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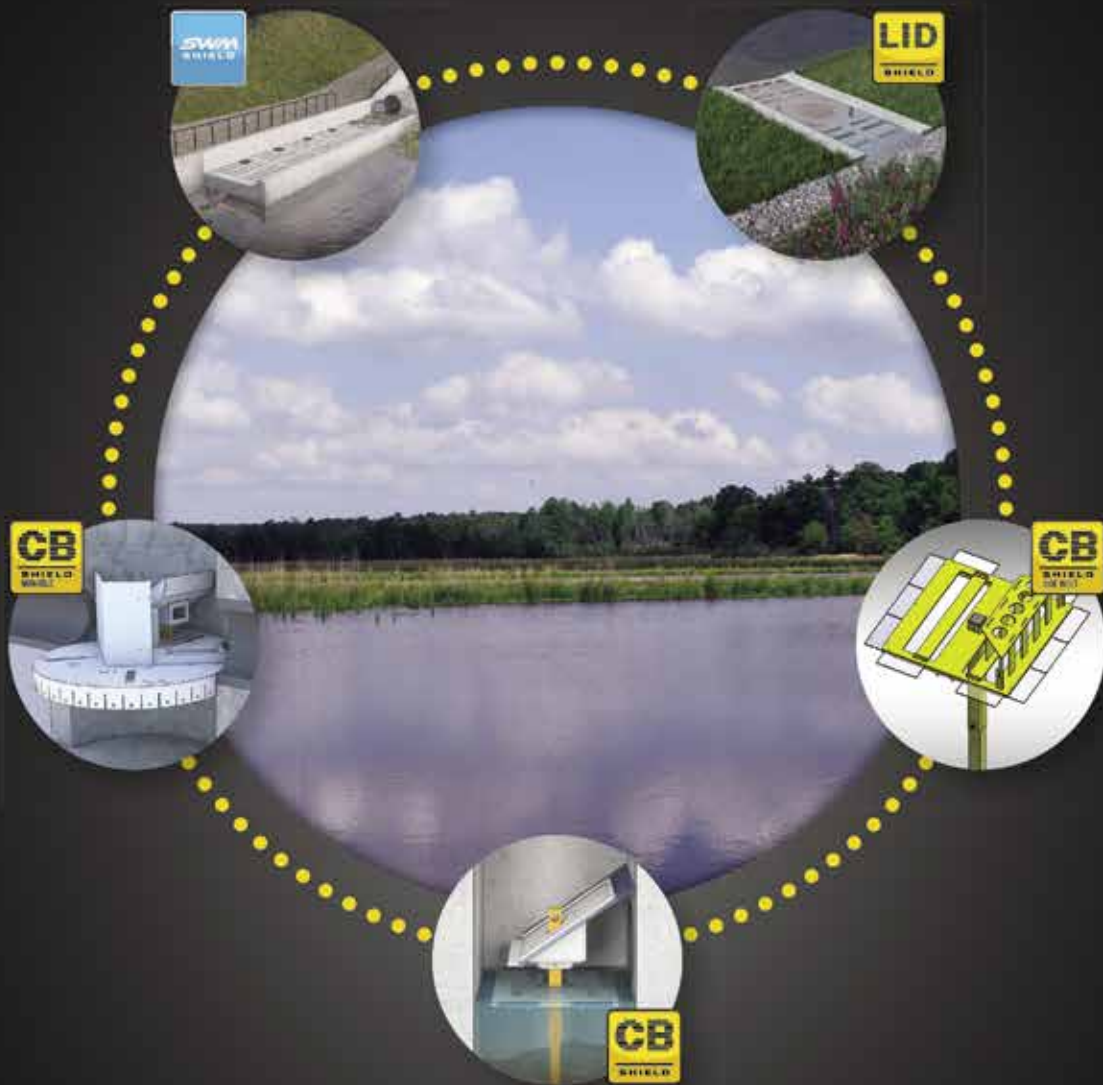
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STORMWATER

8 Assessing Stormwater Quality

Collaboration between City of Saskatoon and University of Saskatchewan assesses stormwater quality.

BY MARKUS BRINKMANN,
KERRY MCPHEDRAN,
AND MITCHELL MCMANN

WASTEWATER

12 Advancing Municipal Co-digestion

Examining the drivers for undertaking municipal co-digestion projects.

BY SIMRAN CHATTHA

DRINKING WATER

14 Reliable and Safe

Is the shared responsibility for ensuring reliable access to safe drinking water effective?

BY SIMRAN CHATTHA

WATERSHED MANAGEMENT

16 Freshwater Salinization

Looking at what we can do to keep our freshwater fresh.

BY ANGELA WALLACE, CALVIN HITCH,
JONATHAN RUPPERT, KRISTA CHOMICKI,
LYNDSAY CARTWRIGHT,
AND TIM VANSETERS

RULES AND REGULATIONS

18 Making Better Decisions

Examining the potential of a National Infrastructure Assessment.

BY ROBERT HALLER

GROUNDBREAKERS

20 Balancing Priorities

Proactive partnership supports business and environmental needs in Kawartha Conservation's watershed.

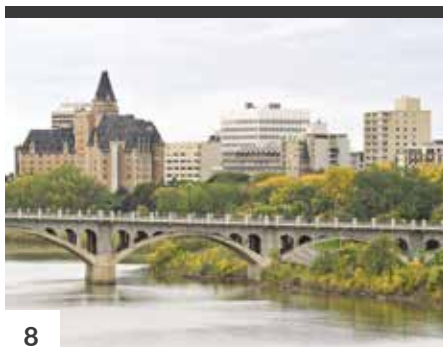
BY JOHN CHAMBERS

BLUE ECONOMY

22 Tackling Plastics in Freshwater

Exploring the challenges and opportunities associated with managing plastic pollution.

BY SIMRAN CHATTHA



8



16



18



26



28

ONE WATER

24 Way Forward

The path towards holistic water management.

BY GYAN CHHIPI-SHRESTHA,
SARIN RAJ POKHREL,
THAIS AYRES REBELLO,
HAROON RASHID MIAN,
KASUN HEWAGE,
AND REHAN SADIQ

CLIMATE CHANGE

26 Drought Response

Unifying the public and private sectors when responding to droughts.

BY RICK ANDREW

WATER QUALITY

28 Contaminants of Emerging Concern

They're here now and everywhere.

BY MICHAEL DORAN

COLUMNS

30 Improving Water Infrastructure

Understanding the imperatives for water infrastructure in rural, remote, and Indigenous communities.

BY IGNATIUS YANKEY

32 Diversity in Water

Exploring why the decision-making process must include diverse groups.

BY LAUREN K. M. SMITH
AND SARAH ELIZABETH WOLFE

DEPARTMENTS

5 Editor's Note

SIMRAN CHATTHA writes about building resilience.

6 Front

Northern Lakes Have Warmed Six Times Faster Since 1992, SAIT Opens New Water and Wastewater Pilot Scale Treatment Lab.

34 People & Events

Appointments, announcements, and event reports.



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Water Canada is published six times a year by Actual Media Inc.

actualmedia.ca

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Phone: 416-444-5842

Subscription/customer services:
416-444-5842 ext. 1

Water Canada subscriptions are available for \$39.95/year or \$64.95/two years.

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Printed in Canada.



Undeliverable mail return to:

150 Eglinton Ave. E, #806, Toronto, ON, Canada M4P 1E5

Canadian Publications Mail Product Sales Agreement 40854046

ISSN 1715-670X



Building Resilience

BY SIMRAN CHATTHA

CLIMATE CHANGE IMPACTS are leaving Canadians under water. The question is: what are we going to do about it?

The reality is that regions across Canada have been dealing with increased rainfall, and in turn flooding, in some way, shape, or form over the last few years. In 2013, communities in and around Calgary and Toronto were affected by major flooding. In 2021, communities in British Columbia, Newfoundland and Labrador, and Nova Scotia were heavily affected.

Over the next few years, damage associated with these types of flooding events is expected to increase. According to a report by the Canadian Institute for Climate Choices:

- Flood damage to homes and buildings could increase fivefold by mid-century and tenfold by end of century, with costs as high as \$13.6 billion annually.
- Damage to roads and railways could increase by up to \$5.4 billion annually by mid-century and by as much as \$12.8 billion annually by end of century.
- Costs to repair and maintain electrical infrastructure could more than double by mid-century and triple by end of century, costing up to \$4.1 billion annually.

One role that governments can play is it can make investments in climate resilient infrastructure, which is no small task. But if the infrastructure investments

are planned wisely, they can help communities build the foundation for a resilient future.

A number of options are available for building this foundation. In a report on Advancing the Climate Resilience of Canadian Infrastructure by the International Institute for Sustainable Development (IISD), experts recommend three categories of options for improving the climate resiliency of infrastructure:

- 1 **Planning and Assessment** (e.g., ensuring that infrastructure planning is informed by climate change projections, climate change risk assessments, etc.).
- 2 **Monitoring and Maintenance** (e.g., foundation movements due to permafrost melting).
- 3 **Structure Changes** (e.g., using permeable pavements to reduce stormwater runoff).

Over the last couple of years, we've also seen natural infrastructure become a mainstream option for enhancing the resilience of our built infrastructure.

Policy-makers and municipal leaders must exercise these options sooner than later to keep our communities from burning or drowning. It's time to build more resilient infrastructure. wc

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**MICHAEL DORAN**

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ABOUT THE COVER

A local partnership in Kawartha Conservation's watershed balanced both business and environmental needs. Learn more on page 20.

Coming up in the next issue:
MARCH/APRIL

Adapting Infrastructure for a Changing Climate

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Mitigating Water Pooling

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Water Replenishment

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Northern Lakes Have Warmed Six Times Faster Since 1992: Research

LAKES IN THE NORTHERN HEMISPHERE have warmed six times faster since 1992 than any other time period in the last 100 years, according to research led by York University.

Lake Superior is one of the fastest warming lakes. It has lost more than two months of ice cover since ice conditions started being recorded in 1857. In Lake Suwa, in Japan, ice formed close to 26 days later per century since 1897 and is now only freezing twice every decade. Grand Traverse Bay in Lake Michigan had one of the fastest ice-off trends, melting about 16 days earlier per century.

"We found that lakes are losing on average 17 days of ice cover per century," said Sapna Sharma, associate

professor in the Faculty of Science at York University. "Alarming, what we found is that warming in the past 25 years, from 1992 to 2016, was six times faster than any other period in the last 100 years."

Sharma led the study with Professor David Richardson of the State University of New York at New Paltz and Climate Scientist Iestyn Woolway of the European Space Agency Climate Office in the United Kingdom.

The researchers re-assessed ice trends of 60 lakes for the first time since 2004. They studied ice phenology records ranging from 107 to 204 years old. "Many of our lakes may be approaching a tipping point to ice-free conditions, which will have vast cultural and ecological implications," said Sharma. www.researchgate.net/publication/354844444

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NEWS: Northwest Territories Releases Five Year Plan for Water Stewardship.
bit.ly/NWTWaterStewardship



SAIT Opens New Water and Wastewater Pilot Scale Treatment Lab

STUDENTS INTERESTED IN sustainable water resource management will have the chance to hone their craft in a new \$1-million Water and Wastewater Pilot Scale Treatment Lab on the Southern Alberta Institute of Technology's (SAIT) main campus.

The lab contains the same state-of-the-art equipment found in an operational water treatment facility—scaled down for learning purposes.

“Each unit simulates a different process used in domestic or industrial water treatment,” said Pablo Pina, academic chair of sustainability at the MacPhail School of Energy (MSE).

Domestic processes treat both the water we drink and the wastewater we produce in a municipality, whereas industrial processes prepare water for use in petrochemical plants, pulp and paper, or oil and gas extraction.

Exposure to both in the lab will give students a unique advantage come graduation.

“Water is an essential component to our economy and we need people who know how to manage it,” said Pina.

Three years in the making, the lab was made possible thanks to an ongoing partnership with Spartan Controls and an anonymous donation to MSE in support of environmental sustainability. Additionally, SAIT's Applied Research and Innovation Services (ARIS) Water Research and Innovation area in the Centre for Energy Research in Clean Unconventional Technology Solutions—in collaboration with MSE—used funding from the Canada Foundation for Innovation and Applied Research Fund. This was to develop the lab's unique industrial water and wastewater treatment train. **WC**

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The City of Saskatoon has launched a number of initiatives that are designed to protect the environment from contents within stormwater.



Assessing Stormwater Quality

Collaboration between the City of Saskatoon and University of Saskatchewan

assesses stormwater quality.

BY MARKUS BRINKMANN, KERRY MCPHEDRAN, AND MITCHELL MCMANN

STORMWATER IS rainfall and snowmelt that runs off land into isolated storm sewers (separated stormwater sewers) or systems that collect a combination of stormwater and municipal wastewater (combined sewers). Most urban areas in Canada developed prior to the 1940s were originally served by combined sewers, while newer and updated systems typically include separate systems.

Saskatoon is the largest municipality in Saskatchewan and its stormwater is conveyed in a separated sewer system, with most of the over 100 outfalls being directed to the South Saskatchewan River with minimal or no treatment. Stormwater can contain high levels of pollutants such as nutrients, organic matter, pathogens, metals, polyaromatic hydrocarbons (PAHs), and salts. In addition to these water-borne pollutants, stormwater outfalls also transport larger

floatable debris such as leaves, plastic and other trash, and rubber tire and road wear particles.

Despite the poor water quality, stormwater outfalls to receiving waters are not currently regulated across all Canadian provinces. However, it is anticipated that regulations for stormwater release will eventually be created, with strict quality requirements similar to current municipal wastewater effluent regulations. Thus, there is a pressing need to better understand the environmental impacts of stormwater runoff pollutants and debris on receiving waters in Canada.

The City of Saskatoon has launched a number of initiatives that are designed to protect the environment from contents within stormwater. Initiatives include the annual street sweeping program, numerous storm ponds that help reduce

contaminants and manage water runoff, and a new snow management facility. Meltwater from the snow management facility runs through an oil and grit separator into a meltwater/stormwater pond. The meltwater then enters a series of specially designed barriers before being discharged in a controlled manner into the stormwater system. The City also participates in the Yellow Fish Road Program every year to educate residents about the impact communities can have on water runoff.

In anticipation of potential future regulations, and in addition to the abovementioned initiatives, much research has been undertaken in Saskatoon, and in other municipalities worldwide, to determine the levels of nutrients, salts, metals, and PAHs in stormwater. Active collaborations around stormwater quality were initiated

between the University of Saskatchewan College of Engineering and the City of Saskatoon Stormwater Utility through an Engage Grant of the Natural Sciences and Engineering Research Council of Canada (NSERC) led by Dr. Kerry McPhedran.

McPhedran holds the Centennial Enhancement Chair in Water Stewardship for Indigenous Communities and leads a group of researchers in environmental

toxicologist Dr. Markus Brinkmann, who is an expert in surface and wastewater quality assessment and monitoring and a faculty member in the University of Saskatchewan's School of Environment and Sustainability, as well as the Toxicology Centre, the Global Institute for Water Security, and the Centre for Hydrology.

Both professors co-supervise engineering graduate student Hayley Popick, research assistant Scott Read, as well as a number of undergraduate research students who had the opportunity to make valuable first-hand experiences in conducting applied research in

partnership with a large municipality. Analytical support was provided by Dr. Jonathan Challis, a Banting Postdoctoral Fellow at the Toxicology Centre. Russ Munro, director of Saskatoon

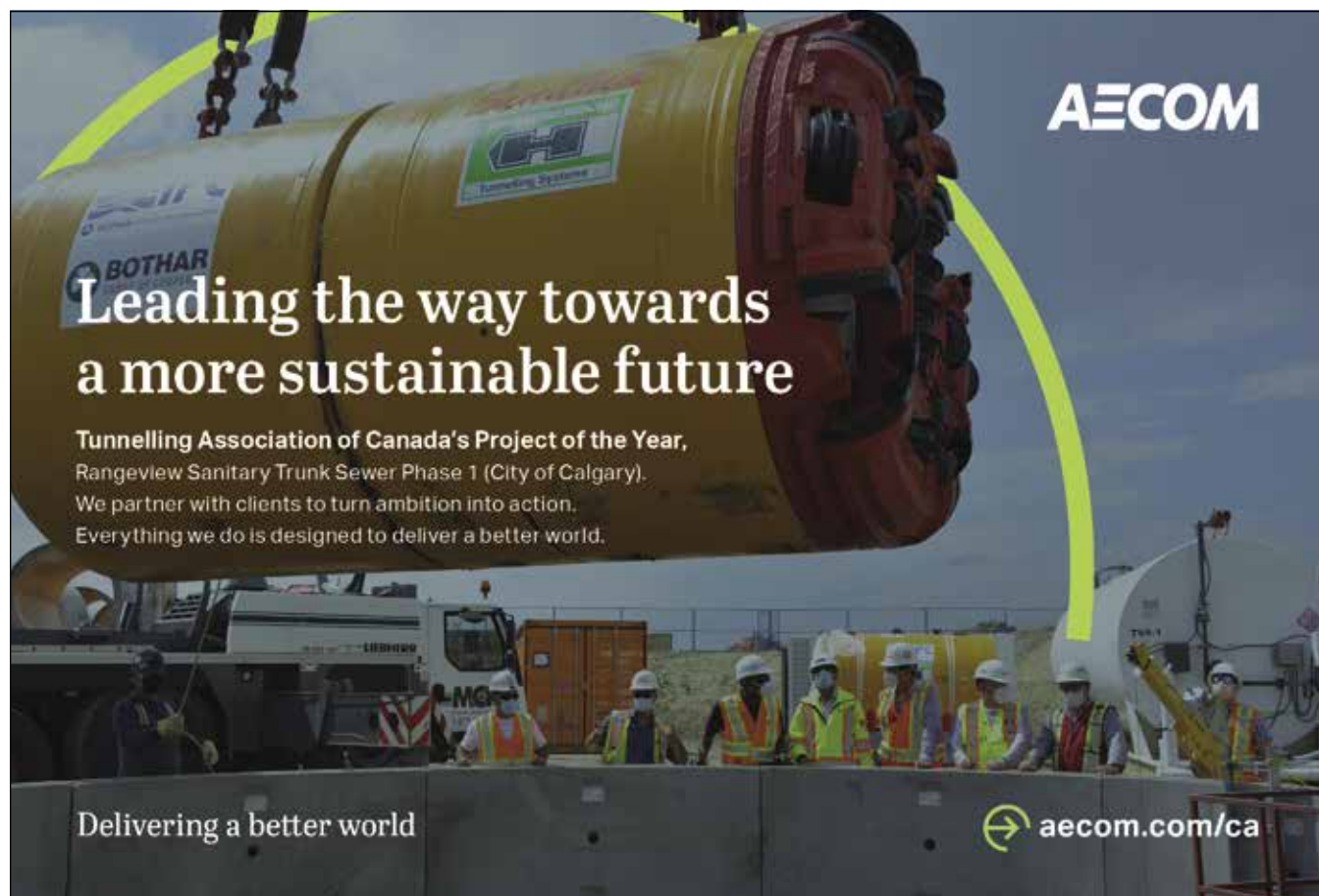
Water, as well as Mitchell McMann, the City of Saskatoon's stormwater utility manager, and their teams have provided significant support to these research and monitoring efforts and continue to support the City's Strategic Goal of Environmental Leadership through these efforts.

In a recent study under this partnership, the research team has used non-target chemical analyses (i.e., unbiased chemical screening methods) to identify novel contaminants of potential concern in Saskatoon's stormwater. This study focused on samples taken from snow facilities, snowmelt puddles, and about a dozen outfall sites along the South Saskatchewan River within the City of Saskatoon in 2019 and 2020.

The researcher found elevated levels (up to 300 µg/L which are among the higher levels detected globally) of rubber-tire derived chemicals that leach from

Saskatoon has launched a number of initiatives that are designed to protect the environment from contents within stormwater.

engineering, with a focus on municipal water and wastewater treatment, industrial wastewater treatment, and Indigenous water-related research. In 2019, this effort was joined by aquatic



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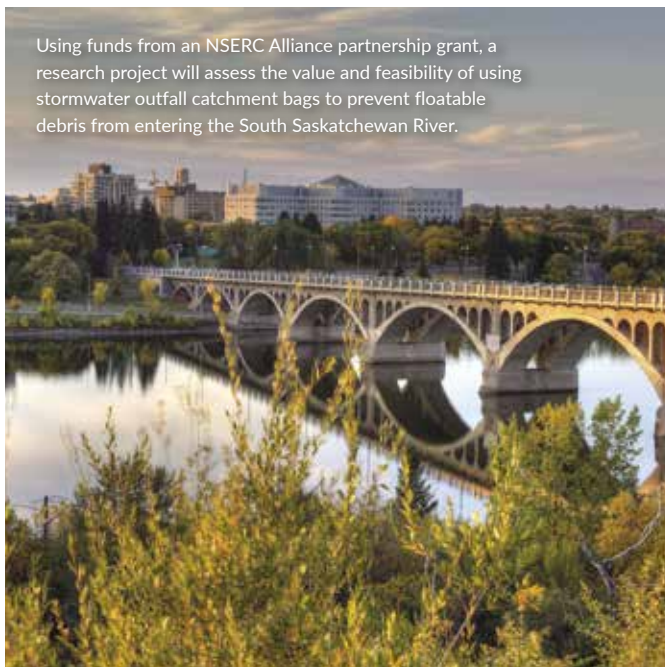
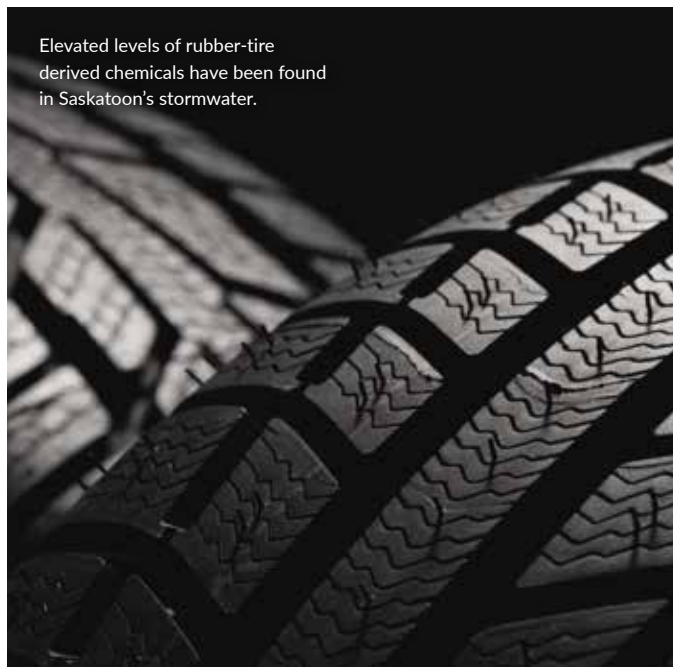
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Elevated levels of rubber-tire derived chemicals have been found in Saskatoon's stormwater.

Using funds from an NSERC Alliance partnership grant, a research project will assess the value and feasibility of using stormwater outfall catchment bags to prevent floatable debris from entering the South Saskatchewan River.



road wear particles. This includes including N,N'-diphenylguanidine, N,N'-dicyclohexylmethylamine, N,N'-dicyclohexylurea, 1-cyclohexyl-3-phenylurea (CPU), as well as 2-anilo-5-[(4-methylpentan-2-yl)amino]cyclohexa-2,5-diene-1,4-dione (6PPD-quinone), a chemical that has recently been identified as highly toxic to coho salmon in Washington State, U.S.

The results of the study (<https://bit.ly/RubberDerivedChemicals>) have been recently published in the prestigious peer-reviewed journal Environmental Science & Technology Letters.

Informed by the findings of this study, it became clear that more work is needed to understand the levels and emission dynamics of rubber tire and road wear particles, as well as floatable debris.

The goal of a recently awarded NSERC Alliance partnership grant is to assess the value and feasibility of using stormwater outfall catchment bags to prevent floatable debris from

entering the South Saskatchewan River through Saskatoon's stormwater outfalls.

These reusable bags are made from high-density polyethylene material and have been used in other municipalities across North America to intercept floatable debris before it can enter receiving water bodies. This proposed proof-of-concept study will initially focus on two major outfalls and, if successful, the City will evaluate the feasibility of potentially equipping other major outfalls along the river with these bags versus other debris limiting methods (e.g. additional street sweeping, upstream treatment, etc.).

In addition to floatable debris, this research project will establish methods and strategies to better understand the spatial and temporal emission dynamics of microparticulate contaminants (e.g., rubber tire and road wear particles, microplastics, brake abrasion dust) as well as dissolved contaminants that originate from these particulates.

In summary, we strongly believe that these collaborative research initiatives between the City of Saskatoon and the University of Saskatchewan will immensely benefit our understanding of the dynamics of stormwater contamination in the City. We also believe these research initiatives will benefit similar municipalities both in Canada and worldwide, and will continue to make tangible contributions to the advancement of environmental health. wc

Collaborative research initiatives will immensely benefit our understanding of the dynamics of stormwater contamination.

The findings indicate that high concentrations may be driven by accumulation of these chemicals on paved surfaces during extended dry periods in Saskatoon's semi-arid climate, followed by occasional intense rainstorms in the summer and snowmelt in the winter. In the absence of toxicity data for aquatic organisms other than coho salmon, which is not found in the South Saskatchewan River, it is currently unclear whether these chemicals represent an acute risk to environmental health. More research is needed to answer this question.

Markus Brinkmann is an assistant professor in the School of Environment and Sustainability at the University of Saskatchewan.

Kerry McPhedran is an associate professor in the College of Engineering at the University of Saskatchewan.

Mitchell McMann is a storm water utility manager at Saskatoon Water.

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
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At the municipal level, there's an opportunity to help reduce emissions by diverting organic waste from landfills to wastewater treatment plants.

Advancing Municipal Co-digestion

What are the drivers for undertaking municipal co-digestion projects?

BY SIMRAN CHATTHA

MANY STAKEHOLDERS RECOGNIZE that the amount of greenhouse gas emissions entering the atmosphere needs to be limited, if not reduced, given the negative implications of global warming.

At the municipal level, there's an opportunity to help reduce emissions by diverting organic waste from landfills to wastewater treatment plants. This is so the organic waste can be co-digested to produce biogas, which has a number of benefits.

Industry experts joined Water Canada for a webinar that explored the drivers for municipal co-digestion, examined regulatory requirements and financing options for projects, and provided examples of municipalities that are currently undertaking projects.

The industry experts included:

- **Indra Maharjan** from the Ontario Clean Water Agency (OCWA).
- **David Blain** from the City of Chilliwack.
- **Tej Gidda** from GHD.
- **Jennifer Green** from the Canadian Biogas Association.
- **David Unrau** from the Town of Petawawa.

What are the key drivers for exploring co-digestion from a municipal perspective?

Maharjan kicked off the discussion about the key drivers for exploring co-digestion projects. He noted that asset management is the key factor that's driving co-digestion opportunities for municipal wastewater system owners.

"The existing wastewater treatment plants are operated based on the revenue from rate payers so there's only one single source of revenue," noted Maharjan. "Among the G8 countries, Canada pays the lowest rates for water and wastewater. The financial model for operating and maintaining the system is not sustainable. That's why there's a need to manage the high expenses that are incurred when maintaining the digesters and getting them functional."

"The second driver for co-digestion projects is that there are digestors

that have unused capacity," noted Maharjan. Co-digestion projects are trying to leverage that unused hydraulic and processing capacity to deal with municipal challenges related to organics management.

"I don't think we're going to be building a whole pile of new landfills going forward," said Gidda. "In fact, we're seeing it more and more difficult to develop landfills but we still need to manage our waste and we're still going

While there are many drivers for undertaking municipal co-digestion projects, there is a need to have financial incentives in place.

to produce it. So this organic waste that we do have is actually a resource and it can also produce renewable energy in the form of renewable natural gas or electricity."

In this sense, municipalities have a

head start in terms of the availability of physical assets in the ground and also the experience in running these plants.

"I think that the anaerobic digestion piece is tried and true in the municipal sector," said Green. "What we're seeing now is that we're taking the biogas that's generated, which now has a value. We can put that out into the market either as onsite use in electricity or heat, saleable for electricity into power grids, or as renewable natural gas in gas grids. Now we almost have a new resource that we can put a value on and perhaps create a new revenue source for municipalities."

In the case of the City of Chilliwack, it's always had excess gas beyond what it needed to heat the traditional hot water boilers. It spent a number of years looking into how it could beneficially reuse that gas. "We started looking at co-digestion as a way of essentially turbocharging the gas production plant," said Blain. "That helped us over that hurdle because the extra gas doesn't change the cost of the conditioning equipment."

While there are many drivers for undertaking municipal co-digestion projects, there is a need to have financial incentives in place when undertaking municipal co-digestion projects.

"From Petawawa's perspective, we've been very fortunate with the support of OCWA in receiving funding," said Unrau. "Through the Federation of Canadian, we got funding for our feasibility study to be completed. Once that was completed, we received funding from the Low Carbon Economy Fund."

Not having financial incentives in place can make it tougher to present a business case about the return on investment. In the Town of Petawawa's case, it was able to build a business case for its municipal co-digestion project once it had received funding.

To view the full discussion, visit www.watercanada.net/blue-economy WC

Simran Chattha is the editor of Water Canada.

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Managing drinking water supplies in Canada properly requires coordination among multiple stakeholders.



Reliable and Safe

Is the shared responsibility for ensuring reliable access to safe drinking water effective? BY SIMRAN CHATTHA

IN CANADA, managing drinking water supplies properly requires coordination among multiple stakeholders. This is, in part, because there is a shared responsibility between all levels of government for ensuring that drinking water is safe. Many other stakeholders (e.g., businesses) are involved in the process as well.

In September 2021, Water Canada hosted a discussion about ensuring reliable access to safe drinking water. We asked questions about what's currently working, what's not working, and what more is needed. Actual Media's **Corinne Lynds** moderated the discussion that included the following industry experts:

- **Michele Grenier** from the Ontario Water Works Association.
- **Madjid Mohseni** from the University of British Columbia.
- **Mike Chaulk** from CBCL.

Part of the discussion focused on the fact that there is coordination between the federal and provincial governments and this is helping to increase communication.

"There is the Federal-Provincial-Territorial Committee on Drinking Water (CDW) that is supported by Health Canada," said Grenier. "There is a lot of collaboration and a lot of communication that occurs through that vehicle to allow for standardization or leveling the playing field."

At the same time, Grenier added that it's difficult to take a one size fits all approach across the country. "There are differences not only geographically, but certainly demographically," she said. "You have municipalities in Ontario that are significantly different in terms of their structure and their capacity compared to, say, remote communities elsewhere in the country. To that effect, I think that the CDW table is an important mechanism in terms of ensuring everyone has the latest information and access to the same data

and access to the same research that's being done in the drinking water file. In terms of implementation, that phase is left to the individual provincial and territorial jurisdictions."

This is where delays come in. There aren't necessarily inconsistencies between the provincial regulations and the federal guidelines. It does take time though to amend legislation and the supporting regulations.

It's a fine balance to try and walk the line between pushing innovative products and understanding the risks.

"There are also issues around regulations and regulatory frameworks that pertain to drinking water in First Nations communities, which tend to be subject to the federal guidelines and not provincial regulations," said Grenier.

"The treatment requirements in a First Nations community might not be similar to a municipality right next door in Ontario. This creates a disconnect and I think that this is one of the areas where we need to focus some efforts moving forward."

Working with risk aversion

There are Canadian water technology companies that have found efficiencies in existing processes or found ways to improve how things have typically been done. At the same time, they are facing challenges with getting their solutions adopted in Canada since the water industry is risk averse. During our webinar, we examined the role stakeholders in the water industry can play in supporting the adoption of novel water technologies.

"I think that it's a fine balance to try and walk the line between pushing innovative products and also understanding the risks that are embedded and that could result in unintended outcomes," said Chaulk.

"In general, there are examples of treatment projects, water and wastewater, that have been earmarked as using innovative and new technologies that ultimately resulted in a very negative outcome for the owner or municipality."

"The projects were undertaken because funding was available preferentially for only things that were seen as new to market or innovative," added Chaulk. "Conversely, there are other positive stories of municipalities that have taken a risk on doing something different on the basis of the innovation and things worked out in their favour."

Part of what needs to be taken into consideration is that the water industry is a compliance driven industry and that there are minimum requirements that need to be met at all times. As a result, there isn't much flexibility for experimentation. At the same time, shared responsibility and collaboration can make a big difference in moving forward.

"I think that with shared responsibility

and collaboration, the finger pointing will be reduced since everybody will take the risk to move forward," said Mohseni. "Having the owners participate fully and take responsibility sometimes helps with the rapid piloting of new technologies. I think this is going to provide them with some assurance about the work and get the regulators involved in the process as well."

"If the owners and technology providers do their piloting in silos without really regulators on board with the idea, that's going to keep them aside," added Mohseni. "When it comes to approving the technology for the full-scale applications, it's going to be a slow and it may not happen. However, keeping regulators involved in the process will help increase the speed of the implementation." WC

Simran Chattha is the editor of Water Canada.

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Water's Next winners receive a plaque and an individually hand crafted glass pin by artisan glassblower Aaron Calenda of Guelph, Ont.

The Toronto and Region Conservation Authority, along with multiple partners, has started to monitor chloride concentrations at the mouths of the major tributaries in the Greater Toronto Area.

Freshwater Salinization

Can we keep our freshwater fresh?

BY ANGELA WALLACE, CALVIN HITCH, JONATHAN RUPPERT, KRISTA CHOMICKI, LYNDSEY CARTWRIGHT, AND TIM VANSETERS

ONE OF THE MOST SERIOUS THREATS

to our freshwater is contamination from salts (also known as freshwater salinization). Salts are a major threat to drinking water supplies. High levels of salt can produce an unpleasant taste in drinking water and may be a health issue for someone with severe hypertension, congestive heart failure, or on a sodium-restricted diet. Recent studies suggest that salts can interact with soils and infrastructure to mobilize multiple contaminants such as metals to create chemical cocktails in ground and surface waters. Even more troubling are the salt impacts to the natural environment that contribute to both biodiversity and habitat loss for many native species.

The causes of freshwater salinization are diverse but increased human inputs of salts into the environment is the key driver. Sources of salts include sewage, fertilizer, water softeners, and mine drainage—just to name a few. Many different types of salts contribute to freshwater salinization but chloride is the main offender in Canada, particularly in urban regions. The majority of chloride comes from road salt used to deice roads in the winter.

Canada began using road salt as a deicing agent in the 1950s and its use has continued to increase dramatically over time. Today, over seven million tonnes of road salt are used each year across the country. In fact, Goderich, Ontario is home to the world's largest salt mine. Ironically, it is located about 500 metres beneath Lake Huron, one of Canada's largest freshwater lakes.

Road salt keeps pavement clear of snow and ice and ultimately saves lives. But its environmental impacts are devastating. Quite simply, road salt is a toxic substance to many organisms. Environment and Climate Change Canada added road salt to the Priority Substances List under the *Environmental Protection Act* in 2001. Priority substances are considered harmful to the environment and can be a danger to human health. In Ontario, road salt has been identified as one of the threats to drinking water under the *Clean Water Act*. Road salt is also toxic to wildlife. Birds can eat salt crystals, which can cause dehydration and death. Many plants and trees cannot grow in salty conditions. Road salt is a particular concern for aquatic organisms like fish, mussels, frogs, and

aquatic insects. It can cause a decrease in size in some organisms as well as interfere with their ability to reproduce. In high enough concentrations, it kills them.

Despite the toxicity of road salt, we still use it. The multiple advantages of using salt in the winter are likely why it has become so popular. It is cheap, easily accessible, and excellent at melting ice at all but the coldest temperatures. As a result, road salt remains the most popular deicing product on the market today. But its affordability means that we often use more than we need—particularly on parking lots and walkways. Given the choice between spreading more salt or risking a potential slip and fall lawsuit, contractors will almost always choose to spread more salt. Unfortunately, the road salt used in winter doesn't just stay on the road or in the parking lot. It gets washed away into streams and persists in the soils, groundwater, and stormwater ponds. Even more alarming—it's accumulating. This means that the amount of salt (chloride) in streams will keep increasing for many years even if mitigation efforts are implemented immediately.

In Canada's most populated area,

the Greater Toronto Area (GTA), chloride concentrations have increased dramatically over time. In Ontario, these values are measured once per month as part of the Provincial Water Quality Monitoring Network (PWQMN). For example, at the mouth of the Don River, chloride concentrations continue to increase. Here the most recent median concentrations are more than three times the Canadian Water Quality Guideline (CWQG) for long-term (chronic) effects. The PWQMN has been invaluable for showing these long-term trends.

But the infrequency of sampling does not capture the peaks and extreme values. To address this problem, the Toronto and Region Conservation Authority (TRCA), along with multiple partners, has started to monitor the mouths of the major tributaries of the GTA using high-frequency sensors. Readings are collected every 15 minutes. Highland Creek, one of the most urbanized creeks within the City of Toronto (89 per cent urban), recorded a peak concentration of 8,400 mg/L of chloride during the early winter months of 2021. That's more than 70 times the CWQG for chronic effects to aquatic organisms (120 mg/L) and 13 times the CWQG for acute (short-term) effects (640 mg/L). The values are also problematic in less

Road salt keeps pavement clear of snow and ice and ultimately saves lives. But its environmental impacts are devastating.

urbanized watersheds. Duffins Creek, a less urbanized creek east of Toronto (17 per cent urban), recorded chloride levels close to 3,000 mg/L in winter 2021. The frequency and duration of these high values pose a considerable threat to fish, aquatic organisms, and ecosystem health. These values also show the importance of increasing water monitoring efforts using modern sensor technology to capture continuous data.

Although we know that the implications to the natural environment are severe, we still use an abundance of road salt. Currently, there are no chemical



Over seven million tonnes of road salt are used each year across Canada.

alternatives that are environmentally safe as well as being affordable and effective. But we do have the ability to reduce the amount of road salt that we use. The first place to start making changes is at home, such as not using salt to clear your driveway of snow. Shovel snow whenever possible and reserve salt for ice. On a larger scale, improved education is needed for those who apply salt. Smart about Salt is a program in Ontario that teaches people about best management practices, such as proper tracking

and logging of salt applications, and how to apply only the amount of salt that is needed to meet service expectations. Because of the toxic nature of road salt, this type of training and certification would ideally be mandatory and regulated. An alternative to a mandated program would be the incentivized model introduced in New Hampshire a few years ago. Contractors that receive regular training and report on their salt use are afforded limited liability relief by the State. This legislation offers contractors a huge incentive to get certified and reduce their salt use.

Freshwater is essential to human survival; we need it to eat and drink. Canada's continued use of road salt is showing its inevitable toll across the country. There have already been significant impacts to infrastructure. For example, salts increase the rate of erosion of rebar within concrete and can contribute to the structural failure of infrastructure, such as bridges and overpasses. It recently cost over \$4 billion dollars to replace Montreal's Champlain Bridge after only 50 years since completion due to damage from salts. Impacts to the aquatic ecosystem also continue to manifest. We need to develop strong management strategies that evaluate salt contributions from different sources on a watershed-ecosystem level and the potential implications to infrastructure, drinking water, and the natural environment. Freshwater salinization is a serious threat to our freshwater and it's time we get serious about using less road salt. WC

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Early in 2021, the federal government proposed the development of a National Infrastructure Assessment program to better guide public infrastructure investment across Canada.

Making Better Decisions

The potential of a National Infrastructure Assessment.

BY ROBERT HALLER

FOR DECADES the utility sector has been lamenting the aging of our public infrastructure, especially in the water, wastewater, and stormwater sector. Our municipal utilities have identified the need for significant investment and called for federal and provincial support to finance what needs to be done. In the last several years, over one hundred billion dollars have been committed by the federal government to match provincial and municipal investments. Some will argue that this is still far from enough, but with these multi-level commitments, how do we cooperatively set a course, agree upon priorities, and aim for the maximum impact from our investments?

Early in 2021, the federal government proposed the development of a National Infrastructure Assessment program to better guide public infrastructure investment across Canada. In March of 2021, Infrastructure Canada released a report titled Building the Canada We Want in 2050. This ‘engagement paper’ initiated a consultation process on how best to conduct “Canada’s first ever National Infrastructure Assessment.”

The report noted three priorities from such a project:

- ① Assessing Canada’s infrastructure needs and establishing a long-term vision.
- ② Improving coordination among infrastructure owners and funders.
- ③ Determining the best ways to fund and finance infrastructure.

The ultimate purpose of the assessment was to better direct and coordinate public funds towards infrastructure that would ensure economic prosperity for all while promoting Canadian innovation.

This report was the first step in the federal engagement process to consult with the many stakeholders involved in public infrastructure. The Canadian Water and Wastewater Association (CWWA) was asked to provide input on behalf of the municipal water and wastewater sector and we provided a lengthy submission in June. While the federal government referred to this as the ‘first’ national assessment

project, we noted our involvement in previous national-level efforts including the InfraGuide and both of the Canada Infrastructure Report Cards. We identified several lessons that could be learned from these prior attempts. We noted that the greatest challenge was the lack of capacity for most municipalities to even conduct complete assessments so there needed to be significant federal support to develop that capacity as a first step. Simply, the best intentioned assessment project cannot succeed if the owners of the infrastructure (Canada’s municipalities) are not able to conduct the necessary inventories, condition assessments and resource evaluations. With federal support, the Federation of Canadian Municipalities (FCM) has since developed asset management and capacity building programs, but even greater investment is required in this first step.

Fully supportive of this new national project, CWWA spoke to the tremendous potential of such an effort. CWWA felt the assessment should collect so much more than just the current condition

and expected lifespan of existing infrastructure. This assessment could first consider options to optimize operations and prolong life cycles before replacement. The project could include a risk assessment, identifying the potential impacts of failure, to help prioritize urgency.

To support national climate change plans, this assessment must also collect information on each operation's energy consumption and consider the opportunities to reduce energy use, or even produce energy toward a net zero target. The energy implications should be a major factor in setting priorities and determining appropriate options.

As the voice of the municipal water sector, CWWA spoke to the vital importance of water and wastewater systems to the health and economy of every community. We spoke to the tremendous potential of the water industry to create good jobs across the country as well as position Canada as global innovation leaders. We noted the leading role municipalities play as the owners and maintainers of the majority of Canada's critical infrastructure, and local government's role as the closest level of government to the people each day. We also spoke to the need for reliable, long-term financing to municipalities to ensure sustainable infrastructure into the future. Finally, we spoke to the need for such an assessment to be a science and fact-based effort led by unbiased experts.

Our municipal utilities have called for federal and provincial support to finance what needs to be done.

Infrastructure Canada received more than 300 submissions—many echoing the same recommendations we made from CWWA. By early August, they were able to analyze all those submissions and release a second report with some clearer direction. It seems they heard what we had to say and they were able to identify several key recommendations from the consultations. First and foremost was a



As the voice of the municipal sector, CWWA raises awareness of the important role water and wastewater systems play in supporting the health and economy of every community.

call for an independent Advisory Body with a mandate to ensure “clear, fact-based advice.” The Advisory Body should “leverage global best practices and domestic experience,” should “consult with all levels of government,” and engage directly with Indigenous Communities.

Another key recommendation was to support Canada's Climate Plan, driving us to net zero and building our resilience to climate change. The final Assessment is to include “a clear set of investment recommendations, including proposed timelines and an infrastructure roadmap,” with “near, medium, and long-term prioritization over 30 years.” Most interestingly, the consultation report suggests that “in parallel, the Government should: establish consistent,

long-term funding guidelines to support sustainable investment; expand the range of funding sources; assess the role of regulatory changes on future funding of infrastructure projects; and continue to leverage the Canada Infrastructure Bank to accelerate infrastructure investment.”

Along with most federal projects, this ambitious effort had to go on hold for

the federal election in September. While the Liberals were returned as a minority government, there were significant changes in the Cabinet. While we have yet to see the final mandate letters for each Minister, we did receive this positive statement from Infrastructure Canada:

The Government of Canada has committed to undertaking Canada's first ever national infrastructure assessment...We heard from a broad array of public and private actors across different infrastructure sectors and regions. There was broad support for taking an independent and evidence-based approach to developing the national assessment of Canada's strategic infrastructure needs.

The department continues to work on the mandate and the design of the National Infrastructure Assessment as well as the body that will lead the assessment, and will share additional details on next steps.

We are confident that this project will proceed and the first step will be to establish the Advisory Body. CWWA expects to be at that table as the national voice for the municipal water utilities supporting a most-promising effort to prioritize our shared investments. WC

Robert Haller is the executive director of the Canadian Water and Wastewater Association (CWWA).

Balancing Priorities

COURTESY, JOHN CHAMBERS



Fenelon Falls Brewing Co., has become a regional destination brewery since opening in 2019. Located on Lock 34 in Fenelon Falls, the brewery offers panoramic views of the Lock and Cameron Lake.

Proactive partnership supports the business and environmental needs in Kawartha Conservation's watershed. BY JOHN CHAMBERS

THIS IS A STORY about people and community. And like many good stories, this one starts over a beer or two.

Located 90 minutes north-east of Toronto, Fenelon Falls Brewing Company runs parallel to Lock 34 on the Trent Severn Waterway—the gateway between Cameron Lake to the west and Sturgeon Lake to the east.

Often referred to as the Jewel of the Kawarthas, Fenelon Falls is a popular and bustling destination for boaters, cottagers, shoppers, foodies, and day trippers alike.

Originally a livery stable built as part of the McArthur House Hotel in the 1880s, the landmark building would become a blacksmith shop in the 1950s and 60s, before being reimagined decades later as a regional destination brewery that offers a spacious and scenic space wrapped around 50-feet of windows overlooking Lock 34 and Cameron Lake.

The vision for the brewery was years in the making with two things remaining consistent throughout the process: a love for the surrounding environment and a desire to give back to the local community.

"The Fenelon Falls Brewing Co. is home to one of the most picturesque locations in the Kawarthas," explained Head Brewer Russell Gibson. "Sitting upstairs, looking out the windows at Lock 34, at the boats, the water, the people, it was imperative to us from the beginning to create a business and experience that people would love and enjoy, but also to respect the environment and the community it calls home."

During the design and construction of the Fenelon Falls Brewing Co., in 2019, the brewery brought in Econse Water Purification Systems Inc. to utilize its BrüClean system to treat wastewater onsite.

"Onsite wastewater treatment helps us to manage our processes responsibly in an environmentally friendly way, allowing us to continuously grow our brewery without negatively impacting our local environment," said Gibson.

It was a chance meeting in the fall of 2019 with then Fenelon Falls Brewing Co., General Manager Mathew Renda and Kawartha Conservation Marketing and Communications Specialist John Chambers that led to a partnership

to take the brewery's support for the environment one step further.

Established in 1979, Kawartha Conservation is a partnership of watershed municipalities that balance environmental capacity and human need.

The Kawartha Conservation watershed is 2,563 square kilometres in size and has a unique landscape that holds wetlands, and long meandering rivers that flow to and from lakes along the Trent Severn Waterway. Agriculture thrives on rich soils and clean water, picturesque rural communities dot the landscape, and conservation and natural areas protect significant natural heritage.

By managing natural resource features that are essential for sustaining water quality and quantity through watershed planning, stewardship, environmental monitoring, and research, as well as management of conservation and natural areas, Kawartha Conservation works to protect and conserve the watershed environment.

During numerous discussions during the fall and early winter of 2019 between Kawartha Conservation and Fenelon Falls Brewing Co., the shared beliefs

and synergies between the two groups was obvious.

“During the design and construction phase, we implemented a number of state-of-the-art environmental measures into the design of the Fenelon Falls Brewing Co.,” noted Gibson. “The principles of design parallel our path to support the community which includes protecting the very environment and communities that makes the local craft brewery so special.”

The result of those discussions was the Kawartha Summer Ale, a beer brewed in collaboration with Kawartha Conservation in support of the Kawartha watershed environment.

Celebrated as the ‘official’ unofficial beer of summer in the Kawarthas, the partnership launched in April of 2020 and ran until Thanksgiving weekend to coincide with the Trent Severn Waterway season.

Originally intended as a one-time limited release with proceeds going to support environmental projects within the Kawartha watershed, the beer launch was an overwhelming success. It sold out twice long before the anticipated wrap up at Thanksgiving.

Our lakes and rivers are so important to the environmental, societal, and economic success of Kawartha Lakes.

“Renewing the partnership for 2021 was an easy choice,” said Kawartha Conservation CAO Mark Majchrowski. “The public response to the Kawartha Summer Ale was tremendous and the cans, proudly displaying our logo and the intent of the collaboration on the labels, put our work and focus front and centre for a huge new audience.

“What we realized and what became quickly apparent is that supporting business and the environment are not mutually exclusive,” said Majchrowski. “In many respects we both want the same things.”

“Supporting the environment through both greater financial investment and awareness was a natural win for Kawartha Conservation, while developing

a new, branded beer and having increased marketing through non-traditional means supported Fenelon Falls Brewing Co.,” he added.

In May 2021, Fenelon Falls Brewing Co., re-released the Kawartha Summer Ale, brewing double the volume from the previous summer, again selling out in record time.

The partnership has resulted in a big win for the environment said Kristie Virgoe, director of stewardship and conservation lands at Kawartha Conservation.

“This partnership has allowed us to plant more than 1,300 trees across the watershed, nearly seven percent of our annual tree planting goal,” said Virgoe. “That is a significant help in being able to add to our urban canopy, support rural plantings, and increase our forestry cover regionally. We have also been able to focus on planting a number of species at risk trees including Butternut trees.”

The positive impacts were not lost on Kawartha Lakes mayor, and chair of the Kawartha Conservation Board of Directors, Andy Letham.

“The idea behind this partnership has always been about supporting people, supporting our businesses, and supporting

our communities,” explained Letham. “We can do that by supporting the environment. We’re the City of Kawartha Lakes, we have more than 250 lakes and rivers which contribute a whole

lot to our economic base. We know how important protecting these assets are, not only for residents and cottagers, but to the businesses that rely on seasonal and tourism traffic as well.”

Letham said pro-active partnerships that support both the business and environmental needs of the broader watershed community are what drive success for everyone.

“This partnership has helped to strengthen our communities and helped to support our environment,” said Letham. “This is a really important story that demonstrates we aren’t operating in silos, though it might seem like it sometimes. The work we’re all doing and trying to do is connected. When people visit our communities, our businesses

are successful. When we protect and support our lakes and rivers and conservation areas, we make them destinations for people.

“Business supporting the environment, and environmental and conservation organizations supporting business just makes good sense for everyone,” Letham added.

Majchrowski echoes those sentiments. “Our lakes and rivers are so important to the environmental, societal, and economic success of Kawartha Lakes,” he said. “Working with the Fenelon Falls Brewing Co., on this exciting partnership has already had tremendous benefits for the long-term health of our environment and our communities, and we are thrilled to be able to continue to partner with them to further the great work we’ve already accomplished together.”

For the brewery, seeing the success of its business and the positive impact it has already had on the community is both rewarding and motivating.

“I think when we started this partnership with the Fenelon Falls Brewing Company, we honestly felt it was going to be for one year and we would evaluate at the end,” Gibson said. “I don’t know that any of us imagined how successful it would become.”

“The Kawartha Summer Ale resonated with the community and visitors and seeing first-hand the positive impact it is having on our environment and conservation efforts locally through tree planting makes this a win-win for everyone,” added Majchrowski.

Plans are already underway to further expand and grow the partnership in 2022.

“I am excited for the potential of what we can accomplish with Kawartha Conservation,” said Gibson. “We’re looking at a lot of different ideas and opportunities for this year, but what I do know is that working together we can definitely do a lot of good for our environment, for our communities and for our business community, and I think that’s really exciting for everyone.” WC

John Chambers is the marketing and communications specialist at Kawartha Conservation.

Most studies on plastic pollution in the Canadian context have focused on the Great Lakes region.



Tackling Plastics in Freshwater

What are the challenges and opportunities related to tackling plastics in our freshwater? BY SIMRAN CHATTHA

THERE HAS BEEN a significant amount of focus on the plastic that ends up in our oceans. At the same time, we need to consider the plastics that are entering our freshwater.

An estimated 10,000 tonnes of plastic waste are entering the Great Lakes every year, as reported by CBC. Information about plastic pollution in Canadian freshwater bodies outside the Great Lakes Basin is limited; this is because most studies on the topic have focused on this region.

To better understand the challenges and opportunities associated with tackling plastics in Canada's freshwater, Water Canada hosted a discussion with industry experts in November 2021. The industry experts included:

- **Christopher Hilken** from Pollution Probe.
- **Suja Sukumaran** from Thermo Fisher.
- **Anna Posacka** from Ocean Diagnostics.
- **Jesse Vermaire** from Carleton University.

How big is the current challenge we're facing?

The Canadian water industry is in the early stages of understanding the current challenges associated with plastics in our freshwater. As a result, the approach for understanding the amount of plastics in our freshwater is derived from the work that has been done to understand the amount of plastics in our oceans. For example, some modelling that has been done around the Great Lakes is based on problems we've seen in oceans.

"The current understanding is that we've put about 10 million kilograms, or 22 million pounds of plastic into the Great Lakes area," said Hilken. "Everyone is familiar with the garbage patches in our oceans. Well, we have microplastic clusters in the Great Lake and the concentrations are every bit as dire as they are in the ocean. So I think it's an equal but different problem. Because it's so new, I think it's a really

interesting area to be working on because there's a whole lot to be done in terms of knowledge building, as well as the actions to address it."

Posacka added that we can build on the work that has been done on understanding the amount of plastics in freshwater systems that act as channels to our oceans.

"We have evidence that rivers receive large quantities of plastic litter," said Posacka. "As Suja mentioned, the larger forms, the macroplastics, are an important component of the microplastics that we find in our environment. It's estimated that approximately 80 per cent of microplastics come from the breakdown of larger plastics."

Of the microplastics we're finding in our rivers and wastewater effluent, microplastics from fibers, presumably from our clothing, are the most common type of plastic we're finding.

"About 90 per cent to 95 per cent of

"It's estimated that approximately 80 per cent of microplastics come from the breakdown of larger plastics," according to Anna Posacka from Ocean Diagnostics.



all these microplastic pieces are these microfibers," said Vermaire. "So it's a huge component in terms of pieces of plastic, not necessarily weight. The other thing with the microfibers that I think we're just learning is how easily they're transported in the atmosphere. That becomes a more difficult problem to control in terms of plastic pollution, because essentially these microfibers are found everywhere. They don't really have a point source that you can use some sort of engineering solution to help remove them."

What are the opportunities for technologies and technology providers?

There are a couple of opportunities for technologies and technology providers to help tackle plastics in our freshwater. One of the opportunities is at the manufacturing level.

"One of the greatest unknowns right now is the extent to which textile factories and manufacturing facilities are releasing microfibers into the environment. But we have a reason to believe that it's likely to be significant," said Posacka. "One opportunity for technological solutions has to do with treating and

preventing waste being released at the manufacturing level. Most of these factories are not in Canada so plastic pollution is truly a transboundary issue."

The other opportunity for technologies and technology providers has to do with household-based interventions and treatments.

"I think there's an opportunity to look for solutions that help treat greywater at the household level before it gets into the wastewater plant," said Posacka. "I think it's going to be a lot more expensive to introduce a technology intervention at a wastewater treatment plant to address the few percent of microplastics that aren't treated with the conventional wastewater treatment."

Interested in learning more about plastics in our freshwater? Watch the replay of the discussion on Tackling Plastics in Freshwater at watercanada.net/blue-economy

Thank you to Thermo Fisher and the Global Water Institute at Carleton University for sponsoring the discussion. WC

Simran Chattha is the editor of Water Canada.

GREATEST CHALLENGE

During our webinar on Tackling Plastics in Freshwater, we asked attendees about the greatest challenge they're facing in addressing microplastics.

Here's what they had to say:

Complexity of the issue
56.8 per cent

Limited analytical capacity to assess the problem
22.7 per cent

Limited data on environmental concentrations
18.2 per cent

Lack of access to the data
2.3 per cent



The One Water Approach is a holistic approach that integrates drinking water, wastewater, and stormwater into one entity, accounting for all water resources, rivers, lakes, and groundwater together at a river basin level.

Way Forward

The path towards holistic water management.

BY GYAN CHHIPHI-SHRESTHA, SARIN RAJ POKHREL, THAIS AYRES REBELLO, HAROON RASHID MIAN, KASUN HEWAGE, AND REHAN SADIQ

AN URBAN WATER SYSTEM (UWS) constitutes three main service components: drinking water, wastewater, and stormwater. These components have been managed in silos since history. Even today, the trend continues. It has led the existing urban water management (UWM) to be less sustainable, resilient, and reliable, primarily attributed to increasing population, changing climate, growing urbanization, and affluence. According to the United Nations, 40 per cent of the global population can have a water deficit by 2030; thus, to avoid this deficit, UWM requires a change.

An innovative and relatively new paradigm—One Water Approach (OWA)—is considered a path to overcome these water-related challenges. OWA is a holistic approach that integrates drinking water, wastewater, and stormwater into one entity, accounting for all water resources, rivers, lakes, and groundwater together at a river basin level.

OWA establishes a close interconnection between three UWS service components. For example, as the population increases, there is a higher consumption of drinking water, generating a larger volume of wastewater. Also, the pressure on stormwater

infrastructure elevates, especially during high rainfall and spring freshet.

In such a scenario, OWA plays a significant role as this approach regards no water as a waste; instead, it views the by-products of water as resources. Wastes produced from wastewater treatment can be used in energy recovery. At the same time, different low-impact development techniques (e.g., bioswale, permeable pavement, green roofs, etc.) can absorb excess water, which helps in reducing stormwater runoff and controlling floods. Besides, this approach also puts greater attention to stakeholder engagement, technical innovations, and policy changes.

Climate change and water

Climate change is regarded as a wild card in water management. The impacts of climate change are primarily experienced through changes in water such as extreme climates like floods, drought, unpredictable water availability, and source water quality deterioration. On the other hand, certain climate solutions like biofuel development, a clean energy option, can severely deplete water sources. These solutions may result in water scarcity; this will require water

to be transported from a long distance to meet existing needs, which will consume more energy and emit more greenhouse gases. Therefore, climate solutions without the consideration of water impacts can backfire. In this condition, OWA plays a key role in water management. OWA provides a framework for managing water in different climate solutions. Urban water consumes a huge amount of energy for water collection, treatment, distribution, and wastewater treatment. So, water conservation saves energy, too, curbing carbon emissions. Also, flood management via OWA reduces infrastructure damages. Therefore, water can be a catalyst for climate adaptation and solution.

Canada's water challenges

More than 80 per cent of the Canadian population is now living in cities. Compared to Europe, Australia, and other developed countries, Canada has a higher per capita residential water consumption of 215 litres per capita daily (lpcd). Thus, the demand to provide safe and clean drinking water is ever increasing. On the other hand, water reuse in Canada is relatively less, which is about 3 per cent. Besides, the country is

experiencing warming twice the global average, with Northern Canada almost three times the world average. Increasing heat waves and wildfires deteriorate water resources too. Also, the frequency and magnitude of floods, like the devastating flooding in British Columbia in November 2021, is increasing. The statistics have shown that government's expenditure in disaster relief increased significantly in the past three decades. For example, from 2017 for five years, the federal government is spending about \$900 million per year for disaster relief, largely by floods. Thus, proper stormwater management can save a big portion of these expenditures.

Global status of OWA applications

Currently, Australia and the United States are two countries that have been implementing the OWA practices in their cities. Different cities have applied various strategies to implement the OWA with encouraging results. For instance, the City of Los Angeles has developed the One Water LA, a program based on the collaboration of water and energy departments. They noticed an increase in climate-resilient tree use for landscape projects and improvement in water planning and legislation changes that increase the possible uses of reclaimed water. Another good

recently initiated a collaborative program across their various departments to make water-related decisions, which will help preserve water sources, strengthen data analytics, and implement low-impact development techniques.

OWA project and learnings

A One Water project has been ongoing in the School of Engineering at the University of British Columbia Okanagan to evaluate and benchmark the performance of small to medium-sized urban water systems in the Okanagan Valley (British Columbia). The four-year project prospects to develop a web portal to store, share, and analyze the near-real-time data. The project has ten partners from the valley, including the City of Kelowna, City of West Kelowna, City of Vernon, Regional District of North Okanagan, District of Lake Country, District of Peachland, District of Summerland, Town of Osoyoos, Westbank First Nation, and Okanagan Basin Water Board. The Okanagan has unique challenges of high population growth and the country's largest residential water consumption rate of 1032 lpcd based on the Okanagan Basin Water Board (OBWB) study. Ironically, the valley has one of the lowest per capita freshwater availabilities in Canada. Water restrictions are normal especially in summer in many cities in Okanagan, such as Kelowna, West Kelowna, Vernon, etc.

All the utilities across the valley and those who participated in the project are small to medium-sized. The participating eight utilities have a population under

from about 5,000 to about 80,000 people. Some utilities have all three services—drinking water, wastewater, and stormwater—while others have only one of them. A large difference in service type, service size, and type of technical staff participant result in different levels of experiences and understandings. It was often difficult to reach a consensus in certain circumstances, such as selecting performance indicators. Also, individual utilities have their priorities and mandate that add additional challenges to reach a common ground. Using the cycle of a round-table discussion with all partners and one-on-one meetings with few as per need and regular monthly communications kept the project on track. The project has developed key performance indicators of urban water systems for individual water systems. Currently, the research team has been developing another set of indicators through the lens of OWA.

Conclusions

Urban water management has been a challenging task since history. Climate change, increasing population, and affluence impacted water quantity and quality further. The OWA can be a practical solution for managing urban water systems balancing community needs and ecosystem requirements. Thus, the modern shift to “One Water” will open avenues in strengthening better management of UWS that helps reduce water footprint as well as increase sustainability, resiliency, and reliability of water services. OWA should be within the scope of the new “Canada Water Agency” that is under formulation under Environment and Climate Change Canada. ^{WC}

The One Water Approach establishes a close interconnection between three urban water system service components.

example is Philadelphia, preventing 1.5 billion gallons of wastewater from contaminating water sources. Following the world trend, few initiatives are encountered in Canada. For example, York Region (a regional municipality in Ontario) initiated the “Made-in-York One Water Approach” plan in 2016 to attain UWS sustainability. This initiative has been successful as its long-term water conservation strategy has reduced water demand. Similarly, the City of Vancouver

35,000 each, and the ninth utility serves about 80,000 people. This project is challenging having small to medium-sized communities with a newer concept of “One Water.” The greatest limitation is the utility's scarcity of human resources to participate in the external project apart from inadequate funding. Despite these limitations, the partners have been keen to engage in new research initiatives. These utilities have a large diversity in service population ranging

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Haroon Rashid Mian is a postdoctoral fellow at the University of British Columbia.

Kasun Hewage is a professor at the University of British Columbia.

Rehan Sadiq is a professor at the University of British Columbia.

A decrease in a water supply can create significant challenges for farmers, power companies that rely on hydroelectric power, and water companies that may experience increased maintenance and repair fees.

Drought Response

What needs to happen to unify the public and private sectors when responding to droughts? BY RICK ANDREW

WITH 563 LARGE LAKES across the country, Canada has more lakes than any other country in the world. It also holds the third-largest freshwater supply. Despite this, droughts have affected the great north for centuries with at least 40 droughts occurring in western Canada. Multi-year episodes have been observed in the 1890s, 1910s, 1930s, 1960s, 1980s, and the early 2000s. Droughts in southern Ontario/Quebec are usually shorter, smaller in area, less frequent, and less intense. Nonetheless, there have been some major drought occurrences there as well during the 20th century.

More recently, an extreme heatwave in Western Canada from late June through July in 2021 caused the most intense and extended drought to date. Agriculture Canada assessed that the drought covered 93 per cent of agricultural land in Western Canada, affecting 45.9 million acres of cropland, 52.6 million acres of pasture, and over two million cattle. Across Canada this year, extreme heat and below-average precipitation has led to feed and water supply shortages that

have affected farmers nationally.

A private and public sector unified approach is needed to better equip federal and local governments with the resources needed to respond to droughts. Additionally, consumers and water professionals should be educated on how they can conserve water through daily behaviour changes and by investing in devices that conserve and efficiently use water.

Negative impacts of droughts

Droughts, in addition to warming temperatures, can result in water supply chain disruptions and interruptions in home life. Unlike other catastrophic disasters, droughts do not appear suddenly but rather develop over time. They are also becoming increasingly hard to predict because the water supply data from past years are not as reliable due to climate change steadily altering the level of water in areas. Other negative implications of droughts include:

Water supply shortages: Droughts can decrease the water supply in

impacted areas. This creates significant challenges for farmers, power companies that rely on hydroelectric power, and water companies that may experience increased maintenance and repair fees. If gone unaddressed, this could ultimately result in water restrictions being implemented on homes and businesses.

Degradation of water quality: Evaporation of water can cause the concentration of Total Dissolved Solids (TDS) in the water to increase, which impairs the water quality. Increases in TDS can harm the aquatic ecosystem, make the water more corrosive, and cause the taste of the water to decline as well.

Increased wildfires: Droughts, in tandem with higher temperatures, are a recipe for wildfires because of the drier soils and increased evaporation. The toxic chemicals and smoke stemming from the fires, and the materials used to extinguish it, are then released into water systems. This results in increased water contamination during a time where the water supply is already low.

Negative health outcomes: Droughts can result in long-term negative public health outcomes. The number of cases of respiratory illnesses and diseases typically increases during droughts due to the decline in water quality and supply. For those that may not have the economic means to relocate from drought-prone areas, they will ultimately have a shorter life span in comparison to those who do not live in these areas.

How to prepare and respond

There is still time to turn the dial back on climate change and human-induced droughts. We cannot afford to ignore the clear signs that climate change and human behaviour are causing droughts. If we do, more irreparable damage will be inflicted on our water and agricultural systems, as well as our communities.

To improve the public's understanding of drought best practices, we should:

- 1 Communicate water conservation methods to consumers:** Water professionals should spark conversations with consumers during droughts on how to best conserve water. Methods such as reduced showers, checking for leaky pipes, and investing in drain flow restrictors have been proven to be effective in reducing water usage.
- 2 Prepare emergency kits:** Local governments should educate the public on how to best prepare for droughts. This could include storing an appropriate level of bottled water



- 3 Promote water conservation and efficient devices:** Water professionals should promote devices, such as toilets, sinks, showers, and landscaping fixtures, that use water efficiently. Investing in these devices can ensure that water supplies are being used responsibly without consumers even being aware of the change.

- 4 Look to certified water filters:** For those that fear their water may have been contaminated during a drought, it is recommended that you read your water quality report to see what contaminants may be listed. You should then focus on purchasing a water treatment system that

is third-party certified by an organization such as NSF. NSF and other third-party certification organizations ensure that treatment systems are safe to use with drinking water, won't leak, and that the manufacturer's claims are indeed true. Be sure to check that the water treatment device that you purchase is approved to treat the contaminants that may be listed in your water quality report.

Moving forward

Time is of the essence. We have witnessed enough economic, environmental, and human wreckage from droughts and noticed the warming temperatures to know they are a significant threat to human life.

For these reasons, a unified approach is needed between the public and private sectors to ensure that consumers are knowledgeable on how droughts impact their water supply. The onus is on federal and local governments, as well as water professionals, to be public health champions and ensure this information is accessible to all.

If we come together and commit to this cause, we can make certain that we are prepared for what tomorrow may bring. If we do not, we stand to lose a once-in-a-generation opportunity to turn the dial back on the significant progress made thus far. **wc**

Droughts, in addition to warming temperatures, can result in water supply chain disruptions.

in case of emergencies and stocking up on food that does not require much water to prepare. Moreover, for those who may be struggling financially and/or housing insecure, local governments should identify and publicize cooling center locations to prevent heat-related illnesses and where bottled water can be accessed during droughts.



Rick Andrew is the director of global water systems business development at NSF International.

Cannabis is a concern for Canadian municipal water treatment facilities that anticipate increased usage of the drug given its recent legalization.

Contaminants of Emerging Concern

They're here now and everywhere. BY MICHAEL DORAN

WHEN WE LATHER UP OUR HAIR with shampoo in the morning, we seldom think about what is actually going down the drain to be treated at the local wastewater treatment plant. We may also assume that these facilities are able to properly treat the shower water.

However, shampoo—and many other products used daily by households and industries—contain compounds that are resistant to traditional water treatments.

These compounds are called Contaminants of Emerging Concern (CECs), a term used by water quality professionals to describe pollutants that are detected in water bodies, may cause ecological or human health issues, and typically are not monitored or regulated under current environmental laws.

Both Environment and Climate Change Canada and the Environmental Protection Agency (EPA) are reporting that CECs are increasingly and consistently being found in groundwater, surface water, municipal wastewater, drinking water, and food sources.

Besides personal care products, common CECs include pesticides, pharmaceuticals, industrial chemicals,

and surfactants (detergents). They are finding their way into watersheds because traditional water treatments—such as chlorine and ultraviolet (UV)—have shown to be largely ineffective at treating or removing these contaminants.

What is their impact? Let's consider pharmaceuticals.

In 2010, researchers at the University of Calgary analyzed water in two rivers south of Calgary to study the effects of contaminants on a common minnow. Some of the contaminants they discovered in the rivers included synthetic estrogens, which are present in birth control pills and hormone therapy drugs.

In almost every minnow population, the researchers found that male minnows had elevated levels of a protein that is normally only found in females when they produce eggs. This abnormality ultimately resulted in more female fish and fewer male fish being produced than would occur naturally, thereby disrupting the fragile marine ecosystem.

Recent research suggests that exposure to pharmaceuticals and other chemicals in drinking water may affect human reproductive systems, too.

While traditional water treatments are largely ineffective at eradicating CECs, there is an increasing body of evidence that indicates aqueous ozone is highly effective in destroying these compounds.

Ozone (O₃) has been used as a disinfectant for well over 100 years. It is recognized in the U.S. and Canada as the fastest and strongest method of disinfection—faster and more powerful than Peroxyacetic acid (PAA), chlorine, or UV.

It is produced by applying an electrical charge to oxygen (O₂) molecules in water, causing the oxygen molecules to separate and temporarily recombine with other oxygen molecules. (In nature, ozone is generated naturally by the sun's ultraviolet rays or through lightning strikes.)

When ozone encounters pathogens such as bacteria or viruses in water, it causes those micro-organisms to “oxidize.” This is a natural process that splits the cells and kills those contaminants, leaving environmentally safe oxygen as the only by-product. It has no impact on PH levels, and, unlike chlorine, leaves no chemical by-products in the water.

Ozone also has a very short half-life, which makes it very reactive and efficient at killing pathogens quickly. When ozone is used in food processing, ozone's residual half-life is anywhere from 10-20 minutes.

Ozone can be safely produced onsite with generators that replicate the natural oxidation process to create one of the most powerful and effective commercial oxidants in existence. As a result, ozone is used in many industry applications to disinfect and eradicate an extensive list of viruses, bacteria, and CECs like pharmaceuticals, petrochemicals, and microplastics.

There have been a number of studies that have been conducted in recent years to determine the efficacy of ozone in treating CECs.

In 2015, McGill University undertook a study to assess the potential of ozonation as a disinfectant tool to remove certain CECs—including pharmaceuticals, personal care products and illicit drugs—from wastewater.

The McGill research results show that the use of ozone yielded high removals of CECs for a large variety of target compounds, with an average of 86 per cent for ozonation compared to seven per cent for UV disinfection. The study also determined that ozone-treated samples were less toxic than the secondary effluent, with a decrease in

**Besides personal care products,
common CECs include
pesticides, pharmaceuticals,
industrial chemicals, and detergents.**

relative residual toxicity of 89 per cent under the optimal conditions tested with ozone technology.

Cannabis is also a concern for Canadian municipal water treatment facilities that anticipate increased usage of the drug given its recent legalization.

In 2017-2018, a study at the Water Institute at the University of Waterloo looked at how ozone could be used in treatment facilities to remove the active ingredients from cannabis—

tetrahydrocannabinol (THC) and cannabidiol (CBD)—from drinking water and prevent them from entering surrounding waterways in the effluent water.

Led by Sigrid Peldszus, research associate professor at the Department of Civil and Environmental Engineering at the University of Waterloo, researchers monitored drinking water treatment plants on the Grand River and Lake Ontario and found that ozonation degrades THC and CBD very efficiently. They concluded that when ozonation is used in the municipal treatment process, it is unlikely that these active ingredients will reach treated drinking water.

Cyanotoxins are another class of CEC that is increasingly worrisome. These toxins have been linked to fertilizer run-off from agriculture operations, urban storm run-off, and overflowing septic systems that discharge excess nitrogen and phosphorus into the water system. When combined with warmer water temperatures, these nutrients create

an overabundance of blue-green algae blooms that are a risk to human and wildlife health.

In a study published in 2020 in *Ozone: Science & Engineering*, The Journal of the International Ozone Association, researchers at the University of Windsor examined the effect of ozonation on three cyanotoxins found in Detroit River water: microcystin-LR (MLR), anatoxin-a (ANA), and cylindrospermopsin (CYN).

The study concluded that ozonation, even at very low dosages, is an effective treatment for the three cyanotoxins. Moreover, increasing the ozone dose led to enhanced removal of all types of cyanotoxins in the water.

These studies are just a small sampling of the research that has concluded that ozone is one of the most effective ways of treating CECs.

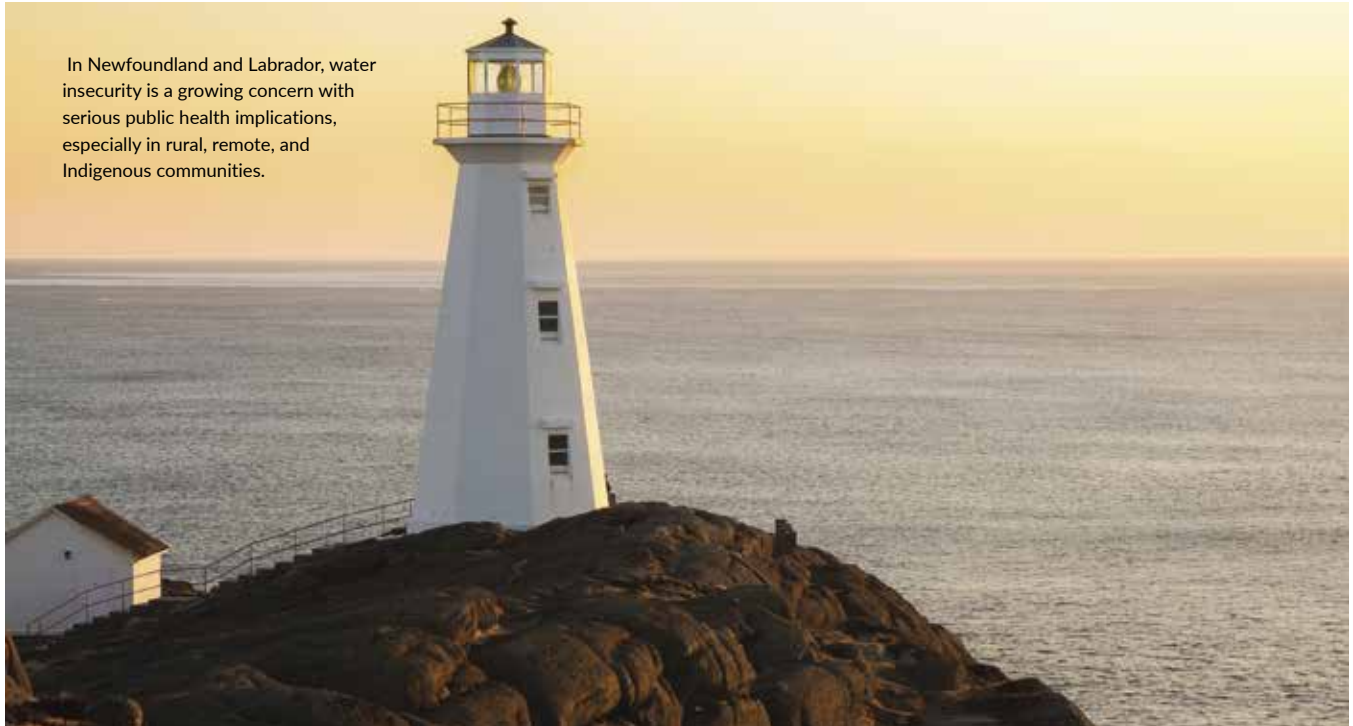
Ongoing research is critically important, since it is clear that CECs are no longer an “emerging concern” but rather are here now and everywhere, affecting our ecosystems and human health in ways we have yet to fully determine. *WC*



Recent research suggests that exposure to pharmaceuticals and other chemicals in drinking water may affect human reproductive systems.

Michael Doran is co-founder and president of Aclarus Ozone.

In Newfoundland and Labrador, water insecurity is a growing concern with serious public health implications, especially in rural, remote, and Indigenous communities.



Improving Water Infrastructure

What are the imperatives for water infrastructure in rural, remote, and Indigenous communities? BY IGNATIUS YANKEY

WATER IS THE LIFEblood of every community, an integral part of ancient and modern societies. Without it, life is unsustainable. Access to potable water is everyone's fundamental human right, as acknowledged by the United Nations. In the absence of sufficient quantity and quality water resources, livelihoods and communities are adversely impacted, as well as activities such as cooking, bathing, and farming. Inadequate access to available water resources can also make us vulnerable to infectious diseases due to poor sanitation, and in some cases create conflicts between water users and reduce resilience of communities. Recent experiences with the COVID-19 pandemic have given us plenty more reasons to appreciate every single drop that comes from our taps or in some cases, community water stations (structures, often in small rural and remote communities, where safe drinking water can be obtained). The use of water resources in any form, depends on its availability, quality, management, and related infrastructure. Unfortunately,

water insecurity continues to be a chronic concern for many rural, remote, and Indigenous communities across Canada.

A sustainable potable water supply in Canadian communities is inherently linked to water infrastructure. Water infrastructure, when it is monitored, maintained, and working properly, can provide us with good quality drinking water and limit the pollution of our local rivers and streams. Yet addressing aging and deteriorating water infrastructure has not been made a priority since the 1970s, resulting in challenges with monitoring, maintaining, and replacement of deteriorating water infrastructure and maintaining water services. The Walkerton tragedy in May 2000 is a historical event that demonstrates the importance of the maintenance and monitoring of water sources and infrastructure. After the death of seven and illness of over 2000 people in the Walkerton Ontario, a provincial government public inquiry ("Walkerton Inquiry") revealed that if continuous

monitoring and proficient training had been in place, the contamination would have been prevented from entering the distribution system.

Despite the wide response after the Walkerton Inquiry, a recent report by Environment and Climate Change Canada stated that 87 per cent of Boil Water Advisories (BWAs) issued in Canada in 2019 were due to problems with the equipment and processes used to treat, store, or distribute potable water. This statistic will only grow as our infrastructure continues to age and deteriorate. The majority of these BWAs in Canada (82 per cent) were issued in rural communities where potable water systems serve 500 people or less.

The Government of Canada has highlighted concerns about long term BWAs in recent years (BWAs in place for over one year), particularly in First Nations communities. Subsequent investments have reduced the long term BWAs from 162 to 44 (across 32 communities, as of October 2021).

Yet many other long term BWAs continue to exist. As of October 2021, the Government of Newfoundland and Labrador, for example, reported 161 BWAs that had been in place for over one year across 124 communities. Of these, 53 BWAs in 42 communities had been in place for more than two decades. All but one of these communities (98 per cent) have populations of less than 500 residents.

Newfoundland and Labrador (NL), like other provinces, offers a classic example of where concerns such as aging, degrading, and inappropriate infrastructure is widespread in rural communities. In NL, water insecurity is a growing concern with serious public health implications, especially in rural, remote, and Indigenous communities. A 2014 study on rural drinking water in NL revealed a high incidence of undesirable

Such water treatment systems can be tailored to specific water sources and conditions at the community-level and are designed to provide high-quality drinking water to residents at a central location. While often a supplementary and/or short term water source, for some communities PWDUs are their primary source of clean, safe drinking water.

The onset of the COVID-19 pandemic added challenges for the communities and provided an opportunity to further investigate both the benefits and challenges associated with maintaining and operating PWDUs. A diverse research team made up of researchers from Memorial University, the University of Guelph, Municipalities of Newfoundland and Labrador (MNL), NunatuKavut Community Council (NCC), and Nunatsiavut Government (NG) came together with the support of Qalipu First Nation to tackle these questions.

Preliminary findings indicate that the pandemic has further exposed weaknesses in rural

water systems and in some cases further exacerbated challenges associated with accessing water from PWDUs, such as further delayed access to new units and replacement parts. Further, many NL communities who have managed to invest in PWDUs experience challenges related to human resource capacity, training, and/or funding, all which impact their ability to maintain and operate PWDU infrastructure. Thus, the pandemic has created further challenges and barriers, preventing vulnerable individuals and communities within the province from accessing the most basic human right. These communities did, however, show the ability to adapt to the ever-changing COVID-19 guidelines and to take precautions to prevent further challenges such as ensuring they had sufficient human resource capacity for operating the PWDUs should stricter guidelines stipulate that the units must be supervised and cleaned constantly throughout the time it was open to the public.

Overcoming PWDU water challenges

Given the jurisdictional complexity around drinking water in NL, the capacity, coordination, and collaboration of all relevant institutions and actors (such as Indigenous and other local communities) related to drinking water is critical to collect relevant knowledge, practices, and capacity. For example, the collaborative PWDU research team housed at Memorial University's Grenfell Campus has brought different jurisdictions together with the purpose of finding scale appropriate solutions for enhancing drinking water security and alleviating chronic water problems in small communities throughout NL.

Another positive sign is that in January 2021, federal and provincial governments announced millions of dollars in joint funding via the Green Infrastructure Stream to address deteriorating potable water systems and wastewater infrastructure in communities. While these initiatives are an important step, proper monitoring and maintenance is also important. In NL, drinking water distribution and treatment systems are large components of the infrastructure that ensure the availability and security of usable/freshwater resources, but continued investments in upgrades, maintenance and in some cases new, more appropriate types of systems are needed.

Drinking water challenges have consistently plagued rural, remote, and Indigenous communities throughout Canada and we know that the lack of and/or aging infrastructure is one of the top causes of these challenges. We also know that the COVID-19 pandemic has further stressed the importance of water security. Communities need reliable and sustainable potable water sources. PWDU systems provide clean, safe drinking water when they are in service and they offer a small-scale infrastructure solution for many communities. At the same time, there are still opportunities to enhance community resilience. WC

A sustainable potable water supply in Canadian communities is inherently linked to water infrastructure.

and non-potable drinking water, including discoloured tap water, unpleasant water odour, large numbers of BWAs, high levels of disinfectant by-products, and use of untreated water sources including roadside springs. As in the Walkerton inquiry, aging and degrading infrastructure and lack of operator training were identified as common causes of water insecurity in NL communities.

Ensuring safe water in NL with potable water dispensing units (PWDU)

A small scale solution that has evolved to help rural, remote, and Indigenous communities in NL secure sustained access to potable water has been the installation of potable water dispensing units (PWDU). These systems, also known as water kiosks, have been adopted and installed in over 32 communities throughout NL since the early 2000s to help address water insecurity concerns, including BWAs and other problems with community-wide distribution systems.



Ignatius Yankey is an alumnus of the Environmental Policy Institute that's based at Memorial University.

As we grapple with climate-induced water stress, it's time to change representation, retention, and power allocation in water decision-making.

Diversity in Water

Exploring why the decision-making process must involve diverse groups.

BY LAUREN SMITH AND SARAH WOLFE

LEAKY PIPELINES are hurting Canada. But these pipelines aren't the ones we think of first—those made of steel to carry oil or natural gas. Rather, they're the professional pipelines that move people from their graduate school training in water-related fields on to decision-making and leadership roles.

This leaky pipeline has implications for both representation and outcomes. It means that the people making critical decisions about Canada's water use and conservation—how our water and sewage systems should be designed, for instance, or whether a dam should be built or wetlands paved over—aren't diverse. Without a diversity of expertise and options, we're potentially ill-prepared to deal with a changing climate's inevitable and severe water problems.

Climate change means longer droughts, greater urban flooding, and more contaminated water. These crises will impact our health and undermine our economic systems, including economies already weakened from the ongoing COVID-19 pandemic. In

response to unexpected crises and climate changes, governments at all levels must be both agile and creative. Those abilities will be possible with a wider range of experiences and perspectives at the decision-making table.

Effective solutions must involve diverse groups in the decision-making process. Effective problem-solving requires a broad outlook to examine the problem from all angles and differing abilities to see alternative opportunities. A solution for one may not work for all; diverse groups help to identify issues in potential solutions that may inadvertently harm underrepresented groups. We've seen this time and time again in medicine, where treatments are recommended based on predominantly male-dominated trials or research, without recognition of biological or cultural gender differences. Empirical findings from political and behavioural science consistently shows that more gender diverse groups are better equipped to respond to complex problems like climate change and make superior environmental decisions.

Research has indicated that groups with 50 percent or more women protect more natural resources and are more attentive to issues important to the entire population. There is also evidence that companies with greater numbers of women in leadership roles more willingly report their climate impacts. The leadership style that business research has found to be most successful for generating innovative water solutions is transformational leadership, a style linked to high emotional intelligence, is team-oriented, and challenges assumptions. These skills foster the creativity, inclusion, and innovation needed to address growing water problems—and are most commonly demonstrated by female leaders. These leaders are better at uniting and sparking cooperation among diverse teams.

While significant effort has been made to diversify Canada's water sector over the past decade, men still largely determine strategic decision-making. In 2020, we surveyed leadership among Canada's water decision-makers across

97 governmental, non-profit, and private sector positions. Members of these groups make critical decisions, such as funding water innovation and research, establishing safe water quality guidelines, and developing measures to reduce flooding.

Our survey captured whether the top decision-maker was a solo male or female leader or if males and females shared leadership. In every sector we studied, male decision-makers were the majority. In governmental and non-profits sectors, solo male leaders were almost twice as common as solo female leaders. In the private sector, they were also 14 percent more common than solo female leaders and joint leadership. Our survey findings correspond with additional research that confirms water management and water innovation are primarily male-dominated fields.

We also surveyed the characteristics of lead decision-making teams,

seven years, for instance, the University of Waterloo's Collaborative Water Program has consistently enrolled and graduated more female than male masters and doctoral students—60 per cent female, 38 per cent male, and 2 per cent unreported. The start of the pipeline, at least, is already full of talented female water professionals with advanced educations.

Rather than focusing only on the relatively easier recruitment task, we must also address retention—reducing the pipeline “leaks”—as these women move through the ranks. Research from multiple fields has shown that professional pipelines leak because of entrenched barriers of childcare and eldercare responsibilities that still fall disproportionately on women's shoulders and the ‘extractive’ workplace cultures that preferentially hire and promote uber-productive “superstars” while overlooking productivity from women. Defenders of the status quo argue

that family concerns are individual responsibilities and that more equal representation in leadership can't or shouldn't be mandated. But other countries

around the world are demonstrating the impact of more responsible recruitment and retention practices. In these places, diverse teams are generating more productive ideas to solve the problems those societies are confronting.

Addressing this disconnect between what we have, what we need, and what is possible is essential as the professional pipelines are currently more fractured than ever, leaking 10 times more women than men from the workplace in the aftermath of the COVID-19 pandemic. With increased domestic workloads as schools and daycares closed—and remain unpredictable with hybrid learning and repeated temporary closures—more women than men were forced to manage unpaid childcare labour. The workforce ‘return to normal’ is, in reality a male-dominated return: men have returned to work at three times the rate of

women. And this employment loss is not limited to lower paid jobs or less technically skilled sectors—women in innovation and executive positions are also at risk of leaking out of the workforce at greater rates than men. These employment discrepancies are further exacerbated when we consider intersections of gender, race, sexual orientation, immigration status, and other aspects of identity.

While our initial research focused on gender, other identity intersections are relevant to Canadian water decision-making. But we cannot wait for all the research to be done to act. This diversity conversation is critically important now, as the federal government considers a Canada Water Agency to protect the nation's freshwater resources. Sadly, the government's related consultation documents don't yet mention a diversity agenda for this agency's leadership or management. Such diversity considerations are critical for effective water decision-making.

As we grapple with climate-induced water stress, it's time to change representation, retention, and power allocation in water decision-making. Gender is just the start: with greater diversity in leadership, Canada will be better positioned to face its coming water crises.

The research conducted by the authors was supported by Wolfe's Canada's Social Science and Humanities Research Council (SSHRC) through its Insight Grant. WC

Diverse groups help to identify issues in potential solutions than may inadvertently harm underrepresented groups.

including advisory boards and executive management. Although here the gender discrepancies were less stark, women were absent from the more powerful roles. This poor representation raises the risk that decisions about the priority of water problems and about how to best solve those problems will be uniformly conventional. These decisions and solutions potentially decrease applicability across all Canadians if the 51 per cent of female Canadians are not adequately represented in decision-making processes.

So how do we resolve the leaky pipelines impacting the gender diversity in Canada's water decision-making? To increase gender diversity among water leaders, it's not nearly enough to intensify recruitment of women into water-related fields. That recruitment is surging. Over the past



Lauren K. M. Smith is a PhD Candidate, Social and Ecological Sustainability, at the University of Waterloo. Smith is also a SSHRC Vanier Scholar and founding member of the Society, Environment, and Emotions Lab.

Dr. Sarah Elizabeth Wolfe is an associate professor, Social and Ecological Sustainability, at the University of Waterloo. She is also founding member of the Society, Environment, and Emotions Lab.

APPOINTED



QUENTIN
HANCHARD

On behalf of the Board of Directors of Credit Valley Conservation (CVC), Chair **Karen Ras** announced that **Quentin Hanchard** was appointed the conservation authority's new chief administrative officer and secretary/treasurer effective December 10, 2021. He replaced Deborah Martin-Downs who retired on December 31 after eight years with CVC.

"We are excited to welcome Quentin to his new role as chief administrative officer," said Ras. "He brings a wealth of experience and knowledge to CVC. His proven ability to foster relationships with a wide variety of stakeholders will help continue CVC's legacy of engagement and ensure we can move rapidly to complete many of our upcoming projects and initiatives."



COLLIN
KNAUSS

The Great Lakes Protection Fund welcomed **Collin Knauss** as its project development manager. Knauss will lead the organization's project development efforts, spotting new opportunities and launching new approaches to improve the health of the Great Lakes.

Knauss, who joined the Fund in September of 2021, brings a passion for the Great Lakes, its ecosystems, and communities. He understands the ins and outs of cultivating high-performing partnerships, especially those around water infrastructure, sustainability, equity, and economic empowerment issues.



DOMINIC
LEBLANC

Prime Minister **Justin Trudeau** named his new cabinet after his Liberal party held onto its minority government in last fall's federal election. **Dominic LeBlanc** was named the new minister of infrastructure and communities, while also remaining minister of intergovernmental affairs. Other ministers of note include **Steven Guilbeault**, who took over as the new minister of environment and climate change, and **Filomena Tassi**, who was named minister of public services and procurement.



STEWART
DICKSON

R.V. Anderson Associates announced the appointment of **Stewart Dickson** as a principal and leader of its municipal conveyance team, where he will focus on developing multi-year business plans and strategic growth initiatives for the practice. With over 22 years of experience in linear infrastructure, Dickson is a key addition to RVA's award-winning municipal practice, having led several large-scale water and wastewater projects in major cities across North and South America throughout his career.



NATHALIE
GELENCSE



CHARLES
GAGNON

AECOM announced that it has named **Nathalie Gelencser** as vice president, water business development, and **Charles Gagnon** as director, water business development. Gelencser is based in Toronto and Gagnon is based in Montreal. Gelencser brings extensive experience in all aspects of infrastructure and engineering business processes, particularly in growth planning and market development.

In her new role, Gelencser will focus on increasing market share for AECOM's water/wastewater practice, particularly for municipal and industrial clients. She will work alongside business development leads on sales, marketing, and client capture strategies.

Gagnon has over 20 years of experience in leading sales teams and will be responsible for AECOM's growth in eastern Canada for the water and power markets. Bilingual in English and French, his primary focus will be managing business development and identifying industry trends and internal efforts to increase market awareness.



Kevin Holman (left) and Victor Cumming (right).

The City of Vernon announced that one of its operators at the Vernon Water Reclamation Centre (VWRC) received province-wide recognition for his dedication in the field of water and wastewater treatment.

Kevin Holman was recently named the Operator of the Year for British Columbia and the Yukon by the Environmental Operators' Certification Program.

"On behalf of the City, I would like to congratulate Mr. Holman for this wonderful recognition," said Mayor **Victor Cumming**. "The City takes great pride in having the right people in the right places to serve our community, and in making this a place where excellent people choose to live and work. We're honoured to have Mr. Holman as part of the City of Vernon team and are pleased to see his efforts recognized on such a great scale." wc

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HydroDome is the latest innovative stormwater management technology from Hydroworks that provides benefits for water quality and water quantity or flow control.

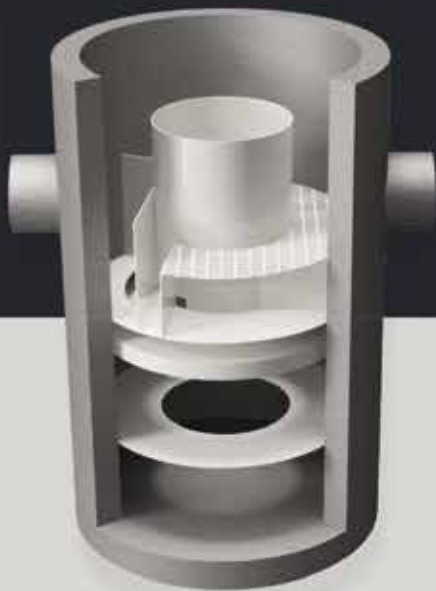
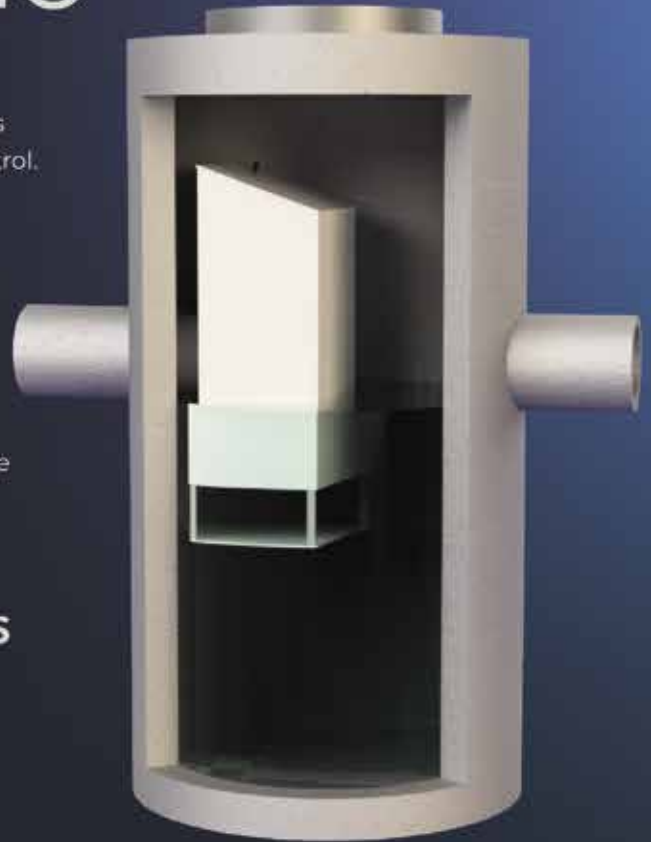
By combining the functions of a separator, hood, and flow control with active storage, HydroDome provides a multipurpose storm water solution in one structure.

HydroDome efficiently removes oil, trash, and TSS from stormwater runoff.

ETV™ Verified, Canadian-made, and complete with a free sizing program available for download at www.c-i-p.ca.

**CONTACT US FOR ALL YOUR
STORMWATER MANAGEMENT NEEDS**

ALSO AVAILABLE



HydroStorm

Next-Generation hydrodynamic water quality separator. ETV™ Verified and NJDEP Certified



HydroFilter

LID friendly stormwater filter and infiltration device. NJDEP Certified





Effective stormwater management.
Long-term mud control.
Low Impact Development.

Ecoraster's versatile permeable paving system allows for natural drainage into the ground, without producing harmful stormwater runoff. Engineered in Germany and manufactured in Canada, our products are made from 100% post-consumer LDPE plastic and are fully reusable and recyclable, making them truly sustainable.

Confidently backed by a 20-year warranty.

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