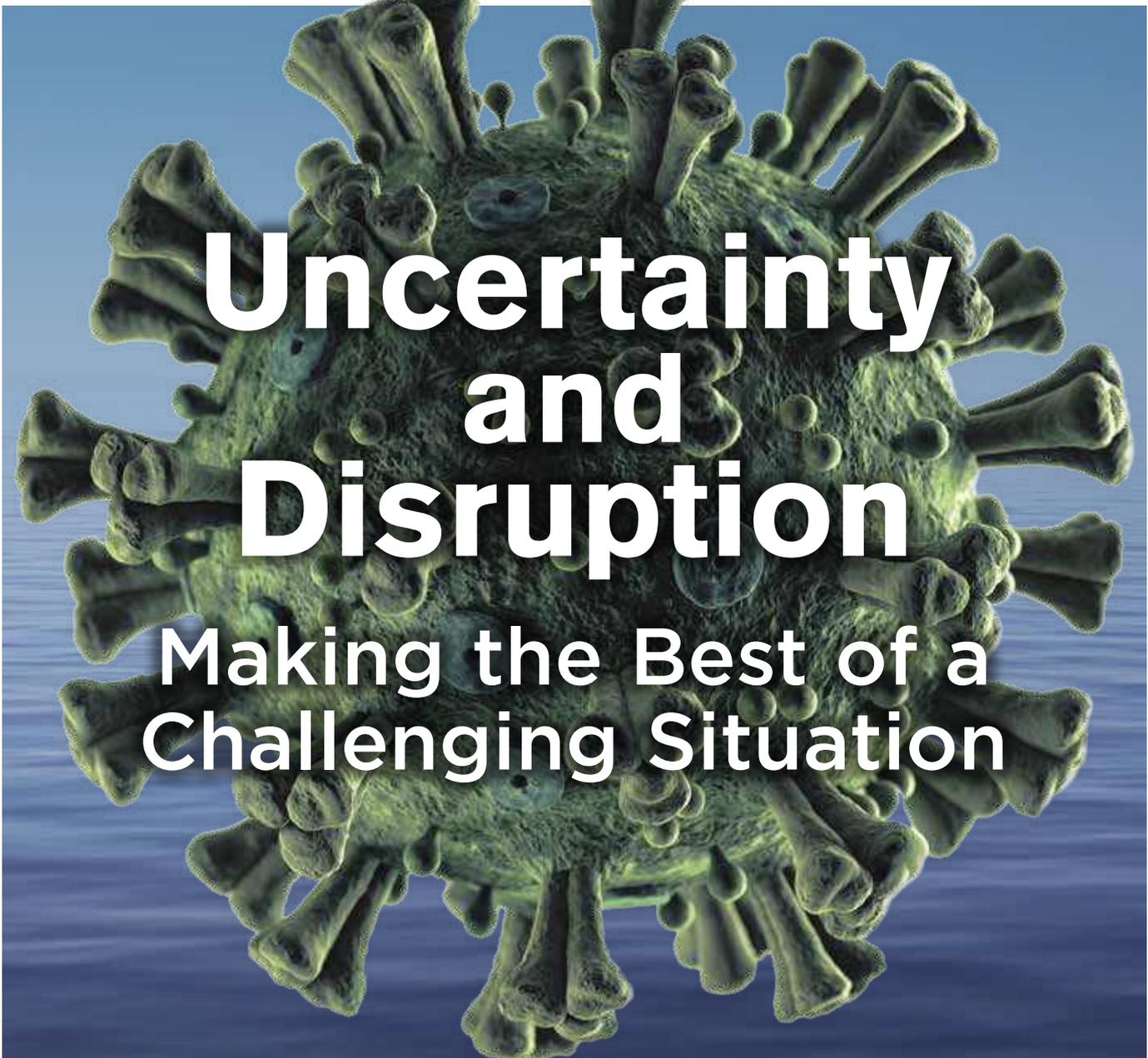


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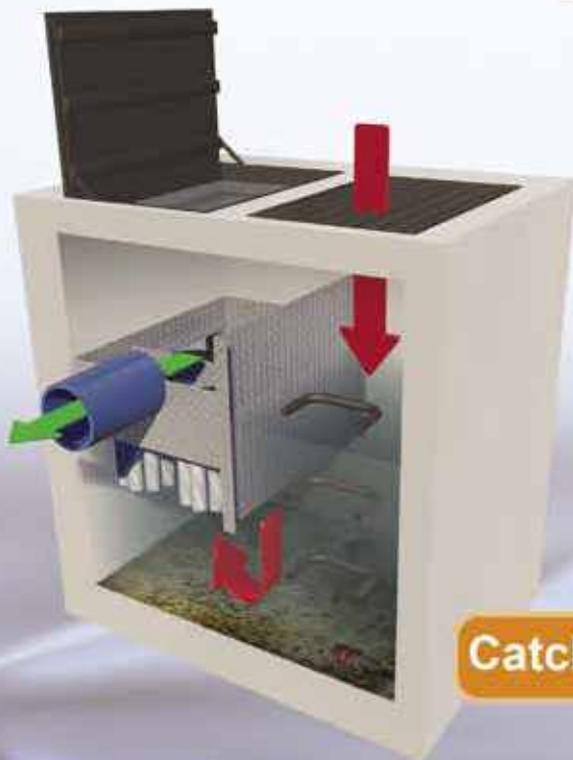
A New Look at Water Technology.
BY **ALAN SHAPIRO**

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A Step in the Right Direction

BY CORINNE LYNDS

I FOR ONE AM VERY THANKFUL for modern medicine. More specifically, the blood thinners that are extending my parents' lives, the antidepressants that help my friend face the world each day, and the over-the-counter medications that break a high fever when one of my kids are sick.

There's no doubt that scientific breakthroughs in pharmaceutical products like these are improving the quality of our daily lives. The challenge is that anywhere from 30 to 90 per cent of oral pharmaceuticals are estimated to travel through our guts and end up in the sewage system. Since wastewater treatment plants were not designed to eliminate many of these compounds, they are showing up downstream in freshwater sources that are relied upon for drinking water, irrigation, and fish habitats.

The problem is that wastewater treatment technology has not evolved at the same pace as pharmaceutical innovation.

This is an issue that has been gaining momentum for years. In 2018, the Canadian Water Network led a national review of known contaminants and contaminants of emerging concern in municipal wastewater. As part of this review, industry experts were surveyed to find out which emerging contaminants were of greatest concern. Predictably, pharmaceuticals and personal care products topped the list as the emerging contaminants that need to be addressed most immediately through wastewater treatment.

A lot of products are covered under the pharmaceuticals and personal care umbrella, but antidepressants in particular have become an area of focus for several recent studies.

In one report, a team of researchers from Environment and Climate Change Canada and McMaster University found that fish living downstream from a wastewater treatment plant show changes in their normal behaviour—ones that made them vulnerable to predators—when exposed to elevated levels of antidepressant drugs in wastewater.

Findings like these are driving further investment. The Government of Canada is stepping up to accelerate studies that will "help scientists better understand the threats that our ecosystem faces." At the end of March, Fisheries and Oceans Minister Bernadette Jordan announced \$2.89 million in funding for contaminants research. This funding supports nine research projects addressing the biological effects of contaminants on aquatic species.

Two of these projects aim to uncover more information about the effects of antidepressants in wastewater. The International Institute for Sustainable Development (IISD) Experimental Lake Area received \$220,736 over three years to characterize the effects of exposure to an antipsychotic pharmaceutical on several aquatic species. And the University of Waterloo received \$219,420 over three years to support a research project that will examine how antidepressants move in the environment and impact fish.

Investments like these are a step in the right direction. More collaboration is needed with research institutions to develop new and updated technologies and regulations to protect our water supply. **wc**

Corinne Lynds is the content director of Actual Media Inc.

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For daily news and discussion, visit





VICTORIA KRAMKOWSKI
Victoria is a government and community relations specialist at the Toronto and Region Conservation Authority (TRCA).
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JEN ATKINSON
Jen is the director of operations at Water First.
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MELISSA DICK
Melissa is a program manager at Aqua Forum.
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JULIETTE DUFRESNE
Juliette is a project administration officer at Aqua Forum.
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ABOUT THE COVER

Wastewater-based epidemiology has emerged as a way to overcome shortcomings related to individual swab-testing and other methods for determining positive cases of COVID-19. Read more on page 12.

Coming up in the next issue:
JULY/AUGUST

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Progress Update on Drinking Water Advisories in First Nations Communities

MARC MILLER, minister of Indigenous services, provided an update on the Government of Canada's commitment to end all long-term drinking water advisories on public systems on reserves.

"Today [April 1, 2021] marks an important milestone in our shared commitment to improve access to clean and reliable drinking water," said Marc Miller, minister of Indigenous services. "In November 2015, there were 105 long-term drinking water advisories on public water systems on reserves."

"As of today, by working in partnership, First Nations communities have lifted 105 long-term drinking water advisories," added Miller. "There are currently no long-term drinking water advisories in effect on public systems in British Columbia, Alberta, Quebec or the

Atlantic provinces. We will not stop until we lift the remaining 54 advisories."

As of March 31, 2021, 105 long-term drinking water advisories and 177 short-term drinking water advisories were lifted and access to clean water was restored to approximately 5,920 homes in First Nations communities.

According to the Government of Canada, reaching 105 long-term drinking water advisories lifted marks a significant milestone—matching the number in place when this Government committed to eliminating all long-term drinking water advisories on public systems on reserves. While additional advisories have been added over time, both by expanding the scope of the commitment and short-term advisories becoming long-term, the Government of Canada noted that reaching this number is a testament to five and a half years of real progress. **wc**

Share your story about the Canadian water industry with Water Canada!

Email Editor Simran Chattha at simran@actualmedia.ca



Study Shows Winter Road Salt Poses Year-Round Threat to Aquatic Life

TWO UNIVERSITY OF TORONTO RESEARCHERS have found that the salt spread on roads and sidewalks in the Greater Toronto Area during the wintertime remains a threat to aquatic life in the city's rivers during the warmer months.

PhD student Lauren Lawson and aquatic ecology professor Donald Jackson say heavy salting—including by businesses and private citizens, who the researchers say tend to salt excessively—is having a year-round impact on aquatic life.

They reported their findings in a paper published recently in the journal *FACETS*.

“Our research shows that chloride pollution from road salt is a year-round threat to our urban freshwater ecosystems,” said Jackson. “Of the samples we took from four GTA rivers and creeks during the summer, we found

that nearly 90 per cent exceeded federal guidelines for long-term exposure of aquatic life to chloride.”

In northern temperate regions like North America, the primary non-natural or anthropogenic source of salinization is road de-icing and anti-icing agents applied to highways, streets and sidewalks. In cities—where road density is highest—this results in high concentrations of chloride in runoff flowing into urban waterways.

Lawson and Jackson estimate that more than one-third of the sites sampled had concentrations that would be lethal, according to government guidelines, to two-thirds of aquatic species. This could possibly be more given species' greater sensitivity while in early stages of development during the summer. The concentrations discovered may also negatively affect reproduction and spawning. *wc*

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NEWS: British Columbia Invests in Watershed and Wetland Initiatives. bit.ly/BCInitiatives



NEWS: Upgrades Announced for Combined Sewer System in Uptown Saint John's. bit.ly/SaintJohnsSewer

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The public stormwater system is extremely important for keeping people, properties, and the environment safe, but needs to be complemented by stormwater management on private properties as well.



Bioretention cells are one of many stormwater best management practices that can be implemented on public and private properties.

Copyright Credit Valley Conservation Authority



Stormwater best management practices, like pervious asphalt, can be used on private properties that require paved surfaces.

Copyright Sustainable Technologies Evaluation Program

Next Generation of Stormwater Incentives

New approaches to incentivizing stormwater best management practices.

BY DR. VICTORIA KRAMKOWSKI

STORMWATER user fees have provided many Canadian municipalities with stable, dedicated funding for critical stormwater services, while stormwater credit programs can lower stormwater charges and potentially incentivize private properties owners to implement stormwater best management practices (BMP). However, in the quest to achieve widespread BMP uptake, municipalities are increasingly looking beyond a standard credit program to a more nuanced and diverse approach to incentivizing stormwater management efforts.

A proven approach to funding infrastructure

Canadian municipalities have long struggled with the ballooning costs associated with building, maintaining, and retrofitting stormwater infrastructure. These costs are magnified through pressures that include aging infrastructure nearing the end of its life cycle, a lack of

stormwater infrastructure within legacy development, increased impermeable surfaces that exacerbate runoff and flooding, and a changing climate that will result in more extreme storm events.

However, unlike other water- and wastewater-related municipal services typically charged as user-based utilities, stormwater services in Canada have historically been funded through property taxes. This forces stormwater management to compete with other municipal services for funding. It also bases rates on property value rather than a property's actual use of the stormwater system.

To address these issues, many Canadian municipalities have either moved to, or are exploring, stormwater user fees or charges, with at least 14 municipalities having adopted stormwater charges in Ontario alone. While stormwater charges may vary from simple flat rates to tiered fee structures to individual assessments for each property, they are almost always

based on the amount of hard surface that is found, or can be expected, on a property.

The status of stormwater credits in Canada

Typically, such incentives take the form of stormwater credits, which reduce the stormwater charge that a property owner pays. Though stormwater credits potentially apply to both residential properties and industrial, commercial or institutional (ICI) properties, most municipalities choose to offer them to ICI properties, which have the highest impervious surface and land uses that may impact water quality. Stormwater credit programs in Canada vary but can provide a maximum stormwater charge reduction of anywhere from 45 per cent to 95 per cent and may encompass many types of BMPs that address peak flow reduction, water quality improvement, infiltration, and education.

However, while stormwater charge-based funding has been transformative for municipalities when it comes to the ability to plan for, build, maintain, and improve critical stormwater infrastructure, they have found less success in incentivizing BMPs on private land through stormwater credits.

Most Canadian municipalities with stormwater credit programs have received far fewer applications for credits than originally expected—often less than five per cent uptake. Other municipalities have received no credit applications, even after several years of operating a stormwater charge.

Expanding incentive approaches

With stable funding, there are also opportunities to explore and experiment with new approaches to incentivizing the adoption of BMPs. While addressing the current municipal infrastructure burden remains critical, it is recognized that what happens on private properties is also a major key to reducing flood risk, improving water quality in urbanized watersheds, and better educating the public about the importance of stormwater management and how it works.

So what are the triggers that prompt different types of properties to care about stormwater management? What are the right—versus realistic—incentives to spur action? This is what many municipalities are now turning their attention to.

Municipalities are looking at three major questions when it comes to incentivizing BMP uptake:

- ① Who does your audience go to for information and guidance?
- ② How can property-specific opportunities be maximized?
- ③ What tools are needed to successfully implement and maintain BMPs?

Finding the right voice to speak to your audience

When it comes to construction and property improvements, it should be no surprise that property owners turn to vendors, contractors, and consultants for guidance. The power of working with vendors cannot be underestimated. As an example, one Canadian municipality that offered an under-subscribed sump pump

subsidy for a particular neighbourhood found it was suddenly overwhelmed with applications by residents after local contractors became aware of the subsidy and undertook an aggressive door-to-door marketing campaign.

Understanding needs—and opportunities—for different properties

Other municipalities with established stormwater charge and credit programs are exploring what property- or area-specific opportunities can be leveraged to increase uptake of BMPs. Recognizing that space constraints limit BMP implementation, and the fact that many properties may share drainage and realize cost benefits with shared BMPs, the City of Mississauga is formalizing a process to administer credits for communal BMPs shared among more than one property to also share stormwater credits.

The right tools for the job

Finally, municipalities are looking carefully at the tools that different types of property owners need to truly energize uptake of BMPs. It is recognized that the stormwater charge reductions offered by credit programs alone often offer insufficient payback periods. But even the provision of additional financial incentives, such as grants, rebates, or subsidies, is more effective when paired with the guidance and expertise that many property owners crave in order to build the confidence and understanding needed to both implement BMPs and maintain them over the long term.

This pairing of financial and knowledge resources has shown promise even in the residential sector where municipalities often do not offer stormwater credits. For example, since 2019, the City of Guelph has offered a rain garden rebate program that pairs free home visits and in-depth guidance from a community organization, REEP Green Solutions, with a rebate of up to \$2,000 for residential property owners to implement a rain garden. This popular program has seen impressive uptake and actual implementation of residentially-appropriate stormwater BMPs.

Municipalities are also looking to partner with organizations that hold

relevant expertise to help increase uptake of BMPs. For example, Partners in Project Green (PPG) is a collaboration between Toronto and Region Conservation Authority (TRCA), its partner municipalities, and the Greater Toronto Airports Authority. PPG works closely with businesses and municipalities to leverage different layers of internal and external expertise, as well as funding opportunities, to build the business case to implement sustainability measures, including those related to stormwater management.

Similarly, the conservation authority-led Sustainable Technologies Evaluation Program (STEP) offers training in building, operating, and maintaining BMPs. It also undertakes cutting edge research with both municipalities and companies to assess and identify the most effective approaches to stormwater management. Both PPG and STEP are working closely with municipalities to find creative ways to make BMPs feasible for businesses.

Looking to a resilient future

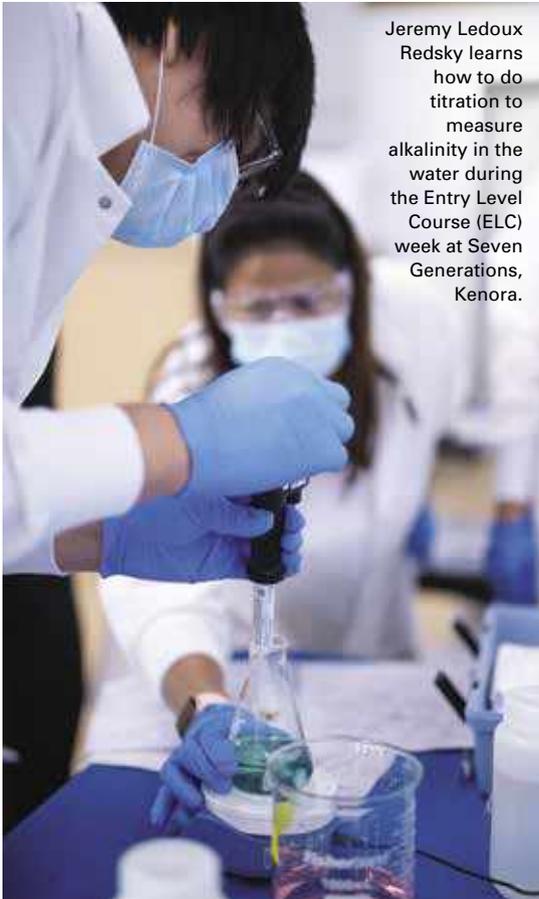
Ultimately the goal of incentivizing stormwater BMPs is to normalize widespread implementation. Stormwater credits remain a good starting point but municipalities that are serious about diversifying stormwater management need to be creative when looking at both the public system and beyond it.

Further options could include:

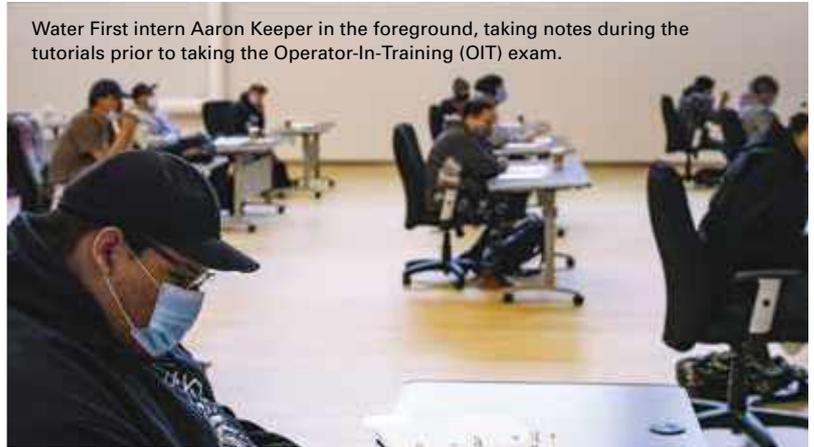
- Creating a market for stormwater credit trading.
- Integrating the valuation of ecological services into green infrastructure BMPs.
- Creating an appetite among consumers for businesses and neighbourhoods that are stormwater management champions.

Finding the right combination of approaches may be tricky. But with stable funding and a culture of learning and experimentation, the reward of resilient communities and healthy rivers is within reach for municipalities. wc

Dr. Victoria Kramkowski is a government and community relations specialist at the Toronto and Region Conservation Authority (TRCA).



Jeremy Ledoux Redsky learns how to do titration to measure alkalinity in the water during the Entry Level Course (ELC) week at Seven Generations, Kenora.



Water First intern Aaron Keeper in the foreground, taking notes during the tutorials prior to taking the Operator-In-Training (OIT) exam.



Interns Georgina McLeod and Sunny Payash work together to measure water quality parameters at the beach at Anicinabe park in Kenora during Environmental Water week.

Training and Development

How a resilient group of young Indigenous water treatment interns become new water treatment plant operators despite 2020 challenges. BY JEN ATKINSON

AT THE ONTARIO First Nations Technical Services Corporation's water symposium in 2018, Water First's executive director, John Millar, was delivering a talk about a water treatment training internship with seven First Nations communities on Manitoulin Island. Phil Tangie, Bimose Tribal Council's water hub manager at the time, stood up from his chair in the audience and asked Millar, right there and then, when Water First might begin working with his Tribal Council.

Since then, Bimose Tribal Council and Water First have been on a journey together, co-delivering a water treatment plant internship program and supporting young Indigenous adults from 10 First Nations in the region to become operators in training. Despite the difficulties

presented by the COVID-19 pandemic, and through many other challenges that have required great perseverance and resilience, 73 per cent of our interns have become operators in training to date. These new trainees are working with Bimose Tribal Council's technical services department to address shortages in water treatment plant coverage and build capacity for people across 10 Anishinaabe communities in Northwestern Ontario.

Water First team members sat with members of Bimose Tribal Council's technical services department to discuss their unique model, and the impact that the internship has had on communities. Wayne Holmstrom, overall responsible operator, Aaron Henry, operator in charge, and Adam Peacock, technical services

officer, work closely together to service communities in what they call a hub model: a centralized system of support for water treatment plant operators in each of the Tribal Council's communities. They have been working closely with our interns to train them—as well as depend on them. Here is what they had to say.

Water First: Can you describe your hub model of providing water treatment plant services to communities and how interns have been involved?

Wayne Holmstrom: Launched four years ago, our vision was to provide a safety net for water treatment plant operators in member communities, and a local hub operating under the

Tribal Council to offer a network of communication for plant operators to call on, and bounce issues off of, each other. The hub speeds up response times and advances knowledge for everyone across the board.

Interns faced many different kinds of situations working with the hub team, from a problem with a pump in one community, to dealing with frozen lines in another, and even helping one community with a temporary solution for getting water while its plant is being built. With these communities depending on the hub for parts, assistance with troubleshooting, and emergency response, our operators are working beyond capacity. Without our interns, operators would be overloaded. We count on interns to carry actual workloads, and they catch on quickly.

Water First: Can you talk about the water treatment plant internship curriculum?

Aaron Henry: The hub team helps with the direction of operators in different communities—to prep them for licensing, to work on upgrades once communities have made capital investments, and to get up to speed on different challenges that are happening. Every plant is unique and troubleshooting for each plant is different; there are a lot of variables in the equipment and upgrades. The interns work with us in all of these areas, as well as assisting operators with day-to-day operations response and support for communities, including daily bacterial testing. Adam Peacock, our technical services officer, has been doing a tremendous job providing guidance to interns on hands-on training and completing assignments.

Water First: How has the internship program benefitted interns, communities, and Bimose Tribal Council?

Adam Peacock: A benefit to the interns is that their training opens up the opportunity for them, as operators, to take their level-one training anywhere. For the operator-in-training (OIT) course, 10 interns received entry-level OIT certification and we hope that all interns will achieve the same.

Aaron Henry: The Water First team has been phenomenal, meeting and recognizing the extra-support needs of interns, such as flexibility in childcare scheduling—even reaching out personally to interns that may have had challenges with the material or attendance. The team understood and participated in some cultural aspects of the program, such as water ceremonies. They have been supportive in ensuring our perspectives are included in the program. Another really important advantage has been having women in the group. Traditionally, women in our culture are water stewards. Having two women in the internship, and women in the water field, prepares our communities for success in safeguarding the future, and this is invaluable to what it means to people in general.

Wayne Holmstrom: Having young students be interested in water has created a support system. As a result of interns understanding other communities' plants and different systems, they rely on one another and their communities are there for each other. It has been great to see friendships built.

Water First: What is your vision for the future of the program?

Wayne Holmstrom: We are hoping to work on wastewater in the future—it is a lot harder than drinking water to treat.

Aaron Henry: There are some operators that have been in their roles for 15 years. It would be nice for them to begin work in wastewater too.

Concluding thoughts

The Water First team is incredibly proud of the stamina and innovation the interns have shown throughout the pandemic. Compounded by the COVID-19 pandemic, unique challenges have become even more difficult, yet our interns have collaborated to ensure the completion of their training.

They have had to pivot some of their training to an at-home, online program, and blended with experience inside the treatment plants in reduced group sizes, they have also had to be very diligent in taking precautions against the spread of COVID-19.

They have risen to the challenges of addressing day-to-day operations, response, and support. They have proven to be quick learners and have been an important part of relieving some of the added stressors that the pandemic has caused in many communities. They persevered and pushed through despite, at times, not being able to see their families.

It is because of this group that the internship continues. The accomplishments of our interns-turned-trainees, achieved through determination and creativity, has been one of our favourite success stories of 2020. As illustrated by one of our interns and future certified water treatment plant operators, Georgina McLeod from Wabigoon Lake Ojibway Nation, our interns are also finding the program relevant and valuable.

“I so love the Water First training program,” said Georgina. “I will work and study hard to make all of the team proud and [so] that your hard work and dedication was—and is—successful in all of us obtaining our certifications. Thank you for everything. I so much gratefully appreciate it.”

About the Bimose Tribal Council Internship

Bimose Tribal Council formed in 1983 and is owned and operated by nine First Nations communities located between Kenora and Dryden. Each is diverse with unique needs, some of which include water issues. The Bimose Tribal Council internship was announced in March of 2020, when it was anticipated that each intern would accumulate 1,800 hours of on-the-job experience in water treatment plants, which is a requirement for them to become entry-level operators. Through the 18-month program, interns would also pursue their water quality analyst certification. *wc*

Jen Atkinson is the director of operations at Water First.



For further information on the Water First internship program, visit waterfirst.ngo/what-we-do

The research team at University of Saskatchewan has monitored levels of SARS-CoV-2 in Saskatoon's wastewater since June 2020.

Wastewater-based Epidemiology

Supporting public health decision-making related to the COVID-19 pandemic through population-level data.

BY MARKUS BRINKMANN, KERRY MCPHEDRAN, YUWEI XIE, JONATHAN CHALLIS, AND JOHN P. GIESY

SINCE THE EARLY DAYS OF the COVID-19 pandemic, individual swab-testing has been adopted globally as the gold-standard for acquiring information regarding positive cases, rates of infection, and acute outbreaks. While this method is valuable for acquiring personalized data for contact tracing, it is limited by the fact that symptoms might not appear for as many as five days after infection. Moreover, some infected persons may not exhibit symptoms or have only mild symptoms, and thus might never be tested. These pre-symptomatic or asymptomatic individuals have the potential to unknowingly infect others, causing some of the most severe outbreaks.

Prior to the onset of symptoms, infected persons start shedding SARS-CoV-2, the virus causing COVID-19, within approximately 24 hours of being infected. Thus, scientists and public health experts worldwide have turned to wastewater-based epidemiology (WBE)

to overcome some of the aforementioned shortcomings. Monitoring of wastewater influents for viral outbreaks is not an entirely new idea—it has been employed to track outbreaks of SARS, Ebola, Zika, and Influenza, among others. Today, COVID-19 WBE has now been adopted globally. It is used for detecting outbreaks locally (e.g., student dorms, long-term care facilities, etc.), municipally, provincially, as well as nationally. For example, WBE is used in the Netherlands as the primary indicator for the success of public health measures at the population-level.

A University of Saskatchewan (USask) group of researchers led by Professor John P. Giesy (Veterinary Biomedical Sciences and Toxicology Centre), Markus Brinkmann (School of Environment and Sustainability, GIWS, and Toxicology

Centre), and Kerry McPhedran (Civil, Geological and Environmental Engineering) has teamed up to harness this opportunity to pursue COVID-19 WBE.

Dr. Yuwei Xie, a postdoctoral fellow in the Toxicology Centre under Dr. Giesy's supervision, has adapted and refined methods for quantification of traces of

The viral RNA signal in wastewater has been one of the leading indicators of impending surges.

SARS-CoV-2 in wastewater. The team has participated with great success in a Canada-wide inter-lab comparison led by the Canadian Water Network. It is also part of the national expert advisory and working groups led by the Public Health Agency of Canada (PHAC).

In partnership with the City of Saskatoon

(Mike Sadowski) and the Saskatchewan Health Authority, the team has monitored levels of SARS-CoV-2 in Saskatoon's wastewater since June 2020. The pilot study was initially funded by the Global Water Futures program and supported through in-kind contributions of personnel and sampling equipment by the City of Saskatoon, as well as other postdocs, technicians, and students. Individuals who have supported the project include Drs. Jonathan Challis and Yufeng Gong, Femi Oloye, Mohsen Asadi Bagloee, and Jenna Cantin.

It has been shown that the viral RNA signal in wastewater has been one of the leading indicators of impending surges in case numbers, and we have previously warned Saskatoon's population of upcoming increases in positive cases. Additionally, data are being shared with Dr. Nathaniel Osgood (Department of Computer Science) who is using this information from wastewater to inform cutting-edge provincial and national modeling efforts to model the spread of SARS-CoV-2.

The team was recently able to secure funding from PHAC to continue this important work. In addition to ongoing surveillance of Saskatoon's wastewater, the team has partnered with five First Nations communities selected by their respective Tribal Councils and coordinated through the Indigenous Technical Services Cooperative (ITSC, Mr. Tim Isnana).

This work is very important since First Nations communities are particularly vulnerable to COVID-19 outbreaks and use very different strategies for cleaning their wastewater (i.e., lagoons, instead of conventional activated-sludge or biological nutrient removal (BNR) type treatment processes). Many First Nations have indicated that community members are concerned with potential long-term risks to their livelihoods if wild animals visit the lagoons (e.g., beaver, muskrat, mustelids, and waterfowl) and become carriers of the virus. Our research will help inform these risk assessments and provide community members and public health experts with the best available data. In addition, other researchers at USask are currently developing refined serological and molecular test methods to detect SARS-CoV-2 in wildlife.



Researchers from the University of Saskatchewan teamed up to pursue COVID-19 wastewater-based epidemiology.

In the fall of 2020, several new variants of concern (VOCs) (i.e., genetic mutants of the currently predominant wild-type form of SARS-CoV-2) emerged globally. These include the variants first detected in the United Kingdom (B.1.1.7), South Africa (B.1.351), and Brazil (B.1.1.28.1). It is expected that novel VOCs will emerge as time progresses and selection pressure against wild-type SARS-CoV-2 through vaccination increases. These variants are particularly concerning since they are described to be more readily transmissible and potentially cause more severe COVID-19 symptoms as compared to the wild-type strain. The USask research team's work will also begin addressing the issue of VOCs through monitoring Saskatoon's wastewater for the viral signatures of these variants. This work could help inform public health experts and decision-makers about the prevalence of certain VOCs in the City's population and provide useful data in combination with the variant screening of individual swab samples that is currently done at the Roy Romanow Provincial Lab (RRPL) in Regina.

The USask team is also exploring other novel techniques to support and complement the ongoing SARS-CoV-2 surveillance. Some of these research and development projects include untargeted proteomics for measurement of the viral proteins in wastewater and optimization of chemical tracer detection (e.g., artificial sweeteners, human metabolites) for more accurate normalization of viral counts.

While the COVID-19 pandemic has resulted in a renaissance of wastewater-based surveillance globally, SARS-CoV-2 will not be the last virus or pathogen that researchers will monitor in wastewater. In

this light, similar methods could help inform the prioritization of public health measures during the regular flu and cold seasons.

At the same time, it is becoming more and more evident that several other viruses that have only caused local outbreaks so far may possess the potential to cause future pandemics. Using the knowledge and capacities established during the COVID-19 pandemic will likely result in efforts to screen wastewater broadly and continuously for its diversity of pathogen genetic material using sequencing technologies. This type of untargeted wastewater surveillance will be a crucially important element of our preparedness for potential future pandemics and thereby help the world identify and contain outbreaks early. wc



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COVID-19: One Year Later

What have we learned? BY SIMRAN CHATTHA

WHILE WE HAVE ALL FACED uncertainty and disruption in the face of the COVID-19 pandemic, the Canadian water industry seemed to be well-prepared to face potential challenges. However, we wanted to get a more accurate assessment to see how the industry actually fared in the first year.

Water Canada reached out to leaders in the Canadian water industry and asked them the following question:

How do you think the Canadian water industry fared in the face of the COVID-19 pandemic?

Here are the responses we received.

Canadian water utilities are designed to face these kinds of situations by design. However, the speed, length, and breadth of this pandemic was unsurmountable for first few months to cope. As months passed, the pressure to continue much needed maintenance and construction activities to avoid breakdowns and cost increase for major capital projects.

One area that was significantly impacted was around innovative demonstration projects. As much of the work force was busy and occupied with regular operations, the new innovative

projects were parked for time being, causing slowed adoption for the new emerging technology and projects. One positive outcome of the pandemic is increased collaboration between utilities around increasing resiliency and COVID-19 monitoring.

Indra Maharjan, Director of Innovation, Technology, and Alternative Delivery at the Ontario Clean Water Agency (OCWA)

I think the Canadian water industry has demonstrated incredible resilience, ingenuity, and integrity in the face of the COVID-19 pandemic. Beginning with integrity, our front-line workers are the industry's silent heroes, showing up day-in and day-out to get the job done to ensure our drinking water and water environment are safe and accessible. I cannot thank our utility and local co-government service providers enough for their rapid and continued response to the ever-changing COVID-19 conditions.

As for the ingenuity, we are experiencing a definitive pivot within the water industry to advance their remote solutions capabilities. Whether it be through remote surveillance,

Zoom meetings, or leveraging artificial intelligence and machine learning, we are seeing the industry expand these capabilities to supplement conventional hands on or boots on the ground practices.

Finally, the resilience of the water industry has been clearly evident through an increased awareness and priority on the preservation of our natural and built water assets. As people transitioned from the office to working from home, people have become far more aware of what is most important, and I believe this has resulted in an increased awareness on basic necessities (such as clean water and sanitation) as well as an increased appreciation for the diverse and amazing natural resources we have access to across the country.

Stephen Horsman, President of the BC Water and Waste Association (BCWWA)

The COVID-19 pandemic has forced us all to be nimble and responsive to the issues of the day. Municipal water providers have had to react to a broad range of challenges, from revenue reductions and staffing challenges, to

the implementation of enhanced health and safety protocols. The OWWA Board wants to acknowledge and thank all water professionals that have continued to deliver essential water services through the current pandemic. “Thanks to all of you, the majority of Ontarians never give a second thought to turning on the tap and having safe water. This is perhaps the greatest compliment we can receive on a job well done.”—Nick Reid

Michele Grenier,
Executive Director of Ontario Water Works Association (OWWA)

Canada’s water industry came together in the past year to meet the challenges of the pandemic while continuing to address other important priorities. Leading organizations including the Canadian Water and Wastewater Association (CWWA) and the Canadian Water Network (CWN) compiled resources to help water sector companies stay updated and aware of government guidance. Canadian companies continued to innovate—LuminUltra developed a new tool for COVID-19 wastewater monitoring. Meanwhile, Foresight launched the waterNEXT ecosystem to support the next generation of Canadian water technologies. Along with IISD and Aqua Forum, we mapped more than 600 Canadian water technology organizations. We look forward to continuing to energize innovation and adoption of Canadian water tech through waterNEXT.

Jeanette Jackson,
Chief Executive Officer of the Foresight Cleantech Accelerator Centre

We say, “never let a good disaster go to waste,” meaning, despite the challenges, these are opportunities to shine. Water utilities faced a major financial pinch from the pandemic. Depending on customer base, many utilities saw sharp drops in water demand from commercial and industrial users, reducing their revenues. Businesses closed with unpaid bills as more residential customers could not afford to pay their bills.

But this pandemic proved the resilience of our sector to maintain systems regardless of the challenges. The value of clean, safe water delivered to your home was recognized throughout

a crisis that demanded handwashing and cleaning. The public also learned the genuine risks posed by flushing inappropriate products that cause clogs that threaten your home. This pandemic has also pushed a longstanding effort to recognize our sector as an essential service with essential frontline workers.

Robert Haller, Executive Director
of the Canadian Water and Wastewater Association (CWWA)

The biggest lesson for us has been the realization that civil society can take collective action to solve big problems. We will need to employ this type of collective action in order to address the continued and exacerbated impacts of the climate and biodiversity crisis on the health of our watersheds in Canada and around the world. The COVID-19 pandemic has shown us that we are capable of cooperating and managing for COVID-19 globally and this type of collaboration will be what is ultimately necessary to address climate impacts on the health of our waterways.

Kat Hartwig, Executive Director
of Living Lakes Canada

Community-based water monitoring thrived in 2020 despite the uncertainties that we all felt last spring. With several provincial and federal government monitoring programs paused, community organizations were able to step up and fill water quality data gaps. Even with low COVID-19 cases in the Atlantic Provinces compared to the rest of the country, many organizations were uncertain whether they would be able to legally and safely get outside.

As restrictions began to ease in May and June, community organizations and volunteer groups were able to coordinate monitoring teams within “bubbles” to safely collect invaluable water quality data. Undoubtedly, this shows not only how nimble but passionate and dedicated community-based water monitoring groups are, and how necessary these organizations are to understanding our water systems.

Emma Wattie, Director of the
Atlantic Water Network

For our water industry, the COVID-19 pandemic has been not a time of delay, but a time of adaptation, resilience, collaboration, and transformation.

Our water sector, along with its supply chains and its associated construction teams, has risen to the challenge with:

- Emergency procedures to prevent and reduce risks of infection.
- Business continuity measures.
- Virtual delivery models.

In this period of uncertainties, Canadian water utilities are ideally positioned to embrace the rapid changes the pandemic has caused. By adopting new working schedules, alternate work shifts, working-from-home and remote teamwork, among other measures, our industry continued to provide essential services.

Emergency preparedness and response planning is inherent in the operation of water, wastewater, and stormwater systems. At the cornerstone of this success is the modernized regulatory framework, which coalesces existing asset management, health and safety, and quality and environmental requirements into integrated management systems, which are becoming popular by Ontario water utilities.

As we transition to a post-COVID era, continuous innovation and the ‘permanent uncertainties’ that arise from this war-like environment are likely to make permanent modifications to our business practices. Our industry is likely to have a continued experience and expansion in remote working, intelligent water systems, e-learning, augmented reality as training and troubleshooting tools, and proliferation of integrated management systems.

Our frontline workers, operators, contractors, and suppliers who have kept our water systems safe and functioning deserve special thanks and recognition.

Edgar Tovilla, President of the
Water Environment Association
(WEAO) (2020-2021)



Simran Chattha is editor of Water Canada.



The story of COVID-19 wastewater monitoring. BY LISA ANDREWS AND ALAN SHAPIRO

COMMUNICATING SCIENCE during a crisis is no simple task. Over the past year, governments across the world have faced the shared challenge of communicating the latest research, public health measures, projections, and uncertainty surrounding the COVID-19 pandemic. Results have varied widely, from strong evidence-based leadership in some jurisdictions to widespread misinformation and public distrust in others.

While in many ways on the periphery of COVID-19 conversations, water sector organizations have similarly been challenged to conduct and communicate critical research on unprecedented timelines. In countries including the Netherlands and Canada, monitoring of COVID-19 through sewage has emerged as a powerful tool to help public health agencies prioritize limited resources. The development of this approach over the past year has been driven in no small part by the effective coordination and communication of research by water sector leaders.

Effective Crisis Communication

The Netherlands is a small country operating under a unitary government,

with well-established water governance. In fact, water boards are the oldest form of local government in the Netherlands. The interdisciplinary KWR Water Research Institute bridges science to practice through research for the national and international water sector, with a strong focus on the Dutch and Flemish drinking water utilities. KWR works in close collaboration with STOWA (Foundation for Applied Water Research) and the Dutch Water Authorities (water boards) that manage wastewater treatment plants (WWTPs) across the country.

With the onset of the COVID-19 pandemic, KWR sought to support key solutions by leveraging its expertise in wastewater monitoring and risk communications. While a group of scientists began to conduct research on sewage surveillance, a team of social scientists sought to better understand how to effectively communicate science during a public health crisis. The team reviewed a wide range of resources and best practices with the aim of helping colleagues and stakeholders limit the spread of misinformation.

Based on this work, the team produced

a report outlining guiding principles and strategies for stakeholders within and beyond the water sector. The report's key findings include a step-by-step communication process as well as three key themes for communicating science during a crisis:

- 1 Knowing your audience.
- 2 Building trust.
- 3 Informed decision-making to enable action by the target audience.

These three themes can be seen in practice through the effective mobilization of the Dutch and Canadian water communities to advance research around COVID-19 wastewater surveillance.

The Dutch Story

KWR researchers were able to quickly pivot towards COVID-19 sewage surveillance at the outbreak of the pandemic. "Most of the sewage surveillance and engagement work is related to wastewater treatment plants and water boards. These are the research and communication partners with whom we have been collaborating the most, and who were already close partners before

this work and the pandemic,” explains Frederic Béen, scientific researcher at KWR who has co-led the COVID-19 wastewater surveillance research with Dr. Gertjan Medema.

KWR was able to rapidly share research findings with water boards, WWTPs, and other researchers to help them make informed decisions and take action during the crisis. “In the beginning,” shares Béen, “the focus of the research was on methodology, answering questions like: ‘Can we detect the virus?’ and ‘Can we detect it in a quantitative, accurate way?’ Then the research focus shifted, because suddenly there was confidence in the results that were being produced. So the focus changed to: ‘What do we do with this data?’ and ‘How do you best utilize it from a policymaking perspective?’”

Over the course of the pandemic, KWR’s wastewater surveillance work has focused on international research and coordination, while Netherlands’ National Institute for Public Health and the Environment (RIVM) has operated the national COVID-19 wastewater monitoring program.

As we move into pandemic recovery, the water sector’s COVID-19 focus is by no means over.

KWR’s COVID-19 experience has not been without its lessons. “Sewage surveillance is a support for decision-making which is not used to its fullest potential because, among other things, challenges associated with effectively communicating and translating the data for policy making,” explains Béen. “That is where we still have some work to do to make sure this happens in an effective and transparent manner, so that the strength of the method can be understood by those who are not familiar with this type of environmental monitoring.”

The Canadian Story

An ocean away, the Canadian water sector has also been navigating the challenges of COVID-19. But unlike the Netherlands’ well-coordinated water governance structure, Canada’s water sector is more

loosely connected. Wastewater services are provided by a network of municipal and regional utilities across the country. They coordinate with public health agencies at municipal, provincial, federal, and Indigenous levels, and are supported by research conducted at a cross-Canada network of universities.

Within this national water management landscape, the Canadian Water Network (CWN) plays an important enabling and coordinating role, serving as a trusted broker of insights for the water sector in a way that helps achieve collective progress. CWN works to assess not only the state of the science but also its particular and varied relevance to different decisions, facilitating conversations to inform decision-making and policy around complex and emerging water issues, from flood management to contaminants of emerging concern.

Early in the COVID-19 pandemic, in recognition of the existing and emerging need in Canada, CWN convened the COVID-19 Wastewater Coalition—a national network to support those interested in wastewater surveillance technology in accessing the latest research and connecting with peers. The role of the Coalition is not to advocate for this technology, but rather to enable the public health community to assess whether or how the approach would be useful.

“Our positioning around wastewater surveillance research and emerging practice was less ‘we need to do this’ and more ‘there needs to be coordination for this to happen in Canada,’” explains CWN CEO Bernadette Conant. “Our engagement strategy leveraged existing relationships.”

Enabling and informing decision-makers rather than public outreach has been the central focus for the Coalition to date. However, a handful of health agencies have taken a leadership role in communicating water surveillance methods and data to the public. Ottawa Public Health was the first to launch a public dashboard to make COVID-19 wastewater data available to residents. Metro Vancouver and

City of Calgary have since followed suit.

What’s next?

As we move into pandemic recovery, the water sector’s COVID-19 focus is by no means over. “The pivot now,” explains Conant, “is to better understand variants and define most relevant use cases for this emerging technique of wastewater surveillance, such as long-term care homes, remote communities, and ongoing value and opportunities.”

For KWR, the research and sewage surveillance work with the water boards and WWTPs continues. “In terms of research,” shares Béen, “the work of KWR has triggered follow up studies all over the world. The current situation with the variants offers the opportunity to show the strength of our sewage surveillance method and continue monitoring the spread.”

Both the Dutch and Canadian experiences demonstrate KWR’s crisis communication principles in action. KWR and CWN knew their audiences well due to years of collaboration, which helped them understand and respond to their audience’s needs. Both were trusted leaders in the water sector, which allowed them to coordinate emerging research among a wide array of stakeholders and in a rapidly changing landscape. And in both cases, the resulting research enabled key decision-makers to evaluate and implement new tools to support their pandemic response.

As COVID-19 continues and wastewater surveillance tools become more established, communicating the implications of this emerging research to the public—a complex audience with its own unique set of needs and considerations—will become increasingly important.

Thank you to the staff at KWR and CWN for contributing to this article. wc



Lisa Andrews is a scientific researcher at KWR.

Alan Shapiro is the director of waterNEXT and principal at Shapiro & Company.



How can we help ensure the prosperity of the Canadian water industry?

BY SIMRAN CHATTHA

THERE ARE A NUMBER of emerging challenges and opportunities in the Canadian water industry. Some communities are dealing with water shortages and boil water advisories. At the same time, many organizations, governments, associations and water tech companies are helping pave the way towards a brighter future.

To discuss what needs to happen in order to ensure the prosperity of the Canadian water industry, Water Canada hosted the Building the Blue Economy webinar in February 2021. Sanexen's Martin Bureau and Matrix Solution's Steve Braun joined Actual Media's Todd Latham for the discussion. Together, they dove into these questions: What types of demonstration platforms are available for municipalities and water technology companies? How do we value water?

Exploring demonstration platforms

To build a Blue Economy, Latham noted we need proven ways of building water infrastructure and deploying water technologies.

"Is there anything going on in

municipalities that allows that to happen?" asked Latham.

"Are there any organizations, like FCM, or associations, like CWRA, providing demonstration platforms?"

According to Braun, "the importance of successfully bringing forward good, new technology is important." He noted that there is a lot of good work happening. For example, Ontario Water Consortium is an organization that provides demonstration platforms.

Braun also noted programs, like the Scientific Research and Experimental Development Tax Incentive Program, are offered by the federal government. In addition to this, the Federation of Canadian Municipalities offers programs that allow municipalities to apply for a certain percentage of funding for innovative solutions.

Similarly, Bureau noted some programs that are offered by governments and other organizations. He noted Sustainable Development Technology Canada is pushing for showcasing technologies

that have been developed in Ontario. The program is starting in Ontario but may be expanded throughout Canada. Bureau also added that the Ministry of Economy and Innovation in Quebec is organizing a forum for addressing tertiary and quaternary water treatment in our systems.

One of the takeaways from this discussion was that demonstration projects could help municipalities overcome risk adversity and bringing them up to speed with what's available. Traditionally, municipalities have said

We need proven ways of building water infrastructure and deploying water technologies.

that "we've never done it that way before so why change now mentality," said Latham. "That's probably because there's this risk adversity to adopting new technologies or trying new things. I think having these demonstration projects would be helpful."

How do we value water?

One of the topics Water Canada’s team has talked about is the value of water. “The perception of most Canadians is that your turn on your tap, you flush your toilet, and you don’t really think about it because we’re probably not paying enough for our water,” said Latham.

Bureau added that he believes that water is a public good. “It should be given the value that it has but we’re not seeing that right now,” he said. For example, Bureau noted there are no records that indicate how much water is being consumed in each home in Montreal and that there’s a long way to go there.

“We see where we have public utilities, the awareness of citizens is much higher,” said Bureau. In these cases, Bureau noted utilities are being asked for proof that they are dealing with leaks as an example.

“In Canada, utilities are losing 20-30 per cent of their water to leaks,” said Bureau. “I know in some cities in southern California where five per cent is totally unacceptable. So there is a place for a separate administration and management of water systems. I would certainly love to see that happening. I believe [water] should remain public but it should be recognized as the key resource it is.”

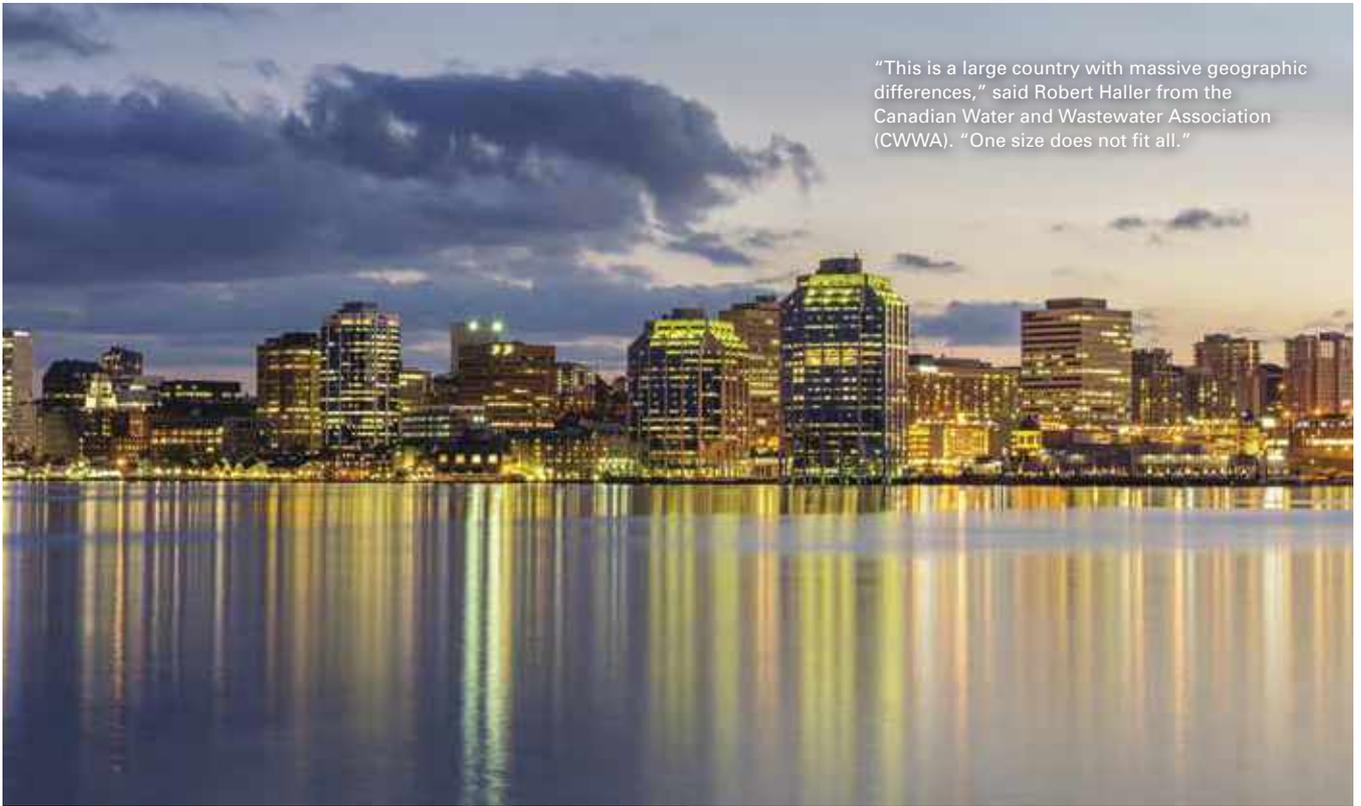
Braun added the important role that organizations like Living Lakes Canada, among others, play in supporting integrated watershed management. “One of the recommendations we’re making to the Canada Water Agency is that some stable funding or consideration about how they collect their data to make sure that we can support these initiatives and make sure they’re ongoing.”

These types of organizations keep us in check and help us find where the problems are, noted Braun.

“I’ll bring it back to what I do in the flood world a lot,” said Braun. “One of the greatest things we’ve had available to us as flood modellers is citizens out posting to YouTube what happens during a flood. We can model all day long about where we think water might go during a certain rainfall event after certain wet conditions in a watershed. It’s really valuable when we see citizens posting a flood video downtown in a city or out in the country somewhere that shows where the water levels go. This will become more and more valuable to us as citizens.”

Given the challenges Canada is currently facing, and is expected to face in the future, understanding the value of water will be an important foundation for ensuring we can effectively build the Blue Economy. **wc**

Simran Chattha is the editor of Water Canada.



“This is a large country with massive geographic differences,” said Robert Haller from the Canadian Water and Wastewater Association (CWWA). “One size does not fit all.”

Governing the Blue Economy

How can we break down geographical silos and achieve new governance models that work for all Canadians? BY CORINNE LYNDS

WATER GOVERNANCE, often confused with water management, is as tricky as water itself to nail down. Streams, rivers, and lakes flow across multiple jurisdictions, and water cares nothing for geographic or bureaucratic boundaries.

In March 2021, Water Canada hosted a webinar on Governing the Blue Economy to explore what steps we can take to break down geographical silos and avoid politically influenced water decisions and regulations. Actual Media’s Todd Latham was joined by Robert Haller from the Canadian Water and Wastewater Association (CWWA), Indra Maharjan from the Ontario Clean Water Agency (OCWA), and Kalpna Solanki from the Environmental Operators Certification Program (EOCP).

Defining governance

Latham kicked off the discussion by revisiting the definition of what exactly

governance covers. “Governance refers to how we make decisions, while management refers to the models, principles, and information we use to make those decisions.”

In their opening remarks, panelists indicated governance is largely a provincial mandate, other than the federal role that covers oceans, boundary waters, navigable waters, and national parks. “So, we’re in a position now where we’ve got overlapping jurisdictional silos that I think are preventing us from adopting best practices on governance,” said Latham.

How can we break down those silos?

Speakers unanimously agreed collaboration is what’s needed. They identified challenges, offered up examples of success stories, and expressed optimism about the role the

Canada Water Agency will play.

“This is a large country with massive geographic differences,” said Haller. “One size does not fit all. So, having it centralized isn’t necessarily the answer.” He cited the Canadian Drinking Water Guidelines as an example of how all the provinces and territories worked together to come up with an agreement on direction and guidance of safe drinking water. It was then rolled out to each province and adjusted to suit.

Solanki referenced the *Canada Water Act* that was passed in 1970 and used that as another example of how all the certification groups from different levels of government across Canada need to come together to level the playing field. “Yes, there are regional differences, but if a level 3 treatment operator moves from New Brunswick to British Columbia, that person should be able to work as a level 3 treatment operator for water treatment in B.C.”

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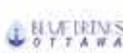


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Are small systems best served by local or federal oversight?

Small water systems were a hot topic in this webinar, which makes sense if you consider just how many there are across Canada. “We have something like 4,600 small water systems in British Columbia, that we know of,” said Solanki. “The larger ones can take care of themselves, but the smaller ones are not organized enough to go after the infrastructure dollars they need.”

This was a common thread in the discussion, panelists agreed the province and the health authorities need to work more closely with the small systems to access infrastructure dollars to drive improvements.

“Some of the work I do is in supporting our small system owners in applying for this funding,” said Maharjan. “I think the management can be left to the local municipal bodies to decide, but in terms of the governance, I think provincial governance would be good.” He also noted many of the current funding programs are provincial and under the Pan-Canadian Framework of provincial and federal combined dollars. With that in mind he believes it’s “federal responsibility to keep these systems afloat.”

Speakers agreed that the feds need to push money to the municipalities to drive governance of local and small systems with provincial leadership. Latham pointed out this is the current model, and asked: why isn’t it working?

you tend not to value it, and to waste it,” said Solanki. “I completely agree,” said Maharjan. “I grew up with the hardship of having no clean water... That said, I don’t think we can just increase the rate of water to recover and make the system financially sustainable. I think it will take two things to make the system work. One, we do need to increase water rates, at least attached to market inflation. And two we need to find other sources of revenue from wastewater, whether it’s biosolids or finding efficiencies and reducing operating costs.”

What about watershed-based governance?

“This is one of the most exciting things to come out of the Canada Water Agency,” said Haller. “Not only

What is the top issue that needs to be addressed in Canada?

Ensuring safe and reliable access to drinking water for all citizens 52.3%

Water quality and quantity 4.5%

Climate change 38.6%

Emerging contaminants 2.3%

Other 2.3%

“We are so eager to buy stacks of bottle water in Walmart and Costco, but we don’t want to pay a little bit more for the water coming out of our taps,” said Maharjan.

Solanki reiterated the need for collaboration. Maharjan agreed, adding that a greater focus on technology and data sharing was also critical. Haller cited a need to strengthen watershed authorities. “All the risks to my water supply were outside my municipal boundary, so I couldn’t affect the zoning, the planning, the plans, etc. And the towns that were the problem, didn’t care because there were on well water, so it didn’t affect them. Regional authorities need to be empowered to force this regional protection control of our source water...”

How do we pay for water?

The federal government may hold the purse strings on infrastructure investment, but that raises another concern: where does the money come from?

“We don’t pay enough for water. When you’re not paying for something,

will it get 20 federal departments and agencies talking to each other, but it has all been about watersheds and source protection. The federal departments are starting to bring in all the provincial data, but what about all the other localized groups, Riverkeepers, etc. If we start to pool that scientific data and make it publicly available... that would make us all think on this watershed basis. If anything awesome is going to come out of the Canada Water Agency, it’s going to be first this collection and sharing of data.”

Collaboration, collaboration, collaboration—that’s what it’s going to take to effectively govern Canada’s Blue Economy.

Look for part four of the Blue Economy series in the July/August edition of Water Canada. [wc](http://www.watercanada.net)

Corinne Lynds is content director of Actual Media.

Which level of government should have the biggest role in water governance?

Federal 58.5%

Provincial 22%

Local (municipal, Indigenous governments, etc.) 19.5%

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Relationship-building is key. Patricia Gomez, cofounder of Clean Nature and alumni from the 2019 AquaHacking Challenge, speaks with conference attendees.



Identify strategic alignment with municipal priorities. Water entrepreneurs on a tour of the Utilities Kingston wastewater treatment plant with Allen Lucas, manager of research and projects, as part of the 2019 AquaHacking Challenge.

Tapping the Municipal Market

Nine insights for small companies looking to tap the municipal market.

BY MELISSA DICK AND JULIETTE DUFRESNE

IN RECENT YEARS, the number of small and emerging water technology companies developing innovative solutions to address municipal water resource management challenges has grown significantly. A recent collaborative mapping exercise between Foresight Cleantech Accelerator Centre, the International Institute for Sustainable Development (IISD), and Aqua Forum revealed hundreds of small companies operating in the water technology space in Canada.

As pressures on municipal water and wastewater treatment systems continue to increase due to a changing climate, aging infrastructure, growing populations, and more, innovative technology solutions created by agile and resourceful small and emerging companies will be an important part of the public sector's toolkit to continue to deliver safe and reliable water services.

However, regulatory and operational barriers within the municipal legislative framework as well as other sector-specific

challenges can significantly hinder an emerging company's ability to access this sector. This article offers nine insights for smaller companies navigating this space gathered through exploratory discussions with both company founders and leaders in the water technology and municipal sectors. These insights are but a starting point in what is a growing discussion about water technology innovation in the public sector in Canada.

1 Understand the municipal structure and its departments

Municipalities of different sizes are structured differently. Smaller municipalities often have individuals serving in several roles, one of which may be serving as a water operations manager. Larger municipalities, on the other hand, may have staff focused specifically on innovation within the water service department such as water conservation officers or managers of water services. In some cities, water works are managed

by a utility. How a product or service will need to be positioned will vary depending on who a company reaches out to within the municipality or utility. Understanding the scope and context of the staff person's role and the broader mandate of their department will help a small company do this more effectively.

2 Build strong connections and relationships

Relationship-building is a key pillar in the successful deployment of water technology solutions by municipalities and utilities. Reaching out to individuals within the municipality or utility to build an understanding of their motivations and needs is strategically important. Securing support from champions and influencers who can advocate for the testing or deployment of a new solution can often make all the difference. These allies may come from unlikely places. Job titles may not be the primary guide when seeking to build strategic relationships. Look to

identify those individuals who will benefit directly from the implementation of the solution by staying abreast of local issues and concerns. Local media is a good source of information to help identify potential municipal champions.

3 Focus your efforts

Small and emerging water technology companies are often tempted to tackle many problems all at once. Successful small companies in the water technology space have tended to focus on only one or two problem areas at a time. Focusing efforts will facilitate a more comprehensive understanding of the problem and allow companies to identify where their solution can have impact. It will also help scope efforts to establish key relationships and help identify and secure the resources required to achieve high impact.

4 Understand the relevant regulations and policies

Municipal water and wastewater treatment is subject to several regulations and policies. Understanding of the federal, provincial, and municipal laws and policies that relate to a new product or service will not only better position the company to develop a relevant solution but will also help support productive conversations with municipal and utility staff about the issue and the proposed solution. Innovative technological solutions that indirectly contribute to water-related outcomes through improved communications and decision-making are also subject to regulations and procedures, such as information technology and data policies. Regulations and policies vary between cities and provinces and may change with incoming governments.

5 Identify strategic alignment with municipal priorities

It is critical to understand the water-related issues that a municipality is managing to be able to strategically position a particular solution. This information can be found in several publicly available sources: municipal meeting minutes, strategic plans, and city budgets. Upcoming procurement goals are sometimes posted and can provide useful context. Strategic opportunities

can also be identified by analyzing which municipal priorities indirectly involve water-related issues. For example, cities with sustainability and environmental initiatives or those prioritizing energy efficiency may be interested in knowing about greenhouse gas emission or energy reduction capabilities of a given water technology solution.

6 Develop partnerships to increase capacity and credibility

The way municipal procurement processes are designed can make it especially difficult for a small and emerging company to win a traditional request for proposal. One strategy to boost a small company's chances at securing a municipal contract is by partnering with a larger company and offering an innovative solution as one component in a suite of services. This "foot in the door" approach helps smaller companies establish credibility and build the capacity to meet the contract requirements.

7 Join a network or association

There exist many professional water and wastewater associations that bring together municipal representatives, academics, industry leaders, and entrepreneurs at national, provincial, and local levels. Joining such networks provides an opportunity to meet potential clients or partners in the municipal space. Some associations include working groups or committees with members who self-identify as interested in learning about new technologies. Seminars are regularly offered to members on numerous topics, including municipal purchasing processes. These provide valuable opportunities for smaller companies to learn about internal processes that can otherwise be challenging to navigate, such as procurement.

8 Marketing is key

A lack of visibility can be detrimental to successfully testing or deploying an innovation water technology solution within a municipality. It is therefore important to develop a strong marketing strategy, to actively establish brand recognition and to raise awareness about a company's new technological solution. Any opportunities to participate

in expositions or conferences should be taken advantage of. In all communications with a potential client, messages and vocabulary should be adapted to reflect the end-user's specific needs.

9 Practice patience

Timelines and processes for the development of municipal projects are especially long. They can often extend over multiple years based on the size and nature of the project. Many steps are required for the deployment of an innovative technology of significant magnitude, such as budget processes, project approval, and procurement processes. There is also the consideration of public communications and managing ratepayers' perception about the project. Even projects with smaller budgets acquired through direct contracts can take several years to complete.

Concluding thoughts

In a post-COVID world, with a focus on a "green" economic recovery, the opportunities for clean technology—including water innovation—will only grow. With the increase of water management challenges due to climate change impacts and increased land development, municipalities are under pressure to improve water management systems where possible. Technological innovation has a definite role to play. It is hoped that the insights in this article may enable those small and emerging companies with innovative water tech solutions to better position themselves vis-a-vis potential municipal clients to ensure safe and reliable water services and improved freshwater health in Canada. **WC**

Melissa Dick is a program manager at Aqua Forum.

Juliette Dufresne is a project administration officer at Aqua Forum.



For more details about the insights offered in this article, subscribe to the AquaHacking newsletter (aquahacking.com) to receive a notification once the report in its entirety will be available.

Renewing Water Infrastructure

An emergency watermain lining project is completed alongside the City of Markham in Ontario to restore the life of a failing watermain.

Solutions coming down the pipe to help address asset renewal.

BY SIMRAN CHATTHA AND CONNIE VITELLO

THE CONSTRUCTION of water infrastructure across the country has accelerated in recent years. Canada's latest Core Public Infrastructure Survey found that an average of approximately 13,000 kilometres of new linear water assets were built per year in 2017 and 2018, compared with around 6,000 kilometres per year from 2000 to 2016.

Municipalities are continually thinking about how to renew and repair this critical infrastructure. As municipalities address their infrastructure needs, new technologies and existing methods are poised to play a pivotal role. However, some methods are more commonly used and recognized than others for a variety of reasons.

Open-cut trench excavation and trenchless rehabilitation, most often the cured-in-place pipe (CIPP) method, are among the methods that are commonly being used by municipalities. What are the benefits and drawbacks of these methods? What are the variables that should be used to select one method over

another? Let's explore these questions.

Replacement versus rehabilitation

After watermains are put into service, their structural integrity and hydraulic performance will eventually start to deteriorate. Structural deterioration can be caused by a number of reasons. For example, metal-based pipes develop internal and external corrosion, causing the pipe walls to thin or degrade. This can, in turn, cause the watermain to eventually leak or burst.

Various options are available to repair and/or renew linear water infrastructure.

One option is open-cut trench excavation, which is the traditional method that has been used for lateral sewer construction, repair, and replacement. This method involves excavating down to and exposing the existing pipe so that it can be repaired or replaced and then backfilled.

The advantages of using this method

are that it can have a lower cost in unpaved areas compared to other methods, it can be used in cases where there is a collapsed or severely broken pipe, and there's no need to remove roots or debris from the pipe.

However, there are also disadvantages of using this method. More excavation is required with this approach when compared to other methods. This option may also require the removal of street and sidewalk pavement, which increases repair expenses and creates inconvenience for the community.

Trenchless rehabilitation, particularly CIPP, can also be used to repair existing pipelines. It is a jointless, seamless pipe lining within an existing pipe. The process of CIPP involves inserting and running a felt lining into a pre-existing pipe that is the subject of repair. Resin within the liner is then exposed to a curing element to make it attach to the inner walls of the pipe. Once fully cured, the lining acts as a new pipeline.

A major advantage of this method is that it doesn't require excavation. The disadvantages can include the need to make sure the liner size needed is available for a particular pipe (when not a common size) and the need to facilitate a bypass of the flow in the existing pipeline while the liner is being installed. It is also considered by some as more of a temporary fix than a long-term replacement method. However, others report that certain CIPP projects can provide an additional 100 years of life.

Patrick McManus is executive director of the Ontario Sewer & Watermain Contractors Association (OSWCA), which represents over 750 companies across Ontario, including contractors, manufacturers, distributors, and consulting engineers. They collectively perform over \$1 billion a year in capital projects to ensure safe drinking water and environmentally responsible wastewater treatment and disposal.

According to McManus, typically, open cut and tunnelling are the preferred options. "Pipe relining is a relatively new offering and becoming much more widely used but still considered to be a niche," said McManus. "It's another tool in the toolbox that temporarily provides more life for already buried infrastructure with minimal disruption and excavation."

However, deciding on the best option for a particular municipality really depends on the objective and circumstances of that municipality, stated McManus.

"This is not an either-or decision," said Stewart Dickson, director of conveyance with WSP in Thornhill, Ontario. "Rehabilitation and replacement are both valuable methods of pipeline renewal that can be implemented, independently, or jointly."

Key variables to consider

When it comes to linear water infrastructure, how do municipalities and water infrastructure owners decide how to rebuild or renew their pipelines?

In Canada, there is currently a preference for open-cut as trenchless options are still mainly in the development and acceptance phase. Many of the projects today are still being led by designs favouring open-cut



A recent open-cut project image provided from a project site in Ontario, courtesy of the Ontario Sewer & Watermain Construction Association.

solutions. However, the consulting industry does evaluate trenchless proposals and is awarding alternative trenchless when it is evaluated to have the lowest total installed cost.

"There are various reasons that one option may be more desirable than another," explained Dickson of WSP.

He advises his clients to consider the following:

Project objectives: Understanding client goals and overall objectives for the project is critical to establish the preferred renewal strategy.

Site constraints: Site constraints have the ability to preclude one option of renewal. Perhaps there is sensitive surface infrastructure that can't be disturbed or complex sub-surface conditions that will influence the preferred renewal approach.

Budget: Most of WSP's clients are municipalities who will budget for upcoming projects years in advance. It is important to understand which methods of renewal can be accommodated within their budget.

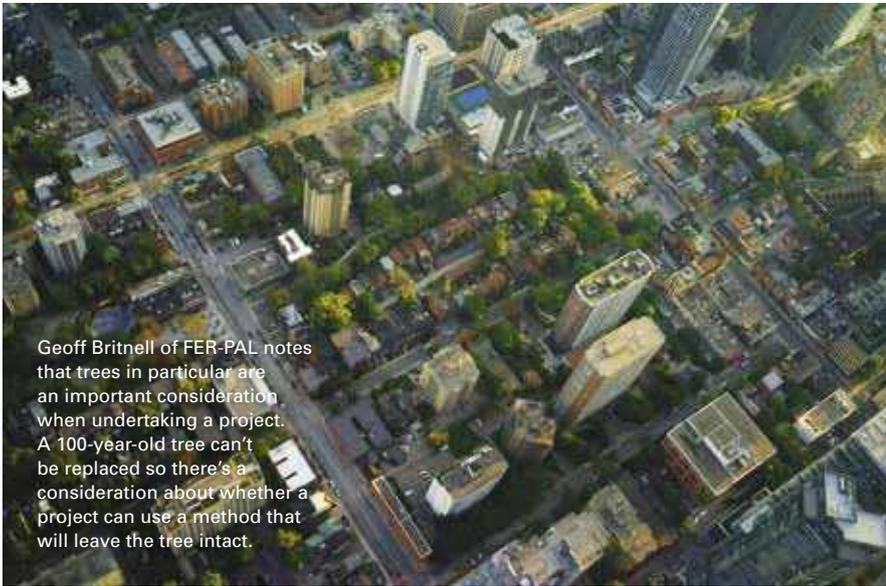
Schedule: A project may need to be completed within a certain timeframe, due to other upcoming work. Or perhaps the work has presented itself under an emergency situation, requiring immediate attention. This project constraint may make one or more options of renewal preferable.

Barry Kelly, a consultant with Assetic, an asset management software company, acknowledges that the decision-making process can be complicated and that it all depends on the project, and the balance of priorities involved.

"I'm seeing a trend that municipalities are getting better at looking beyond just that one project," said Kelly. "They're getting more information so they can make information-based decisions."

He points to the big picture that includes transportation projects, other infrastructure projects, and factors such as the growth of that area, the age of, and the conditions of the pipes.

David Crowder, a senior associate at RV Anderson, also notes that there a number of variables that need to be balanced. "Several variables are reviewed when



considering rehabilitation or replacement of a buried asset,” said Crowder. “This could include depth, diameter, age, water material, and watermain usage (industrial, residential, or hospital).”

“Depending on the diameter, pipe material, condition, and age of the watermain, we first consider what rehabilitation technologies are available to extend the life of the buried asset,” added Crowder. “We suggest that a desk top study be completed to determine if rehabilitation or open cut should be considered.”

As environmental awareness increases, trenchless can be an attractive option.

Geoff Britnell, business development manager at FER-PAL Infrastructure, added that there are direct and indirect costs to consider. The direct costs have to do with the financial savings of the projects.

“The indirect costs are really what we’re talking about when it comes to variables,” said Britnell. “That’s every other impact that can come from the project that isn’t necessarily financial. It could be trees, disruption to a neighbourhood, disruption to traffic, and disruption to business.”

While there don’t seem to be any easy answers, there are certainly a few key variables to consider.

It comes down to dollars and cents, according to Gregory Baird, president of The Water Finance Research Foundation. “Open cut is more expensive with the traffic and road replacement. But a rehab many times may not be feasible,” said Baird.

Geography is also a key variable when deciding on project strategies. Regionally, a big inhibitor seems to be geological conditions and the lack of knowledge of subsurface conditions. When dealing with rock, it drives cost up for both the contractor and the customers. However, in places such as the Greater Toronto Area, there are not as many geographic challenges, and most owners and regulators are aware and accepting of trenchless technologies.

In Halifax Regional Municipality, Halifax Water is using a combination of open-cut replacement and rehabilitation in the wastewater collection system work, but open-cut replacement is the main linear water infrastructure renewal method.

“Trenchless rehabilitation methods of non-structural cleaning and spray-on lining, structural lining, and non-structural pull-through liners have been used on occasion,” according to Jamie Hannam, director of engineering and information services for Halifax Water. “Conversely, trenchless CIPP is the predominant method utilized for gravity

sewer rehabilitation versus open cut.”

The key variables Hannam considers when deciding between using an open-cut versus a trenchless method include: the total project cost, the effectiveness of the solution (i.e., whether it re-establishes original design performance and estimated service life), and access to the infrastructure for construction (whether the pipe is accessible for open-cut). For example, pipes that are located under a highway or railway make trenchless solutions more enticing and affordable relative to open-cut options.

As environmental awareness increases, trenchless can be an attractive option. From no idling traffic to no cutting of trees, trenchless is becoming a more viable option as it is better understood. Along with this, the new methods of preparation and installation allow for less steps and complexity of the rehabilitation program.

Britnell of FER-PAL notes that trees in particular are an important consideration. A 100-year-old tree can’t be replaced so there’s a consideration about whether a project can use a method that will leave the tree intact.

“[Environmental considerations] haven’t necessarily played a strong role in the decision-making process yet, but I think it’s something we all recognize is coming relatively fast in the near future,” remarked Britnell. “That is, what is the environmental cost to do a project with open-cut versus CIPP or rehabilitation? A lot of it comes down to what’s above the watermain or utility you’re looking at replacing.”

Water Canada intends to take a closer look at this issue through a survey with environmental and engineering consultants across Canada to inquire about their current practices and opinions related to the management, design, and procurement of linear public sector water infrastructure in Canada. We will be reporting on the results in the next edition. Stay tuned. *wc*

Simran Chattha is editor of Water Canada magazine and Connie Vitello is editor of EnvironmentJournal.ca.

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Remembering Nick Reid

WHEN NICK REID passed away peacefully on March 17, 2021 the family lost a loving husband and father, Water Canada magazine lost a trusted advisor, and the entire water industry lost one of the good guys.

Nick was an important part of Water Canada's team. In 2016, he joined Actual Media, Water Canada's parent company, as a managing partner and took an active role with Actual Media's water-related publications and events, specifically Water Canada, the Water's Next Awards, and the Canadian Water Summit. Nick always enjoyed the company strategic retreats on Lake Erie.

Nick was the type of person you wanted to share time with and was one

of the sincerest people you could meet. His always calm, thoughtful, and optimistic outlook came with a fun and playful wit. Todd Latham, president of Actual Media, attended one of the two pandemic-reduced services held for Nick and was touched by the family's memories and fun stories, the special remarks from close friend and colleague Angela Murphy, and by the song that Nick's daughter Jessica wrote for him and performed.

There has been an outpouring of reflections on LinkedIn posts by his colleagues at Ryerson Urban Water, Ontario Water Works Association, and the Ontario Clean Water Agency and by others, including a video that Todd posted of his boyish excitement opening a new issue of

Water Canada. According to his son Graham, he opened Christmas presents the same way! Nick was a devoted family man and a positive advocate for clean water education and technology in Ontario. He was a generous and patient mentor and he was a friend to many. Rest in Peace Nick.

The memorial page for Nick's life reflections can be accessed at bit.ly/NickReidMemorialPage

The tribute for Nick on Ryerson Urban Water's website can be accessed at bit.ly/NickReidRUW

Contact Angela Murphy (angela.murphy@ryerson.ca) for information on a Ryerson scholarship being set up in Nick's name. wc

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APPOINTED



CORINNE LYNDS

Actual Media Inc., the parent company of Water Canada, announced that **Corinne Lynds** has joined the company as content director.

“Corinne brings a rare combination of B2B journalism and publishing expertise, as well as creative agency smarts and strategies,” said **Nick Krukowski**, vice president and publisher of Actual Media.

Lynds will be responsible for managing all editorial and content operations. She will oversee industry-leading content creation, curation, and delivery for readers, visitors, and followers of Actual Media’s print, digital, and experiential platforms across the water, infrastructure, and environment sectors.

In her previous role, Lynds worked with Motum B2B as a multi-platform editorial director and content marketing strategist, leading editorial teams to develop engaging content to educate and entertain niche audiences. She is an accomplished, results-oriented media specialist who creates strategic alliances with key industry partners to deliver engaging and market-specific content. She has also worked with leading publishing companies, including Annex Business Media and Rogers Publishing.



NOEL KERIN

The Walkerton Clean Water Centre (WCWC) has announced the appointment of Dr. **Noel Kerin** to its board of directors.

Dr. Kerin practices medicine in the fields of occupational

and environmental medicine. In this field he has worked with many of the toxic agents that affect water systems. He is the lead physician studying occupational diseases at General Electric (GE) and Ventra Plastics since 2004. The GE investigation is the largest worker toxicology study conducted in Canada, according to WCWC.

Dr. Kerin’s work in organizing national conferences in occupational and environmental medicine has allowed him to work with international experts in the fields of occupational and environmental health. He has firsthand knowledge of the results of industrial pollution of water in such places as Peterborough, where there was major pollution of the water basin of the Little Lake/Otonabee River system. These experiences have encouraged him to want to work further for our clean water.



KEALY DEDMAN

Kealy Dedman joined the Region of Peel as the commissioner of public works on March 29, 2021. In this role, Dedman joins the members of Peel’s Executive Leadership Team and will be responsible for overseeing the Region’s Public Works services.

Most recently, Dedman was the deputy chief administrative officer—infrastructure development and enterprise services—at the City of Guelph. She has extensive experience in engineering, transportation, and environmental services in the public sector.



MARIE-CLAUDE DUMAS

Marie-Claude Dumas has been named president and CEO of WSP in Canada.

Since joining WSP in January 2020, Dumas has served as global director of major projects and programs, executive market leader in Quebec, working closely with Canadian and global operations and leadership.

“As we have entered the last year of our strategic cycle, we are confident that Marie-Claude’s extensive technical background, combined with her track record in major project delivery, will set the foundation for sustained growth at WSP in Canada, in addition to capturing the benefits offered by the Golder acquisition,” said **Alexandre L’Heureux**, president and chief executive officer of WSP.



MITCH WEEGMAN

Mitch Weegman has been hired as the Ducks Unlimited Canada (DUC) Endowed Chair in Wetland and Waterfowl

Conservation at the University of Saskatchewan (USask).

Weegman, an avian ecologist, will teach and mentor USask students while delivering research that addresses some of the most pressing environmental issues of our time.

“Saskatchewan, and more broadly the Canadian prairies

 <p>Canadian Environmental & Engineering Executives Conference</p>	<p>SEP. 29 - OCT. 1, 2021</p> <p>Wosk Center for Dialogue</p> <p>Vancouver, B.C.</p>	<p>REGISTRATION IS NOW OPEN</p> <p>CE3C.CA</p>
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and parklands, are legendary for wetlands and waterfowl,” said Weegman, who will begin his role in USask’s Department of Biology on July 1, 2021. “Even as a kid, I read about and dreamed of visiting these landscapes. Launching the chair is the honour of my lifetime and I’m looking forward to getting started.”



ANGELA CLAYTON

Angela Clayton joins Infrastructure Ontario (IO) as the president of the project delivery team. Clayton is returning to IO after working

five years with one of IO’s partner companies—Plenary Americas. During her time with Plenary, she led the group charged with overseeing design, construction, operations, and maintenance of all Plenary buildings across North America.

“Angela’s expertise and influence are recognized across the industry,” according to **Michael Lindsay**, who previously held this role and was promoted to president and CEO of IO in the fall. “She has been a key member of the influential industry organization, the Future of Infrastructure Group, advising Infrastructure Minister, the Hon. Laurie Scott, on various industry issues, including IO’s evolution.”

A strong advocate for diversity in the industry, Clayton has been a member of the Women’s Infrastructure Network (WIN) for the past eight years and currently sits on the Toronto Chapter steering committee.



RAY BASSETT

The Canadian Construction Association (CCA) announced that **Ray Bassett** is the chair of the 2021-22 board of directors. Bassett is a 37-year veteran of the construction surety industry, having led both claims and underwriting practices for leading national surety companies in Canada. He is focused on improving collaboration and value among stakeholders in the construction industry.

Bassett joined the CCA Board of Directors in 2010, has chaired the Manufacturers, Suppliers & Services Council, as well as an executive committee focused on federal prompt payment, which was instrumental in having industry concerns and recommendations addressed in the *Federal Prompt Payment for Construction Work Act*.

In his address to members at the annual general meeting, Bassett articulated one of CCA’s advocacy focuses for the association over the next year: “[We need] a long-term federal infrastructure plan, that is evidence-based, and is better aligned with the needs and priorities of provincial and municipal governments, and has a clear and uncluttered funding mechanism—this will bring more public and private projects to the market in a more predictable flow,” said Bassett.

The CCA also thanks outgoing chair, **Joe Wrobel**, for his dedicated leadership.



NADIA TODOROVA

Nadia Todorova has been appointed executive director of the Residential and Civil Construction Alliance of Ontario (RCCAO), a leading industry advocate for infrastructure investment and labour management.

“On behalf of the directors of RCCAO, I would like to congratulate Nadia on her appointment as executive director,” said board chair **Peter Smith**. “She has been an integral part of our organization for almost three years now and has proven herself to be a tireless advocate for Infrastructure and issues that are important to Ontario’s construction industry and our many employees.”

Todorova had been interim executive director for the past several months and prior to that led government relations work for RCCAO for almost three years. She has extensive advocacy experience and is well-versed in the policy development process, having authored numerous reports in her previous roles as senior policy analyst with the Ontario Chamber of Commerce and policy analyst with the Ontario Road Builders’ Association. She has also worked as an economist for the Ontario Ministry of Infrastructure.

“Although the pandemic has created challenges, I see many opportunities for RCCAO’s growth and success. I look forward to leading RCCAO as it continues to make a significant positive impact on Ontario’s infrastructure agenda,” said Todorova. WC



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It is time for a definition of water tech that considers water across the entire water cycle.

A New Look at Water Technology

BY ALAN SHAPIRO

THE PAST TWO DECADES have seen the rapid rise of clean technology ('cleantech'), from the term's introduction in 2002 to an expected \$2.5 trillion global market by 2022. Defined by Natural Resources Canada (NRCan) as "any process, product, or service that reduces environmental impacts," cleantech encompasses a wide range of solutions across multiple sectors looking to support ambitious environmental and climate goals.

Alongside this trend, there is growing awareness of the existing and emerging challenges faced by engineered and natural water systems, particularly in response to climate change. In Canada, the federal government has launched two new high-profile initiatives—the Canada Water Agency and Blue Economy Strategy—to advance national conversations around the future of Canada's freshwater and ocean resources. The government also committed to ending all long-term drinking water advisories on First Nations reserves by March 2021, a goal which to date has not been met.

With the urgency of these challenges and the corresponding need for water solutions (some comfortably fitting within the cleantech definition and others less so), it's surprising to learn that no widely accepted definition of water technology ('water tech') currently exists. Organizations and initiatives such as the Government of the Netherlands and the UK's Water Innovation 2050 strategy have offered a range of 'water sector'-specific definitions. And somewhat

disappointingly, a Google search for 'water technology' treats the term as largely synonymous with 'water treatment.'

In a day and age when the scientific community has established water-related planetary boundaries around freshwater use and ocean acidification, and the international development community has set global Sustainable Development Goals around clean water and sanitation (SDG 6) and life below water (SDG 14), it is time for a definition of water tech that considers water across the entire water cycle.

Along with this new, broader scope, it's important to consider the social purpose that water technology serves. Globally, water tech must work to advance SDG 6: ensuring availability and sustainable management of water and sanitation for all. In Canada, it must support water equity for Indigenous, remote, and rural communities. And just as NRCan's definition of cleantech sets an aspirational goal of reducing environmental impacts, a definition of water tech must serve to inspire and propel a growing ecosystem of innovators and changemakers rather than constrain water solutions within a rigid box.

So let's give it a try. ***Water technology or water tech refers to processes, products, and services that support sustainable and equitable water quality, quantity, supply, and management across the entire water cycle, as well as the interaction and integration of water with other human and natural systems.*** Building on this, water innovation refers to the development

and implementation of novel ideas, processes, and systems to advance water needs and challenges across all sectors.

While this definition is only a starting point, it acknowledges the more than 600 organizations that make up Canada's water technology ecosystem (along with the thousands of water technology users and stakeholders they serve). The water technology ecosystem was mapped through a recent collaboration between Foresight Cleantech Accelerator Centre, the International Institute for Sustainable Development (IISD), and Aqua Forum. Some of these organizations have traditionally been considered part of the 'water sector' (e.g., municipal utilities), while many more have not (e.g., lithium brine mining start-up Summit Nanotech or aquaculture technology start-up AquaFort AI).

Canada's rising tide of innovative water solutions offers an opportunity to build and support a home-grown, sustainable, and equitable ecosystem of organizations working collaboratively to meet the world's most pressing water challenges. So let's define water technology on our own terms, and let's set a high bar to propel water innovation through the coming decade and beyond. **wc**

Alan Shapiro is the director of waterNEXT, Foresight Cleantech Accelerator Centre's new Pan-Canada water technology ecosystem initiative, and principal at Shapiro & Company. You can find him on Twitter @watercomm.

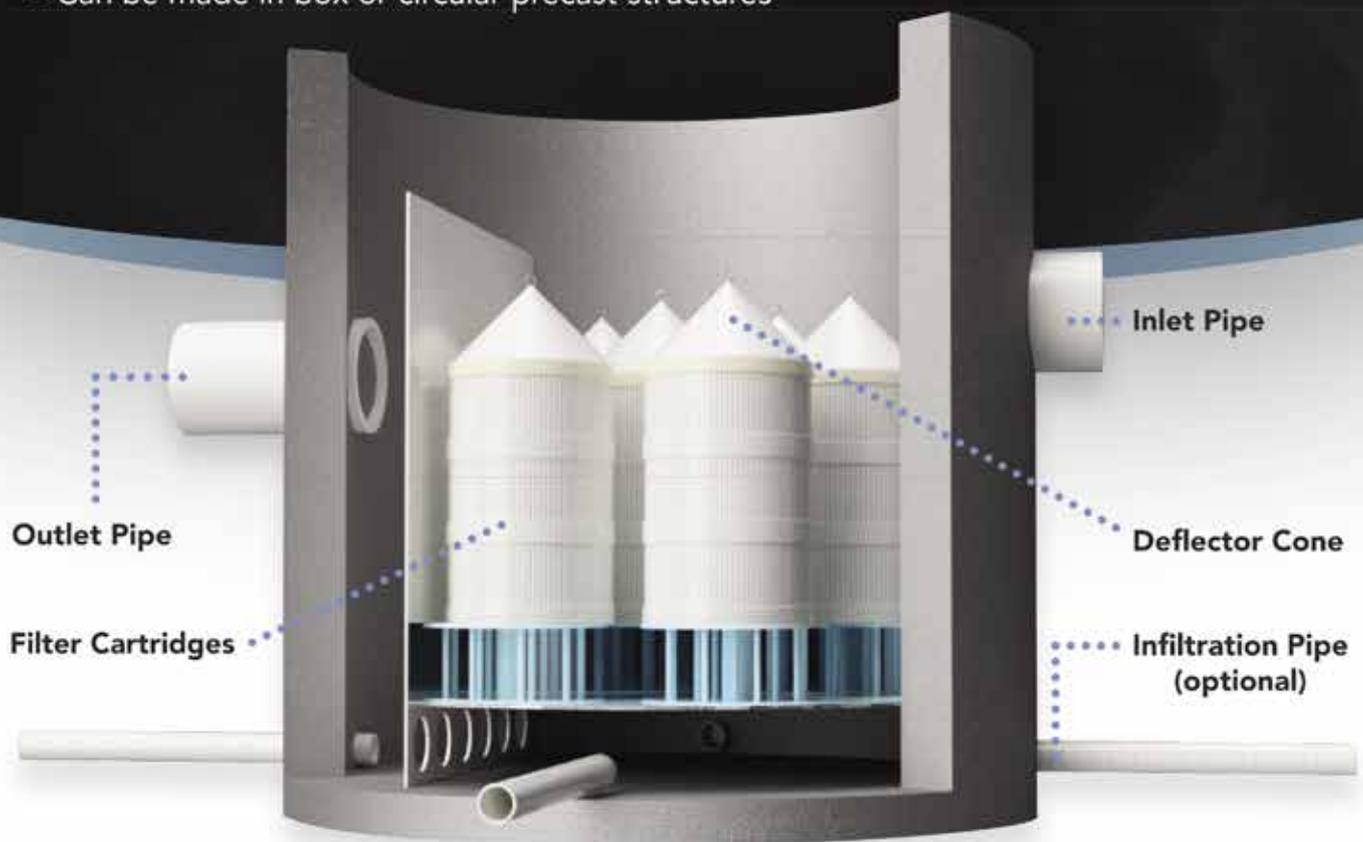
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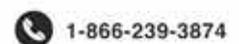
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