

WATER CANADA

CONDITIONS UNKNOWN

**Capital planning
in an era of
climate change**

**Green Bonds
Go Blue**

**Trade
Opportunities
with the U.S.**

**Smarter
Procurement**





THE RIGHT MIXER
FOR YOUR
PROJECT
EQUALS OPTIMAL
RESULTS.
LET'S SOLVE
WATER.

At Xylem, we understand how crucial it is to have the right tools for your job. With over 200,000 mixers installed worldwide, you can rely on our expertise to not only deliver, but help you determine the most effective, efficient mixer for your specific process.

Our Flygt submersible mixers, along with our jet mixers are all designed to capitalize on the tank conditions in your facility to achieve maximum results.

Explore our complete mixer offering, suitable for both municipal and industrial jobs, at www.flygt.com.

CONVEYANCE

8 Intelligent Asset Management

Making good decisions with the tools available.

BY **TONY ANDREWS**

DRINKING WATER

14 Valued Assets

The case for municipal user fees to cover the private and social costs of our water.

BY **CHRISTOPHER RAGAN AND JONATHAN ARNOLD**

STORMWATER

20 Life Flows On

Measuring biodiversity in urban streams.

BY **MARY TRUDEAU**

WASTEWATER

24 High Standard

Optimizing asset management through environmental management standards.

BY **EDGAR TOVILLA**

WATER RESOURCES

30 Transboundary Troubles

Mining company looks to overcome selenium challenge.

BY **SAUL CHERNOS**

FEATURES

10 Planning for the Unknown

Factoring climate change into asset management strategies.

BY **EVE KRAKOW**

18 Green Bonds See Blue

How water projects are helping to tackle climate change.

BY **TED CHAPMAN**



10



18



29



30



42

26 Free Flow

Continental access is key to Canadian cleantech success.

BY **JEFF SANFORD**

29 Cycle 150

Connecting communities to the coast through the Great Lakes Waterfront Trail.

BY **KATHERINE BALPATAKY**

34 Wave of Opportunity

Establishing coastal resilience in the face of climate change is a tremendous challenge, but there are equally big financial tools to get there.

BY **KATHERINE BALPATAKY**

COLUMNS

17 LIQUID ASSETS

An outcomes-based venture capital solution to water challenges.

BY **PAUL RICHARDSON**

36 RULES & REGS

The need for sustainable funding in water and wastewater.

BY **ROBERT HALLER**

42 H2OPINION

Balancing Canada's interests in the Columbia River Treaty.

BY **JON FENNELL**

DEPARTMENTS

5 Editor's Note

Unprecedented Response

6 Front

NAFTA, Sewage
Bypass Reporting Act

38 People & Events

Jobs, awards, contracts, and the latest event coverage.



WSP

Question today
Imagine tomorrow
Create for the future

At WSP, that means creating innovative solutions to the challenges the future will bring, while seizing opportunities to safeguard and protect precious water resources.

What if we can?

wsp.com

EDITOR

Katherine Balpataky

PUBLISHER

Todd Latham

ASSOCIATE PUBLISHER

Jane Buckland

ART DIRECTOR & DESIGNER

Donna Endacott

ASSOCIATE EDITOR

Andrew Macklin

CONTENT AND MARKETING MANAGER

Todd Westcott

CONTRIBUTING WRITERS

Tony Andrews, Jonathan Arnold, Ted Chapman, Saul Chernos, Jon Fennell, Robert Haller, Eve Krakow, Christopher Ragan, Paul Richardson, Jeff Sanford, Edgar Tovilla, Mary Trudeau, Krytyn Tully

ADVERTISING

Jane Buckland jane@actualmedia.ca
Todd Latham todd@actualmedia.ca

ADVISORS

Nick Reid, James Sbrolla

WATER AMBASSADOR

Lee Scarlett



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

ACTUAL MEDIA INC.

147 Spadina Avenue, Unit 208
Toronto, ON, Canada M5V 2L7
Phone: 416-444-5842

Subscription/customer services:
416-444-5842 ext. 211

Water Canada subscriptions are available for \$39.95/year or \$64.95/two years and include the annual Buyer's Guide issue.

©2017 Actual Media Inc. All rights reserved.
The contents of this publication may not be reproduced by any means in whole or in part, without prior written consent from the publisher.

Printed in Canada.



Undeliverable mail return to:
147 Spadina Avenue, Unit 208
Toronto, ON, Canada M5V 2L7
Canadian Publications Mail Product
Sales Agreement 40854046
ISSN 1715-670X

Proud member of:

Canadian Association on Water Quality
Canadian Water Resources Association
Ontario Ground Water Association
Water Environment Association of Ontario
Water Environment Federation



Unprecedented Response

BY KATHERINE BALPATAKY

IT'S NOT A RECORD that any community would wish to hold. "This event is unprecedented and all impacts are unknown and beyond anything experienced," stated the U.S. National Weather Center via Twitter. Harvey, backed by a warming Gulf of Mexico, has unleashed rainfall so heavy, so devastating that meteorologists cannot even put a probability on it—out there in the 99.999 percentile.

At the time of writing, the U.S. National Hurricane Center has reported that isolated storm totals would reach 50 inches (127 centimetres) in the Greater Houston Area. It's not the kind of extreme weather event that can really be planned for. It does, however, move the goal post on what's possible in a warming climate.

Canada's share of extreme weather and water events have been no less concerning. According to Catastrophe Indices and Quantification (CatIQ), insured damage for 2016 topped \$4.9 billion. In 2016, the Insurance Bureau of Canada, with support from Natural Resources Canada, commissioned the Green Analytics Corporation and Ontario Centre for Climate Impacts and Adaptation Resources to conduct a study on what the future might hold for Canadian communities as they manage weather extremes. The findings of the study highlighted the need to increase infrastructure investments now to reduce future costs. But, it's not just a matter of increasing investment—investments must be made more wisely, considering

the measures necessary to reduce climate change risks on a spatial and temporal scale broader than has ever before been considered.

In this issue of Water Canada, we explore options and best practices for improving water project and green infrastructure finance. This includes intelligent asset management tools (page 8), municipal user fees (page 14), impact investing (page 17), green bonds (page 18), and ideas on how to leverage the new federal infrastructure bank for increased coastal resilience (page 35). As Canada embarks on the second round of negotiations with the U.S. pertaining to the North American Free Trade Agreement, we are also keeping a close eye on how water cleantech, and more broadly, water resources, may be affected (pages 6, 26). You can sign up for our Droplet newsletter at watercanada.net to stay abreast of this news.

At the end of September, Water Canada will join a host of other Canadian companies who will travel to Chicago for WEFTEC. This is an annual event for us, and we go in support of Canadian business leaders who are seeking out new partnerships with American utilities. Canada, with the support of our trade officers, puts a very strong foot forward at WEFTEC. As always, we are proud to highlight the success stories that flow from such efforts, as we have done on page 26, looking at Ostara's success in leading us closer to a circular economy. Bravo!

Last word: our thoughts are with the families of Texas.



All back issues of Water Canada are available for download at library.actualmedia.ca

Contact Katherine at

416-444-5842 ext. 116 or email katherine@watercanada.net

@CanadianWater WaterCanada



CHRISTOPHER RAGAN
Christopher is an associate professor of economics at McGill University, chair of Canada's Ecofiscal Commission, and a member of the federal government's Advisory Council on Economic Growth.
PG 14



JONATHAN ARNOLD
Jonathan is a research associate with Canada's Ecofiscal Commission.
PG 14



MARY TRUDEAU
Mary is a seasonal lecturer at the University of Ottawa's Institute of the Environment.
PG 20

ABOUT THE COVER

Water infrastructure operates in a dynamic environment. Therefore, asset management and capital planning must consider estimates of short, medium, and long-term variability that can be expected over the life of an asset. Engineers and asset managers use design codes and studies to estimate the magnitude and likelihood of extreme weather events, those codes and studies are based on historical data. What municipalities are finding is that these historical precedents are not reflective of the new norm resulting from climate change. Thus is the challenge facing public sector asset management: designing and budgeting for the unknown.

NEXT ISSUE: NOVEMBER/DECEMBER

- **The economic impact of protecting the Great Lakes**
- **Chloride rising**
- **Innovations in nutrient management**

PLUS Regular columns, including Rules & Regs, Groundbreakers, Fine Print, and Liquid Assets.

To inquire about advertising, contact jane@actualmedia.ca

FRONT



Foreign Affairs Minister Chrystia Freeland talks to the media after day one of the NAFTA talks in Washington, D.C., Wednesday, Aug. 16, 2017.

Water at the NAFTA Table

BY TODD WESTCOTT

AS THE FIRST ROUND of NAFTA negotiations wrap-up, there have been no signs that water is on Minister Chrystia Freeland's agenda. Ralph Pentland shared his perspectives on how we might expect water to come to the table.

Currently a member of the Forum for Leadership on Water (FLOW), Ralph Pentland was the director of the Water Planning and Management branch of Environment Canada from 1978 to 1991. Since then, Pentland has had ongoing involvement in efforts to manage transboundary waters. Water Canada asked him how Canada's water might come to the NAFTA trade table.

"During the free trade debates of 1987–88, the Mulroney government tried to separate the water export controversy from free trade more generally by introducing an Act prohibiting water export," said Pentland. He helped the Department of Justice draft said Act, but it was never passed.

In the first round of NAFTA negotiations, the primary focus was on auto parts, pharmaceuticals, and labour. As negotiations progressed, "officials from all three countries continued to engage a wide range of stakeholders, including representatives of the private sector; industry associations; civil society, including labor groups; legislative representatives; and state/provincial officials," said a statement released by Global Affairs Canada.

"NAFTA does prevent restrictions on the exportation of goods (like bottled water.) But, it does not prevent restrictions on the exportation of water in its natural state," said Pentland. In addition, NAFTA does explicitly restrict any actions that could harm the integrity of the environment. "The current federal legislation does

not focus on water export per se, but instead prohibits the diversion of water into any stream crossing the border. The primary purpose is to protect the ecological integrity of watersheds, but it incidentally prevents any significant water export." Consequently, NAFTA would not supersede federal law preventing bulk water diversion.

"Looking ahead to embryonic NAFTA negotiations, it will be important to avoid one: water in its natural state somehow being redefined as a good; and two: any change that would limit the ability of individual nations from protecting their aquatic environments," said Pentland.

In 2010, Pentland chaired the Canadian Water Issues Council at the University of Toronto, "which proposed model legislation to prevent exports from Canada by banning transfers between major river basins." Thereafter, he worked with government officials to promote legislation that would reflect this type of ban.

There's an urgency behind stronger regulation to prevent large groundwater removals. "In many regions, Canada's waters are already under severe stress, and several of those stresses are escalating quickly with climate change. Removal of significant amounts of water from natural basins would reduce the resilience of those systems and their capacity to cope with future, unpredictable stresses."

The next round of negotiations is scheduled for September 1–5 in Mexico City. **WC**



Todd Westcott is Water Canada's content and marketing manager.

More than 300 million litres of sewage was discharged from the Niagara Falls wastewater treatment plant as a result of heavy rainfalls on June 1, 2017.



Sewage Bypass Reporting Act passes first reading in Ontario

BY KRYSTYN TULLY

ON MAY 31, the *Sewage Bypass Reporting Act*, 2017 passed first reading in the Ontario Legislature. The bill amends the *Ontario Water Resources Act* to ensure that information about sewage bypasses is communicated to the general public.

The Act comes at a time when more people than ever before are turning to the water for recreation, social life, and access to nature. The number of Ontarians visiting beaches in Ontario nearly doubled in the last decade, for example.

Unfortunately, when people get to the water's edge, they are still finding sewage, debris, and "no swimming signs" marring their coastline. It's no surprise that nearly 70 per cent of Canadians believe that deteriorating sewage infrastructure will become a "more urgent" issue in the near future (Source: 2017 RBC Canadian Water Attitudes Study).

Sewage treatment plant operators in Ontario already report bypasses to the Ministry of the Environment and Climate Change. The Act requires that the Ministry, in turn, alert the

public. This ensures that Ontario every community enjoys the same level of access to information. To improve the Act, two alerts should be required: one basic, immediate alert that tells the public when a bypass has started and a more detailed alert after it is over with the length of the bypass, the volume of untreated or partially treated sewage released during the bypass, and the impact on the environment.

The Act won't solve Ontario's sewage infrastructure problems, but it will ensure that people are told about sewage bypasses as they happen. This gives the public the information they need to protect their health. It also makes people more informed about the state of their local wastewater infrastructure and the need for investment in proper capture and treatment of sewage. **WC**



Krystyn Tully is the vice president of Swim Drink Fish Canada.

CORRECTIONS AND OMISSIONS



On page 33 of the July/August issue, we mistakenly identified one of the founders of Lystek, Dr. Ajay Singh, as Jim Belcastro. We apologize for this error.

On page 40, we listed the organizing committee members who were responsible for the Canadian Centre for Inland Waters' open house event. We failed to acknowledge the contributions of Laurier Thibeault, Holly Foerter, and Hilary Prince who are employees of Environment Canada and were instrumental in this event.

FRONT

Online at
WATERCANADA.NET



BLOG: Travelling AquaVan 150 connects communities to waterways.
bit.ly/AquaVan



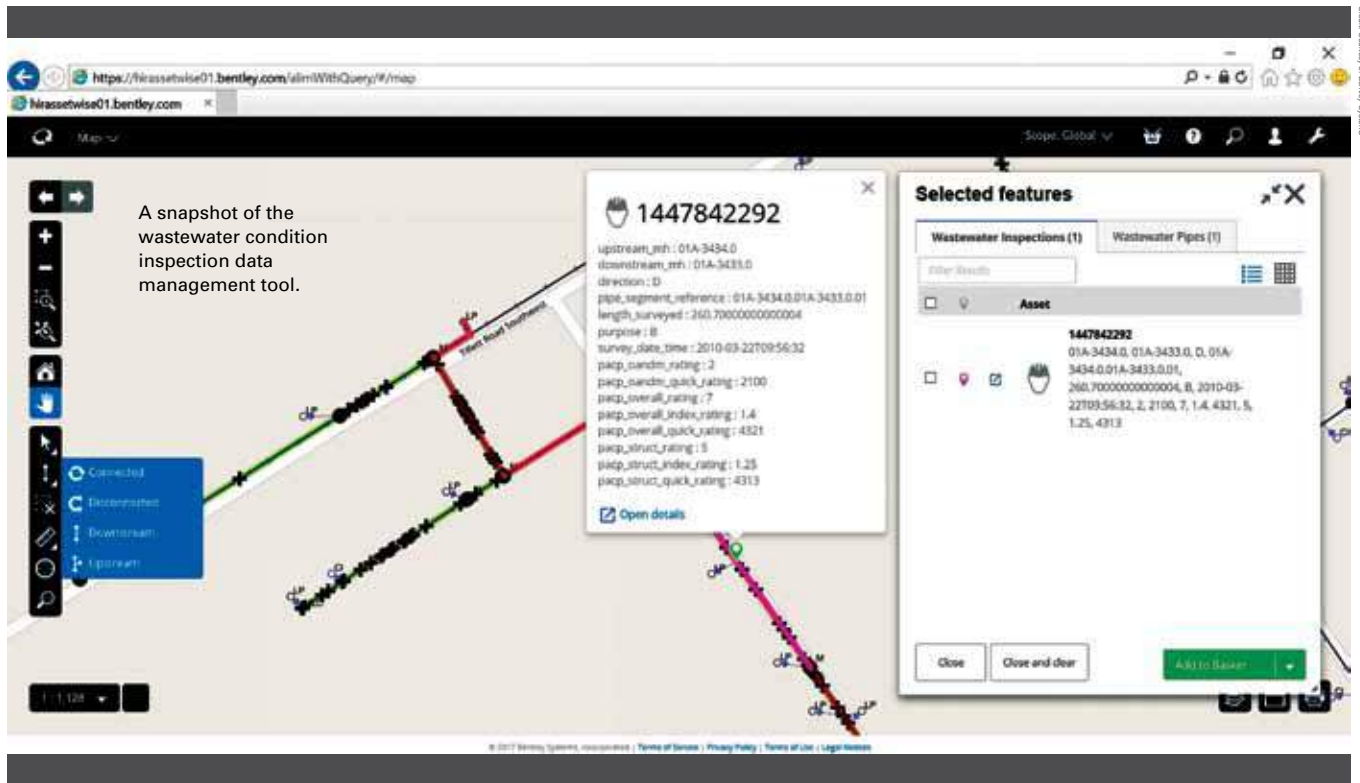
NEWS: Funding for Treaty-based Land and Water Boards in NWT.
bit.ly/WaterBoardFund



INFOGRAPHIC: The founder of Waterlix has created a map that shows the costs of water loss.
bit.ly/WaterLossMap



NEWS: Manitoba launches consultations on a new partnership with farmers to create ecological goods and services. bit.ly/GROWman



Intelligent Asset Management

Making good decisions with the tools available. BY TONY ANDREWS

PIPE DETERIORATION AND FAILURE

is a growing concern of water service providers across the globe. Since pipes are predominantly underground, water and wastewater assets suffer from being out of sight, and out of mind. Consequently, it is a challenge for water and wastewater network service providers to have a complete understanding of the assets they own, where they are located, and their assets' current condition. The ramifications can be costly. For example, a sewer pipe that is located deep below a major road intersection has a much higher consequence of failure compared to a shallow sewer pipe located beneath a suburban side road.

Relevant documents, images, and videos are generally not readily accessible across an organization because of poor information management, and data is filed away in separate systems. That

data is often unmanaged, lacks quality control, and most problematically, there is no association with the inspected asset in an organization's geographic information system (GIS).

The five I's

Intelligent asset lifecycle management systems solve this age-old problem, and the economic benefits for utilities are significant. The fundamental principles associated with intelligent asset lifecycle management systems for water and wastewater networks are captured within "the five I's."

1 Infrastructure: Know what you own and where it is located.

- This includes defining the asset register and tracking asset class libraries, data standards, and all associated documents.

2 Inspections: Know the condition and remaining life.

- Condition assessment includes CCTV inspections and manhole inspections.
- Mapping/asset capture/locating surveys includes utilizing manhole surveys, GPS, CCTV, and visual surveys.
- Inflow/infiltration tests include dye tests, smoke tests, flow monitoring/isolation, and I/I property tests.

3 Incident failures: Know how it is performing and how it fails.

- This typically includes pollution combined sewage overflow (CSO) and sanitary sewer overflow (SSO), flooding, blockages, collapses, odour, and customer complaints.

4 Interventions: Know what you are going to do to improve performance.

- Proactively plan and execute the right maintenance at the right time to avoid failures, such as pipe cleaning (e.g., jetting), pipe repairs (e.g., cure-in-place liners), and manhole repairs.

5 Inhabitants: Know what service you deliver to your customers.

- Know how the investment and activities help improve service (e.g., reduction in basement flooding, etc.).

Maintaining and expanding large-scale and widely dispersed assets that fail at different rates, for different reasons, and for which the consequences (impact) of the failure varies, is a challenge. But new solutions help utilities make risk-based decisions with a comprehensive system for monitoring, managing, and analyzing the asset condition and performance data and information.

The most important decision that a water/wastewater owner-operator must make is regarding what's worth doing and when. The latter involves a compromise between the cost of a proposed action and the reason for doing it, or the consequence of not doing it. Making good decisions is at the heart of good management and involves being effective by taking the right actions and being efficient by performing those actions capably. Success or failure in decision-making in most cases rests with the former—choosing to perform the right action, for the right reason, and at the right time. Achieving success in decision making is difficult without quality and reliable data on location, condition, and performance; and intelligent asset lifecycle management systems make it possible for the next century. *wc*



Tony Andrews is the principal product manager of water and wastewater of Bentley Systems.

FER-PAL
INFRASTRUCTURE

FER-PAL has been working in the background since 1986 helping to provide communities like yours with clean water using technologies that are sustainable and eco-friendly.

FER-PAL. HELPING YOUR COMMUNITY HELP YOU.

Learn more about us and our projects at youtube.com/user/ferpalinfrastructure

Stay ahead of the curve with FER-PAL

[f](https://www.facebook.com/ferpalinfrastructure) [in](https://www.linkedin.com/company/ferpalinfrastructure) [t](https://twitter.com/ferpalinfrastructure) [You Tube](https://www.youtube.com/user/ferpalinfrastructure)

e: info@ferpalinfrastructure.com ferpalinfrastructure.com

TMIG APPOINTS CHIEF EXECUTIVE OFFICER

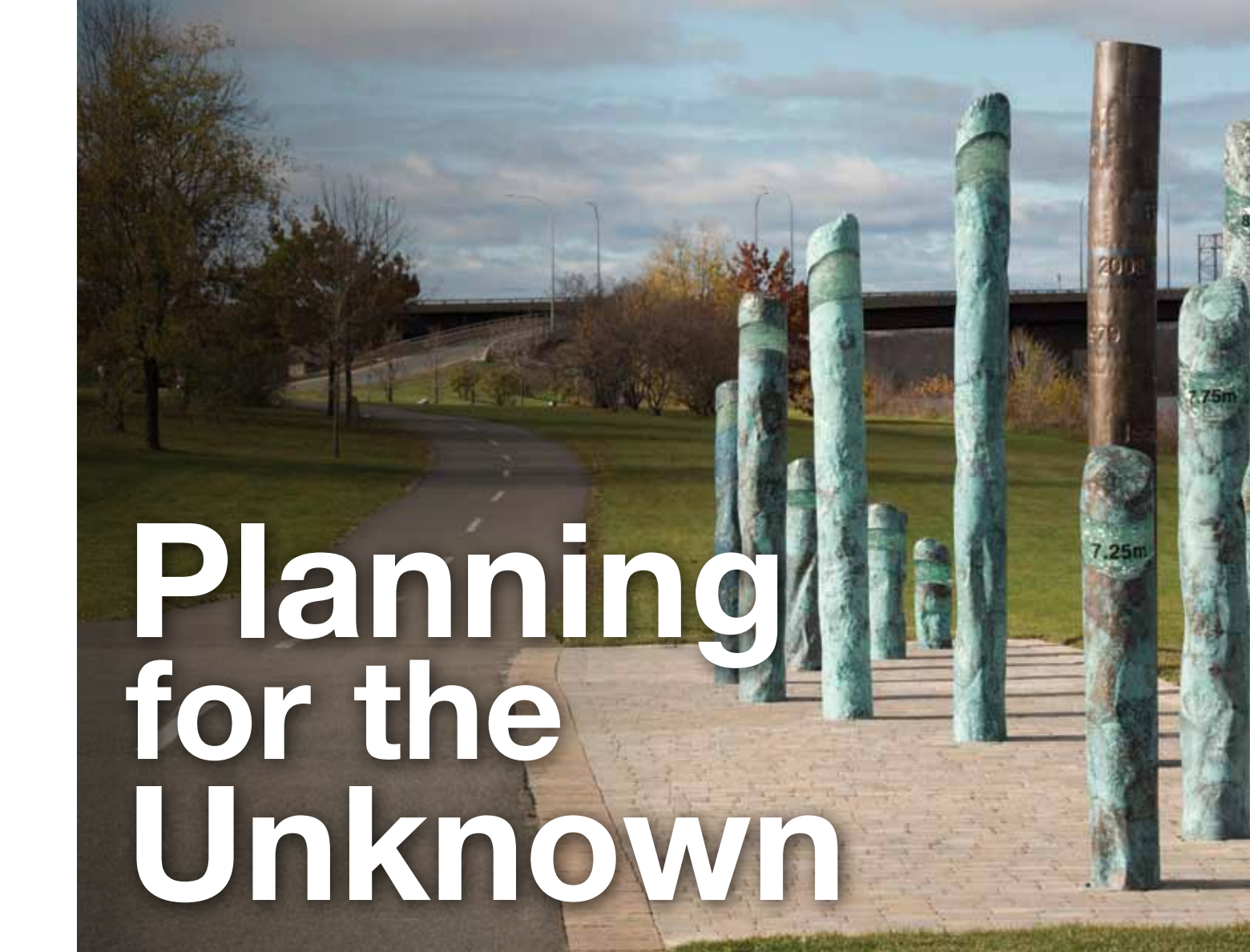
The Municipal Infrastructure Group Ltd. (TMIG) is pleased to announce the appointment of Mr. Dale Dionne to the position of Chief Executive Officer. In this position, Dale will lead TMIG into our next phase of growth, broadening our client base and service sectors, while nurturing the relationships with existing clients and ensuring TMIG continues to deliver the exceptional level of service that we are proudly known for.

"I am pleased to congratulate Dale on his well-deserved promotion to CEO of our growing firm," said David Scott, Founding Partner. "Dale's leadership and management style fits perfectly with the culture created within our organization and our clients will benefit greatly from his attention to detail with regard to quality project delivery." Dale assumed responsibilities on June 26, 2017.

TMIG is a privately-owned, client-focused engineering consulting company with more than 90 professionals and staff working from both TMIG's head office in Vaughan and satellite office in Whitby. The firm has experience in project management, class environmental assessments, engineering design, construction management / contract administration, and public consultation. For more information, visit www.tmig.ca.

"I am excited and very grateful to have been selected for this opportunity. Over the years, TMIG has been able to grow steadily, shaping a solid base to build upon. I look forward to leading TMIG to even greater things."
— Dale Dionne, P.Eng., MBA, PMP

TMIG



Planning for the Unknown

Factoring climate change into asset management strategies.

BY EVE KRAKOW

A FEW WINTERS AGO, the City of Fredericton was hit by a deep cold spell, coupled with exceptionally heavy snowfall. Not only did this tax snowplowing operations, but its water and sewer system experienced a record number of freeze-ups. “Crews were out all winter thawing frozen pipes,” recalled Sean Lee, assistant director of engineering and operations. “We often talk about climate impacts in terms of things getting warmer. This was a bit of an eye-opener.”

It just goes to show how many unknowns there are with climate change. Although this particular issue hasn’t (yet) affected the city’s infrastructure renewal plans, other aspects of climate change have. In fact, the City of Fredericton is one of the municipalities leading the way when it comes to integrating

climate change concerns into asset management planning.

Asset management involves looking at infrastructure holistically, over its full life cycle, in terms of the services it provides. Part of this process is looking at the risks your infrastructure faces, in order to decide on what investments to make and when. From this perspective, the effects of climate change are just another set of data to be factored in.

It’s not about trying to replace all your infrastructure, managers explain, but about determining priorities and flagging vulnerable aspects so that when it comes time to do retrofits, upgrades, or replacements, those adaptive changes are part of the plan.

City of Fredericton

Built at the confluence of the Saint

John and Nashwaak rivers, the City of Fredericton is subject to river flooding, flooding from intense rainfall events, and may eventually be affected by tide changes from sea level rise.

Like many cities, its infrastructure is old, but Fredericton has a strong infrastructure renewal plan. “We have a pretty good understanding of the age, condition, and life cycle of our assets, and we have a plan to move ahead to reduce our overall infrastructure debt over the next twenty years,” said Lee. “As part of that, in trying to get the best value for the residents of our city, we add in a climate change filter.”

For example, over the last 15–20 years the city has been increasing the size of all its major culverts. They’ve also raised key sections of roadway to keep important transportation links open during spring



All photos courtesy of the City of Fredericton

Left: Flood marker art installed on the City of Fredericton's riverfront shows elevations of past floods of record.

Right: The same markers during April 2017 spring flooding.

When we talk about resilience from an asset management perspective, we look at the level of service that will be maintained during an extreme event and how fast it will recover afterward.

flooding, and raised the minimum elevation for new housing.

The key to getting things done however, has been integrating the work into long-term strategic plans, with all departments working together. Alicia Keating, assistant director of finance and administration, believes strength lies in this holistic approach. "We have financial plans to target our infrastructure renewal, and as we do that, we're planning ahead to make sure we incorporate aspects of climate change, changes in demographics, in the types of buildings, *et cetera*."

While climate change holds many unknowns, various models and tools are being developed. For example, the City of Fredericton worked with the Insurance Bureau of Canada (IBC) and the Western University to create

forward-looking rainfall Intensity-Duration-Frequency curves specific to Fredericton. The city has also worked with the INTACT Centre on Climate Adaptation and the University of Waterloo on the development of a national standard for Flood Resilient Subdivisions in Canada.

Fredericton is also one of three original communities that piloted the Municipal Risk Assessment Tool. Originally developed by IBC in collaboration with Tesera Systems, the application uses analytics and municipal and climate data to identify areas and infrastructure at risk from climate change. Fredericton continues to work with Tesera Systems as the firm seeks to develop a more advanced version that will incorporate asset management components to help municipalities identify priorities and

make cost-effective decisions.

Assessing vulnerabilities

Guy Félio is a senior advisor for asset management solutions and infrastructure resilience at Stantec Consulting and a member of the CWWA National Climate Change Committee.

"When we talk about resilience, from an asset management perspective, we look at the level of service that will be maintained during an extreme event and how fast it will recover afterward," he explained. In the asset management process, a municipality identifies its level of service objectives. "Then you establish the risks of partially or completely losing that service and how to protect it; that helps prioritize where to invest."

Traditionally, risk has been associated primarily with deteriorating



As part of its infrastructure renewal program, the City of Fredericton has been upsizing all of its major culverts to prepare for more frequent major storm events. This is a photo of a 1925 era pipe (in the foreground) culvert that is being replaced this year by two pipes, to meet the 1.2 times 1:100 year criteria essentially more than doubling the size of the pipe capacity.

infrastructure. Climate change adds a new set of hazards—whether it's stronger winds, sea level rise, changing tides, more frequent and higher intensity rainfall, or more wild fires.

For identifying how infrastructure will be affected by climate change, Félío is a strong advocate of the Public Infrastructure Engineering Vulnerability Committee Protocol developed by Engineers Canada in 2007. "It can be applied to any type of infrastructure, in any size community, at the system level or asset level. You don't get bogged down in the process, because you're missing climate data."

Last year, Félío worked with Elmer Lickers of the Ontario First Nations Technical Services Corporation (OFNTSC) to do a high-level risk screening of the water and wastewater infrastructure for the Mohawk Council of Akwesasne near Cornwall, Ont. "Using the PIEVC assessment, we found that if the infrastructure is maintained in a

state of good repair, they could mitigate about 25 per cent of extreme risks." MCA indicated that the assessment provided recommendations for adjustments to design, operations and maintenance that will help preserve their vital infrastructure. Félío is now working with OFNTSC to develop a First Nations PIEVC/Asset Management toolkit.

City of Ottawa

Like Fredericton, the City of Ottawa does not have a stand-alone department for climate change adaptation, but integrates these concerns across all departments. Hiran Sandanayake is a senior engineer in water resources and asset management. "We've always had to think of climate within water resources, and there's always been uncertainty," he said. "Adding climate change to what we do is just an incremental addition."

Over the past few years, the city has been conducting studies to better understand flood risks in different neighbourhoods.

Sandanayake, who also chairs the CWWA Climate Change Committee, is now trying to leverage the information obtained for specific neighbourhoods to fill out flood-risk information city wide, in order to determine high-risk areas and set priorities for decision-making. He's hoping to build a model that other cities can use as well.

Last year, Ottawa used the PIEVC Protocol to analyze a series of culverts that had been identified as high risk. The analysis also enhanced the city's asset management process by allowing them to see impacts of extreme weather events that they might have otherwise overlooked. "Sometimes if you break things up too much into silos, you miss the big picture," said Sandanayake.

Ultimately, says Sandanayake, "you can't design everything for every possibility. The tools of asset management are good for dealing with risk and adaptation. What are the highest risks? What risks are acceptable? What

can we afford? What's the right time to do it so we can stretch those dollars as far as possible?"

Natural assets

In some cases, natural resources are far more resilient than man-made structures. This is just one of the reasons that the Town of Gibsons, British Columbia, (population 4,400) has been attracting attention for its incorporation of natural assets into its asset management planning.

"We see natural capital as the bridge between climate change and asset management," said Emanuel Machado, chief administrative officer for the Town of Gibsons.

As part of its asset management planning, Gibsons considers the services provided by natural assets, such as forests, aquifers, creeks, wetlands, and foreshores. For example, while the Gibsons aquifer supplies the town's drinking water, creeks and woodlands

convey and treat rain water run-off, and the foreshore provides a vital seawall to protect the waterfront from storm surges and sea level rise.

Part of the process to gain a thorough understanding of the value provided by its eco-assets involves putting dollar figures to these services and looking at what it would cost to replace the natural asset with an engineered alternative if it were degraded or destroyed. To do this, the town has been using open-source modelling software called Invest, developed by the U.S.-based Natural Capital Coalition and used under license by the David Suzuki Foundation.

Equipped with this formation, the town will be able to determine what actions, timelines, and costs are needed to properly maintain its natural assets and include them in its asset management plan to ensure that sufficient funds are in place to do so. Ultimately, the town seeks to manage risks and provide services at lower cost.

Gibsons has also partnered with the David Suzuki Foundation, Sustainable Prosperity, and Brooke and Associates Consulting to create a framework for other municipalities to follow. Five cities are currently taking part in this project through the Municipal Natural Assets Initiative.

If there's one common piece of advice from these municipalities, it's don't wait to start integrating climate change concerns into your planning. "There's enough data out there," said Fredericton's Alicia Keating. "You can't wait for a perfect delineation of what's to come, or the perfect time. You have to just jump in and start." WC



Eve Krakow is an Ottawa-based freelancer and regular contributor to Water Canada.

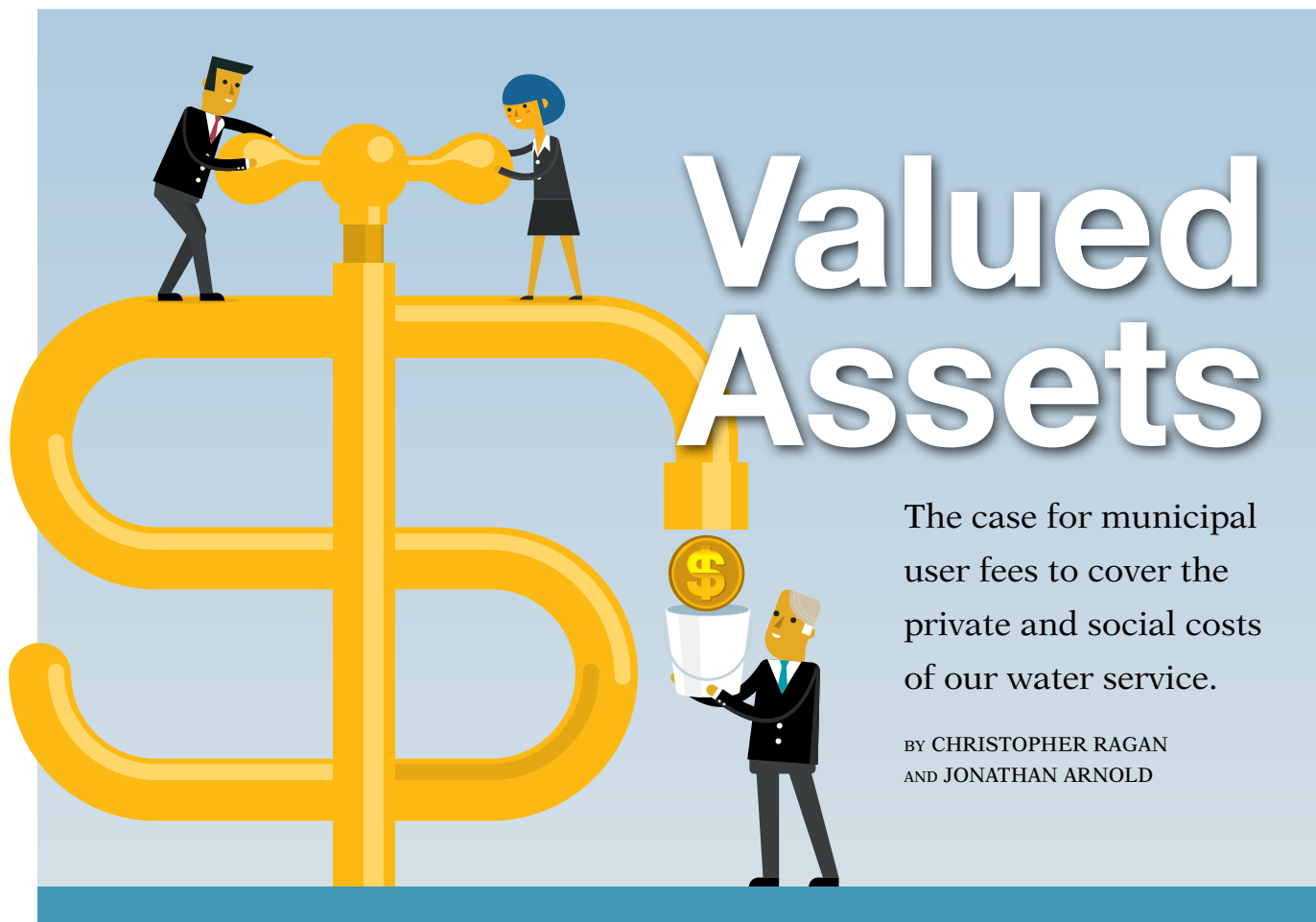


An Exceptional Blend

Cole Engineering is thrilled to welcome XCG's water consultancy and training business to our family. By combining XCG's industry-renowned experts in water, wastewater and stormwater with our existing team of planners and engineers we have further enhanced Cole's position as Ontario's leader in water and wastewater consulting.

Moving forward as one.

www.ColeEngineering.ca



Valued Assets

The case for municipal user fees to cover the private and social costs of our water service.

BY CHRISTOPHER RAGAN
AND JONATHAN ARNOLD

BY INTERNATIONAL STANDARDS,

Canadians pay very low prices for water services. This encourages wasteful consumption and leaves water utilities with insufficient revenue to keep infrastructure in good repair. These challenges also pose a direct threat to our water quality. Getting the prices right—through well-designed user fees—is critical to ensuring that our municipal water and wastewater systems are financially and environmentally sustainable.

An entire spectrum of costs

Charging the right price for water starts with aiming for full-cost recovery. Although the concept of full-cost recovery appears straightforward, it's not always clear which costs are being considered. Due to evolving service needs of municipalities, improved accounting methods, and a growing awareness of environmental impacts, the definition of full-cost

recovery has broadened over time.

It is useful to think of full-cost recovery along a spectrum, separated into two major buckets: private costs and social costs. Private costs are those paid directly by the water utility, such as day-to-day expenditures for operations and maintenance. Private costs also include longer-term capital costs associated with building and upgrading infrastructure. Importantly, these capital costs include deferred projects, typically known today as the infrastructure gap. Private capital costs also include future projects required to accommodate growing demands on the water system.

Social costs are broader in scope and are borne by society. They include the costs associated with sustainably maintaining and protecting our natural freshwater assets, which provide significant value to our water and wastewater systems. Social costs also include the economic value of water as a resource: as the local supply of water

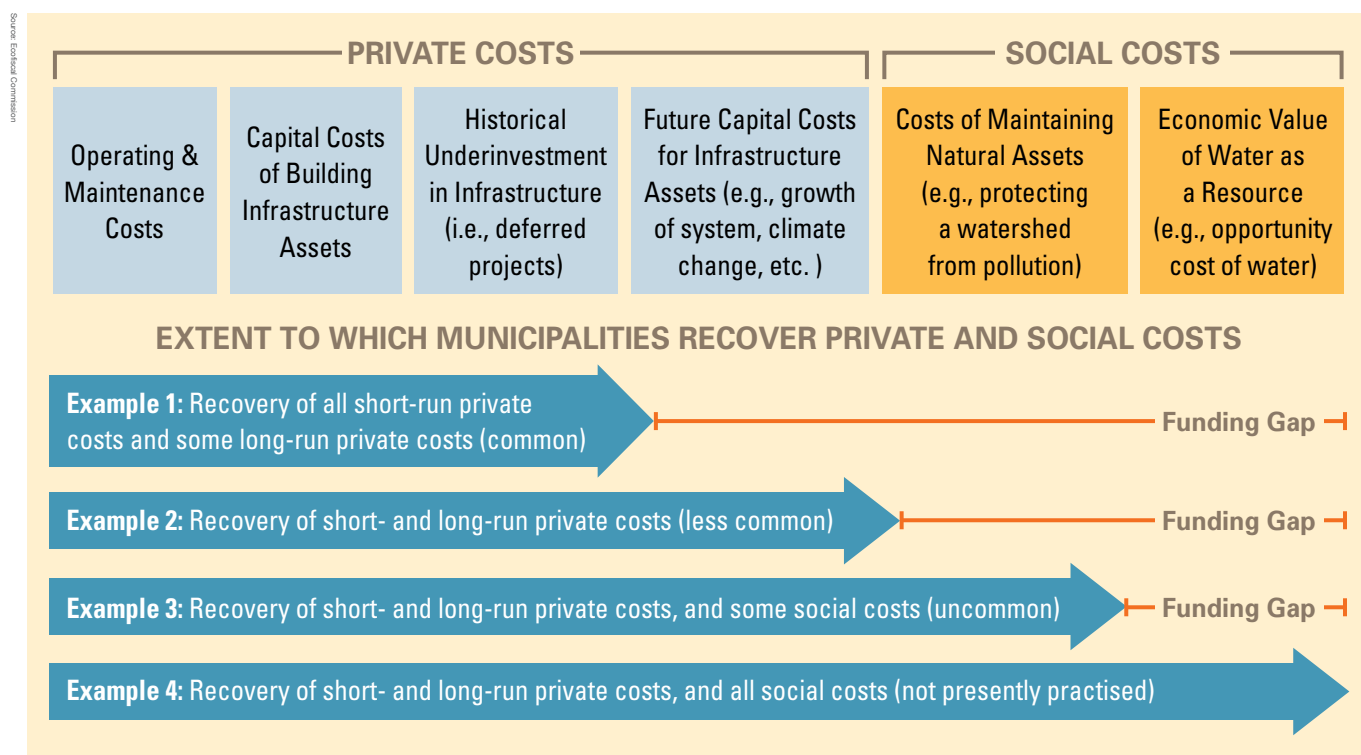
becomes scarcer, our uses of water become increasingly limited.

The extent to which Canadian municipalities recover the entire spectrum of costs vary widely. Most municipalities recover a large portion of private costs, such as operating and maintenance costs and existing capital outlays. Deferred and future capital costs, however, are less commonly recovered, which is why the existing infrastructure gap for Canadian municipalities is so large.

In addition, virtually no municipalities recover social costs. The full funding gap is therefore the difference between the total (private plus social) costs of providing the service and the total revenues generated, and differs across municipalities.

The case for multi-rate user fees

Recovering all private and social costs is necessary for genuine full-cost recovery. But how municipalities recover these

Figure 1: Spectrum of Costs for Municipal Water and Wastewater Systems

This figure shows the spectrum of costs associated with municipal water and wastewater systems. Private costs refer to the costs incurred directly by the municipal water utility, such as the costs associated with building, maintaining, and operating the water and wastewater infrastructure. Social costs are those associated with managing the natural ecosystems that provide critical services, such as lakes, rivers, and aquifers. Full-cost recovery is only possible when water utilities generate enough revenue to cover each of these cost components; otherwise, funding gaps will exist.

costs is also important. Municipalities can use several revenue tools, such as property taxes, user fees, and provincial and federal grants. Our research shows that well-designed user fees are the best way to pay for water and wastewater systems.

First, user fees can both generate revenue and act as an important price signal. These two functions of user fees can help water utilities recover costs, encourage water conservation, and maintain clean and safe water.

A multi-rate user fee—with both fixed and volumetric components—is also the most effective way to meet these objectives. The fixed portion ensures predictable revenues for utilities, even in the face of ongoing gains in water conservation. The volumetric component sends a price signal to users that incentivizes further conservation and encourages system efficiencies.

Third, user fees are also fair, because water users pay for the amount of the valuable resource they use. The fees

can also be designed to ensure that water remains affordable for low-income households. And with sufficient conservation deferring or eliminating the need to expand capacity, the cost of the overall system can decrease.

Closing the gaps

Canadian municipalities will be able to keep providing high-quality drinking water to their residents if they adequately maintain their systems. Some cities are further ahead than others. Thanks to the use of asset management plans, municipalities have a better handle on reducing their infrastructure gaps. And thanks to multi-rate user fees, many municipalities are now financially self-sufficient and thus no longer reliant on government grants. For smaller municipalities, closing the funding gap often means using several revenue sources; here, government grants can play an important role.

While user fees alone are not a panacea in covering all private and social costs,

they should certainly play a leading role in the way we manage our water and wastewater systems. **WC**

Christopher Ragan is an associate professor of economics at McGill University, Chair of Canada's Ecofiscal Commission, and a member of the federal government's Advisory Council on Economic Growth. Jonathan Arnold is a research associate with Canada's Ecofiscal Commission.



The Ecofiscal Commission will publish its new report on municipal water and wastewater pricing at the end of September. The report highlights ten best practices for pricing and protecting municipal water and wastewater services, drawing on examples from small, medium, and large municipalities across the country. To learn more, visit ecofiscal.ca/water.



An outcomes-based venture capital solution to water challenges. BY PAUL RICHARDSON

ON JULY 12, 2017, Aquatic Informatics announced a three-way merger with WaterTrax and Linko Technology, forming the largest water data management company in the world. The transaction gave Renewal Funds a timely exit of our position and holding in the company, also delivering a strong return for our investors. It also endowed Canada with a dominant, fast-growing, cleantech leader headquartered in Vancouver, B.C.

Renewal Funds invests in environmental technologies and sustainable food systems on behalf of 193 concerned individuals, family offices, and charitable foundations.

The fund supports forward-thinking entrepreneurs, while delivering above-market returns for our investors. Aquatic Informatics was our first foray into the cleantech sector in 2010. Renewal was able to play a role in the growth and evolution of the company, which developed from a small start-up to the primary tool of the United States Geological Survey.

Impact investment needs

Aquatic Informatics is a significant success story in the highly competitive Canadian water technology landscape, where firms are in continual need

of capital if the industry is to remain globally competitive. However, the probability of profits from investment in the information technology and energy-related sectors creates strong competition for cleantech companies seeking capital.

The 2017 Canadian federal budget allocated \$1.8 billion in funding for venture capital, working capital, and large project finance for cleantech innovation. But, public financing accounts for only a portion of the capital needed for the industry to its reach full potential.

Canada needs a robust venture

capital sector, one that moves towards impact investing. A thriving, socially and environmentally conscious financing sector will continue driving Canadian-made, leading technology solutions for challenging global issues. Companies like Renewal Funds play a crucial role in this finance ecosystem. We, and impact funds like us, consider the overall positive social and environmental benefit offered by a product or firm as being equal to the potential profits. Unlike traditional venture capital forms, we offer capital investment with patience on returns to early-stage cleantech firms—we act as a bridge between the two most common models of quick-to-scale venture and public funding.

A thriving, socially and environmentally conscious financing sector will continue driving Canadian-made, leading technology solutions for challenging global issues.

A thriving impact investment model can boost changing and new Canadian priorities and policies as the world's technological and economic markets evolve. While fossil fuel companies continue to benefit from huge government subsidies and tax breaks, the cleantech sector remains underfunded. Public incentives ought to be given to broader sectors of companies creating solutions for a carbon constrained future. Renewal will act as a catalyst for these changes.

Market shift

There is a massive opportunity for financial intermediaries to develop

and offer impact models to their clients—the primary vehicle for investors to align their values with their money. But there is also an urgent need for more professionals educated and practicing in the impact space. New product creations that align values with wealth creation present a major new marketplace, as the success of Aquatic Informatics demonstrates.

A robust venture capital sector willing to prioritize environmental and social needs, along with exceptional financial returns, is essential. The rapid

shift in economic activity needed to ensure a safe, clean, fair future requires new thinking, and the centrality of water to our social, environmental, and financial needs makes it arguably the most important resource to protect. WC



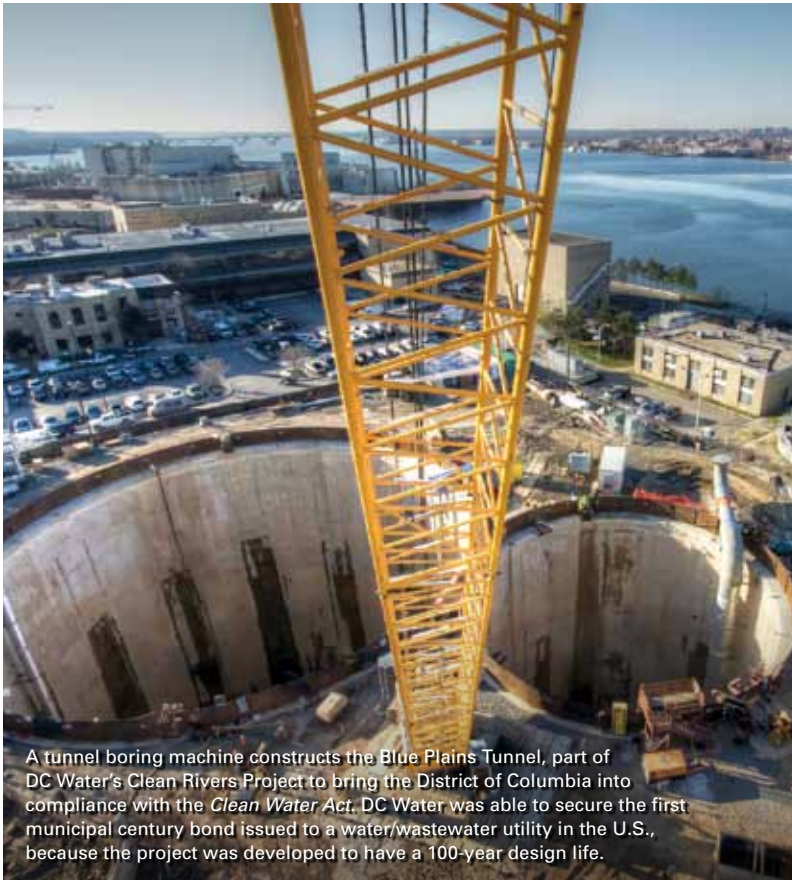
Paul Richardson
is the CEO of
Renewal Funds.

Nutrient Recovery for the N-E-W Paradigm

Making Utilities of the Future, Fact.

Utilities of the Future are partnering with Ostara's Nutrient Recovery Solutions to create a N-E-W (Nutrients, Energy, Water) Paradigm. With Ostara's solutions, operational efficiencies are improved. Chemical costs and sludge loads are reduced. And production of a high-value and renewable fertilizer provides responsible, sustainable crop nutrition, further protecting the world's waterways. Solutions that work for you. And the planet.

Learn more at ostara.com



A tunnel boring machine constructs the Blue Plains Tunnel, part of DC Water's Clean Rivers Project to bring the District of Columbia into compliance with the *Clean Water Act*. DC Water was able to secure the first municipal century bond issued to a water/wastewater utility in the U.S., because the project was developed to have a 100-year design life.



Green Bonds See Blue

How water projects are helping to tackle climate change. BY TED CHAPMAN

IN 2016, the number of green bond issuances doubled to US\$83 billion—boosted by China's US\$36 billion of new issuances, and raising the total outstanding green bond debt to approximately US\$200 billion. Issuance in 2017 is on track to show strong growth, with Bloomberg data indicating US\$68 billion in green-labelled bonds in the first half of the year versus US\$95.6 billion in all of 2016. So far, the majority of these bonds have been issued to fund sustainability projects, such as more energy-efficient buildings, low-carbon transportation, and renewable power projects.

However, the green marketplace is increasingly seeing bonds that are issued to fund water-related projects. These projects are focused on mitigating the detrimental impacts of climate change on water, such as water stress (where water

demand is high relative to the supply), as well as pollution. In order to do this, they aim to use water resources and networks more efficiently and improve the quality of water treatment infrastructure for the benefit of end users and, of course, for the environment.

Climate concerns

We have observed a plethora of unwelcome consequences associated with climate change. Yet, for water, one is particularly significant: global warming is altering the hydrologic cycle.

As outlined in U.S. Global Change Research Program's 2017 *Our Changing Planet* report, this means extreme weather patterns are being exacerbated. Indeed, the location, volume, timing, form, and intensity of global precipitation are all prone to greater unpredictability due to shifts in the atmosphere. Results

can vary—from drought to flash flooding.

Why water projects matter

To this end, both public sector funding and private sector financing of water projects to address problems including water scarcity, source water protection, pollution, and treatment are crucial. Raising capital for these projects is necessary not only to the water sector, but also for electricity generation and other water intensive industries. It will also be increasingly important in the food chain, directly for irrigation and indirectly to support riparian and riverine environments. Indeed, increased efficiency and governance of the collection, treatment, recycling, and disposal of water are all drivers of positive environmental impact—whether they take place at local or watershed levels.

In this way, the practical impact may vary from the relatively small task of including water-conserving bathroom and kitchen appliances in buildings to large-scale wastewater treatment projects that engage in energy recovery.

Issuing a bond

One such project is the District of Columbia Water & Sewer Authority's Clean Rivers Project in the U.S. Currently, the district's rivers fall victim to combined sewer overflows (CSOs), which occur when heavy rains overwhelm the authority's combined wastewater and stormwater collection system and treatment capacity. The result is untreated sewage in the Potomac or Anacostia Rivers, or other waterways that lead to the them.

There are a rapidly growing number of investors that seek to include green securities and other social impact debt instruments in their portfolios.

The DC Clean Rivers Project aims to reduce the incidences of CSOs by at least 96 per cent by creating 17 miles (27 kilometres) of storage tunnels with a combined capacity of 187 million gallons (about 708,000 cubic metres) to temporarily hold precipitation runoff rather than overflowing the system, until such time it can be sent to the authority's flagship Blue Plains treatment plant. Along with other related infrastructure projects, the Clean Rivers Project protects property and infrastructure from flooding, capturing and treating the system's flows to levels far beyond the regulatory minimum standards. It should be noted that those standards are already robust as DC Water, along with utilities in six other U.S. states, are under separate but related environmental regulatory scrutiny to protect and restore the Chesapeake Bay. Moreover, the project will continue Blue Plains' use of biogas (as a by-product) to fuel up to 10-megawatts of electricity in the

region, reducing the massive treatment plant's electric load and dependency upon the grid.

For this project to come to fruition, DC Water issued the first ever municipal green bond for water investments in the U.S. market, raising a total of US\$350 million in 2014. Due to overwhelming demand this was US\$50 million more than originally intended, and DC Water has since issued a number of new green bonds. The most recent of these was issued in January 2017 for US\$100 million to further the investments in the Clean Rivers Project.

Going green

The decision by an issuer to identify a bond as green highlights a desire not only to use the proceeds to finance environmentally beneficial projects, but also to assure both investors and communities that the entirety of the proceeds will go towards a project of green value. Reasons vary, but management often

represents to S&P Global Ratings several potential benefits including broadening the investor base and the demand for the issuance, demonstrating social responsibility, and fulfilling the utility's mandate to be an environmental steward. From an operational standpoint, they offer to enhance long-term resilience to climate change and readiness for extreme weather events, thereby mitigating related future costs and supply interruption.

We have observed that there are a rapidly growing number of investors that seek to include green securities and other social impact debt instruments in their portfolios in addition to traditional investment strategies. WC



Ted Chapman is the sector director and sector lead for utilities on the U.S. Public Finance team at S&P Global Ratings.

**KAESER
COMPRESSORS**

Efficient blower solutions ...



... at the leading edge
of technology and
performance.



KAESER COMPRESSORS
is one of the largest and most successful suppliers of air systems, with about 4000 employees worldwide.

Our primary goal is providing exceptional customer service coupled with innovative products and progressive system solutions. With over 90 years of experience, KAESER is the specialist.

KAESER's extensive range of premium products includes:

- Rotary screw compressors
- Reciprocating compressors
- Portable compressors
- Compressor controllers
- Rotary blowers
- Vacuum pumps
- Compressed air dryers and filters
- Air Audits & Turnkey Installations

www.kaeser.com



COURTESY: NIA SIMPSON

Measuring biodiversity in urban streams. BY MARY TRUDEAU

URBAN WATERCOURSES support a surprising number of aquatic species, including fish, clams and mussels, frogs and toads, turtles and snakes, aquatic birds and mammals, plants, algae zooplankton, and benthic invertebrates. Although urbanization reduces the number of species that can thrive for many reasons, life finds a way to continue in stressed waterbodies. For example, even the most urbanized stretches of the Don River in downtown Toronto support four fish species (white sucker, blacknose dace, longnose dace, and creek chub), among other animals.

Urbanization begins to affect aquatic biodiversity very early in the land development process. In fact, by the time 10 per cent of a watershed has urbanized, biodiversity is markedly impaired in terms of the number of species present. The reasons for this species loss are varied and depend on the needs of each specific creature. For instance, certain species are sensitive to pollutants, others have specialized habitat needs that are lost with urbanization, and some, such as trout, cannot survive in water temperatures above a certain threshold.

Research that I conducted suggests certain changes in flow regime are also associated with reduced fish diversity. Specifically, a change in how fast flow rates within rivers increase during rainfall runoff (called flow acceleration) is correlated with reduced numbers of fish species. More research is needed to understand what causes higher flow acceleration to affect fish. Urban stream syndrome is a term used to describe the condition of urban watercourses. The term refers to impaired biodiversity in urban watercourses and has been

documented in studies in Canada, the United States, Australia, and several European countries.

Globally, biodiversity is in decline, and the rate of extinction for freshwater species is about five times higher than land-based species. Unlike many other indicators of well-being, threats to aquatic biodiversity are not mitigated by increased societal affluence. With increased affluence comes increased water security, such as reliable drinking water, wastewater treatment, and flood control measures. The infrastructure built to provide water security, including dams and urban water services, alters aquatic habitat, water flow, water quality, water temperature, and sediment transport and erosion. These changes, in turn, jeopardize aquatic biodiversity.

Why care? Biodiversity is the source of provisions upon which humans rely, including for food, fresh water, and medicines. Biodiversity also regulates global processes, including climate, pollination, air and water purification, and soil generation. Although cities are not considered natural environments, all provisions that go into building cities ultimately come from nature. Our human habitats, as well as those of all other life forms, rely on biodiversity. A healthy natural environment is also a tremendous source of inspiration and enjoyment. A diverse range of animals within an ecosystem is vital for system resilience in the same way that a web is more resilient to cuts than a string.

Improvements have been made to the design and operating standards of urban infrastructure to reduce some of the

impacts on aquatic animals. However, the effects of changes do not happen right away. For example, studies in Canada and Sweden found a time lag of several decades between increased road densities and decreased wetland biodiversity. Trends related to past alterations are likely still manifesting in terms of aquatic community health. For this reason, a long-term and sustained effort is required to return watercourses to biological health.

If given the chance, life in freshwater can rebound from dire states, as demonstrated by recovery efforts for the Thames River in England (which was declared biologically dead in the 1950s), Cleveland's Cuyahoga River (which caught fire in 1969), and New York's Hudson River, whose polluted conditions inspired the creation of the Riverkeeper network.

With the potential for time-lagged effects, climate change, urbanization, and other stressors, a precautionary approach is imperative to protect the web of life relying on water. Full deployment of protective techniques is warranted. Low impact development (LID) techniques that change the ways rainwater reaches urban watercourses provide one example of improved approaches, as do improvements to wastewater effluent quality and source controls for pollutants. The incalculable value of biodiversity is worth the sustained effort required to implement changes needed for its protection. **wc**

Mary Trudeau is a seasonal lecturer at the University of Ottawa's Institute of the Environment.

Weathering the Storms:

Ontario Municipalities Plead for Stormwater Infrastructure Funding

On May 31st, Ontario Member of Provincial Parliament for Dufferin-Caledon, brought forward Bill 141, *Sewage Bypass Reporting Act, 2017*. If passed, an amendment would be made to the *Ontario Water Resources Act* to ensure that information about sewage bypasses is communicated to the general public.

The Ontario Society of Professional Engineers, the Residential & Civil Construction Alliance of Ontario, and the Ontario Sewer & Watermain Construction Association support improvements to reporting processes as the public deserves to know when untreated sewage is released into Ontario's waterways. It is therefore an amendment that all political parties should be able to agree upon, since it concerns public health and safety.

A study on the condition of stormwater infrastructure and the type of asset management planning that is done in municipalities across Ontario found that resources and funding are extremely limited.

It is estimated that \$1.2 billion would be needed to replace stormwater infrastructure in six focus municipalities alone. As this funding gap increases across Ontario, so will the economic and environmental impacts caused by deficient stormwater management systems.

In an era of more intense weather, it is important that municipalities, with provincial assistance, prepare standalone Stormwater Infrastructure Asset Management plans.

To view the finding of the assessment, visit bit.ly/StormwaterReport2017



Sandro Perruzza
Chief Executive Officer,
Ontario Society of
Professional Engineers
sperruzza@ospe.on.ca
416-223-9961 ext. 223



Andy Manahan
Executive Director,
Residential and Civil
Construction Alliance of Ontario
manahan@rccao.com
Tel: 905-760-7777



Giovanni Cautillo
Executive Director,
Ontario Sewer and Watermain
Construction Association
giovanni.cautillo@oswca.org
Tel: 905-629-7766 ext: 229

PVC is the material of choice for Canadian municipal piping, now and into the future.

Its superior application versatility, material longevity, and environmental sustainability make it the responsible choice for water infrastructure projects in Canadian communities of all sizes.

Across all of its characteristics, PVC's very nature provides unparalleled economic value throughout its implementation lifecycle. This cost-effectiveness puts it head-and-shoulders above other piping alternatives for all municipal applications.

Now is the time to explore the capabilities of PVC and **utilize its advantages** in your municipality.

Product **BENEFITS**



Versatility

Material that Adapts

PVC piping systems require 30-70% less material than other products, making it lighter to transport and easier to install. Its ease of installation provides flexibility and the ability to work in speciality applications, making PVC the ideal choice for even your most complex projects.



Longevity

Enjoy a Century of Benefits

PVC has emerged as the municipal piping material of choice for cities across Canada, providing a lifetime expectancy of over 100 years. It's unmatched reliability and durability provide many long-term benefits.



Sustainability

The Responsible Choice

At a time when legacy underground piping infrastructure is corroded and failing, and water quality issues are at the forefront, PVC offers a sustainable, safe solution which is, without question, the material best suited for long-term applications.

Responsible
Choice



Choix
Responsable



It's a lightweight product to handle and we really take note of the non-corrosive aspects. The smooth interior wall also maintains its flow capacity through time. During our annual maintenance programs, our flushing times to clean the pipe are reduced compared to the old cast iron pipes, which could be as much as ten times as long.

Ensor Nicholson
City of Moncton, NB



We took some pipe from that first installation of PVC, dug that pipe up and put it through the same paces that brand new pipe [...] was being put through and we found that after 17 years, there was virtually no difference between the pipes.

Doug Seargeant
EPCOR, Edmonton AB

Cost-EFFECTIVE



With only 5% of the lifetime costs of municipal water infrastructure projects related to material, the economic benefits of PVC will be enjoyed by your municipality for more than a century.

Its cost-effectiveness offers benefits in:

- Reduced transport and installation labour costs
- Lower ongoing direct and indirect repair costs
- Reduced pumping and operating costs
- Reduced energy burden

Explore how PVC can reduce your municipality's water infrastructure and capital project costs today.

Material of Choice in CANADA



To find out more, visit www.ResponsibleChoice.info



Optimizing asset management through environmental management standards.

BY EDGAR TOVILLA

THERE ARE AN INCREASING NUMBER of municipalities in Ontario adopting environmental management standards (EMS) for their wastewater and stormwater systems in the form of ISO 14001, a standard of the International Organization for Standardization. Based on a review of current municipal activity in Ontario, it was found that some municipalities are also voluntarily adopting EMS-related practices to address eco-design, climate change, and life cycle assessment, in the form of asset management plans, as part of their water management approaches.

There are three major drivers for this trend in voluntary adoption of private sector standards, primarily:

- Anticipation of regulatory changes after the Walkerton tragedy;
- Canadian courts decisions and laws referencing EMS; and
- Convergence of public and private governance to supplement regulatory requirements.

Low point

In May 2000, an estimated 2,300 people became seriously ill and seven died from

exposure to microbially-contaminated drinking water in Walkerton, Ont. Following the Walkerton tragedy, the drinking water governance framework was redesigned with three new acts and twelve regulations. As part of this process, the regulator partnered with the Canadian Standards Association to develop a quality management standard for municipal drinking water; the 2006 Drinking Water Quality Management System (DWQMS). However, while the state-based governance structure for water utilities providing drinking water was modernized to incorporate an EMS



Region of Peel staff working on wastewater infrastructure asset management and mapping tools. Clock-wise from top left to right: Heather Crawford, John Rampal, Edgar Tovilla, Fernando Neves, and Anthony Valentini.

approach, wastewater and stormwater sectors were not similarly adjusted. They remain with basically the same conventional, minimalistic governance structures established in the 1950s.

High mark

In anticipation of the government's reaction to this tragedy, five municipalities adopted ISO 14001 for both drinking water and wastewater systems: York Region in 2001, Richmond Hill in 2006, Collingwood in 2007, Erin Area/Lake Huron (that supplies water the City of London) in 2006, and Durham Region in 2006. While there is still no legislated requirement that EMS standards be adopted, there is a critical mass of knowledge, systems infrastructure, and experience that has been generated after 10 years of practicing DWQMS. This knowledge set could be applied for the effective adoption of specific elements from EMS (that apply to wastewater and stormwater) in municipalities across the province.

Courting better standards

The law and courts are also driving

the need for public-private policy convergence on formal and legally-binding EMS. For municipalities with voluntary EMS, a new legal standard could decrease the likelihood of a violation taking place, and where violations do occur, it would allow the municipality to enforce a higher standard of care.

Increasingly, federal and provincial court rulings include sentencing where EMS are a component. For example, a ruling for the 2014 Alberta Capital Region Wastewater Commission spill case, the 2003 City of Winnipeg spill case, *R. v. City of Calgary* (2000), and *R. v. Prospec Chemicals Ltd.* (1996).

There are many regulations and statutes that reference the ISO 14001 (see bit.ly/DWISO for a complete list.) This research suggests that there is an increasing policy convergence in the Ontario municipal drinking water, wastewater, and stormwater sectors in the form of adopting risk-based management system approaches that draw on private (non-state) regulation such as that of the EMS from the ISO 14001. This convergence is leveraged with the critical

mass of experience in applying the mandatory DWQMS for then drinking water, which municipalities are also transferring such asset management tools proactively to their wastewater and stormwater systems

There is ample evidence on the convergence of public and private governance to supplement regulatory requirements. Changes on the Ontario EPA under the *Open for Business Act* (2010) and the Environmental Access Sector Registry (EASR) legislation since 2012, further support a risk-based approach for wastewater and stormwater for both municipal and industrial sectors.

Through anticipatory and converging regulatory changes, legislation for wastewater and stormwater is being calibrated to mirror that of the drinking water's more modern framework. Dozens of municipalities in Canada already have systems in place to optimize their asset management with life cycle analysis and infrastructure sustainability plans that go beyond current regulatory requirements. And governments from around the world are choosing to implement Environmental Management Systems in response to increased public expectations and environmental awareness around managing growth and infrastructure expansions. Implementing EMS can help local governments reduce their environmental impact while also reducing operational costs through increased operating efficiency.

In the future, efficiently designed EMS will be essential for all water utilities, as municipalities move beyond complying with environmental legislation and regulations, toward fully integrating environmental management into their overall business operations. **WC**



Edgar Tovilla is a PhD candidate at Ryerson University, manager of wastewater operations at the Region of Peel.

He is also the recipient of the 2017 Ontario Municipal Water Association Industry Leadership Award.



Continental access is key to Canadian cleantech success.

BY JEFF SANFORD

THE RENEGOTIATION OF the North American Free Trade Agreement is underway. Canadian corporate executives are, with good reason, concerned that a new wave of protectionism could wash across the continent. Donald Trump, who campaigned on promises to force U.S. governments to Buy American threatened to cancel the agreement just as negotiations began.

Let's hope cooler heads prevail, and that level-headed negotiators recognize the benefits of the free trade system that is allowing organizations across the continent to work together to solve the biggest, most pressing problems afflicting this economy.

The benefits that flow from the integrated continental economy that has emerged in the two decades since NAFTA are many. A particularly good example is that of Vancouver, B.C.-based Ostara Nutrient Recovery Technologies, which just opened the world's largest phosphorus reclamation plant in the United States. The project is a reminder of how an integrated North American

economy can facilitate important projects like this, which is countering the conditions that now lead to the emergence of dead zones in the Gulf of Mexico each summer.

The Metropolitan Water Reclamation District of Greater Chicago, Ill. (MWRD) is a massive organization that manages the watershed around Chicago and 128 surrounding suburban communities. It does this through half-a-dozen treatment plants and 22 pumping stations. The major concern at the agency these days is what to do about the city's wastewater that contributes to hypoxia in the Gulf of Mexico. The MWRD was created in 1889 with a goal to manage the increasing volumes of Chicago wastewater being dumped into Lake Huron. To save the city's waterfront, the agency reversed the flow of the Chicago and Calumet River Systems and diverted the waste water into the Des Plaines River. Today that wastewater

feeds into the Illinois River, then it's on to the Mississippi, and eventually into the gulf where phosphorus-rich agricultural run-off from the mid-west creates huge algal blooms that deprive fish of oxygen leading to wide-spread hypoxia and dead zones. Obviously, reducing phosphorus at the source has become an important goal at the MWRD.

We cannot accomplish the goal of reducing phosphorus without embracing innovation and establishing partnerships that extend beyond borders.

The organization voluntarily reduced the allowable levels of phosphorus in wastewater, even before regulations had to be enacted. "We want to be able to send water to the Gulf of Mexico without contributing to the dead zone. It's the biggest issue in the mid-west now. It's an issue here, in Lake Erie, and across the continent," said David St. Pierre, executive director of the MRWD.



❶ Kishia Powell, commissioner of the Department of Watershed Management at the City of Atlanta said sourcing the best water technology at the best price, no matter where it originates from, is what citizens expect. ❷ David St. Pierre of the Metropolitan Water Reclamation District of Greater Chicago said that international trade is crucial for addressing challenges such as a nutrient pollution. ❸ The Metropolitan Water Reclamation District of Greater Chicago's phosphorus reclamation plant. ❹ In an August 14th statement, following the first round of NAFTA negotiations, Minister Chrystia Freeland said, "When innovators on both sides of a border are free to produce and sell their best wares to a wider market, while also getting access to goods and services from the other side, everyone wins." Freeland is pictured here with Secretary Tillerson in Washington. ❺ May 25, 2016 marked the official unveiling ceremony to celebrate the completion of the world's largest nutrient recovery facility at the MWRD's Stickney Water Reclamation Plant. (L-R): Robert A. Kaplan, U.S. Environmental Protection Agency Region 5; Frank Avila, MWRD Board of Commissioners; Phillip Abrary, Ostara; David J. Walsh, MWRD Board of Commissioners; Barbara J. McGowan, MWRD Board of Commissioners; Mariyana Spyropoulos, MWRD Board of Commissioners; Robert F. Kennedy, Jr., Ostara board member; Steven Koch, deputy mayor of Chicago; David St. Pierre, MWRD; Kari K. Steele, MWRD Board of Commissioners.

To manage phosphorus levels the agency hit on Ostara's Pearl technology. Wastewater flows through three reactors filled with catalysts that pull the phosphorus from the water. The extracted mineral collects into tiny, nutrient-rich pearls. The by-product is an eco-friendly, slow-release fertilizer branded under the name Crystal Green. All in, the process creates a virtuous cycle: The water is cleaned, the plant recovers a mineral that is finite on earth, and a new revenue source is generated in a product that sends phosphorus back to the land. It's just the

kind of forward-thinking, sustainable economic activity that's needed.

Decades of intensive economic activity have created huge pollution issues. Managing the effects of this industrial activity in an attempt to create resilient, stable economic systems is vital to future prosperity—it's more than just an economic trend. That these Canadian and U.S. organizations could easily come together and finish the project while remaining free of border hassles or regulations on procurement is one of the important outcomes of the two decades of NAFTA-

based trade. "We cannot accomplish [the goal of reducing phosphorus] without embracing innovation and establishing partnerships that extend beyond borders," said a MWRD staffer. "We are extremely appreciative of the support and working relationships we have with Canadian companies."

St. Pierre said he searches high and low across the continent for new technologies. "We are always open to new innovations in the wastewater industry that provide efficiency and practical solutions to wastewater treatment and

resource recovery. I'm always looking for solutions," said St. Pierre. On occasion, he will tour the Toronto water conference scene in search of a new solution. He added that he is currently considering a Canadian supplier for a de-watering

"I am absolutely looking at the Canadian product. I have to. I run a utility."

— David St. Pierre, executive director, Metropolitan Water Reclamation District of Greater Chicago.

press that the agency is soon to acquire. "I am absolutely looking at the Canadian product. I have to. I run a utility. There are a lot of challenges in the water sector. I have to know what's out there," he said.

As for the Chicago phosphorus reclamation plant, it's been up and running since late May. "The new

Ostara project has just been completed and it's functioning well," said St. Pierre. Earlier estimates had been that there would be a 30 per cent reduction in phosphorus levels. But according to St. Pierre some early tweaks to the installation are paying off. "Now that it's running a little more smoothly we're possibly looking at a 45 per cent reduction in phosphorus," he said.

Over time the process is expected to yield 10,000 tonnes per year of reclaimed material, allowing sales of Crystal Green that should provide a net operating benefit of about \$1 million per year. Even better, the low original capital outlay of \$35 million is a fraction of the \$750 million the organization would have spent on a conventional system to reduce phosphorus levels to below 0.3 milligrams per litre. "There was a huge saving with this system," said St. Pierre, "an important consideration at a taxpayer funded organization."

No wonder then Ostara is enjoying a bit of a boom in brand recognition around

the continent. The company has just completed a pilot project of the Ostara process in Atlanta that seems likely to lead to a permanent plant there. "They are considered the leader in this area," said Kishia Powell, commissioner of the Department of Watershed Management at the City of Atlanta. "We built the pilot project, and that has provided the proof. [But] this is how we approach our work: We make sure we are sourcing the best technology at the best price, whether it's from Canada or the U.S. We owe it to customers."

Let's hope the deep benefits of a highly integrated North American economy that allows the seamless and free flow of goods and services across the continent doesn't get sent down the river in the chaos of the Trump White House. **wc**



Jeff Sanford is a freelance journalist in Toronto.



October 30 to November 1

WHO WILL ATTEND?

- TECHNOLOGY COMPANIES
- UTILITIES
- GOVERNMENT
- INVESTORS
- ACADEMIA
- INDUSTRY

FEATURING:

NOVEMBER 1 2017

Water Innovation in Action

WORLD WATER-TECH NORTH AMERICA

Toronto // November, 2-3, 2017

HOSTED BY:

WaterTAP

Technology Acceleration Project

IN PARTNERSHIP WITH: 

TORONTO • ONTARIO

Learn more at WaterInnovationWeek.com



Participants of the 2017 Great Waterfront Trail Adventure.

Connecting communities to the coast through the Great Lakes Waterfront Trail. BY KATHERINE BALPATAKY

ALTHOUGH HAMILTON, ONTARIO is best known for the fire and smoke of Stelco Steel, the city is offering up breathtaking views of Lake Ontario to my left and waterfalls to my right. As I wind down the side of the escarpment on my bicycle, I can't contain my happiness. What a perfect way to start the day.

I am cycling with a group of about 150 Canadians and Americans who have joined the Waterfront Regeneration Trust's 2017 cycling tour, the Great Waterfront Trail Adventure. This year's seven-day event crossed 550 kilometres of the Trail from Point Pelee National Park to the Rouge National Urban Park. The group is celebrating Canada 150 and the newly awarded Ontario Trail of Distinction.

The long-term vision shared by the Waterfront Regeneration Trust and its community partners is to create a trail that embraces all of Canada's Great Lakes and the St. Lawrence River. The most recent expansion in 2017 connected Lake Superior, Sault Ste. Marie, and Sudbury.

"The Great Lakes Waterfront Trail is the culmination of 25 years of investment and co-operation among communities and First Nations, conservation authorities, and many other partners," said Marlaine Koehler, executive director of the Waterfront Regeneration Trust.

"We are thrilled to accept the recognition on behalf of this partnership."

A great history

The trail was inaugurated in 1995 by the Hon. David Crombie, former mayor of Toronto and president of the Canadian Urban Institute. At that time, it was just 275 kilometres in length along Lake Ontario stretching from Hamilton to Trenton.

"The idea arose in public discussions of the late 80s and early 90s, in particular from the documents of the IJC [International Joint Commission]," said Crombie. "They had adopted the Great Lakes Water Quality Agreement in 1972 and brought forward a number of amendments, and that fuelled a great public discussion."

Crombie explained that in 1988, the federal government, and then later the provincial government, established the Royal Commission on the Future of the Toronto Waterfront to provide a framework for the waterfront's development. Appointed this task by the Minister of Transport, Infrastructure and Communities, Crombie took a fairly generous definition of "waterfront", because he recognized the importance of watershed boundaries to the coastal system. Since then, the Great Lakes

Waterfront Trail has gone through six major expansions to reach its current length of 2,100 kilometres. The Trust has focused primarily on cycling tourism, because they have identified cyclists as the group most likely to do multi-day tours—an important factor for economic development.

"We know from studies that have been done by various groups that a cyclist will spend about \$115 per day. But the most important thing about a cyclist is that they don't just drive through; they will stop in all the towns and villages [...] they're not just about the bike, they're about the local museums and restaurants in small town Ontario," said Koehler.

"We used to say, when you are on the trail, you are going to be part of 21 per cent of the world's freshwater and centuries of Indigenous people's cultural history and now of people all over the world," said Crombie.

"The trail became our great vehicle, by which we thought people could understand its philosophy by implementing something in their own areas that would protect, restore, and regenerate their waterfronts," he said. WC

Katherine Balpatak is Water Canada's editor.

Transboundary Troubles



Mining company looks to overcome selenium challenge.

BY SAUL CERNOS

EVEN AS AN OCTOBER 5TH COURT DATE looms to address a series of misadventures with a water treatment system, Teck Resources has received provincial environment ministry permission to extend the operational life of four coal mines in southeastern British Columbia.

The world's second-biggest shipper of steelmaking coal operates five open-pit mines near Fernie, B.C. However, with releases of selenium and other compounds into the Elk Valley watershed and southwards into Montana sometimes exceeding regulatory guidelines, ongoing mining activities in the region are coming under fire.

A longstanding history of toxic releases predates Teck's full acquisition

of the properties in 2008. Then in 2013, the provincial environment ministry ordered an area-based management plan to set water quality targets, including stabilizing and reducing selenium concentrations in response to ongoing water quality concerns. The following year, Teck took what it hoped would be a decisive step to curb the toxic releases, opening its West Line Creek Active Water Treatment Facility. However, the deaths of 74 fish in the immediate vicinity during testing and initial operation proved a serious setback and resulted in three charges under Canada's *Fisheries Act*.

Teck made operational changes to

the treatment facility with a view to preventing any reoccurrences, and it was fully recommissioned in February 2016. But, the incident which led to the fish deaths, coupled with lingering frustration over decades of pollution, have renewed opposition from conservationist groups, including the Flathead Wild coalition and Wildsight.

Slow drip

Erin Sexton, a senior research scientist with the University of Montana who is a scientific advisor to the Confederated Salish and Kootenai Tribes, said governments have long known that mining in the Elk River valley contaminated



A University of Montana grad student takes a water sample from the Elk River.



The Elk River watershed is located in the southeastern corner of B.C.



Erin Sexton, a senior research scientist with the University of Montana, collects water quality samples in the Elk River above and below the Teck mines to examine mine impacts.

waterways, threatening fish and other wildlife downstream in Lake Koocanusa and the Kootenai River. “The [B.C.] provincial guideline is two micrograms per litre of selenium, and selenium started

memorandum of understanding banning oil, gas, and mining development in the Flathead River watershed, the region’s other transboundary river. While no such arrangement exists for the Elk River

included both federal governments, Teck, and affected First Nations and Tribes.

Cross-border contamination received added scrutiny in 2014 when the parties came up with the Elk Valley Water Quality Plan to address discharges of selenium, cadmium, nitrates, and sulphites.

Selenium, found in the overburden that’s removed to access coal seams, is a particularly complicated compound. Joe Skorupa, a biologist with the U.S. Fish and Wildlife Service, who sits on a binational committee looking to develop a water quality standard for Lake Koocanusa, said it’s a naturally occurring trace mineral that’s considered safe in very limited amounts but in higher doses abruptly crosses the toxicity threshold.

Skorupa said that species differ in

“We have a dedicated team working on this issue and are now piloting a corrective option that we believe will address this issue through an addition to the existing treatment process.” — Chris Stannell

to cross that line in the early 1990s and continued on,” she explained.

In 2010, B.C. and Montana signed a

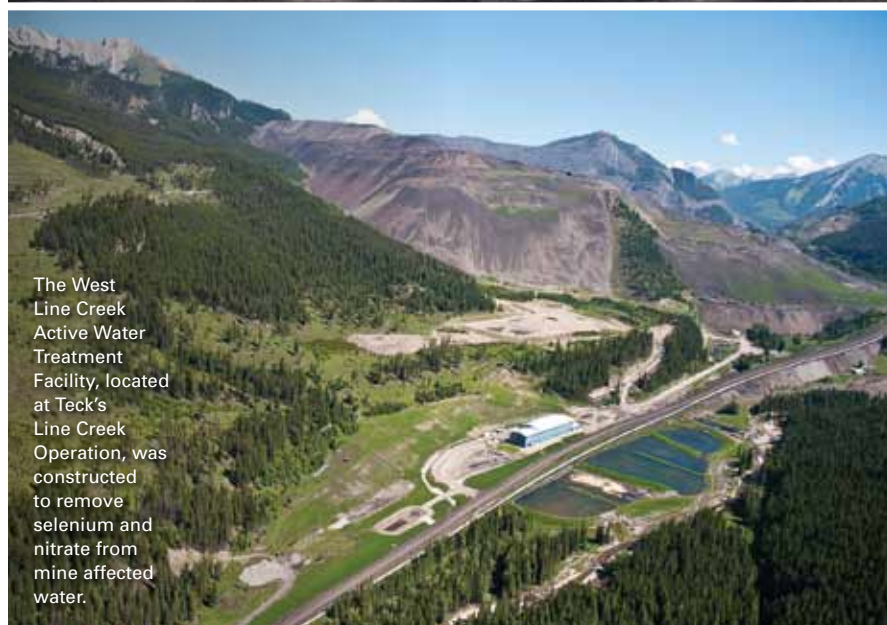
watershed, the agreement drew Montana into discussions around planned mining activities in the Elk Valley. Participants also

Credit: Teck Resources



A hauling truck at Teck's Fording River Operation moves coal that is used in steelmaking. The Fording River Operations is located approximately 29 kilometres northeast of the community of Elkford, in southeastern B.C.

Credit: Teck Resources



The West Line Creek Active Water Treatment Facility, located at Teck's Line Creek Operation, was constructed to remove selenium and nitrate from mine affected water.

how they absorb selenium and pass its toxicity up the food chain. Multiple factors ultimately affect concentrations and impacts on wildlife, complicating estimates that up to two micrograms per litre is safe.

"As an interim standard it's adequate," Skorupa said. "But there's some evidence it might not be fully protective of Lake Kootenai since the current concentration is below two micrograms per litre. Yet, we have selenium concentrations in fish tissues that are too high and need to come down."

While standards may need to account for concentrations in animal tissues,

Skorupa said it would be better to prevent discharges from happening at all. He explained it's relatively easy and inexpensive to treat the bulk of the selenium, but the challenge is dealing with the smaller, remaining percentile that needs to be removed in order to meet water quality standards. "It's a goal that's been chased over and over—untold amounts of dollars have been spent on it."

Instead, Skorupa said phosphate miners in Idaho have more easily and affordably achieved success by isolating the overburden on-site, using clay caps, so it doesn't disperse. "They're trying to

prevent the polluted water from being generated in the first place rather than letting the polluted water be generated and then treated," he said.

Teck spokesperson Chris Stannell said the West Line Creek Active Water Treatment Facility uses a biological process and is now achieving its design specifications for reducing selenium and nitrate concentrations.

However, Stannell said Teck is working to address ongoing challenges related to selenium compounds. "We have a dedicated team working on this issue and are now piloting a corrective option that we believe will address this issue through an addition to the existing treatment process."

Stannell said Teck has roughly 15 research and development programs underway to determine how to better protect water quality. The company is also monitoring water quality and aquatic health through regular sampling at approximately 100 stations in the Elk Valley to evaluate potential effects at both a local and regional scale in the watershed.

"While monitoring indicates selenium and other constituents are not at levels that are affecting populations of fish and other sensitive aquatic life, we recognize that action is necessary to ensure that concentrations do not increase to levels that could affect those populations," Stannell said. "That is why we are undertaking extensive work to ensure the continued aquatic health of the Kootenai Reservoir and the Elk River watershed through the Elk Valley Water Quality Plan."

A 2017 update posted online itemizes some of these undertakings, including bringing two new water treatment facilities online (in 2019 and 2020) and one pilot project that has found processes that remove approximately 90 per cent of selenium and nitrate from released water.

While Teck works on its solutions, the B.C. government has approved extensions to the operating lifetime of four of its Elk Valley mines. Three new coal mines involving other

companies are also proposed and in the early stages of federal environmental assessment.

Teck initially planned to expand its fifth mine in the area, Coal Mountain. But in late 2015, citing low commodity

“Since that time [2016] the plant has been in continual operation and is continuing to remove selenium and nitrate from the mine water to below permitted levels,” Hurrell said. “However, sampling indicates that total selenium

facilities in the Elk Valley over the next 15 years, Hurrell added.

While this story continues to unfold, Erin Sexton said she respects the efforts Teck is making but is critical of the provincial government’s decision to extend mining in the Elk Valley when the treatment technology remains unproven and contamination remains an issue.

Further blasting, removal, and deposition of new rock will result in increased cadmium, selenium, nitrates, and sulphates in the waterways, Sexton said. “From my perspective, we have certainty about the contaminant trends in the river and the source and a lack of certainty and supporting data about how to stabilize and decrease the trends.” WC

They’re trying to prevent the polluted water from being generated in the first place rather than letting the polluted water be generated and then treated.

prices, the company announced it will conclude existing operations there in late 2017.

Amélie Desmarais, a spokesperson with Environment and Climate Change Canada, and Lara Hurrell, a spokesperson with B.C.’s Ministry of Environment, both declined comment on toxicity issues. However, Hurrell said her ministry is tracking Teck’s progress.

in the treated effluent contains a higher than expected proportion of bio-available selenium. A local area monitoring program is in place downstream of the plant to detect any effects in the river, and Teck is currently taking steps to improve outcomes at the treatment plant.”

While Teck currently operates a single treatment facility in the Elk Valley, plans call for Teck to build eight additional



Saul Chernos is a Toronto-based freelance writer with a focus on environment and infrastructure issues.

WATER CANADA

THE COMPLETE WATER MAGAZINE

**Coming up in
the next issue:**

November/December

The Great Lakes Issue

Protecting the world’s most important freshwater resource.

WC
BUYER’S
GUIDE
2018

AD BOOKING DEADLINE:
OCTOBER 13

MATERIAL DEADLINE:
OCTOBER 20

DISTRIBUTION DATE:
NOVEMBER 3

For ad sales, contact **Jane Buckland** at
416-444-5842 ext.115 or jane@actualmedia.ca

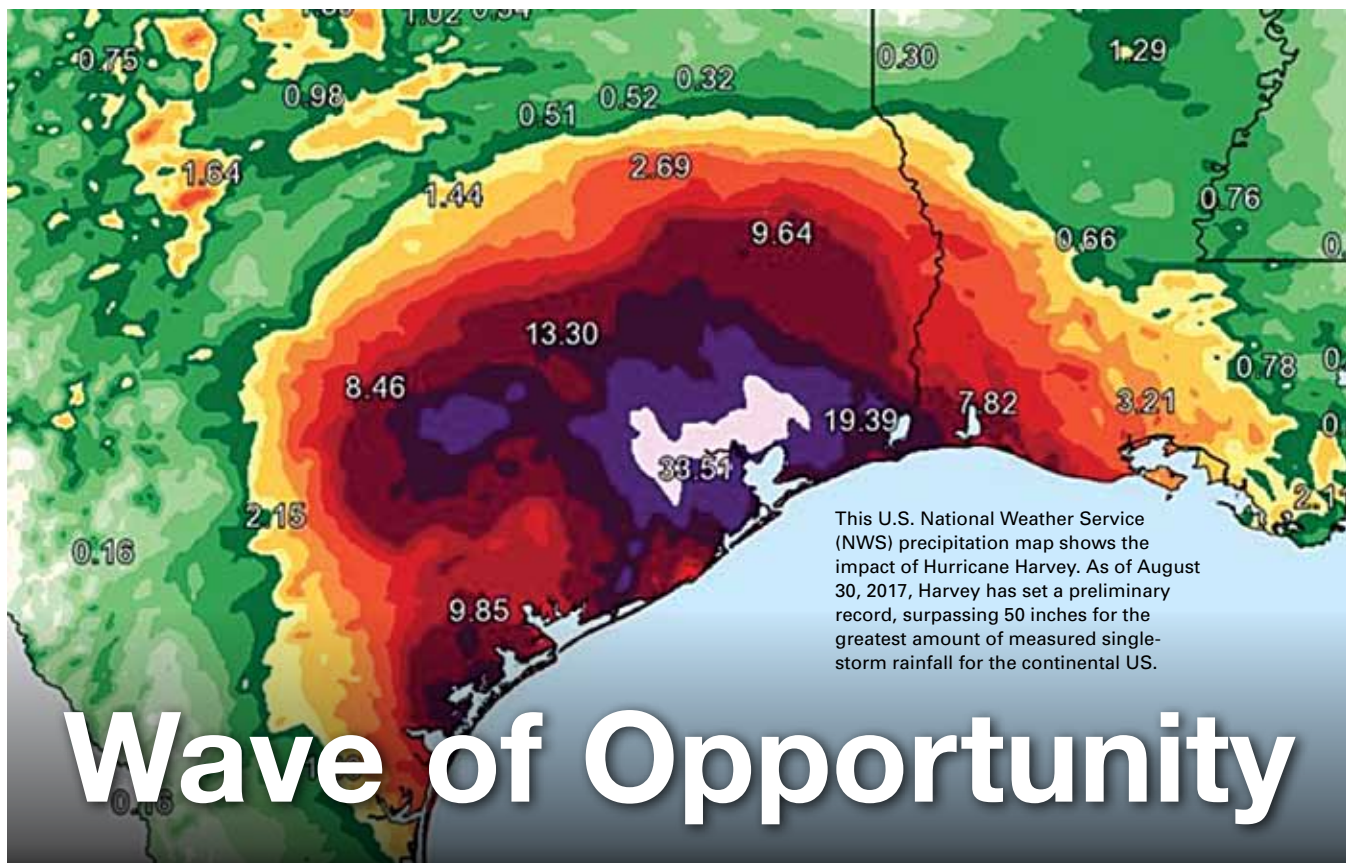
**Water and wastewater innovators,
let us help you make a splash.**

cawt

technology development
testing, verification, certification
pilot and demonstration
laboratory analysis

cawt.ca
Located in the City of Kawartha Lakes, ON

Fleming College



Wave of Opportunity

Establishing coastal resilience in the face of climate change is a tremendous challenge, but there are equally big financial tools to get there. BY KATHERINE BALPATAKY

EVERY DECADE OR SO there is a global catastrophe that redefines the public policy conversation. For those interested in coastal development and climate change, Houston, Texas and Hurricane Harvey is that event. An estimated 127 centimetres of rain has fallen on the Greater Houston Area—so much rain that the National Weather Service had to update the colours used to map rainfall.

For those on the outside, it is difficult to comprehend the challenge ahead. The damage, by some estimates, will range between \$10–30 billion. To make matters much worse, the Federal Flood Insurance Program is already about \$20 billion in debt due to Hurricanes Sandy and Katrina, Tropical Storm Irene, and two others; and the Federal Flood Insurance Program is set to expire on September 30th—when the U.S. Treasury Department will hit its debt limit. Oy vey! But there are lessons to be gleaned from Harvey. Let's assume for one minute that the funds to rebuild will surface somehow.

Dr. Charles Colgan is the director of research at the Center for the Blue Economy (CBE). He has served the National Ocean Economics Program (NOEP) as a consultant for more than 14 years, and he is the lead author of a new study prepared for Lloyd's of London that examines options for financing natural infrastructure that helps protect against future flooding and storm surges. Colgan believes that there is plenty of funding out there for natural infrastructure projects.

"I think that if you look at Harvey or any of these storms, and you say 'haaa, well now is the time that we'll make massive investments in resilience,' I would say, 'Well no, that's not going to happen, because recovery still comes first,'" said Colgan. "But there are smart ways to recover and dumb ways to recover. There are ways that you can build resilience over time."

Innovative finance needed

Colgan believes that the future of

infrastructure finance, particularly in the creation of resilient infrastructure, will depend on new financing mechanisms that combine public and private, and even non-governmental funds. Green bonds, the do-good debt, is one financial tool that the authors examine to get the job done, in addition to catastrophe bonds and resilience bonds.

Globally, green bonds have grown so big in recent years that VanEck rolled out the first-ever U.S.-listed green bond exchange traded funds (ETF) on the NYSE Arca exchange in March 2017. The Organisation for Economic Co-operation and Development (OECD) reported in June 2015 that the green bond market had a total value of \$600 billion. Catastrophe bonds (also known as cat bonds) and resilience bonds are another key mechanism. These are risk-linked securities that transfer a specified set of risks from a sponsor to investors. Insurance companies typically issue these bonds through an investment

bank, which sells to investors.

Infrastructure banks are also important funding mechanisms, because as Colgan *et al.* note, the banks are ideal for leveraging different resources to fund projects, making them attractive to private capital markets. Given that Canada is in the process of developing its own federal infrastructure bank, Colgan said there is a great opportunity for Canada to build a bank that can capture the benefits of risk reduction in ways that support market-based finance.

"P3 is just the start of this," Colgan said. "Our focus on the financing of natural infrastructure for flood control purposes doesn't really lend itself to P3 in a lot of cases, but it's entirely reasonable to back catastrophe bonds or other kinds of financial instruments by setting up special purpose tax districts." He added that areas where flood, sewer, water, or stormwater infrastructure is needed at a scale that would generate a large flow of funds, there is great potential to find private

investors who will provide the money.

A key conclusion of the report is that the largest opportunities for funding are in the redirection of post-disaster recovery funds to pre-disaster investments in risk reduction, whether through green bonds or other financing methods, such as infrastructure banks.

Grey infrastructure bias

One of the biggest hurdles for creating more resilient coastlines is overcoming what is referred to as grey infrastructure bias. "There's a tendency not to do new things, because you want to get things done quickly. You might go in with a green infrastructure project and say, 'Let's rebuild this wetland or move development off this wetland, so that it provides flood control for the next time,' But there's nothing in the regulations to help the agencies deal with this stuff. [...] There's a bureaucratic bias against doing innovative things in the recovery process."

His suggestion is for governments to identify investment opportunities proactively, before the next catastrophic event. "That's the lesson: don't waste a crisis. Now's the time to go in and put more money than you need to recover into fixing things so that next time it's not as bad." WC

Katherine Balpataky is Water Canada's editor.



The report entitled, **Financing Natural Infrastructure for Coastal Flood Damage Reduction**, was developed in collaboration with the Nature Conservancy and UC Santa Cruz. It is available online at centerfortheblueeconomy.org/green-financing.

WATERCANADA

BUYER'S GUIDE 2018 Your source for water products and services.

DISTRIBUTOR **MANUFACTURER** **SUPPLIER**

Are you listed?

Make it easier for online buyers to find your complete details.

BEST OFFER: Complete Listing

WATERCANADA.NET/BUYERS-GUIDE

WATERCANADA.NET

NEW SITE COMING SOON!

- Comprehensive daily news
- Original features and interviews
- 100% responsive for all digital platforms
- Better visitor experience
- Visually compelling design

Canada's #1 source for water news!

Register Online



Canadian Water and Wastewater Association

National Water and Wastewater Conference

in conjunction with the CAWQ National Symposium on Water Quality Research

November 5-8 2017

St. John's Newfoundland



www.nwwc2017.ca



Solid Support

Federal grants for water infrastructure were needed, but so too is sustainable funding.

BY ROBERT HALLER

RECENT FEDERAL INFRASTRUCTURE GRANTS offer truly great community development opportunities, but we must not forget that our true goal is to be self-sufficient entities.

We all agree that this is an exciting time to be working in the water and wastewater industry. The federal government has committed to improving Canadian water infrastructure and our environment, and they've been met in partnership by the provinces and territories, and the whole project is being supported by significant grant programs. For years, our sector has been desperately calling for such a level of grant funding, but we must not forget that our ultimate goal is to become viable operations that are financially sustainable and hence, not reliant on periodic, competitive grants.

I'm not saying we won't accept federal/provincial funding, as there is a huge discrepancy between who collects

the bulk of the taxes and who owns, maintains, and operates the bulk of public infrastructure. There is always room for senior level funding support, but it must be consistent and reliable—a known quantity that we can count on next year and twenty, thirty, or forty years from now. That's how we plan and deliver reliable services.

Leading up to the federal infrastructure plan announcements, CWWA called upon the federal government to use a portion of the funds to encourage community capacity building and to move municipalities toward sustainable, long-term planning. That's why we are so pleased to see the asset management funds flowing through the Federation of Canadian Municipalities (FCM) and their Municipal Asset Management Program (MAMP). This practice is exactly the support that is required,

and the best part is that the decisions are being locally led—by the mayors.

Municipal engineers and planning staff have been advocating for asset management for many years, but this requires a commitment of municipal effort and resources—that were often cut during municipal council budget deliberations. Many provinces have been mandating some level of asset management into new water legislation or tying proper management to funding. This has led to varying levels of success. For the most part, only the largest urban centres have been able to dedicate adequate staffing and an appropriate budget to proper asset management programs.

So now, having the mayors, through the FCM, take ownership of this effort, through FCM, offers a far greater chance of success for all communities. FCM's Municipalities for Climate Innovation Program (MCIP) does the same for addressing our climate adaptation

challenges, and FCM is very keen to roll out these programs and the Green Municipal Fund (GMF) with solid support programs and staff to assist. Full details can be found through the FCM website. (fcm.ca)

Meanwhile, there are other projects underway to support our quest for sustainability. CWWA is proud to be a supportive partner to a Canadian Water Network (CWN) and Public Sector Digest (PSD) project. This joint CWN/PSD research combines a national survey on asset management with specific case studies to illustrate some best practices. Part 1 will be released this fall with Part 2 to commence soon after.

Over this same period, Canada's Ecofiscal Commission has focused its researchers on water pricing, a major part of our sustainability plan (see page 14). The Commission's latest report is titled Only the Pipes Should be Hidden: Best Practices for Pricing and Improving Municipal Water and

Wastewater Services is to be released by this fall. The report makes a solid argument for full-cost accounting and appropriate water pricing. This could be a great tool in developing your case for raising rates at your utility. All of these programs and reports will be presented and discussed at the National Water & Wastewater Conference in St. John's this November. WC



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



We love hearing from you! Tweet us @CanadianWater

9th Annual **canadian water summit**

2018
June 20-22
VANCOUVER

Knowledge to Practice
How we Transfer Science,
Research and Policy to
Real-World Applications

SAVE THE DATE!

@CdnWaterSummit

bit.ly/CdnWaterSummit17

The Canadian Water Summit

To participate, contact jane@actualmedia.ca

watersummit.ca



JON GRANT

Jon Grant has accepted a new position as director of business operations and strategy at EMAGIN, an artificial intelligence company in the water sector. Grant, formerly a research manager at Water Technology Acceleration Project (WaterTAP), said, "Over the past 5 years, I had the best job in the water sector. I got to connect people to solutions that helped improve water situations and grow the water sector."

Grant's past work includes new product forecasting and analysis at BASES, a service of Nielsen, market analysis and development for a startup healthcare company, and advising an early stage water analytics company. He holds a BBA in Finance and International Business from the University of Cincinnati, an MSc in International Political Economy from London School of Economics. Jon also holds an LLM in Water Governance and Conflict Resolution, a joint degree between the UNESCO-IHE Institute for Water Education in Delft, Netherlands and the IHP-HELP Centre for Water Law, Policy and Science in Dundee, Scotland.

FER-PAL Infrastructure has announced that **Luc Lupien** has joined the business development team to manage the company's growing market presence in municipalities across Canada.

Lupien has been appointed to the newly created position of municipal market expansion manager and will be focused on expanding the company's presence and customer service in the structural watermain lining market.

With over 30 years of experience in the industry, Lupien will be joining FER-PAL after eight years as the market development director and sales director for Sanexen Environmental Services Inc. "I look forward to the opportunity to begin something new with FER-PAL, while continuing to expand the market for Aqua-Pipe and CIPP watermain relining," said Lupien.



GARY THORNE

In July, WSP bolstered its water and wastewater consulting team by adding two new specialists.



DAVID LYCON

Formerly with WSP in Australia, **Gary Thorne** will assume the role of water and wastewater technical lead, specializing in the design and construction of water and wastewater treatment plants.

Thorne has more than 40 years of high-level water experience and involvement in more than 100 major water/wastewater projects worldwide. He is known for his process approaches, which include the first nano-filtration plant in the U.K. for removing colour and organics and the first drinking water combined DAF/Filtration process in the U.K.

"What keeps me engaged is the opportunity to develop the next generation of water and wastewater professionals in Canada. The younger generation allows us to envision older processes in water and wastewater and make them new," said Thorne.

David Lycon is bringing more than 20 years of municipal and industrial wastewater treatment experience to WSP Canada, including in wastewater process selection studies, all phases of wastewater process design, process modelling using BioWin simulation software, project management, construction contract administration, and the provision of commissioning assistance and training.

Lycon's primary experience is in enhanced nutrient removal and solids handling technology. He has led the design on a number of wastewater treatment plants throughout British Columbia, Alberta, Nunavut and the Yukon, and participated in wastewater treatment projects in most provinces, the United States, China, and the Caribbean.

David will work from WSP's Vancouver office.



VINCE PALACE

The International Institute for Sustainable Development Experimental Lakes Area (IISD-ELA) has announced its new head research scientist, **Vince Palace**.

Palace is an aquatic toxicologist with 25 years of experience in determining exposure, evaluating potential impacts and developing mitigation strategies related to chemical and non-chemical aquatic stressors. Working with industry, government and community stakeholders, he has led projects on the impacts of agriculture, hydroelectric power, the oil and gas industry, and mining on aquatic ecosystems.

Additionally, Palace has extensive project experience with multi-level examinations of wastewaters from mines, pulp and paper mills and municipal effluents. He brings considerable experience with Canada's regulatory framework for Environmental Effects Monitoring to IISD-ELA.

He is an active adjunct professor and lecturer at the University of Manitoba in the departments of Biological Sciences and Environment and Geography. His expert opinion and testimony have been sought by national and international clients including the United Nations Environment Program, Environment Canada, Health Canada, Natural Resources Canada, the U.S. EPA, and the World Fisheries Trust, among others.

JOHN
MACKENZIE

The Toronto and Region Conservation Authority (TRCA) has selected **John MacKenzie** as the new chief executive officer.

After a year-long North American search, City of Toronto councillor **Maria Augimeri**, chair of TRCA, announced MacKenzie as the successor to current CEO, **Brian Denney**. Denney will step down as CEO after a 44-year career at TRCA.

MacKenzie brings more than two decades of experience in urban and environmental planning, public administration, infrastructure planning, project delivery, and environmental stewardship to his new role at TRCA. He is currently deputy city manager of planning and growth management

at the City of Vaughan, where he has played a leadership role in advancing corporate and strategic initiatives. MacKenzie is recognized as an expert on technical and policy matters related to land use planning, natural heritage planning, real estate, infrastructure delivery, land development, and environmental assessment.

In his previous roles at the Ontario Government, MacKenzie successfully managed significant infrastructure projects and played a major role in government policy initiatives including the establishment of the Greenbelt Plan and the Oak Ridges Moraine Conservation Plan.

"As the Toronto region grows, we face tremendous challenges and opportunities in safeguarding the long-term quality of life through the protection and restoration of a healthy natural environment in the region," said Councillor Augimeri. "Mr. MacKenzie brings the knowledge, experience and leadership qualities to help TRCA and its municipal partners address those challenges and opportunities and forge a path toward a healthy and prosperous future for the Toronto region for generations to come."

MacKenzie will begin his term as CEO of TRCA in November 2017.



TIM EDER

Tim Eder, who has served as executive director of the Great Lakes Commission since 2006, is joining the Charles Stewart Mott Foundation as a program officer in the Environment Program. He will manage a grantmaking portfolio that focuses on addressing freshwater challenges, particularly those in the Great Lakes basin.

During his tenure at the Great Lakes Commission, Eder played a key role in efforts to address critical Great Lakes issues, including invasive species, water quality, and economic development. The commission is an interstate agency that represents and advises the governors of all eight Great Lakes states, and the premiers of Ontario and Quebec, as they work to strengthen the region's economy and promote sustainable use of Great

Lakes water resources.

"The decision to hire Tim reflects Mott's longtime commitment to protecting the water resources of the Great Lakes," said **Sam Passmore**, director of the foundation's environment program. "The drinking water crisis in Flint—not to mention similar challenges faced by Toledo and other older cities—demonstrates the importance of the work. Tim's deep experience in the field, including his work with top state and federal officials, adds new dimensions to what the Foundation can do to help."

Eder said managing water-related grants at Mott is the opportunity of a lifetime.

"The Mott Foundation has been instrumental in creating and supporting nongovernmental organizations that have helped this region achieve worldwide recognition for progressive environmental programs and policies," Eder said. "The Flint water crisis reminded me why I entered this field and left me more determined than ever to make a difference for people and communities facing environmental challenges."

Eder has worked on Great Lakes environmental issues for the past 30 years. Prior to joining the Great Lakes Commission, he held a variety of regional and national positions with the National Wildlife Federation. Both the commission and NWF are longtime Mott grantees.

CARL
BODIMEADE

The Source Water Protection Committee in the Niagara Peninsula has selected **Carl Bodimeade** as a public interest representative. The committee is responsible for reviewing the annual progress report prepared by the Source Protection Authority. The annual report summarizes the progress made by various stakeholders in implementing the policies in the source protection plan. The committee is also responsible for overseeing any technical updates to the Assessment Report and Source Protection Plan as required.

Bodimeade is a professional engineer with over 35 years of experience in project management, engineering, and planning, focusing on water, wastewater, and stormwater. He is currently senior vice president of Hatch Infrastructure. Bodimeade has led and participated in a number of boards and committees, including the Ontario Coalition for Sustainable Infrastructure, the Toronto Region Board of Trade's Infrastructure Committee and Smart City Working Group, and the Institute for Sustainable Infrastructure. He is a resident of Pelham, Ont. where he and his wife operate an organic, pick-your-own blueberry farm in Ridgeville.



JOHN PRESTA

The new president of the Water Environment Association of Ontario (WEAO) is **John Presta**.

Water quality has always been top of mind for John. As director of environmental services for the Region of Durham, his team conducted more than 8,000 tests in 2016, demonstrating water quality standards that go above and beyond our legal guidelines.

"Bacteriological quality is the most important aspect of drinking water quality because of its association with water-borne disease," said Presta, in a recent interview with Durham Radio News. "We have achieved 99.8 per cent compliance for bacteriological samples, which is a very impressive rate."

After graduating from civil engineering at the University of Toronto, Presta entered the field as a consultant. Only a few years later, he joined the Region of Durham as a junior engineer, where his career flourished for the next twenty-seven years.

Presta intends to champion the water environment across associations, industries, and people. "We want to increase exposure to WEAO, not only to the water environment industry but also to other associations. We want to continue to increase our membership and attendance to the conference and add on successful events like the Utility Management Forum."

MARCUS
HENDERSON

Marcus Henderson, business development manager for Mississauga-based KSB Pumps Inc., has been elected to the board of directors of the Ontario Pollution Control Equipment Association (OPCEA). OPCEA is a trade association supporting suppliers of equipment and services for wastewater management. Member organizations work closely with Ontario municipalities and industries in the areas of water supply and wastewater management.

"I'm honoured to have been chosen to serve on the OPCEA Board. Infrastructure renewal is a high priority for Ontario and the OPCEA's members have specialized expertise that can contribute enormously to these efforts," said Henderson, who is a graduate of Queen's University in Chemical Engineering. He joined KSB Pumps in 2016.

SAAD Y.
JASIM

The International Board of Directors of the International Ozone Association (IOA) elected Dr. **Saad Y. Jasim** as the president-elect for the International Ozone Association, starting January 1, 2018, to December 31, 2019. On January 1, 2020, Dr. Jasim will begin his term as president of the International Ozone Association. Dr. Jasim is the first Canadian to be elected president of the International Ozone Association.

The manager of utilities at the City of White Rock, Dr. Jasim oversees day-to-day water operations and the large-scale infrastructure and research projects associated with White Rock's Total Water Quality Management Plan. He has led the city's research on secondary disinfection and treatment processes for the reduction of naturally occurring arsenic and manganese in White Rock water.

Since joining the City of White Rock in 2016, Dr. Jasim has overseen many water-related milestones for the White Rock,

such as the completion of the Merklin Reservoir and Pumping Station. Dr. Jasim also spearheaded studies with RES'EAU WaterNET, which are focused on identifying the best technologies that will provide a significant reduction of arsenic and manganese to provide quality water.

OLIVER
BRANDES

Oliver Brandes, the co-director of the POLIS Project on Ecological Governance at the University of Victoria's Centre for Global Studies, an independent, respected national water and governance expert has been commissioned to support the review of pollution in B.C.'s Hullcar Aquifer. Brandes will provide strategic advice and oversee aspects of the review. He will also lead a team that will make recommendations to Heyman that will ensure that best practices for the agricultural sector are aligned with the goal of ensuring safe, clean drinking water to all British Columbians.



Save the Date!
Join us and help shape the future with Green Infrastructure

Explore the latest in green infrastructure performance, economic valuation, public policies, new technologies, and best practices in design, installation, and maintenance.

GREY TO GREEN
Toronto | May 15 & 16, 2018

Presented by

GREEN ROOFS
FOR HEALTHY CITIES

GREEN
INFRASTRUCTURE
FOUNDATION



① Photo taken at a meeting with Schmidt Marine Technology Partners, a program of the Schmidt Family Foundation, that supports the development of ocean technologies. (L-R) Michael Shen, Noémie Giguere, Daniela Fernandez (Sustainable Oceans Alliance), Joy Young, Haley Guest, Jas Aulakh, Jake Hanft, Katherine Balpataky. ② Golden Gates Bridge, San Francisco. ③ Joyce Brooks and the IVLP guests tour the National Mall. ④ Giguere and Guest meet the starfish at the Marine Sciences Institute, Redwood City, CA. ⑤ Hailey Guest raises her hands to salute ocean literacy in front of the WWII ship now used for children's education at the Marine Sciences Institute. ⑥ Photo taken in front of a sculpture (officially "Hand of NOAA" by Ray Kaskey) outside of The National Oceanic and Atmospheric Administration's offices in Silver Spring, Maryland.

International Visitors Program on the Blue Economy

From August 14 to 23 four Canadian water experts travelled to Washington, D.C., San Francisco, C.A., and Monterey, C.A. as participants in an International Visitor Leadership Program (IVLP) focused on the blue economy. The IVLP program is the U.S. Department of State's professional exchange program. Through short-term visits to the United States, current and emerging foreign leaders in a variety of fields experience the country firsthand and cultivate lasting relationships with their American counterparts.

The Canadians participating were: **Jas Aulakh**, senior advisor, Canadian Wildlife Service, Environment and Climate Change Canada (Vancouver); Water Canada's editor, **Katherine Balpataky**

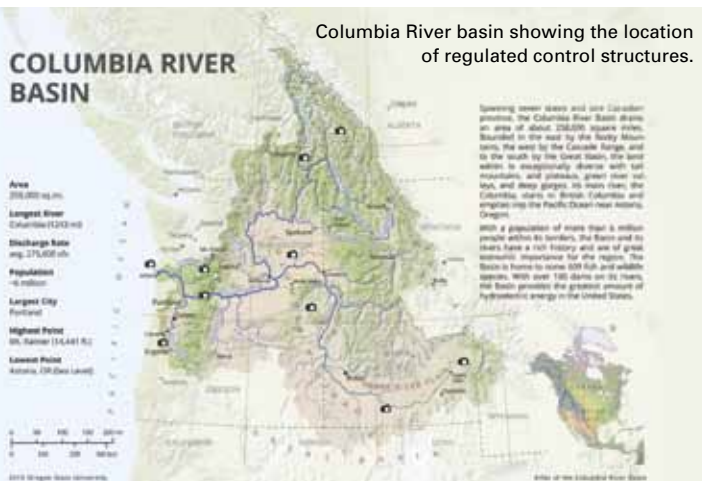
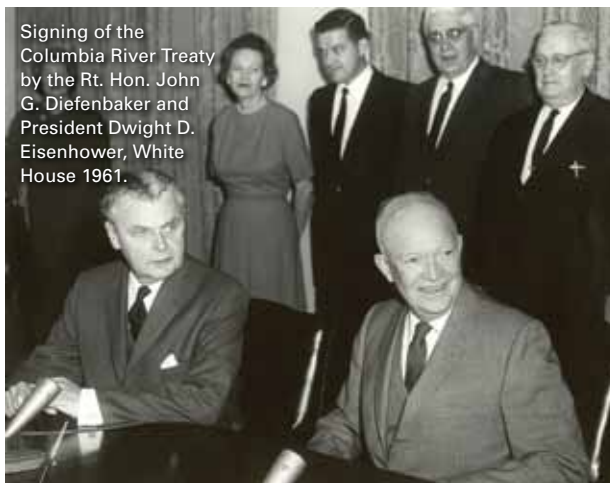
(Toronto); **Noémie Giguere**, executive director, Technopole maritime du Québec (Rimouski); and **Haley Guest**, former Ocean School Program Coordinator and Master of Education candidate, Dalhousie University (Halifax). The four women, accompanied by former foreign service officer and visitor liaison, **Joyce Brooks**, met with government officials, industry and NGO leaders.

The participants explored the role of government and non-governmental organizations in water conservation and management in the U.S. They met with **Carol Muffett**, Center for International Environmental Law; **Pete Leary**, U.S. Fish and Wildlife Service; **Stephanie Bailenson**, The Nature Conservancy;

Carl Gouldman, **Ralph Rayner**, and **Lauren Wenzel** of the National Ocean and Atmospheric Administration; as well as with representatives from the State Department, Senate Commerce Subcommittee on Oceans, Atmosphere, Fisheries, and Coast Guard, and other groups.

The program is intended to strengthen Canadian-American partnerships by connecting participants with researchers, innovators, entrepreneurs, and policymakers to discuss future legislation, business models, and platforms for collaboration. Each year nearly 5,000 International Visitors come to the U.S. on the International Visitor Leadership Program (IVLP).

Signing of the Columbia River Treaty by the Rt. Hon. John G. Diefenbaker and President Dwight D. Eisenhower, White House 1961.



Let's Make a Deal

Balancing Canada's interests in the Columbia River Treaty. BY JON FENNELL

CANADA HAS A LONG HISTORY of trading with the United States. But balancing economic, environmental, and social trade-offs across borders is never easy. The Columbia River is the fourth largest river in North America. It's a majestic water course originating in southeast B.C., flowing into the U.S. near Porthill, B.C. As a transboundary river, it falls under the Boundary Waters Treaty of 1909, administered by the International Joint Commission (IJC).

Since the signing of a joint agreement in 1961, the Columbia River has been jointly managed by Canada and the U.S. under the Columbia River Treaty (CRT). The primary goal of this treaty has been to mitigate flood risk at downstream communities in the Pacific Northwest. A secondary benefit has been the creation of additional hydropower made possible by a series of dams established on the Canadian side. The CRT has been described as a model of how two neighbouring countries can cooperatively manage a river to mutual benefit, or so you would think.

Who needs whom?

In 2014, the possibility to re-negotiate the CRT was triggered under the treaty provisions, and the U.S. has now started the process. The Canadian government has yet to engage and is waiting to see how we might benefit from a modernized agreement.

With only 15 per cent of the basin, our country has generated significant benefit to the U.S. by reducing peak flows and allowing water to spill from our reservoirs during later season low flows. To provide this benefit, Canada has flooded upwards of 110,000 hectares of arable land, displaced many people from their homes and communities, impacted shorelines along natural lakes, and among other things suffered a loss of salmon fisheries due to the construction of large, and impassable, dams.

These losses have resulted in a one-time payment of \$64.4 million to Canada for averted flood damages, plus one half of the downstream hydropower made possible by the extra water released from our country—amounting to \$100 to \$350 million annually since inception. For the U.S., this has averted an estimated \$32 billion in flood damages (\$2 billion in 2012 alone) and generated monetary benefits from the other half of the hydropower. On top of that, the additional water released from Canada has stimulated a \$630 million per year competing agricultural industry, and the flow stabilization has made possible a \$12 billion per year shipping industry.

And yet, arguments are being made to reduce the Canadian entitlement of hydropower from 50 per cent to 10 per cent. More interesting is the fact the IJC has yet to be mandated to balance out any discussions prior to formal proceedings. Odd.

Extreme costs

The anticipated impacts of climate change and intensification of the hydrologic cycle in conjunction with a projected decline in snow pack of around 35 per cent south of the border by 2040, compared to 11 per cent on our side, the Canadian runoff contribution will become increasingly important to the U.S., so will flow contributions from melting glaciers, which are more prevalent in Canada, not to mention the mitigation of extreme runoff events anticipated from more frequent high-intensity storm events. One could say 'the law-of-averages cannot apply, when the costs of extremes are so high'.

Taking a stand

Canada has suffered from an outdated and under-valued agreement. Perhaps it's time to take a stand, press our position, and negotiate a more equitable deal. After all, water security will play a central role in future success across the border. And to the free market economy that relies on it, and competes with ours, that's worth something. wc



Dr. Jon Fennell is a VP and senior advisor with InSolutions, a strategic consulting division of Integrated Sustainability Consultants Ltd.

WEFTEC is the one event for professionals, industry experts, and the most innovative companies from around the world. Learn from the very best thought-leaders in water quality.

Attending WEFTEC connects you to the pulse of the water quality sector and provides the tools, knowledge, and know-how for professional success.



REGISTER NOW

A stylized illustration of the Chicago skyline in various shades of blue. The skyline includes several prominent skyscrapers, with the Willis Tower being the tallest. The buildings are rendered in a simplified, geometric style. In the background, there are some white clouds.

90 YEARS

MCCORMICK PLACE CHICAGO
CONFERENCE SEP 30 – OCT 4, 2017
EXHIBITION OCT 2–4, 2017

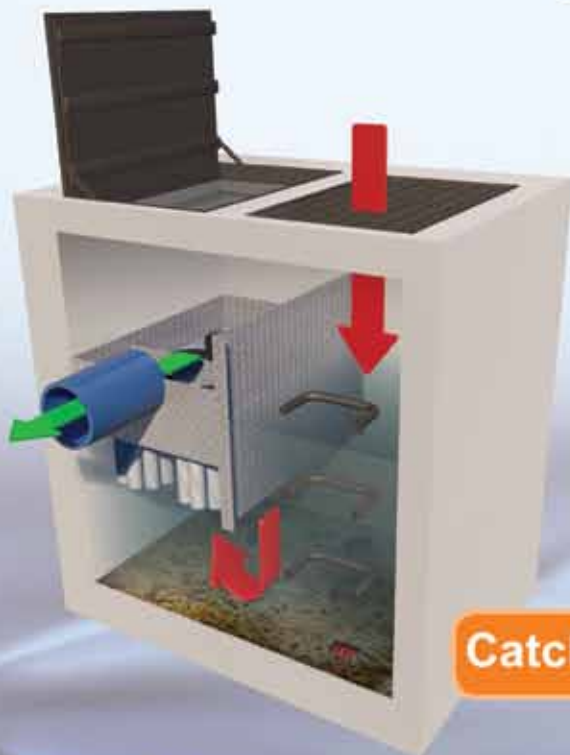
www.weftec.org

Stormwater Treatment

Jellyfish[®] Filter

*The first stormwater filter technology in Canada to achieve
ISO 14034 Environmental Technology Verification.*

- Small footprint & fewer cartridges
- Low driving head (457 mm or less)
- High treatment flow (5 l/s per Hi-Flo cartridge)
- Qualifies for LEED credits
- Rinseable & reusable cartridges
- ISO verified performance



Catch Basin or Vaults



Manhole

Creator of *Stormceptor[®]*

ISO 14034 Verified

Jellyfish Filter is manufactured and sold under license:

Alberta to W. Ontario – Lafarge (403)-292-9502
British Columbia – Langley Concrete Group (604)-533-1656
Ontario – Forterra Pipe & Precast Inc. (519)-622-7574
Quebec – Lécuyer et Fil Ltée (514)-861-5623

For Sizing or Design Assistance contact us at: info@imbriumsystems.com
Tel: 416-960-9900


imbrium[®]
www.imbriumsystems.com