restrictions. Washing down sidewalks, walkways, driveways, exterior building surfaces, or other outdoor surfaces, is not allowed throughout the restrictions. The City of Calgary operations cease non-essential hydrant and main flushing, street and bridge cleaning as well as non-essential washing of city

vehicles throughout the restrictions. Any City landscaped property that is watered with a non-water managed irrigation system also ceases with the exception of those that fall into a category of exempted groups or activities (The City of Calgary Bylaw 22M82).

The watering restrictions strategy meets three objectives with respect to exempted groups. Industrial and commercial customers are treated equitably as a group i.e. no particular group is more burdened than another is. Groups that require water for uses that protect the health and safety of the public are exempt and furthermore, groups that would experience financial hardship in the event that their water use was restricted are exempt as well (The City of Calgary OE2002-24).

The following businesses or specific activities are exempt from watering restrictions that would impact water used in their course of doing business, except when a stage 4 water restriction is in effect.

- (a) Commercial car or truck wash,
- (b) Washing vehicles for health or safety regulatory compliance,
- (c) Childcare facilities,
- (d) Kennels or animal-care facilities,
- (e) Food and beverage establishments,
- (f) Nurseries, garden centres, turf and tree farms,
- (g) Snow or ice making,
- (h) Pesticide or fertilizer application,
- (i) Power or window washing enterprises,
- (j) Testing irrigation systems,
- (k) Integrated Pest Management Test Sites,
- (l) Farming operations and
- (m) Water use for construction purposes, including grading, compaction and dust control.

These groups are expected to comply with respect to landscaped areas on their property.

Water Managed Sites

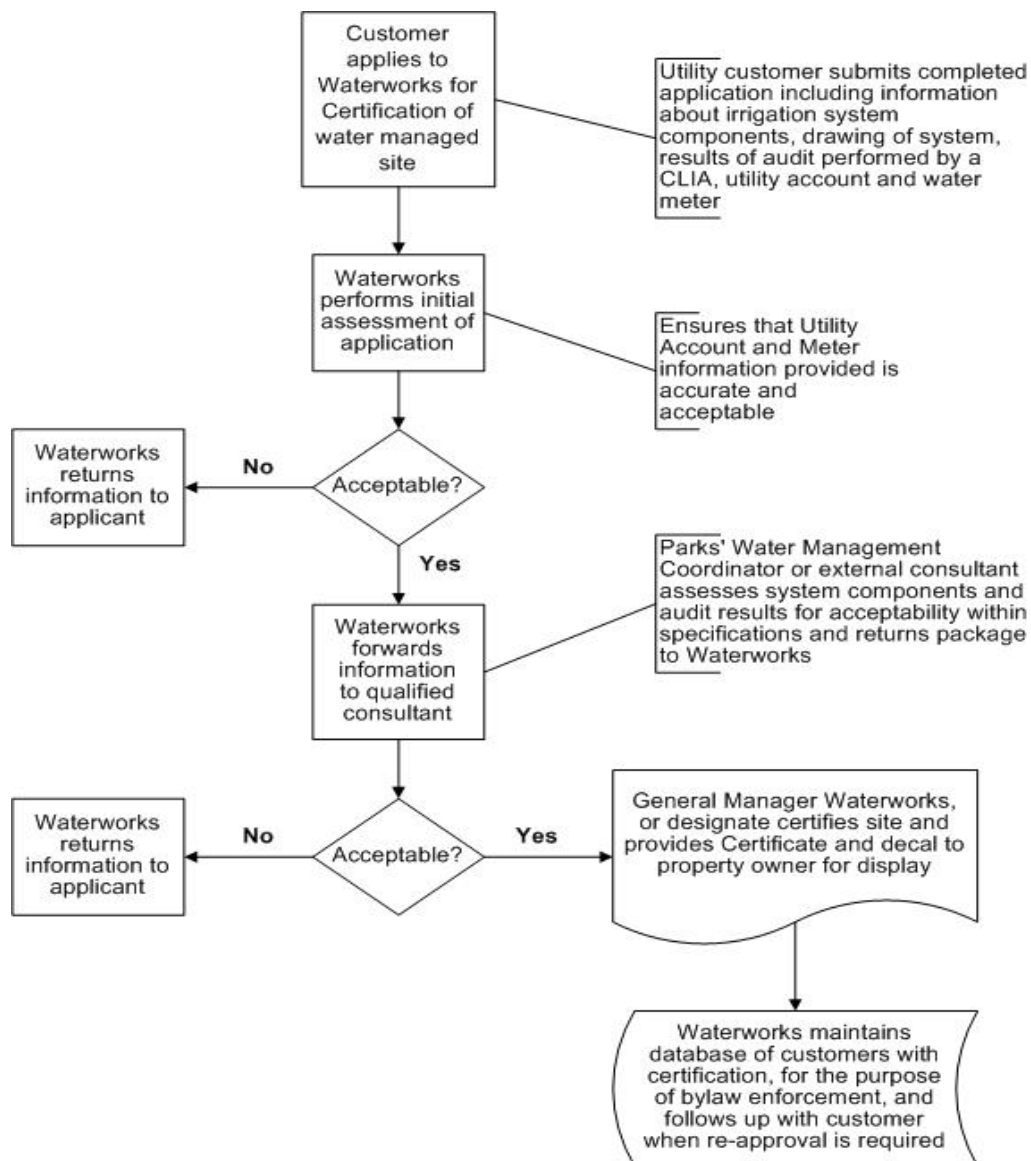
The strategy also includes a benefit for sites that incorporate true water management. Water managed sites use current technology and work towards incorporating weather conditions when applying water to the landscape. They also must comply with a landscape irrigation audit schedule in order to maintain certification of the site. An Irrigation Association Certified Landscape Irrigation Auditor must complete the irrigation audit. When watering restrictions are imposed, water managed sites are required to reduce their watering practices by a designated percentage, which is less restrictive than what non-water managed sites are required to do. This provides a benefit for those property owners who have demonstrated their long-term commitment to water efficiency, by installing and maintaining these systems (The City of Calgary OE2002-34).

All water managed sites must meet the minimum system requirements for installed components. The systems must include a rain switch, a master valve to secure the system if a leak is detected and a metering device. Once all the above requirements are met, water managed sites will fit into one of two tiers of efficiency. A tier one water managed site irrigation system must be centrally controlled, with evapotranspiration based scheduling using real climatic data. A Certified Landscape Irrigation Auditor must audit it for system

efficiency and distribution uniformity, prior to certification and once every two years thereafter. A tier two water managed site irrigation system must be automatically controlled with evapotranspiration based irrigation scheduling using historical climatic data and audited for system efficiency and distribution uniformity, prior to certification and annually, by a Certified Landscape Irrigation Auditor (The City of Calgary OE2002-34). Waterworks identified a need to increase the number of Certified Landscape Irrigation Auditors in the market in order to meet the potential demand for irrigation audits in Calgary. To achieve this, the Certified Landscape Irrigation Auditor course was offered in Calgary, in co-operation with the Alberta Chapter of the Irrigation Association, on two occasions with 50 percent of the fees, for eligible registrants, subsidized by Waterworks.

All segments of customers can apply for their properties to be certified as water managed sites and must follow the process below in order to become certified.

Chart 1: Process for Certifying Water Managed Sites



Penalties reflect the severity of the situation, are aligned with other bylaw penalties within The City of Calgary and the penalties for watering restriction violations in other municipalities.

Table 2: Summary of Penalties for Watering Violations

VIOLATION	PENALTY
Stage 1 First offence	\$200
Stage 2 First offence	\$300
Stage 3 First offence	\$400
Any subsequent offence in Stage 1, 2, or 3	\$1000
Stage 4 First offence	\$500
Any subsequent offence	\$2000

Communication Plan

In order to prepare for times of shortage, Waterworks has developed a comprehensive rollout strategy and communication plan. When watering restrictions are required, an integrated approach to communicating with the public is implemented. The goals of the communication plan include:

- ◆ To provide customers with the information they need, to comply with the mandatory restriction and ultimately reduce their water demand,
- ◆ To maintain public confidence in the operation of the utility during a time of water shortage,
- ◆ To inform employees of Waterworks and The City of Calgary that watering restrictions are in place and to ensure that our staff are the most knowledgeable spokespeople,
- ◆ To respond effectively to needs for information from all stakeholders – the public, employees, media, and City Council and
- ◆ To position The City of Calgary in a leadership role by demonstrating wise use of precious resources.

One of the first steps taken to inform customers of the changes to the watering restriction portion of the bylaw, was to produce a brochure called “Your guide to the watering restrictions bylaw – For Residential Customers” and provide it to all single family residential premises in the city.

The Waterworks website (www.calgary.ca/waterworks) has proven to be a valuable tool to convey messages to customers. In addition, the internal City of Calgary websites are a means of informing employees, both of changes to the existing policy, and changing conditions that might necessitate a mandatory restriction. A list of frequently asked questions, and their respective answers was developed for use on all websites.

Conclusion

After experiencing effects of recent watering restriction events and working through the process of revising the emergency measures section of the Water Utility Bylaw, The City of Calgary has developed an innovative solution, flexible enough to be implemented in emergency situations that may be caused by a variety of conditions.

General acceptance of the new bylaw, and especially the benefit of having certification as a water managed site, has been high. The consultative approach that was taken in these revisions has resulted in greater buy-in from stakeholder groups. Customers acknowledge that The City of Calgary is leading by example through changes in its own operations and water conserving initiatives that Parks and Waterworks have implemented.

The solution balances the needs of utility customers and the business needs of the utility, while incorporating practices that allow for sustained growth of landscaped areas and acknowledge the benefits of advanced technology in irrigation systems. It meets the utility's need with respect to flexibility, demand management and ease of enforcement, while creating equitable stages for all customers and allowing for the protection of landscaping and the city's urban forest areas.

Works Cited

1. The Calgary Horticultural Society. The Calgary Gardener: The Essential Guide to Gardening in Alberta's Chinook Country. Calgary, AB: Fifth House Ltd., 1996.
2. Voss, Ken. Personal Interview. 15 Sept. 2003
3. The City of Calgary. City Clerk. Bylaw 22M82: Water Utility Bylaw. City Clerk, Calgary, AB, 2002.
4. Friesen, Russell. Personal Interview. 15 Sept. 2003.
5. The City of Calgary. City Clerk. Motion NM2001-36. City Clerk, Calgary, AB, 2001.
6. Capital Regional District. Corporate Secretary. Bylaw No. 3061: Water Conservation Bylaw. Corporate Secretary, Victoria, B.C., 2003.
7. The City of Austin Texas. Austin Texas Code of Ordinances. Chapter 4-2: Water Conservation, Article II Divisions 1-3. American Legal Publishing Corporation. 2003.
8. Gregg, Tony. Watering Restrictions that Work: The Summer of 2000 in Austin. Proc. of the American Water Works Association Annual Conference, June 2001, Washington, D.C. American Water Works Association, 2001.
9. Gourdeau, Denis; Doug Marter. Changes to the Irrigation Paradigm: The City of Calgary Parks as a Case Study. Proc. of the Irrigation Association Annual Irrigation Show, Oct 2002, New Orleans, La. Irrigation Association, 2002.
10. The City of Calgary. Waterworks. OE2002-24: Report on Watering Restrictions. City Clerk, Calgary, AB, 2002.
11. The City of Calgary. Waterworks. OE2002-34: Report on Watering Restrictions Supplementary Information on Water Managed Sites. City Clerk, Calgary, AB, 2002.