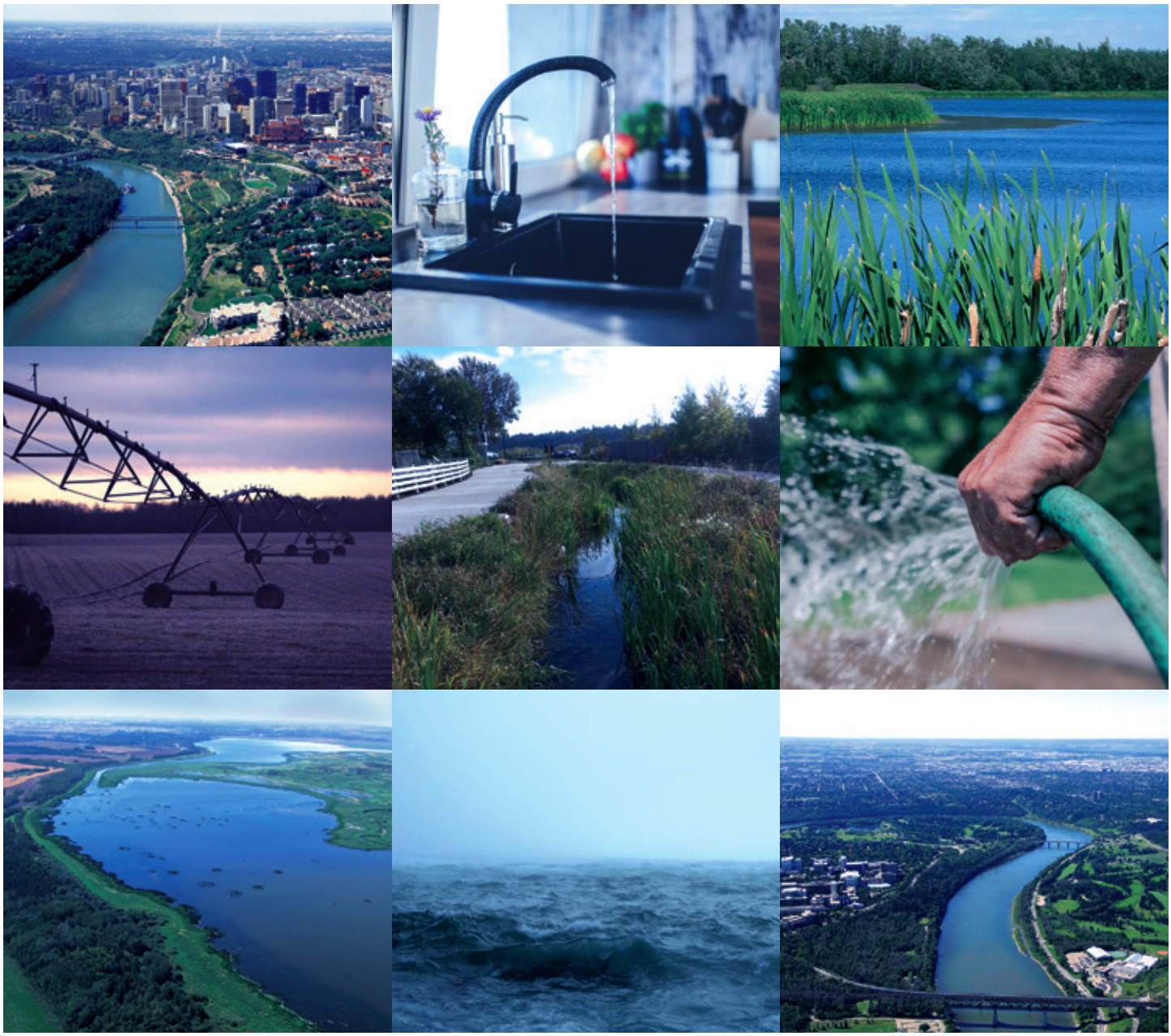
PLAN NORTH WEST

A journal for professional planners of Alberta, Manitoba, Northwest Territories, Nunavut, and Saskatchewan

Autumn 2017, Issue 3



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In this issue...

PLAN North West offers opportunity for publication of original works that are both community-based and research oriented, and relevant to Alberta, Manitoba, Saskatchewan, Nunavut and the Northwest Territories. Types of submissions include case studies, analysis of events and/or trends, profiles of notable planners, projects, or programs, overviews of best practices and guidelines, book reviews or excerpts, and opinion pieces.

Journal Submissions

We are always looking for articles for future issues of *PLAN North West*. Submit an article or idea at any time and a member of the Committee will help you through the process of getting it published. Potential subject areas we are interested in receiving article submissions on include:

- sustainability initiatives
- member accomplishments
- member research
- community development projects
- urban design
- student experiences
- innovative ideas
- planning successes

We are planning a special issue focused on active and sustainable transportation. Please submit articles relating to walkable neighbourhoods, biking infrastructure, accessibility, public transit, etc. For more information, please contact the Committee at plannorthwest@gmail.com or 780 435 8716.

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Feedback

The *PLAN North West* Committee welcomes your feedback. Please submit any comments you may have about this issue to plannorthwest@gmail.com. Your comments, suggestions and feedback are critical for *PLAN North West's* continued improvement and for us to provide the best possible publication that meets the expectations of our readers.

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MESSAGE FROM THE JOURNAL COMMITTEE

Welcome to The Water Issue—An investigation of the fluid landscape of Canada's North West. What is being done to control the uncontrollable? Are we succeeding and how do we know? Adhering to the strictly drawn boundaries we often work in as planners while realizing a fluid landscape is challenging. Water affects every facet of planning, engineering, and design, as it is a critical and basic element for health, sanitation, livelihood, and recreation.

From a discussion on the preparation of water plans, to the allocation of costs associated with clean water, to a general discussion of water issues facing the regions of Canada—these topics are at the forefront of planning. Discussions around natural resources, their exploitation and protection, will continue to grow.

This is the third issue of *PLAN North West*, and *PLAN North West* is *your* journal. As such, the issues should represent the subjects that you are dealing with, and expose you to new methodologies. We encourage you to send us topics that you would like to see explored in upcoming issues. In addition, send us your comments and criticisms so that *PLAN North West* can continue to grow. Contact us at **plannorthwest@gmail.com**.

MESSAGES FROM THE PRESIDENTS

Alberta

The theme of water for this issue of *PLAN North West* could not be timelier. This spring's flooding in Ontario, Quebec and British Columbia, reminded Alberta of the devastating 2013 floods. All newspapers are filled with questions about land use planning and the need to reconsider building on flood plains.

A recent online article on CBC quoted a University of Waterloo professor who stated "poor land-use planning at the local level basically goes unpunished and in fact gets rewarded with additional disaster assistance from the provincial and the federal government." At the 2017 national planning conference co-hosted by the Canadian Institute of Planners and the Alberta Professional Planners Institute in Calgary, our profession had the opportunity to focus on Building Resilience, and the articles about water in this journal provide further opportunity to ponder the impact that water has on planning. From flooding, to the need for water supply for municipal population and economic growth, water does and will continue to play an important role in our decisions as planners.

On behalf of the Alberta Professional Planners Institute, I would like to thank the *PLAN North West* Committee and each author of the articles for sharing their knowledge and continuing to strengthen the discussion on planning.

APPI Reaches Milestone of 1000 Members

APPI now has 1000+ members! As a self-regulated profession committed to the public interest, APPI's thriving and growing membership raises the profile of planning and benefits APPI members and the communities in which we all work and live.

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Saskatchewan

Water is one of our most valuable resources. Water sustains various forms of life and is integral to community development. Many of us turn on our taps to receive clean drinking water without thinking twice. Unfortunately, it is only when we are confronted with contamination or shortages that we realize how valuable potable water is.

As a whole, Canada is considered a water-rich country. However, at the regional and local levels, water quality and quantity can vary significantly. Ken Johnson's article about water supply issues in Nunavut demonstrates that when drinking water supplies diminish, the infrastructure costs to secure, treat and deliver water can rise dramatically.

Sufficient water quality and quantity are necessary to sustain a community. The growth and development of a community is often enabled or restricted by the availability of water. Bill Brant's article discusses how public water supplies influence community planning and development.

Solutions to a community's water quality and quantity issues require innovative, multidisciplinary thinking. Natasha Kuzmak explores several methods for making water-conscious land use planning and development decisions in her article about Calgary's integrated watershed management approach.

Moving forward, more attention needs to be focused on how the decisions we make impact water. As Wendell Berry said; "We do not inherit the earth from our ancestors, we borrow it from our children."

On behalf of the Saskatchewan Professional Planners Institute, I wish to thank the P*LAN North West* Committee and contributing authors for shining a light on the importance of wisely managing our precious water resources through community planning.

Manitoba

On behalf of MPPI members, I want to thank the 2017 CIP/APPI conference committee for hosting a wonderful event in Calgary this past June. The keynote speakers, session speakers and the informal mingling certainly advanced our planning knowledge by sharing experiences and examples from across our great country and beyond.

Some of our MPPI members drove to Calgary by way of the "Winnipeggo" motor home. It was parked in the surface parking lot across the street from the conference hotel and was the venue that hosted the Gala "after party" that continued late into the evening. Thanks to the folks at Landmark Planning & Design Inc. and their crew for making the event even more memorable.

MPPI has some big shoes to fill as Winnipeg will be the host city for the 2018 CIP conference, but our large volunteer conference committee, co-chaired by Donovan Toews RPP and Chris Leach FCIP is ready for the challenge. The conference theme is "SOUL" which emphasizes key planning elements that help shape and transform communities. It represents Winnipeg's grit and authenticity of the spaces and places people gather and connect, and the culture and diversity that is experienced in Manitoba's capital city.

Please mark your calendars and plan on attending July 19-22, 2018 and experience the warm summer weather and warm hospitality of Winnipeg. Hope to see you in Winnipeg in 2018!

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SUBMITTED BY Kristy LeBaron MCIP, RPP & Katy Walsh MCIP, RPP

Manitoba's Guidelines for Preparing Drinking Water and Wastewater Management Plans

SOURCE: *Pexels*

Planners understand the impacts of land use and development decisions are often long term and far reaching. These decisions not only shape our communities and the way we live, but also affect the sustainability of the resources and infrastructure on which our communities depend. Accordingly, land use and development decisions made by planning authorities must consider the associated requirements for infrastructure and services.

In Manitoba, provincial legislation requires that appropriate studies be undertaken when reviewing or making a large-scale amendment to a municipal or planning district Development Plan by-law. These studies provide the background information necessary for undertaking a comprehensive analysis that supports the planning strategies and development directions outlined in the Development Plan by-law.

As each community has its own unique circumstances, the studies necessary to support planning will vary. However, in all cases, it is a minimum requirement for planning authorities to undertake a general overview and assessment of existing infrastructure.

In areas experiencing significant development pressures, planning authorities may need to undertake a more extensive examination of their existing infrastructure—in particular, drinking water and wastewater management systems. In these cases, municipalities and planning districts may need to prepare a drinking water and/or wastewater management plan to demonstrate existing water resources and systems can accommodate proposed development or identify where upgrades may be required.

These plans identify the short, medium, and long-term impacts of development related to water/wastewater infrastructure and resources, helping decision-makers better understand their options, and the associated costs and benefits.

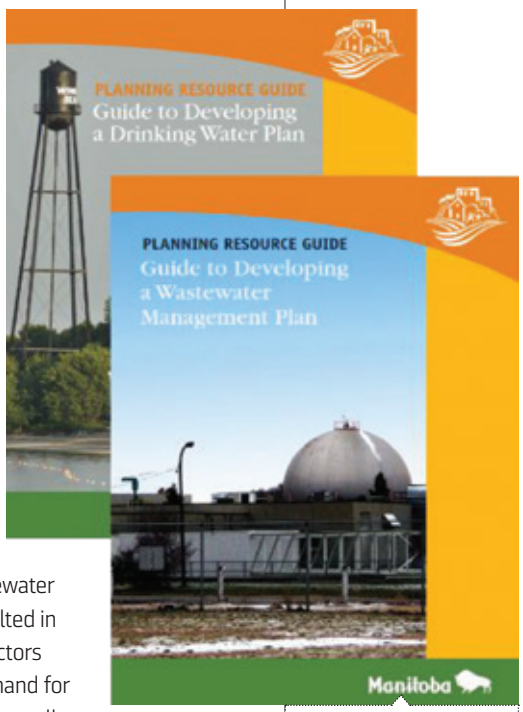
To assist planning authorities to prepare drinking water and/or wastewater management plans, Manitoba's Department of Indigenous and Municipal Relations has prepared two resource guides. The guides are intended for municipal audiences, and assume a basic understanding of the topic and the ability to know where and how to obtain the necessary information

to complete the plans. The information provided is general and can be applied in a variety of scenarios, from rural municipalities with low population densities to mid-sized urban centres. The guides are used by municipalities undertaking to prepare the plans themselves, as well as those hiring a consultant with more technical expertise. The process to prepare a plan is as follows:

- It begins with a description of the **current situation** of the drinking water/wastewater systems in the planning area, including the sources of water/wastewater; current needs; a description of the types of water/wastewater systems in place; associated costs and financing approaches. It also includes an assessment of the functionality and any issues associated with existing systems.
- Next is a depiction of the **projected situation**. This is based on the same information contained in the development plan, such as population projections. Using anticipated growth and development patterns in the planning area, an estimate is made of the subsequent demand and impacts on the current systems, as a result of anticipated growth.
- Following the projected situation is an exploration of **future options** available for water supply/wastewater treatment. One or more approaches are selected. Possibilities for regionalization of water supplies and wastewater systems in the future are explored.
- Last is an estimate of the **implementation and financing** of the future water/wastewater system needs, including timing and location of upgrades, capital and operating costs, and financing mechanisms. Related policy guidance that can be reflected in the development plan is also included.

Drinking water and wastewater management plans can be prepared as a single plan or as two separate documents. Plans are submitted to a provincial technical advisory committee (TAC) for review. The committee is coordinated by Manitoba Indigenous and Municipal Relations with representation from various government departments, including Sustainable Development, Infrastructure, and the Water Services Board. Representation on the TAC reflects the broad impacts associated with land use and infrastructure.

One of the challenges to preparing these plans is gathering complete data—in some cases, complete data is simply not available. However, other procedures may help to close those gaps. Integrated Watershed Management Plans (IWMPs)—long-term plans created cooperatively by residents, government and others to manage land and water in the watershed—involve data collection that can be complementary. The IWMP process results in a snapshot of a region's surface and groundwater resources and the use of these resources as community water supplies. Over time, the information gathered as part of that process will help to build a more complete picture of a region's water situation. Where a long-term record is available, it will be useful for both IWMPs and drinking water/wastewater management plans.



Planning Resource Guides to Developing Drinking Water and Wastewater Management Plans

SOURCE: *Manitoba Indigenous and Municipal Relations*

Drinking water and wastewater management plans have resulted in greater awareness of local factors contributing to increased demand for new and expanded facilities, as well as greater familiarity with the options available to address demand. They have also helped communities prioritize drinking water and wastewater infrastructure investments. The structured planning approach means that important considerations will not be overlooked when considering the need for improved facilities. It also encourages planning authorities to consider a wider range of options to address their infrastructure needs.

Ultimately, this greater local awareness and familiarity supports more robust land use planning and policy. This leads to more informed decision-making that can help to ensure the sustainable development of land and resources.

For more information on drinking water and wastewater management plans, the resource guides are available on the Manitoba Indigenous and Municipal Relations website at **http://www.gov.mb.ca/ia/plups/sm.html**.

About the Author

Kristy LeBaron MCIP, RPP is a principal planning consultant at Catapult Community Planning in Winnipeg, Manitoba. Previously, Kristy was the manager of the Policy and Legislation Unit at Manitoba Indigenous and Municipal Relations where she oversaw the preparation and publication of the Guidelines for Preparing Drinking Water and Wastewater Management Plans.

Katy Walsh MCIP, RPP was a policy planner and analyst with Manitoba Indigenous and Municipal Relations from 2008 to 2016. She coordinated the Drinking Water and Wastewater Management Plan TACs for three years. Katy received her Masters of City Planning from the University of Manitoba in 2010 and is currently working as an Environmental Officer for the Mount Barker District Council in South Australia.

SUBMITTED BY Ken Johnson MCIP, RPP, P.ENG.

Northern Water: An Abundant Resource in Short Supply

Buried installation of insulated High Density Polyurethane (HDPE) water line in Resolute, Nunavut

SOURCE: *Ken Johnson MCIP, RPP*

The Canadian north, including Nunavut, the Northwest Territories and the Yukon covers a massive 40 per cent (3.9 million kilometres) of Canada's land base. The total population of the three territories is around 100,000 people, with 50,000 in the territorial capitals. From a mathematical perspective, the north is uninhabited when the three largest communities are excluded from the equation, allotting one person for every 100 square kilometres of land on average.

It is estimated that 37 per cent of Canada's total freshwater area is contained in the three territories. In spite of this abundant resource, water can be a scarce commodity, particularly for communities in the north that require a clean source of water year round. Winter can last eight to ten months of the year, and in winter, most of the surface water is frozen with a layer of ice up to two metres thick covering it. The north is also a desert with most regions receiving less than 250 mm of annual precipitation, falling mostly as snow. Together with these fundamental challenges, community water supply in Nunavut is particularly challenging due to geographic isolation, extreme cold climate, permafrost geology, extreme costs, limited level of service, and other unique northern community attributes.

Geography and Climate of Nunavut

Nunavut stretches south from the northern tip of Ellesmere Island off Greenland's north coast to the 60th parallel. The eastern boundary is the Arctic waters between the coasts of Greenland and Nunavut, which are only 25 kilometres apart in places. The communities of Qikiqtarjuaq, Nunavut, and Sisimiut, Greenland are only 450 kilometres apart. The southern boundary of Nunavut is the 60th parallel, and the western boundary starts at the Saskatchewan/Manitoba border, heads due north for 500 kilometres, and then angles west to the Arctic coast near Kugluktuk, and finally goes due north near the 110th longitude to the north pole.

The mean annual temperatures in Nunavut range from just below minus 10°C in the extreme southeast, to near minus 20°C in the far north. Nunavut does not

have a significant summer season, and during the cool, brief summer, the ice-filled waters limit the surface temperature to minus 10°C. In July, the warmest month, temperatures are prevented from rising much above 7°C.

In spite of the presence of the Arctic Ocean, Nunavut is one of the driest regions in the world, with a scant 50 mm of precipitation falling in the northern region and 375 mm in the southern region. In general, 50 to 80 per cent of the yearly precipitation falls as snow. Surface water covers approximately seven and a half per cent of Nunavut.

Water Supply and Delivery in Nunavut Communities

Nunavut is the largest of the three territories with 20 per cent of Canada's land mass and only 30,000 people. The 25 communities of Nunavut range in size from Grise Fiord with 140 people in the far north, to Iqaluit, with 7000 people in the south. Eleven of the 25 communities are over 1000 people, and all of the communities except one (Baker Lake) are coastal. Surface water provides drinking water to all of the communities because permafrost geology does not accommodate any groundwater resources.

Community water supplies make use of lakes and rivers, and provide either year round water supply, or a seasonal water supply. The lakes and rivers used year round must consider the formation of surface ice up to two metres thick, which can damage the piping into the lakes if it is placed too shallow, and can damage the piping in rivers, particularly during the river break-up in the spring. Lakes and rivers that provide a seasonal water supply are used to fill long-term storage reservoirs. Nine Nunavut communities have engineered storage reservoirs that have sufficient water stored for up to a year. An allowance for the formation of ice must be considered in the design of these reservoirs.

Proximity of water to the community itself presents another challenge because of the cost of building, operating, and maintaining roads and pipelines. At nearly $1 million (Canadian) per kilometre for a road and a pipeline in some locations, the economics places distant piped water sources beyond the financial reach of most communities. Add to this cost the potential for pipeline freezing, and the severe operating conditions for blizzards, and closer becomes a lot better.

Drinking water is disinfected in Nunavut before delivery to the houses. More substantial treatment using filtration technologies is being introduced into Nunavut communities to provide a multi barrier to the potential for drinking water contamination. Water treatment improvements are encouraged by public health officials, and may ultimately be mandated by public health regulations.

It is estimated that 37 per cent of Canada's total freshwater area is contained in the three territories.

The level of service for water delivery and sewage collection in most Nunavut communities is trucked services, with large water and sewer trucks distributing the water and collecting the sewage. Each home has a water and sewage storage tank for the pumped water delivery and sewage collection.

There are three communities in Nunavut with piped water and sewer systems, namely Iqaluit, Rankin Inlet, and Resolute. These piped systems are unique and expensive to build because of the cost of labour and materials. The construction season for buried water and sewer systems is generally limited to three months of the year when the ground has thawed sufficiently to excavate.

Fire protection is also a unique challenge in Nunavut because of the reliance on a trucked water level of service in most communities to fight any fires. Fire losses are disproportionately higher than southern regions because of the limitations of this level of service, and other issues. One of the simple fire protection measures that is applied is a 12 metre separation distance between buildings.

Potable water filtration treatment facility in Cambridge Bay, Nunavut with storage reservoir and smaller water treatment residuals reservoir

SOURCE: *Ken Johnson MCIP, RPP*

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Pump out trucked sewage collection from in house sewage tank in Repulse Bay, Nunavut

SOURCE: *Ken Johnson MCIP, RPP*

Buried, insulated High Density Polyurethane (HDPE) water and sewer lines between manholes in Rankin Inlet, Nunavut

SOURCE: *Ken Johnson MCIP, RPP*

The Cost of Nunavut Water

The cost of northern water, for both capital cost, and the operation and maintenance costs, is a function of the cost of labour and materials, which are influenced by the geographic isolation, the extreme cold climate, and the permafrost geology. The water and sewer systems have operating challenges associated with the potential freezing of the piping due to heat loss, which is counter acted with pipe insulation, water circulation, and water heating. In the pipe systems where circulation and heating is limited, freeze protection is achieved by 'bleeding' of the water system into the sewer system, which may amount to water use that is two or three times what would normally be anticipated.

An example of the capital cost of a piped system is the replacement of the piped system in Resolute, which was tendered several years ago. The lowest tender received for the project was $44.4 million, which put the project budget approximately $18 million (70 per cent) over the pre-tender construction estimate of $26 million. Resolute has a population of 250 people, so the cost per person for the system replacement was nearly $180,000.

An example of the operation and maintenance costs of a water and sewer system are the costs for water and sewer in the community of Grise Fiord, Nunavut. Grise Fiord is the northern most community in Canada. The annual cost was over $2,200 per person in 2002, or 6.4 cents per litre for water and sewer (4.5 cents per litre for water only); the overall water use was 5,680,000 litres or 95 litres per capita per day.

In comparison to the cost of water in this community, the cost of water is a mere 0.12 cents per litre in Edmonton. A quick mathematical comparison places water costs in Grise Fiord a whopping 40 times more expensive than Edmonton.

Added to these financial challenges are the technical challenges of designing, constructing, operating and maintaining northern water and sewer infrastructure.

Extreme Water Issues and the Future of Nunavut Water

As challenging as 'normal' water supply is in Nunavut, there are several examples of extreme water use issues in Nunavut. In Grise Fiord, the stream that fills the water reservoirs on an annual basis dried up during one filling season, and the community ran out of drinking water before the reservoir could be refilled in the spring. The community resorted to harvesting icebergs, chopping and placing the ice into the reservoir to maintain the water supply.

The communities of Kugluktuk and Kugaaruk are experiencing issues with saltwater intrusion into their river water supply systems because tidal action is creating a salt water wedge that advances up the river to the point of the water supply intake. In the community of Sanikiluaq, saltwater intrusion is also occurring with the ocean making its way into the lake that supplies the community.

Most northern communities also have limited capacity for dealing with water, whether it be financial, administrative or human resources. Contrary to this limited capacity are increasing demands for finance, administration and human resources being driven by increasing regulatory demands, and increasing sophistication in the technology associated with treatment of drinking water and waste water.

Climate change is also emerging as an issue for water supply in Nunavut. The water supply issues in Grise Fiord, Kugluktuk, Kugaaruk and Sanikiluaq may not be conclusively caused by climate change, but the warming of the Arctic is making the problems such as these worse. It is anticipated that the warming arctic climate in Nunavut will influence the quantity and quality of water that is already in short supply. Water supply options for the future are being studied to appropriately increase redundancy and resiliency.

Twelve month water supply reservoir in Chesterfield Inlet, Nunavut excavated into bedrock

SOURCE: *Ken Johnson MCIP, RPP*

Ken Johnson MCIP, RPP, P.ENG. is a planner, engineer, and historian with Stantec. He has been coming and going from the far north for 30 years, and he has lived, worked, and played in Nunavut, the Northwest Territories and the Yukon. As a water engineer specializing in the cold, Ken has planned and engineered a variety water related projects in all three territories. He has written several books about the north including a book on wastewater, a book on community planning, and a book on history–these books are available electronically at the ISSUU website under CRYOFRONT. Ken may be reached at kenneth.johnson@stantec.com.

About the Author

SUBMITTED BY Bill Brant P.ENG., FEC

Water Supply & Community Planning: Promoting an Integrated Approach

SOURCE: *iStock*

Community planning and growth are both facilitated and constrained by numerous issues. Water is one of them and it influences community planning and development in many ways.

In the realm of the human environment, water has many dimensions. First, precipitation and snowmelt contribute to runoff, which requires means for drainage. For many communities, flood control measures are also needed. Second, water resources are needed to provide the supplies essential for human consumption, for firefighting and for industrial needs. Third, after being used, so-called wastewater–or 'sewage'–needs to be conveyed to treatment facilities before being discharged back to the environment. If this article covered the full spectrum, it could be a book, so it will need to focus only on one dimension.

The focus of this article is mainly on public water supply and how it influences community planning and development.

The ancient Romans built aqueducts over two millennia ago to convey good quality water from unpolluted uplands rivers and lakes, because they understood the need for fresh water to supply their large, growing cities (F L Small, 1974). Some of those ancient aqueducts still provide water to a number of cities.

Early in 2016, Ron McCullough, the Chief Administrative Officer of the Rural Municipality of Sherwood, which surrounds the City of Regina, gave me a book entitled "Thirteen ways to kill your community" (Griffiths & Clemmer, 2011). Written by D. Griffiths, a former Member of the Legislative Assembly and Minister of Municipal Affairs in Alberta, it delivered some powerful messages about how to encourage growth, development and prosperity, and also how a community can be condemned to wither and die. The first way identified by Griffiths (2011) as a sure-fire way to kill your community: don't have a good, plentiful, high-quality water supply. A regional development agency, Saskatchewan South East Enterprise Region (SSEER), summarized his message in a Community & Economic Development Information leaflet (2017) as follows:

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Good quality water is essential for community sustainability.

SOURCE: *APPI*

> If water quality in a community is bad, the community is probably in sharp decline with businesses closing, empty houses for sale and a community that appears decrepit and unsightly. Nowadays, people view good quality water as an essential quality of life. Furthermore, many industries require good quality water to be sustainable, including agriculture and tourism… If you want your community to fail, if you do not want to see it grow – just don't bother to address the issue of water (supply, quality, safety, disposal, etc.) (SSEER, 2017)

Elements of Public Water Supply Systems

From the perspective of community sustainability and growth, water supply has a number of critical elements. First is 'source', which may be a groundwater aquifer, lake, river or an impoundment behind a dam on a river. The peak demands of the community must never exceed the licenced and sustainable yield of the source. Licenced yield is the volume which the provincial government allows to be taken, in respect of the water rights of other users of the source and of the sustainable yield, which is the ultimate limit. Sustainable yield is taking on new importance as climate change is affecting the hydrology of most watersheds, sometimes in positive ways, but often negative.

If the available sustainable yield of a water source exceeds the community's peak demand, the limits of a community's water intake or wells are usually not significant constraints: intakes can be twinned or replaced, and more wells can be drilled. In many cases, the capacity of a well may be greater than the current pumping rate, so increasing delivery volumes may be a simple matter of installing larger pumps. If the source is located some distance away from the community, more water may be delivered through an existing pipeline by upsizing pumps to raise pressure, thereby increasing flow rates. However, doubling pressure only increases flow by about 50%, and the pipeline's pressure rating may be a limiting factor. The alternative is to twin the pipeline. Prudent engineers should design intakes, wells and pipelines so that there is an ability to increase flows in the longer term.

The capacity of treatment facilities, including process equipment, water storage reservoirs and pumping systems is usually expandable. Well-designed plants tend to be modular in nature, capable of being expanded with more elements being added in stages as demand increases. Forward-looking designs may even leave room in a new plant for more treatment trains and pumps to be added within the existing structure. At a minimum, plant layouts should be designed so that there is still room on the site to construct additions to the structure, and also provide piping to facilitate those expansions without needing to resort to significant demolition.

Treatment processes can usually be adapted and upgraded, or new processes added, if water quality does not meet regulatory requirements or consumer expectations. There are many advanced treatment technologies available. There are no longer any acceptable excuses for not providing water that meets public health requirements and consumer expectations for no objectionable taste or odour. Where exceptionally difficult water quality challenges exist, there are alternatives to intensive treatment processes. These include developing new sources or connecting to regional supply systems. Many communities in Manitoba, for example, have developed new groundwater sources to replace existing surface water sources, especially those subject to objectionable tastes and odours caused by algae blooms, and even more communities have connected to regional systems, replacing inadequate community supply systems.

Distribution piping systems are not capable of handling increased flow unless they are well-planned with upsized trunk mains to handle community growth. When existing mains are not sufficient to accommodate growth, it is necessary to construct new feeder mains or twin mains within the urban centre. This is costly as other infrastructure will be in the way, such as sewers, drainage piping, gas mains, telecommunications conduits and so on. Another option is to construct satellite reservoir-pumping stations in major growth districts, but this is costly. Satellite reservoir-pumping stations or booster pumping stations may be needed if a community has major differences in elevation, such as may be found if it is located in a valley or in hill country. Multiple pressure zones may not be common in flat prairie communities but they are the norm in valley communities and in the foothills and mountains of Alberta.

Addressing Growth and Development in the Community

When we consider the ability of a water distribution system to accommodate growth and development in the community, we need to look at meeting three fundamental demands: (1) peak domestic uses, (2) industrial uses and (3) fire protection.

1. Regarding peak domestic uses, experience has shown that in most cases, the ability of a distribution piping system to deliver domestic flows at reasonable pressure is less of a challenge than fire protection. A community of 5000 people will probably have a peak hour domestic demand of 50–75 L/s (litres per second), and a community of 1000 people will probably have a peak hour domestic demand of 10–15 L/s, but the provincial fire commissioner and insurer's underwriters will probably suggest that both should be able to deliver 125–150 L/s fireflows to protect businesses and institutions like schools and hospitals (Fire Underwriters Survey, 1991). Recommended fire protection objectives usually exceed peak domestic demand by a wide margin, and as the example shows, it becomes a proportionally greater issue as community size declines. If a system can deliver adequate fireflows, it is almost certain that domestic service can be extended. However, often there will be a limited ability to deliver fireflows at the furthest ends of the system.
2. Other community challenges are the presence of major industries, as industrial water demand is highly variable. Some industries, such as manufacturing of durable goods, use relatively little. On the other hand, agri-food industries generally consume vast quantities of water. Major potato processing plants and oilseed refineries can use as much water as all of the combined domestic demands in a town or small city.
3. Fire protection issues include the volume of water which needs to be provided to fight institutional, commercial and industrial building fires. This is usually disproportionate to the volume of water normally provided to satisfy domestic water needs, so small communities struggle to provide adequate water supplies for fire protection. These fire protection capacity limitations usually affect the source infrastructure, the treatment system, storage reservoir, pumping and distribution mains.

ACKNOWLEDGEMENTS

I extend many thanks to my former Manitoba colleagues Jacquie East MCIP and Ross Mitchell MCIP with whom I have worked on "Integrated Infrastructure Planning" projects. They have helped advance the cause of planners and engineers working closely together, collaboratively and interactively, to provide truly useful documents which facilitate community development.

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SOURCE: *Pexels*

Conservation and System Capacity

When growth and development occur, and water system limitations become an issue, there is another approach to consider, namely conservation. Average per day residential consumption in mature prairie communities usually ranges from 200–300 L (litres) per person, while gross community demand (including institutional, commercial and industrial uses) may exceed 400 L per capita. In the past decade, there has been a noticeable reduction in the water used in new developments where water efficient (low-flow, low-flush) plumbing and modern appliances predominate. My own nine-year old home is very efficient. With four to six adults residing in it, consumption has averaged under 120 L/day per family member. If older housing, businesses and institutions retrofit their plumbing systems, it may be possible to achieve significant reductions in consumption. One way to reduce consumption is by instituting universal metering (although most prairie communities already do that) and appropriately high water rates. Not all communities have rates which recover the full costs of construction, amortisation, depreciation, operation and maintenance. Higher rates may be justified to raise funds for system capacity upgrades, but those same high rates may drive lower consumption, allowing reduction in the size of proposed infrastructure upgrades, or even allow for deferral of the upgrades into the future.

Integrated Infrastructure Planning

With the foregoing as background, there are implications for community planning. It is essential to engage qualified specialists, such as engineers, to assess the capacities of the various elements of the water system, and to estimate the future needs due to growth and development. Determining the best ways to bridge the gap between a system's capacity and growth needs is an exercise which requires innovative engineering. Aside from upgrading infrastructure to support development, there is another approach, which is to encourage growth in those parts of a community where spare system capacity is available. A sensible approach to guiding community infrastructure development is to determine available spare capacity and convert that into equivalent dwelling units. Let's consider the fictional Town of Bison. If the distribution system on the east side of town has spare capacity to accommodate 250 Dwelling Units whereas the west side can support only 50, and the north end mains have no spare capacity, it would make sense to encourage major developments on the east side; limit developments on the west side; and place a moratorium on north end development. However, water supply isn't the only issue which has an impact on development. Even if there is spare water system capacity in the east end of the Town of Bison, there may be sewer system constraints, drainage challenges and flood risks there. Infrastructure isn't the only thing to consider in preparing development plans. Planners look at a much bigger picture, but it is wise to consider carefully the capacities and limitations of water systems and other infrastructure, as they are key elements affecting the viability of development plans, community growth and sustainability. ■

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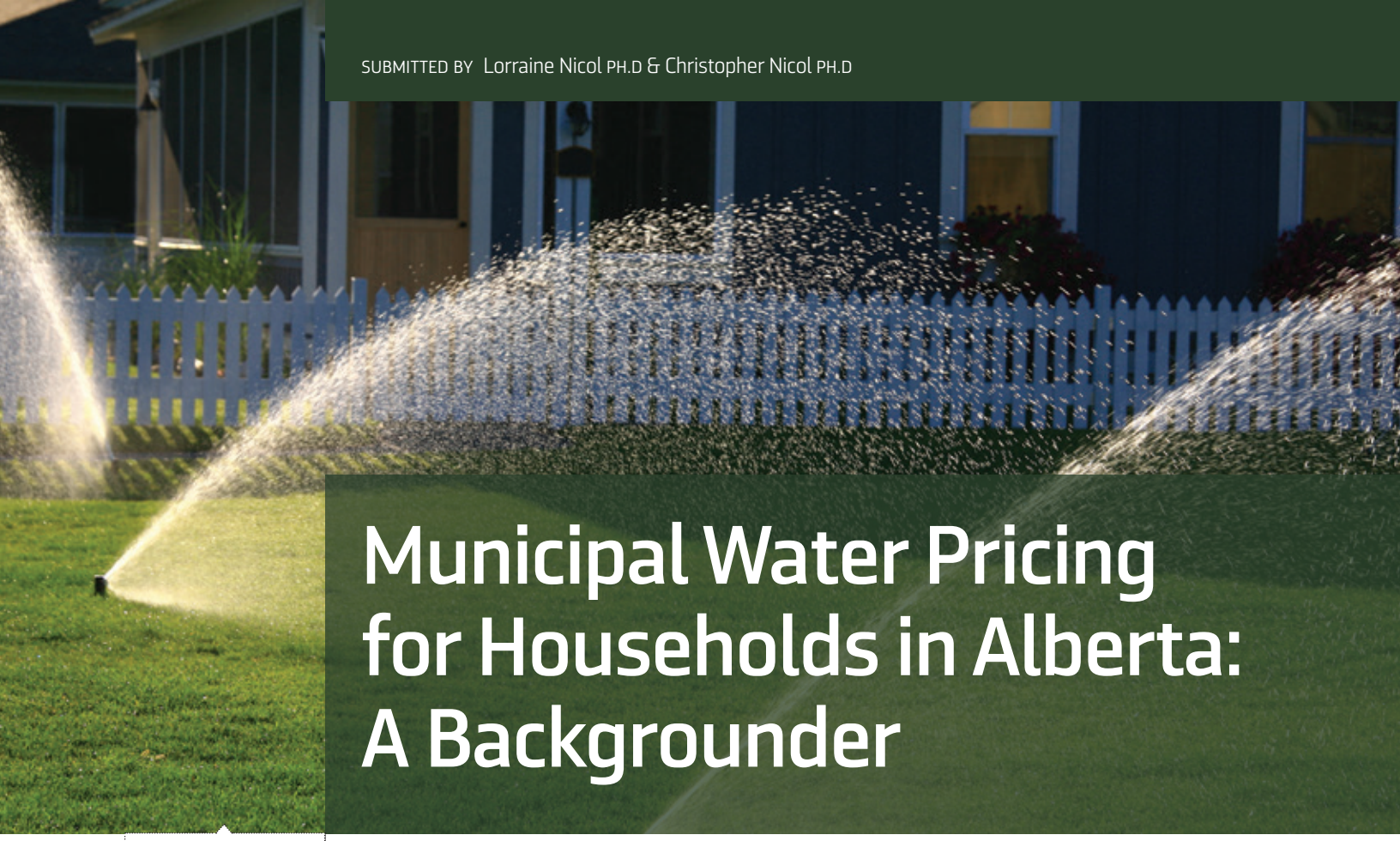

Municipal Water Pricing for Households in Alberta: A Backgrounder

SOURCE: *iStock*

When it comes to conserving water in Alberta, all economic sectors are being encouraged to do so, be they industries, irrigators, or individual households. At the household level, water efficiency and conservation efforts have included a suite of actions such as adopting low-flow toilets, showerheads and faucets, high-efficiency laundry machines and dishwashers, as well as xeriscaping yards. Relevant to these measures is the separate realm of pricing water—the charges levied by municipalities for treating and delivering water. When set correctly, water pricing structures and amounts can incentivise efficiency and conservation. However, it is often contended that municipal water prices charged to households are too low.

This is a dilemma. This paper provides background information on current municipal water pricing, including pricing structures and amounts, across all Alberta cities and towns. It also provides a comparison of this current picture to 2009. The results underscore positive developments in water conservation-based pricing given current water pricing structures and increased water pricing levels relative to 2009. However, this paper suggests more can be done to incentivise conservation by adopting two or more block rate pricing levels rather than the more common practice of imposing a constant volumetric price.

Water and Households

Historically, Canadians have been ranked as having amongst the highest per capita water use of developed countries. All three levels of government in Canada—municipal, provincial and federal—have therefore been espousing water conservation and efficient water use (Brandes, Maas & Reynolds, 2006). To promote household water conservation and efficiencies, many municipalities have been actively engaged in public education as well as the use of rebate programs for the adoption of household water saving technologies (Alberta Urban Municipality Association, 2016).

Although relative to other countries per capita water use in Canada remains high, it has recently been declining. In Canada it fell from 335 litres per day in 2001 to 223 in 2013 (Environment and Climate Change Canada, 2011; Statistics Canada, 2013). In Alberta, in 2013 per capita use was 169 liters per day, the lowest per capita water use of all provinces.

Research into ways to further reduce household water consumption in Canada points to a three-pronged approach. This approach includes water pricing, subsidizing water-saving household devices through measures such as rebate programs, and public education. Based on experience in cities such as San Antonio, Texas, these approaches are more effective together rather than implemented separately. While it appears progress has been made in implementing subsidization programs and public education, water itself is significantly under-priced and needs to increase (Brandes, Renzetti & Stinchcombe, 2010). Canada has one of the lowest municipal water rates of all developed countries (Brandes, Mass & Reyonds, 2006). Under-priced water can result in impediments to further innovation and conservation as well as the inability to cover the full cost of treating and supplying it (Bruneau, Dupont & Renzetti, 2013; Brandes, Renzetti & Stinchcombe, 2010). Pricing is not a 'silver bullet' to water conservation but pricing measures are critical to comprehensive and integrated demand management programs (Brandes, Maas & Reynolds, 2006, p.21).

The prevalence of under-priced water in Canada relates to those municipalities which do not have water meters and charge a flat rate for water no matter how much water is consumed. In 2006, over one-third of Canadian homes did not have water meters. About one-quarter still received a flat rate water bill (Brandes, Renzetti & Stinchcombe, 2010). On average, such households were found to use 467 litres per day per person. This compares to households facing a volumetric price structure whereby households' water charges are based on the amount used. Under a volumetric price structure, households were found to use 266 litres per day per person (Renzetti, 2009). Another problem with under-priced water is that the pricing model does not even cover the full supply cost of the water provided, including the cost of maintaining and replacing infrastructure and implementing necessary system upgrades. In 2007, the aggregate ratio of revenue compared to expenditures in supplying household water in Canada was only 70 per cent (Brandes, Renzetti & Stinchcombe, 2010). Given that water treatment standards and costs are increasing over time, this percentage is actually falling.

Brandes, Renzetti and Stinchcombe (2010) identify several factors needed to implement water conservation-based pricing. First, water metering is required so household water charges can be based on the volume used. Second, the pricing structure should include a fixed charge (sometimes called a 'connection' or 'meter' fee) that does not change when consumption increases, plus a volumetric charge that goes up with increasing water use. Third, water prices in general need to increase. However, the authors stress that changing municipal water pricing is not easy because criticism can be levied at politicians and senior managers, given that water rates can be viewed as a tax, and can therefore cause considerable public backlash (Brandes, Renzetti and Stinchcombe, 2010).

Characteristics of Water Pricing in Alberta

We will now examine some of the characteristics of water pricing in Alberta. Environment Canada has not collected information on municipal water rates since 2009. In this study, we collected residential water rate data for 2015 across all cities and towns in Alberta—one hundred and twenty-six municipalities in all. The data was collected primarily from individual municipality websites. In instances where the data was not provided on the municipality's website, telephone calls to municipal administrators were made to collect the missing data. Based on 2013 population data (Environment Canada), the data collected in this study covered 82.6 per cent of the total provincial population. Not included in the data are municipal districts, villages, improvement districts, Métis settlements and First Nations reserve populations. This study allows us to increase our understanding of the current structure and level of water pricing for the majority of Alberta's residential population. Second, the study provides city and town comparisons and contrasts in order to ascertain if there are any appreciable differences between city and town water pricing regimes. Third, comparisons of price structures and levels between 2009 and 2015 are made in order to identify changes that have taken place over that period of time.

It is important to reiterate that municipalities do not charge for the water itself but charge for the cost of treating and delivering water. This study found individual municipal water rate structures in Alberta range from one component to several. The components can include: a flat or fixed rate, block rates, a constant unit charge, a minimum charge, or a base charge. The definition for each of these components is provided in Table 1.

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Table 1: Rate Types

Rate Type	Definition
Flat/Fixed Rate	Customers pay a fixed amount regardless of their consumption.
Block Rate	A type of volumetric rate where several pre-set consumption blocks are associated with a different unit price for water. For each billing period, the customer pays the unit rate of the lowest block until that consumption level is exceeded, at which point he or she pays the unit rate of the next block until that consumption is passed, and so on. There can be one block rate or more. Additional blocks can be: • Increasing – the unit price of water increases in successive blocks • Decreasing – the unit price of water increases in successive blocks
Constant Unit Charge	Customers are charged a uniform amount per unit of water used per billing period.
Minimum Charge	Applies to metered accounts only. It is a minimum charge for each billing cycle, even if no water is consumed.
Base Charge	Applies to metered accounts only. It is a flat charge that is charged each billing cycle, in addition to any volumetric charges.

SOURCE: *Adapted from 2011 Municipal Water Pricing Report, Environment Canada*

Table 2: Alberta Block Rate Pricing

Blocks	Number of Communities	Population	Per cent of Population
0	2	11,050	0.3
1 (Constant Unit Charge)	103	2,106,211	66.6
2	9	85,478	2.7
3	6	932,602	29.5
4	6	28,751	0.9

In the three sub-sections below, the paper will now present the overall characteristics of the current structure and level of water pricing for the majority of Alberta's residential population; second, provide city and town comparisons of water consumption and water pricing regimes; and third, provide comparisons of price structures and levels between 2009 and 2015 in order to identify changes that have taken place over that period of time.

Overall characteristics

The first notable feature of Alberta residential water pricing is that the vast majority, i.e. 124 of the 126 municipalities, have water charges based on volume, in other words, block rate pricing. This type of pricing cannot exist without water meters. The 124 municipalities with block rate pricing represent 99.7 per cent of the total city and town population in this study (As will be explained below, many of those communities also have base rates or minimum charges). As Table 2 shows, only two municipalities (0.3 per cent of the population) do not have block rate pricing. These two municipalities have a fixed or flat rate where customers pay a fixed amount regardless of the amount of water consumption. And of the 124 municipalities in Alberta that have block rate pricing, 103 municipalities (66.6 per cent of the population) have one block rate. This represents a constant unit charge for water since customers are charged a uniform amount per unit of water used per billing period. Nine municipalities (2.7 per cent of the population) have two block rates, six municipalities (29.5 per cent of the population) have three block rates and an additional six municipalities (0.9 per cent of the population) have four block rates. The percentage of the population with one and three block rates is relatively high because the city of Calgary and the city of Edmonton are respectively included in those two categories.

For the municipalities under a one block rate water pricing structure, the average rate was $1.75 per cubic meter. Of the 21 municipalities that have more than one block rate, 19 of them have an increasing block rate structure and two have a decreasing block rate structure. Those with an increasing block rate structure represent 99 per cent of the population with more than one block rate, a decreasing block rate represented only one per cent. Of those with an increasing block structure, the first block rate was an average $1.74 per cubic meter and the last block rate was $2.31 per cubic meter. This represents a 32.8 per cent increase.

A second notable feature of water pricing in Alberta is the prominence of base charges or minimum charges. A base charge—a flat charge that is charged each billing cycle—was applied to 90 communities representing 95.9 per cent of the city and town population. Another 30 communities, or 3.6 per cent of the population, faced a minimum charge, which is charged even if little or no water is consumed. Only six communities, or less than two per cent of the city and town population, had no base or minimum charge. For those municipalities with a base or minimum charge, the average of the base charge was $20.97 per month and the average of the minimum charge was $39.19 per month. The average minimum charge applied to an average minimum volume of approximately 20 cubic meters.

Of the various combinations of pricing components that can exist, enumerated in Table 1, a base rate plus one block rate is the most common. Seventy-four municipalities have this system of water pricing, representing 63.1 per cent of the city and town population.

Two additional observations are noteworthy. First, ten municipalities impose a specific levy to help cover capital costs. The levy itself has a wide range of values, from $5.00 per month to $30.00 per month, averaging $14.28. The levy applies to one city and nine towns, and represents 3.1 per cent of the population. Second, two communities have strictly one block price or a constant unit charge and not an additional base charge, minimum charge and/or capital cost levy.

City-Town Comparisons of Water Consumption and Water Pricing Regimes

Comparisons between cities and towns produce more similarities than differences. Approximately 65 to 70 per cent of both city and town populations have one block rate or constant unit charge. As seen in Table 3, the only appreciable difference in block rate structures between cities and towns is that a higher percentage of city population is under a three-block rate structure because the city of Edmonton falls in this category. Of the 18 cities, only 3 have greater than one block price. For those three, the block rates are increasing. Of the 108 towns, 18 have more than one block rate. Of those, 16 have increasing rates and two have decreasing rates.

As noted in the first section, the base rate plus one block rate combination was the most common amongst Alberta cities and towns. An almost equal percentage of city and town populations have this feature – 63.4 per cent and 60.7 per cent respectively.

An almost equal percentage of city and town populations have either a base rate or minimum charge, between 97 and almost 99 per cent respectively. The average base charge and minimum charge for both groups of municipalities were also similar. Respectively for cities and towns, they average $21.24 and $21.45 for base charges and $39.76 and $39.17 for minimum charges. Of the six towns and cities that have no base rate or minimum charge, one is a city and five are towns. Of the municipalities that impose a capital cost levy, one is a city and twelve are towns.

2009-2015 Comparisons of Select Water Pricing Factors

Comparisons of 2009 and 2015 data were made for select factors for which 2009 Environment Canada data was available. The data in Table 4 show that there was an increasing percentage of the population whose water rates involved a constant unit charge. Compared to 2009, in 2015 a smaller percentage of the population had decreasing block rate pricing

Table 3: City-Town Comparisons

	CITIES			TOWNS		
Blocks	**Number**	**Population**	**Per cent of City Population**	**Number**	**Population**	**Per cent of Town Population**
0	0	0	0	2	11,0505	2.3
1	15	1,766,285	65.7	88	339,926	71.7
2	2	45,786	1.7	7	39,692	7.1
3	1	877,926	32.6	5	54,676	11.5
4	0	0	0	6	28,751	5.8

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Table 4: Select Water Pricing Statistics for Alberta in 2009 and 2015—Percent of Population, Price

Factor	2009[1,2]	2015
Constant Unit Charge (1 Block Rate)	61.7%	66.6%
Decreasing Block Rate	0.9%	0.3%
Increasing Block Rate	30.8%	32.8%
First Block Price	$0.60	$1.74
Last Block Price	$0.67	$2.31
Base or Minimum Charge	53.3%	99.5%
Average Base or Minimum Charge	$8.06	$24.80
Flat Rate	0.2%	0.3%

1 SOURCE: *Adapted from 2011 Municipal Water Pricing Report, Environment Canada*
2 *Statistics may also include sewer rates*

and a greater percentage had increasing block rates, although the percentage differences between 2009 and 2015 are not appreciable. In terms of block pricing, however, the differences are considerable, with the first block price more than doubling and the last block price more than tripling.

The percentage of the population with a base or minimum charge almost doubled over the 2009 to 2015 period, increasing from approximately half the population to almost the entire population. The average base or minimum charge correspondingly increased noticeably, its level tripling. The percentage of the population that had flat rate water pricing remained almost unchanged from 0.2 per cent of the population to 0.3 per cent.

Discussion and Conclusions

Based on this study's findings there are positive developments in water conservation-based pricing structures and amounts amongst Alberta cities and towns. Virtually all cities and towns have water meters with a form of pricing based on the volume used. Since 2009 this percentage of the population has increased by about five per cent. Further, since 2009 the percentage of the population with a decreasing block rate has fallen and the percentage with an increasing block rate has increased. As measures in promoting water conservation, these changes in water pricing structures should encourage less water use. A very small percentage of the population has a fixed or flat rate whereby water charges are not based on volume.

Given the importance of water pricing in water promoting water conservation, most changes to water prices from 2009 to 2015 are significant and should have positive implications for reducing water use. First and last block prices have more than doubled. However, increasing block rate pricing still only applies to one-third of the city and town population in Alberta, a percentage that has not increased appreciably since 2009. With respect to levying base and minimum charges, the percent of city and town population this applies to has more than doubled since 2009. Correspondingly, the base and minimum charge levied has more than doubled.

Municipalities should consider adopting two or more block rate pricing levels, given that two-thirds of the city and town population in this study have a constant volumetric rate. This measure would further incentivise water conservation by imposing increased water prices on increased water volumes. In addition, more municipalities could consider applying a capital cost levy specifically devoted to capital upgrades and maintenance given that only ten municipalities apply a levy specifically for this purpose.

An assessment of whether pricing levels remain 'too low' is beyond the scope of this study. Nonetheless, significant increases have occurred since 2009. Additional studies should consider, for example, to what degree current water prices are covering capital cost replacement and infrastructure upgrades. ■

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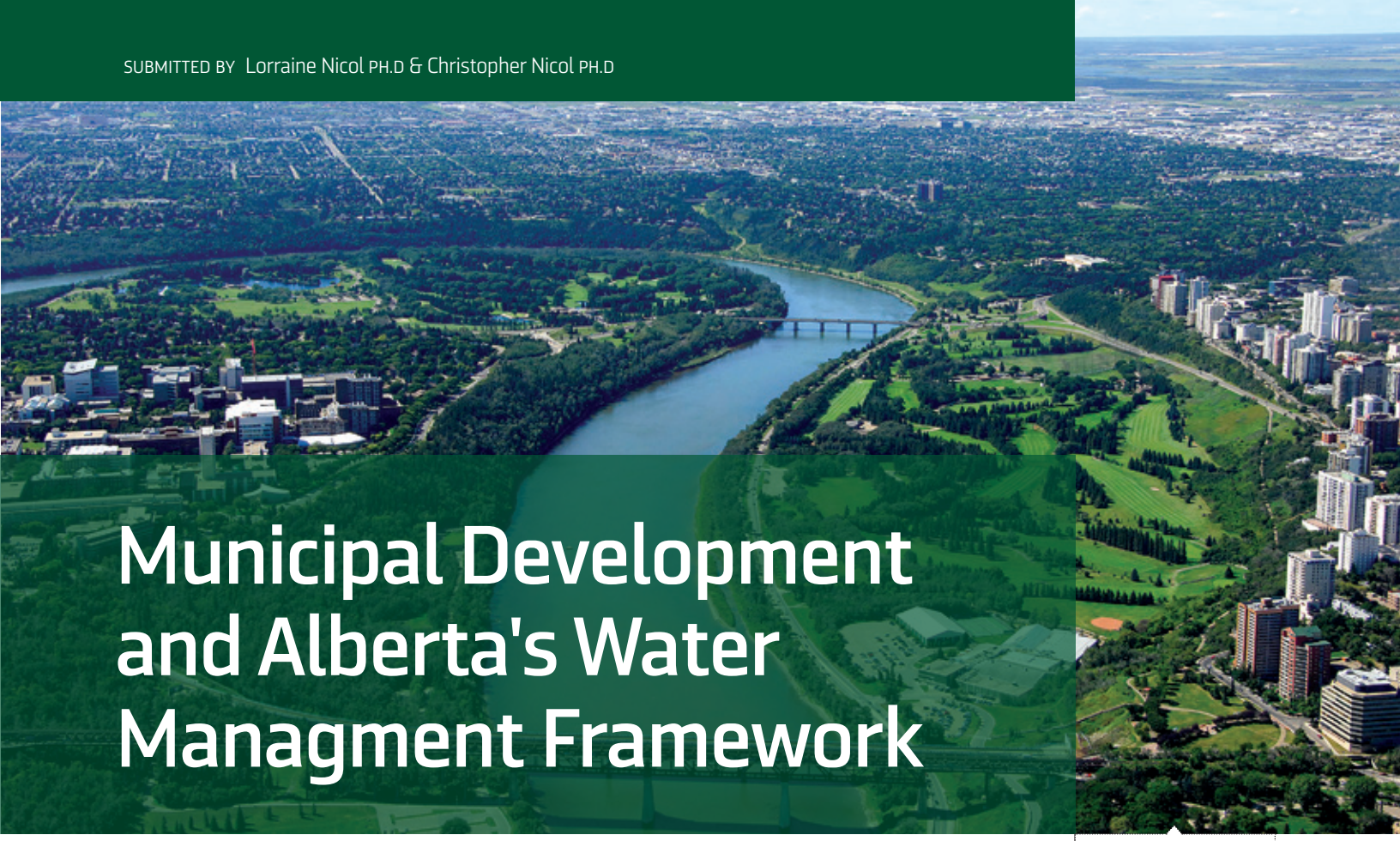

Municipal Development and Alberta's Water Managment Framework

Balancing the 'triple bottom line' of water needs—economic, environmental and social—has become a major challenge.

SOURCE: *APPI*

Water is necessary for municipal population and economic growth. But in southern Alberta, sufficient water supply has become a major issue for some municipalities. This paper includes a study that indicates the extent to which water supply constraints exist; whether they are curtailing residential, industrial, and/or commercial development; and the mechanisms municipalities are using to cope. The study suggests industrial growth is being curtailed in some municipalities, while others are seeking less water intense industries instead of water intensive ones. Virtually all municipalities are managing water through a myriad of agreements and arrangements among themselves, or with irrigation districts. This paper sets out the fundamentals of Alberta's water management framework and presents the findings of the study.

Alberta's Water Management Framework

Water Allocation and Water Demand

When it comes to managing water in Alberta, the province's geography does not help. Eighty per cent of Alberta's water supplies lie in the northern part of the province but the vast majority of water demand comes from the population growth and economic activity in the southern half. Balancing economic and ecosystem water requirements has therefore been particularly challenging for the largest southern basin, the South Saskatchewan River Basin (SSRB), and the four sub-basins within it—the Bow, Oldman, Red Deer, and South Saskatchewan River basins.

At the basis of all provincial water management systems is their water allocation framework. Alberta is among six jurisdictions including British Columbia, Manitoba, North West Territories, Nunavut and Yukon that have their roots in the 'prior appropriation' doctrine. The doctrine assigns rights to fixed amounts of water to license holders for particular beneficial uses. The largest sectoral allocation of water in the

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SSRB is for agriculture where 72 percent of all water allocated is for irrigation purposes and an additional two per cent for non-irrigation agricultural purposes. The next largest allocations are for municipal (14.5 percent), habitat management (4.5 percent), and commercial (3 percent) (Environment and Sustainable Resources Management 2013).

The demand for water has been intense given Alberta's economic and population growth. In the past 20 years, the average annual growth in GDP was 3.6 percent. Between 2004 and 2014, Alberta's population increased by 27 percent, the highest increase of any province or state in North America (Alberta Government 2015). Given that the majority of population and economic growth occurred in the southern half of the province, warning signs of significant environmental distress of river reaches within the SSRB began to appear. By 2005, an Alberta Environment study found 30 out of 33 river reaches had suffered some degree of environmental impact, 22 main stem river reaches were moderately impacted, five heavily impacted, and three degraded (Alberta Environment 2005). Balancing the 'triple bottom line' of water needs—economic, environmental and social—had therefore become a major challenge.

Policy Response

Sensing the looming urgency of the situation and the need for a policy response, the province released a new broad management framework in 2003. The long-term framework, titled the 'Water for Life Strategy', begins from the premise that current and future demand for water to ensure economic growth, support a growing population, and secure healthy rivers and lakes, combined with an increased uncertainty related to the variability of future water supply, will result in water demand exceeding water supply. The foundation of the strategy is therefore based on the need to implement a major shift in Alberta's approach to managing water.

The strategy outlines three main objectives including:

1. a safe, secure drinking water supply;
2. healthy aquatic ecosystems; and
3. reliable, quality water supplies for a sustainable economy.

Some of the means used to achieve those objectives are economic instruments, watershed management plans, and a 30 percent increase in efficiency and productivity of water by 2015.[1] Central to the strategy is the assurance that existing water allocation entitlements would not be reduced.

Another significant measure implemented by the Alberta government in 2005 was a halt to accepting applications for new licensed water allocations for the Bow, Oldman, and South Saskatchewan River sub-basins. As a consequence, the extraction of water for consumptive use has become fixed within nearly every river system in southern Alberta.

Instruments in reallocating water in Alberta

Given the moratorium on new licensed water allocations in the Bow, Oldman, and South Saskatchewan sub-basins and that existing water allocation entitlements cannot be reduced, the province required mechanisms to reallocate water within those basins. For municipalities, this has become particularly important, given that for some municipalities their water requirements for residential, industrial and commercial growth may, now, or in the future, exceed their existing water licensed allocations. One of the highest profile cases of such a circumstance has been the city of Okotoks whose growth has had to be managed around the city's limited water supply.

There are three mechanisms that can be used to reallocate water: transfers of licensed water allocations, amendments to irrigation district licenses, and regional formations among municipalities. The first mechanism, facilitated through Alberta's Water Act, is the transfer of a licensed water allocation. This can include all or part of a licensed allocation, either permanently or for a specified period of time. In addition, under the Irrigation Districts Act, permanent transfers of all or a portion of a district's water license outside the district are possible, but only if a plebiscite is held and a majority of irrigators agree. Because potentially large amounts of water could be permanently transferred between very different users, third party and environmental effects may occur. Therefore, in sections 81 and 82 of the Water Act consideration of the environmental effects of the transfer are required. These sections establish many of the procedures required in the license transfer process, including a public review process if deemed necessary. Also, if it is deemed that some water is required to protect the aquatic environment, up to ten percent of the allocation can be withheld for that purpose.

The second mechanism of reallocating water was established in 2003 when the Alberta government began allowing amendments to irrigation district licenses for non-agricultural purposes including municipal, commercial, and industrial uses as well as other purposes that might enhance ecological values (Bankes and Kwasniak 2005). Since then, amendments were made to some of the St. Mary River, Lethbridge North, Taber, and the Raymond irrigation district water

[1] Productivity is defined as "the amount of water that is required to produce a unit of any good, service or societal value" (Alberta Water Council 2007, 6)

Water Body
SOURCE: *APPI*

licenses. However, when environmental concerns were raised over a proposed amendment to an Eastern Irrigation District license in 2007, the licensing amendment practice was put on hold and a new policy was implemented in 2009. The new practice limits the volume of water that may be applied for in amendments for changes in purpose to licences to a maximum of 1,000 acre feet plus up to two percent of the remaining license volume.

The third mechanism of reallocating water involves sharing of water license allocations through regional formations. In Alberta, regional formations are legislated through the province's Land Use Framework of 2008. The framework creates seven regions based on the major watersheds in Alberta for which each is required to develop a regional plan. Central to the legislation is the notion of cumulative effects management that sets regional thresholds for air and water. The Calgary

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Regional Partnership is a major regional formation in southern Alberta, which began in 2005 and currently comprises 14 municipalities. It has a major water-sharing component based on a 2007 water study that found that under existing licensing arrangements, some communities would experience water shortages as early as 2030. This includes, for example, the communities of Cochrane, Strathmore, and Okotoks. The study concluded that for most of the servicing needs, a regional system originating from the city of Calgary was technically the preferred option (CH2M Hill 2007). Calgary has sufficient license water allocation for three times its current population. It is envisaged that Calgary would create and operate a water utility for surrounding municipalities in need of water. This plan has yet to be implemented.

The Study of Municipal Water Management

This study surveys the extent of water supply constraints in southern Alberta municipalities; whether they are curtailing residential, industrial, and/or commercial development; and if so, what mechanisms municipalities are using to cope. It also ascertains whether municipalities think the provincial government could improve the current water management framework, and if so, how. Finally, the study lists the factors affecting water supply and asks participants to assess the seriousness of them.

The study began by identifying 19 towns and cities in southern Alberta. Geographically, this included Calgary and municipalities south of and surrounding it. Evidence from previous studies (for example, Nicol 2013) found that significant demands on water supply are occurring in relatively large municipalities, therefore the study focused on municipalities that had a population over 2,000 people. The study also identified seven counties in the region. In total, 26 towns, cities, and counties (which are herein referred to as 'municipalities') were identified as pertinent to this study. Elected municipal representatives who sit on their municipal planning commission or board were identified and sent requests to participate in a telephone interview. In total, 15 of the 26 people who were asked to participate agreed to do so. Semi-structured telephone interviews were conducted between June and July, 2015. Given the sensitivity of the information, names of the municipalities remain confidential.

Of the 15 municipalities surveyed, almost half, seven in total, stated their water supply is either restricting industrial development or they are only interested in attracting industries that are less water intensive. The following statements underscore the problem faced by the municipalities restricting industrial development:

> *We don't have a lot of water to work with. We have reached capacity on our surface water allocation. Is water constraining development? Most definitely in our region. No one wants large industrial water users.* —Interviewee #6

> *Our biggest concern is for industries. The concerns is can we supply into the future processing plants like Lamb Weston?* —Interviewee #13

One of those municipalities also stated industries themselves are aware of their city's water constraints and are looking at alternative locations. The interviewee stated:

> *High water industries? I'm sure they wouldn't be looking at (municipality's name) as their prime location.* —Interviewee #7

For municipalities only interested in attracting industries that are less water intense, one statement was indicative of their approach to development:

> *We are not looking at attracting industries that are heavy water users. Residential developments we are not shying away (from) but industries, that depends on what their product is. If they're a high water user, yes.* —Interviewee #12

Two other findings stand out. One municipality said industries are attracted to their community because they do not have the water constraints that exist in other municipalities. Another interviewee said their community wants to remain small and is not looking for development.

The study found that almost all responding municipalities depend on some form of agreement with either other municipalities or irrigation districts. In some cases, municipalities have more than one agreement. The agreements are motivated by municipalities wanting to ensure that their current and future water supply needs are met and/or to share the cost of water treatment. The study found:

- five municipalities are either part of a regional agreement now or are working towards one in the future;
- five municipalities obtain their water from another city, have transferred their license to another city to manage its water, or are working on an agreement to access water from another city;
- five municipalities provide water services to other smaller municipalities including hamlets and small towns;

- three municipalities share their water treatment facilities with other municipalities; and
- two municipalities have an agreement with an irrigation district either to access the irrigation district's water or employ the irrigation district's distribution system.

Across the 15 municipalities, only two were independent and did not have any arrangements with other municipalities or irrigation districts. These measures underscore the preponderance of cooperative water management initiatives.

A relatively small number of municipalities are actively seeking and buying water licenses. Of the four municipalities who said they are seeking to buy water licenses, one municipality stated:

> *We have been actively looking for water licenses. We're successful sometimes and not successful other times. It depends on what we can afford and what is available at the time.* –Interviewee #6

When asked if there are additional measures government can take to assist with municipal water management, considerable room for improvement was expressed. Five interviewees stated that municipalities should have equal access to water rights, that municipalities should be provided the water that they need rather than having to buy water rights. Two indicated there should be more flexibility for irrigation districts to amend their water licenses to supply water to municipalities. Another two interviewees expressed concern over the cost to small communities of the high water standards imposed by the provincial government. Four municipalities complained generally of either a lack of provincial government leadership, direction, or ability to work effectively with municipalities rather than just regulating them.

The final set of questions presented a list of four factors that can affect water supply and asked respondents to rate their level of concern on a scale of one to five (five being high). The factors (some interrelated) were listed as: climate change, flooding, drought, and provincial government's ability to respond to water supply issues. In tabulating the average rating across the factors, the results show a relatively high degree of concern across all factors. The factors and the average concern rating are summarized in Table 1.

In addition, five municipalities added water quality as a concerning factor and an additional five added their concern for storm water management.

Table 1: Level of Concern Regarding Water Supply Factors

Factor	Average Concern Rating
Provincial Government's Ability to Respond to Water Supply Issues	4.2
Drought	4.1
Climate Change	3.7
Flooding	3.5

Conclusions

This study was limited to 15 municipalities; thus the results cannot be extrapolated to all municipalities in southern Alberta. However, the study provides an indication that industrial development in some municipalities is either being curtailed, or less water intensive industries are being considered over more water intensive ones. While some municipalities are seeking to buy water licenses, the vast majority are involved in water agreements with other municipalities or irrigation districts. Municipalities are working within the province's existing water management framework, but they feel the government can do more, from reallocating water to municipalities that need an increased water allocation, to providing greater flexibility to irrigation districts to provide water to them. The study also found municipalities have a high degree of concern over a number of factors related to water, including climate change, drought and flooding, and, equally importantly, the province's ability to deal with water management issues. ■

About the Author

Dr. Lorraine Nicol holds a PhD in Biosystems and Biodiversity (University of Lethbridge), a master's degree in Agricultural Studies (University of Lethbridge), and a master's degree in Economics (Queen's University). She specializes in water resources policy and management in Alberta with special emphasis on water markets, regional water formations, and irrigation water management. She is a Research Associate at the University of Lethbridge's Department of Economics and can be contacted at lorraine.nicol@uleth.ca.

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SUBMITTED BY Natasha Kuzmak

Evolving Our Approach to Integrated Watershed Management

Suburban Calgary homes overlooking a storm pond.

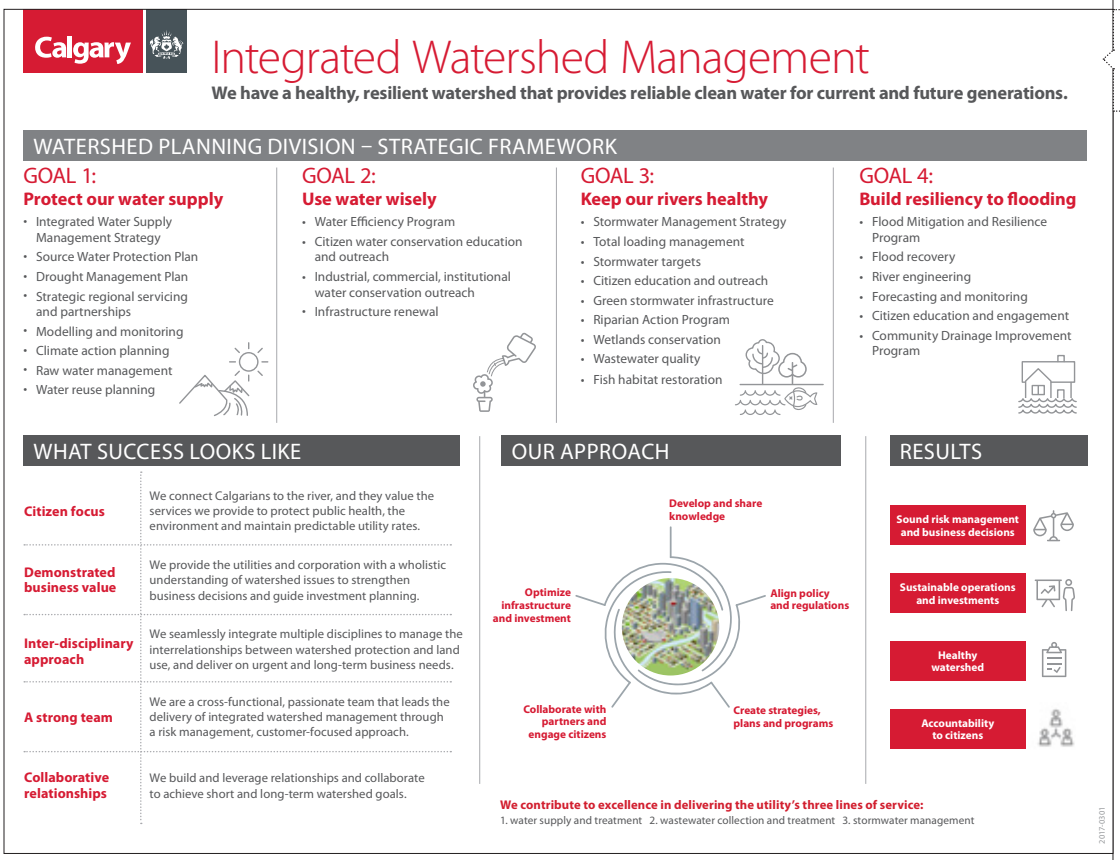
SOURCE: *iStock*

From Water Management to Integrated Watershed Management Planning

Classically, water management—to manage water quantity and quality—was seen as the main focus and responsibility of water utilities. As water becomes a more important and limited resource, ensuring clean water for future generations will become increasingly challenging as urbanization, population increases, and climate change impact water quality and supply. Consequently, water management is not solely in the purview of utilities anymore, as it is affected by how cities are planned and built. Now planners also have a critical role in protecting water.

Water management has evolved dramatically over the years and most cities have followed a common path in advancing water management best practices (Brown, Keath and Wong 2008). For example, in the city of Calgary, public health was improved by constructing a wastewater treatment plant to treat sewage. Shortly after, to provide safe and secure drinking water, the City constructed its first water treatment plant. Another phase of early water management was managing drainage and stormwater through the construction of storm sewers in 1927. This traditional infrastructure (i.e. water, wastewater and drainage) protected public health, safety and ensured good water quality and supply.

However, increasing demands, challenges, and knowledge of water management have resulted in a new understanding. Municipalities now understand that what we do on the land impacts watershed health, as well as water supply and quality. Consequently, managing water as a resource is also a major interest for planners. Integrated watershed management seeks to manage human activities and natural resources on a watershed basis; what we do on the land impacts both water quality and our access to clean and safe water.



Integrated watershed management goals

SOURCE: *City of Calgary*

Challenges in Our Watershed

Calgary faces several challenges in protecting its watershed. First, as Calgary's population continues to grow we must manage our water consumption. There are tight limits on our water supply because our city is located within the South Saskatchewan River Basin, which is closed to new surface water allocations. A limited water supply requires Calgary to plan ahead and manage water consumption.

Secondly, climate change is predicted to bring more extreme flood and drought events (Alberta Government 2016). It is also predicted that climate change will negatively affect the water supply and quality in southern Alberta, as changes in precipitation, seasonal demand patterns, and river flows occur (Alberta Government 2016). These changes will increase pressures on the city's water infrastructure.

Lastly, increasing growth and development put pressure on the landscape. As land is developed and intensified, the increase in impervious surfaces generates more stormwater. Stormwater is a significant contributor of pollutant loadings to the rivers. Depending solely on traditional drainage infrastructure (i.e. storm sewers) will continue to convey pollutants to the Bow River and Elbow River.

The Future of Integrated Watershed Management

As we move towards integrated watershed management, protecting the environment, managing limits on natural resources, ensuring resilience to climate change and intergenerational water equity are key elements. Furthermore, many municipalities are beginning to depend on both grey (e.g. pipes) and green infrastructure (e.g. natural systems with vegetation) in stormwater management. The combination of grey and green infrastructure can achieve both objectives in water management, and objectives in planning complete communities.

The City of Calgary has four main goals in its integrated watershed management framework (The City of Calgary 2016).

1. **Protect our water supply** by reducing risks to our water source.
2. **Use water wisely** through responsible and efficient use.
3. **Keep our rivers healthy** by reducing impacts on the rivers.
4. **Build resilience to flooding** through mitigation, emergency planning, and education.

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Municipalities are beginning to depend on both grey and green infrastructure.

SOURCE: *Carley Friesen*

There are several programs under these goals that connect water as a resource with activity on the land. Some examples include the source water protection program, the use of low impact development to manage stormwater, riparian land management, and flood mitigation work.

There are several ways to make land use planning and development decisions that consider the impact on watershed health and water quality.

Work Across Disciplines

Integrated watershed management requires that professionals work in an interdisciplinary fashion and build upon each other's knowledge and expertise to be successful and achieve multiple objectives.

Water Should be a Priority

Impacts on water and watershed health must be understood and considered when making land use planning and development decisions.

Align Interests

Groups should work together to align their interests and achieve multiple objectives without overly compromising some.

Support Operations

Many planners struggle with creating plans that can be implemented. Integrated watershed management requires that planning for the future be done with technical experts to ensure implementation. This is compounded by a need to ensure operations and systems are in place to support infrastructure. With innovative and new forms of green infrastructure, such as low impact development, this can be challenging (Jin 2016).

As *water management* evolves into *integrated watershed management* it implies a profound shift in planning, as it provides the opportunity to align internal objectives, expand the profession, and use infrastructure as an element of urban form. Applying integrated watershed management will ensure that we protect our watersheds and water quality for future generations. ■

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About the Author

Natasha Kuzmak is a Water Resources Planner at the City of Calgary where she works in a team that creates long-term plans, programs and strategies to protect and manage water and watersheds. She spends much of her time at the City working with watershed stewardship groups including the Nose Creek Watershed Partnership, as well as working to integrate watershed values into the land use planning and development system. In addition to having a background in environmental sciences, she also has a Master's degree in urban planning. Natasha can be reached at Natasha.Kuzmak@calgary.ca.

APPI Awards for Planning Excellence and Merit

Each year the Alberta Professional Planners Institute recognizes exemplary work within the planning profession. Awards acknowledge meritorious plans and projects, undertaken in whole or in part by members of the Institute, that significantly contribute to the livability of communities in Alberta, the Northwest Territories and Nunavut. The 2017 awards were presented at the APPI/CIP conference on June 18, 2017. Recipients receive a Certificate of Planning Excellence or a Certificate of Planning Merit.

2017 Award of Planning Merit Comprehensive and Policy Plan Category

The Edmonton Metropolitan Region Growth Plan

ISL Engineering & Land Services Ltd.,
Capital Region Board, Urban Strategies

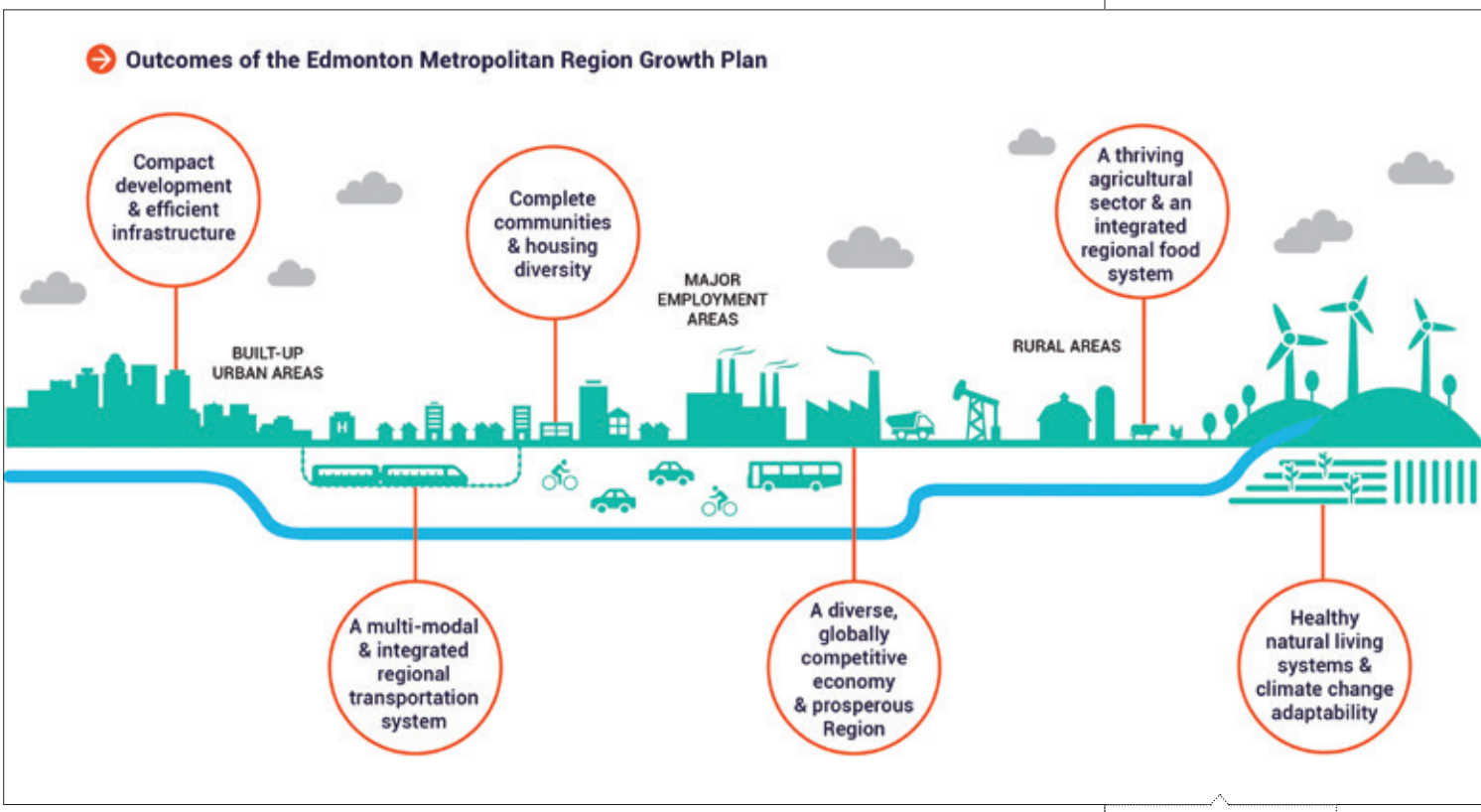
Re-imagine. Plan. Build. These are not just three words—they form the basis of a 30-year growth plan and a 50-year vision for the City of Edmonton and surrounding cities, towns, villages and counties, called The Edmonton Metropolitan Region Growth Plan (the Plan). Approved by the Capital Region Board (the CRB) late last year, the Plan sets the path for sustainable growth and development in the Region through organized and systematic planning.

The Need and Making

The Region consists of 24 vibrant rural and urban member municipalities, abundant natural resources and high quality agricultural lands. Historically, energy has been the primary economic driver in the Region, creating jobs and bringing prosperity, and has also been subject to boom and bust cycles. The Government of Alberta formed the CRB in 2008 with a mandate to manage the Region's extraordinary growth in a strategic, coordinated and integrated way. In 2013, the CRB created a Project Charter responding to a provincially mandated five-year review and update to the 2010 Growth Plan, *Growing Forward*, and the need to foster a diverse economy. The update process began with an independent review of *Growing Forward* that identified its successes, gaps and areas for improvement. From the review, a collaborative and evidence-based planning process was established, culminating in CRB's adoption of the final Plan on October 13, 2016.

Collaborative Effort

The CRB appointed a special task force comprised of elected officials representing a cross section of member municipalities to lead the Growth Plan update process. Their role was to champion the Plan to the rest of the CRB members, review draft materials, provide input and give direction to the project team that consisted of the CRB project manager and project consultants, ISL Engineering and Land Services Ltd. and Urban Strategies Inc. The project consultants brought technical expertise, local knowledge and regional planning perspectives from elsewhere in Canada. Additional key stakeholders included a



Green outcomes

SOURCE: *Urban Strategies Inc.*

Regional Technical Advisory Committee, comprised of senior planning administrators representing cities and counties in the Region. The process also included consultation with a provincial cross-ministerial committee, member municipalities, their Chief Administrative Officer(s), regional stakeholders and outreach to the Region's indigenous people.

The Plan Itself

The Plan makes a significant contribution to regional planning in the Alberta and Canadian context. It is based on seven guiding principles, which include regional collaboration to manage responsible growth, promoting global economic competitiveness, celebrating diversity and promoting excellent quality of life, achieving compact growth by optimizing infrastructure investment, ensuring effective regional mobility, wise management of prime agriculture resources and protecting natural living systems and environmental assets.

Regional Growth Structure

Instead of adopting a one size fits all solution, the Plan recognizes, plans for, and celebrates the diversity of the Region. It introduces a visionary metropolitan regional structure to manage population and employment growth. The structure consists of three policy tiers: the *rural area*, *metropolitan area* and *metropolitan core*, which reflects the diverse municipal membership; and other policy components; centres, major employment areas, and infrastructure corridors. It also includes six interrelated regional policy areas that align to the policy tiers, levels of service, addressing the different urban and rural contexts and unique growth challenges in the Region.

Growth Targets and Policies

The Plan aims to enable the Region to accommodate the projected 2.2 million people and 470,000 more jobs by 2044 within a smaller regional development footprint than anticipated in the 2010 *Growing Forward* plan. It introduces a new set of targets to support compact growth and the efficient use of infrastructure. By building high-density areas close to existing urban corridors, the Region is projected to save $5 billion in infrastructure costs and avoid taking up an unnecessary 250 quarter-sections of land.

Implementation Tools

The Plan contains guidance on implementation tools, including regional context statements that member municipalities will prepare within one year of the Plan's approval, to identify how Municipal Development Plans (MDPs) will be brought into conformance with

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Policy wheel

SOURCE: *Urban Strategies Inc.*

the Plan. In addition, the Plan contains a terms of reference for a Land Evaluation and Site Assessment (LESA) tool that will be used to assess, qualify and quantify prime agricultural lands in the Region. LESA results will be integrated with a regional agriculture master plan, that will provide a policy framework for conserving prime agricultural lands to support the regional food system diversify the agri-food production base, and guide agriculture supportive infrastructure investments. As well, the Plan provides a scope of work for Agriculture Impact Assessments that will be required for development in greenfield areas containing prime agricultural land.

Going Forward

Future studies need to be completed to support Plan implementation, such as a regional agriculture master plan, LESA Tool, regional infrastructure master plan, and integrated regional open space master plan. The CRB will coordinate these and other studies. The Plan includes a requirement for a two-year update to incorporate the outcomes of future studies. The CRB will work with member municipalities to monitor and track progress on an annual basis through key performance indicators and the use of a regional geographic information system. Through monitoring, the CRB will identify areas of success as well as areas to strengthen in the Plan through the five-year interim review and amendment process, and the 10-year comprehensive review and update.

ISL Contributions

APPI Registered members, Constance Gourley RPP, MCIP, Darren Young, RPP, MCIP, GISP, and Candidate member, Shauna Kuiper, M.PL., made substantial contributions to this multi-year, multi-faceted planning project to set regional planning policy direction.

2017 Award of Planning Merit Design Plan Category

Strathcona County Urban Agriculture

Intelligent Futures, Strathcona County, Community Food Lab

In February 2016, Strathcona County commissioned Intelligent Futures (Calgary) and Community Food Lab (Raleigh, North Carolina) to develop their Urban Agriculture Strategy (UAS). The mandate of the strategy process was to build the UAS on a foundation of public interest in different forms of urban agriculture within the county's urban service areas. The UAS was the first outcome of the prior year's Agriculture Master Plan, which set a direction for agriculture in the county. The UAS will support subsequent documents emerging from the Master Plan, and it will inform future revisions to the county's Animal Control and Land Use Bylaws.

The project team began with a goal to create a strategy reflective of Strathcona's position in Alberta—being one of the few municipalities that contains both

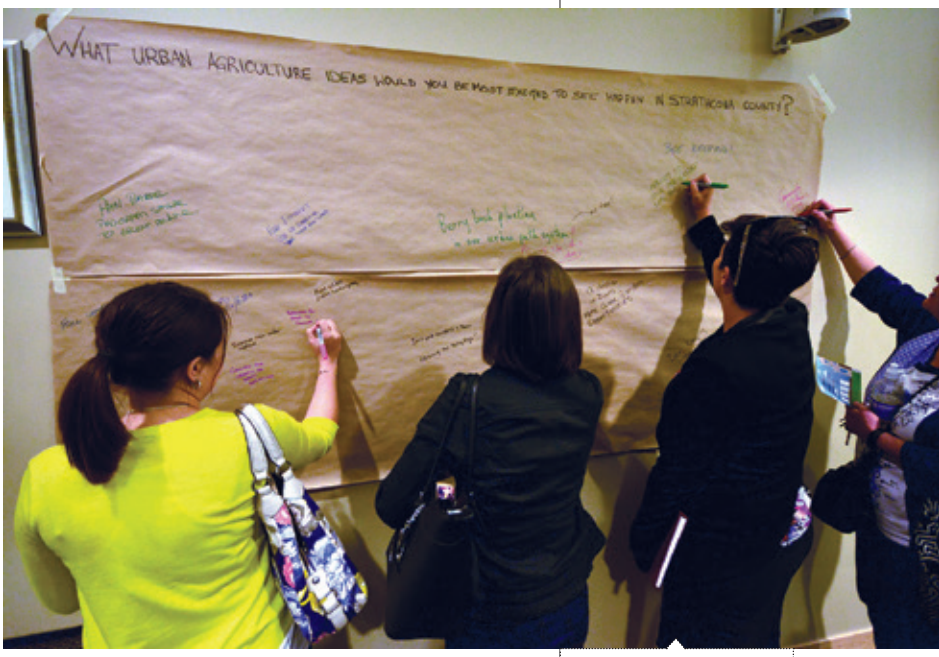
urban and rural areas, as well as the perspectives of its diverse community members and municipal priorities.

Through a phased ten month process, the project team undertook a comprehensive engagement and strategy process to arrive at the final Urban Agriculture Strategy. The three phases of work were: (1) Explore and Assess, (2) Synthesize, and (3) Approval. Through each phase, the team designed and delivered public engagement activities, drafted policy recommendations that reflected research and public input, and created a series of visual communication materials to support engagement. The final strategy was developed from 97 hours of engagement, with 3,824 participants providing 8,896 ideas in one of the largest public engagement processes in the history of Strathcona County.

The UAS was designed with clear and actionable directives. The result: a strategy with its vision supported by a number of key goals and strategy areas to prompt forward movement. The actions in each strategy area were written with the intention of being achieved in a three-year period, beginning in 2017. With a series of defined actions and a compressed time frame, the strategy is intended to rally administration, staff and the community towards achieving the vision. The iterative nature of the strategy—to be supported by follow-up work in 2020—ensures that actions remaining from the intital stage of implementation can be revisited in future versions of the strategy.

The iterative process creates a continuous cycle of action, learning, reflection, and adjustment to build on its own momentum. The complementarity of the strategy areas also drives convergence of action; large challenges can be broken down into manageable pieces and resolved from different perspectives and approaches. The three-year phasing of the strategy also reduces complacency by shortening the implementation and review periods. This ensures that county leadership and administration remain continually focused on current circumstances while keeping an eye on the long-term vision for urban agriculture.

The strategy was unanimously approved by Strathcona County Council on November 29, 2016. Administration is now proceeding with a three-year implementation schedule that considers operational priorities, public feedback, strategic direction and any additional research that may be required. Since approval, several of the strategy's proposed small-scale interventions have begun.



Engagement

SOURCE: *Intelligent Futures*

Engagement

SOURCE: *Intelligent Futures*

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2017 Award of Planning Merit Design Plan Category

Centre City Urban Design Guidelines

The City of Calgary, MVH Urban Planning & Design Inc., AECOM, Beasley & Associates, CIVITAS Urban Design & Planning

Vision for the Guidelines

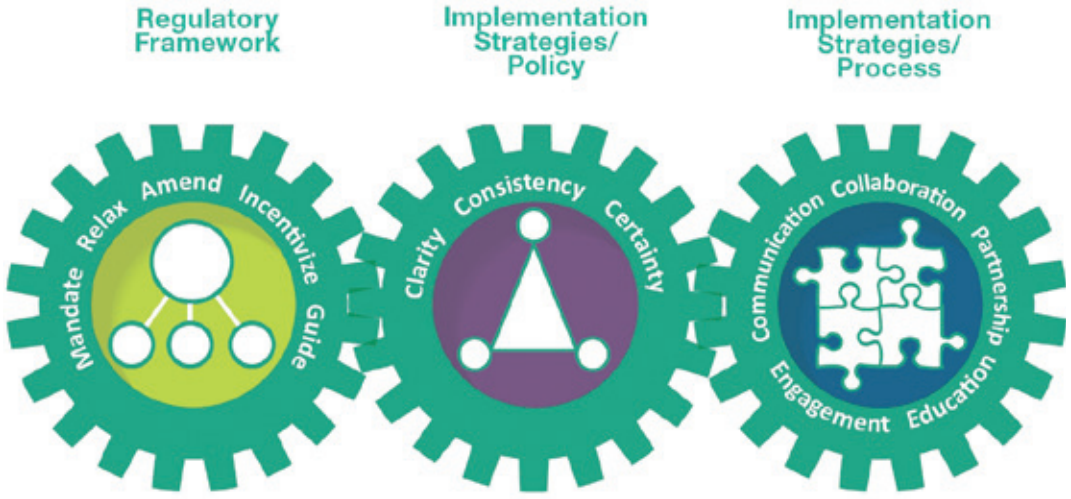
Centre City Urban Design Guidelines is a comprehensive guideline document aimed at achieving the following four objectives:

- Consolidate existing Centre City urban design policies and guidelines, identify any gaps, and develop a comprehensive design guideline in a user-friendly, visually rich graphic format;
- Clarify and outline expectations related to design quality while reflecting current national and international best practices in sustainable and innovative urban design;
- Communicate urban design guidelines widely both inside and outside of the City Administration to ensure that they are applied consistently to all applications; and
- Contribute to an efficient and effective development review process without compromising the City's core urban design objectives.

Planning Process

The City of Calgary's City Wide Urban Design team led this project and strived to achieve the above-mentioned four objectives through an effective engagement process. Key internal stakeholders included representatives from various business units in the City of Calgary. External stakeholders included Centre City developers, architects, property owners, community associations, business revitalization zones and representatives from the development community, design community, and local communities.

MVH Urban Planning and Design Inc. acted as the City's facilitator for public engagement events. CIVITAS Urban Design & Planning, AECOM and Beasley & Associates were the report writing consultant team who produced the first draft of the design guidelines. The city's urban design team delivered the final version of the guidelines, incorporating many ideas from stakeholders, addressing many issues and gaps identified by them.



SOURCE: *City of Calgary*

Stephen Avenue, Downtown Calgary

SOURCE: *Xia Zhang MCIP, RPP*

Guideline Application, Results and Impacts

The final guideline document is an exemplary demonstration of how urban design as a discipline is effectively involved in the development review and policy-making process, leading to the creation of great streets, memorable places and high quality environments as envisioned in Calgary's Municipal Development Plan. The guideline document provides a consistent and streamlined process for the urban design review of development applications.

The creation of the comprehensive guideline document has set the City Wide Urban Design team in a position within the city administration to have greater impact on daily decision-making, helping the city move towards achieving the goal of "urban design excellence." ■

In Memory of
David Owen Palubeski FCIP, RPP
1950-2016

David (Dave) Palubeski passed away suddenly on December 11, 2016 in his Lombard North Group office in Winnipeg as a result of carbon monoxide poisoning. The Provincial Fire Marshall issued a statement following Dave's death reminding homeowners and businesses to ensure furnaces and chimneys are in proper working order and to install carbon monoxide detectors. Please ensure your home and workplace are protected by installing a carbon monoxide detector.

Dave is survived by his beloved wife Patti, sons Brandon (Erin) and Jon (Diana), daughters Samantha (Stefan) and Stephanie, grandchildren Kaeden, Weston and Sydney, and many other family members and close friends. Dave enjoyed life to the fullest, had an infectious laugh and a wonderful sense of humour. He was deeply committed to his family and friends and was happiest when spending time with family and friends at his cabin on Lake of the Woods.

Dave was born in Ottawa on February 25, 1950. His family moved around a fair bit when Dave was younger because his father served in the Canadian Forces. Dave graduated from the University of Waterloo in 1973 with a Bachelor of Environmental Studies (Hons Urban and Regional Planning). His first job in planning was with Parks Canada in the Western Region Parks' Townsite Planning Office in Calgary, followed by a stint as a planner with Manitoba Municipal Affairs, and then as a District Planner with the City of Winnipeg. In 1979 he moved into private sector consulting—where he was engaged in a diverse practice serving the private sector, government, utilities and non-profit agencies.

Dave was President of Lombard North Group (1984) Ltd, Planners, Landscape Architects and Project Managers, based in Winnipeg, with affiliated offices in Calgary and Victoria. His breadth of professional practice spanned over 40 years and included co-ordination of urban design initiatives; regional and urban development strategies; financial and socio-economic impact assessments for major development projects; feasibility assessment and project management of industrial, large format commercial, mixed-use and residential developments; numerous community and neighbourhood plans; and coordination of public consultation initiatives.

Dave was a Past President of both the Manitoba Professional Planners Institute (1997-98) and the Canadian Institute of Planners (2001-03). From 2003-11, he coordinated the CIP- China Planning Advisory Services. He also served as Chair of the City of Winnipeg Downtown Design Review Advisory Board; as a member of the Montreal Design Awards Review Committee and as a member of the Prime Minister's Advisory Council on the Environment and the Economy. In recognition for his outstanding contribution to the profession, Dave was inducted into the CIP College of Fellows in 2006.

Dave's love for life and commitment to his profession and friends was unmatched. He will be missed. ■

In Memory of
Christopher Reddy mCIP, RPP
1950-2017

Christopher Reddy passed away at home, with his wife and daughters at his side, after a long battle with cancer at the age of 67.

Chris obtained his degree in Environmental and Professional Planning from the Nova Scotia College of Art and Design. Pursuing a career in urban planning, Chris travelled coast to coast helping to shape Canadian cities. Chris is best known for his larger than life, gregarious and positive attitude. He was a mentor to many and truly impacted the lives of those he met. He was a lover of photography, art, good food and music. He was known for saying, "It's a great day to be alive," and was always sharing his positive outlook on life with those around him. He cherished all the time he had with family and friends.

Those who knew Chris, know of his love for quiet moments on the front porch with a good book and a glass of scotch. Also a lover of knowledge and great conversation, Chris was a wonderful story-teller. Born in Halifax, he loved being close to the ocean. His life journey brought him across Canada allowing him to develop a true love and fascination of the mountains. He found the beauty in everything around him, from architecture to nature, always capturing those special moments along the way.

Chris had made lasting memories with those who knew him, he will surely be missed. ■

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