



# 2020 EnviroVista Report

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## Introduction

### Recognizing 'Green' Champions

The Alberta Environment and Parks “EnviroVista” program promotes environmental leadership and recognizes environmental excellence through emissions performance and continuous improvement initiatives. EnviroVista provides unique regulatory status for Alberta industrial and manufacturing facilities, including municipal water operations.

The EPCOR Edmonton Waterworks System was granted EnviroVista Champion status by Alberta Environment and Parks on June 1, 2011. In its 10-yr Stewardship Agreement with the province, EPCOR committed to a set of environmental initiatives that go beyond the typical approval-to-operate requirements for a municipal water operation (see Stewardship Commitments below). Many of these commitments are programs and activities EPCOR established that have evolved over the years. While the Stewardship Agreement now recognizes these continuous improvement initiatives, it also commits EPCOR to maintaining certain performance levels going forward. Why did EPCOR make these commitments? Because we know that continuing these programs is the right thing to do if we want to continue to improve and protect the environment and public health. At EPCOR, environmental excellence includes both providing safe drinking water and minimizing our impact to the environment. The health of our water supply affects us today and tomorrow. That’s why EPCOR goes above and beyond to protect the environment while ensuring future generations have access to clean, safe water.

In this report you’ll learn how we’re protecting public health, our drinking water supply and the environment for future generations to come and how we are continuing to meet the commitment we made in 2011.

### Looking Forward

AEP made a decision in 2019 to wind down the EnviroVista program. EPCOR retains EnviroVista Champion status and the Stewardship agreement until May 31, 2021 when our 10-year approval expires. EPCOR was granted a 10-year approval effective June 1, 2021, but there will no longer be a formal Stewardship agreement. EPCOR, nevertheless, intends to continue within the spirit of the EnviroVista program and to adhere to our Stewardship agreements as best as we can going forward.

## Highlights of 2020 EnviroVista Initiatives and Challenges:

- As the COVID-19 pandemic hit in March 2020, EPCOR adapted quickly to ensure that we continued to provide reliable and safe drinking water to the City of Edmonton and surrounding region. Like many other organizations, EPCOR had to rapidly implement new policies and procedures in the workplace to keep both our employees and the public safe and we had to adapt these policies and procedures throughout the year. Some of our programs, such as sampling and testing for lead at the tap in customer's homes, were impacted by the required safety measures. Some construction projects were also delayed. But the majority of our programs moved forward during the year after some adjustment. With the exception of a shortfall of water distribution system samples in April as pandemic transmission concerns were high and protocols were still under development (177 collected versus the required 190), EPCOR met all regulatory and internal drinking water quality requirements during the year.
- The issue of potential water quality problems in large buildings and facilities that were experiencing no or very low water use due to pandemic restrictions came to the forefront in 2020. EPCOR initiated a water quality management program that included increased monitoring in lower-than-normal use areas of the municipal distribution system and targeted communications to business customers about maintaining water quality during COVID shutdowns. EPCOR also contributed to the development of guidelines led by Alberta Health and the Canadian Water and Wastewater Association that provided recommendations for building owners and operators to maintain water quality in buildings.
- During the early stages of the pandemic, EPCOR engaged with Alberta Environment and Parks (AEP) and the City of Calgary to ensure that there was back-up coverage for the operation of water systems across the province. EPCOR also provided water treatment and distribution assistance to the Regional Municipality of Wood Buffalo, a community we don't directly service but have operations in close proximity to, following the flooding in Fort McMurray in the spring.
- EPCOR continued to maintain Environmental Management Systems registered to the international standard, ISO14001:2015 for the Water Treatment Plants and the Distribution System. These systems encourage continuous improvement in how we manage environmental and public health impacts of our operations.
- EPCOR continued collaboration with AEP, North Saskatchewan Watershed Alliance (NSWA) and the City of Edmonton to develop a comprehensive source water quality monitoring program for the North Saskatchewan River. The **WaterSHED (Saskatchewan Headwaters Edmonton Downstream) Monitoring Program** involves building and operating a network of twenty-two flow and water quality monitoring stations at strategic locations throughout the watershed, from the headwaters to the Saskatchewan border. Though collection was temporarily paused due to COVID-19 restrictions, the network was fully operational in 2020 and special projects continued. AEP produced a [technical report](#) on the results. In early 2021, the project also earned an Alberta Emerald Award finalist nomination.
- EPCOR updated the Source Water Protection Plan in 2020 including substantial new information on activities and potential risks in the watershed. Specifically, we added a section that addressed emerging stakeholder concerns around the potential increases in coal mining and their possible impact on Edmonton drinking water.
- EPCOR ramped up construction of the \$44 M Enhanced Lead Mitigation Strategy in 2020. The enhanced lead mitigation strategy includes: (1) addition of orthophosphate to the Edmonton drinking to mitigate lead release from lead service lines and plumbing components containing lead; (2) full lead service line replacement in homes identified as high priority based on lead test results; and (3) full lead service line replacements whenever a service is replaced due to a water main renewal or maintenance work. Full lead service line replacement means replacing the entire pipe from "main to meter" whenever a service replacement is done. Sixty-nine of an estimated 360 high priority lead service lines and 187 other service lines were fully replaced in 2020, and another 13 were abandoned. All told, 256 lead services were

completely removed from the system. Designs of systems for metering of orthophosphate into the drinking water at both water treatment plants were initiated and commissioning is expected at end of 2022.

- EPCOR received a key approval from Edmonton City Council for land rezoning to accommodate the construction of a solar farm within the fence line at the E. L. Smith Water Treatment plant site. When built, this solar farm will help power operations at the E. L. Smith Water Treatment plant, but will also significantly reduce greenhouse gas emissions in Edmonton and help EPCOR meet its GHG emission reduction targets. Design is underway and construction will commence in 2021.
- EPCOR has been operating our water treatment plants in Direct Filtration (DF) mode during the winter and fall seasons, when river water conditions allow it, in order to reduce the amount of chemical (alum) used to treat the water and the amount of solids residuals discharged back to the river during periods of relatively low river flow. The year 2020 was a success in terms of Direct Filtration operation with 168 days in DF operation and reductions of solids residuals released to the river of 43% and 59% relative to baseline in the winter and fall periods, respectively.
- EPCOR continued to investigate the environmental impact of the solids that are discharged to the river in 2020 and to build on the work we completed in previous years (2013 - 2019). EPCOR completed a Triple Bottom Line (TBL) assessment that concluded the environmental impacts of the construction and operation of residual treatment facilities outweighed the environmental benefits to the river. EPCOR developed a residuals management strategy that will be based on comprehensive discharge monitoring and improved environmental assessment of the discharges on the river.

# Ensuring Public Health Protection and Minimizing Environmental Risks

## Environmental Management System (EMS)

EPCOR's E.L. Smith and Rosedale Water Treatment Plants (including the system reservoirs) are registered to the ISO 14001:2015 (effective June 2018) and ISO 45001:2018 (effective January 2019) standards. These are two international standards for managing facility environmental (EMS) and worker safety (Occupational Health & Safety Management System) requirements, respectively. Collectively, these standards are referred to as the Edmonton Water Treatment Plants integrated Management System (EWTPiMS).

Annually, the EWTPiMS is audited internally, as well as evaluated by a qualified certification body. All audit findings are tracked in a formal Audit Tracker worksheet to facilitate managing corrective actions to address audit findings. The EWTPiMS conforms to the EPCOR enterprise-wide HSE-MS, which provides an overarching set of high-level standards and procedures that support operational activities. At the Edmonton Water Treatment Plants (WTPs) and reservoirs, site-specific standard operating procedures (SOPs) address environmental risks and significant aspects and related worker hazards in each operational functional area.

In addition to the WTPs and reservoirs, the Edmonton Waterworks System also includes a large network of pipes and transmission mains – collectively known as the Water Distribution & Transmission (D&T) system; this infrastructure delivers potable water from the WTPs to the reservoirs, and from the reservoirs to customers. The EMS and OH&S-MS for Water D&T, referred to as the EWDTiMS, was registered in June 2017 under the ISO 14001:2015 and OHSAS 18001:2007 standards. In December 2020, Water D&T registered to ISO 45001:2018 from the OHSAS 18001:2007 standard. With the EMS for both the WTPs and Water D&T accredited, the EnviroVista commitment to have the complete Edmonton Waterworks System certified under ISO 14001 has been fulfilled.

## Operations Program

The Operations Program comprises plans, operational philosophies and procedures used by staff to manage the Edmonton Waterworks System. This ensures consistent production and reliable delivery of high quality drinking water while reducing environmental impacts. The comprehensive Operations Program document is a requirement of the EnviroVista Approval and is an integral component of the Edmonton Waterworks' Environmental Management System (EMS) accredited under ISO 14001. A team of subject matter experts from across EPCOR collaborate throughout the year to keep the Operations Program up to date and changes to the Operations Program are reviewed annually by EPCOR management. The first Operations Program was completed on December 31, 2012. The most recent revisions to the Operations Program were completed on February 27, 2021 and included the following:

- EPCOR has developed an Integrated Watershed Management Strategy (IWMS) that addresses discharges from water treatment plant residuals, storm water, combined sewer, and the Gold Bar wastewater treatment plant in a total loadings framework. This includes the development of the IWMS which evaluates the effect of discharges (storm, combined, water treatment plant residuals, and wastewater) on the North Saskatchewan River (NSR) and provides recommendations for monitoring, modelling, and planning strategies. EPCOR is currently leading the development of a 10-year Modelling Strategy for the NSR basin as part of the IWMS.
- As of January 19th 2021 the Blackmud Creek booster, Discovery Park Reservoir and associated distribution system were added to the Edmonton Waterworks system. This infrastructure had been operated in 2020 under a separate Code of Practice registration as it was receiving water from the Capital Region Southwest Water Services Commission transmission line. Following the purchase of a portion of this line by EPCOR, all these operations fall within the Edmonton Waterworks approval. The addition of this reservoir increases the storage capacity by 7.1 ML to a total of 810.99 ML.

- The GeoFIT GIS/work management system was introduced within EPCOR. This system replaces our Network Field Link System and other work order systems.
- Samples collected from lead service lines homes and random daytime samples are normally collected by EPCOR employees. In 2020, EPCOR introduced a procedure for collection of samples by the resident/homeowner for external pick-up and analysis by EPCOR. This modification was introduced specifically to reduce risk of COVID-19 transmission to the resident and/or employee. This modified COVID-19 sampling procedure will continue in 2021 as necessary.
- In the 2021 review of the DWSP, four new action plans were identified and added to the Key Risk Action Plan register. We made significant progress in completing previous year's action plans. Twenty-three completed action plans were removed.
- In 2021, EPCOR plans to focus on several areas in the area of Emergency Management:
  - A continued response to COVID-19 until public health agencies confirm that the virus no longer poses a threat to our workers.
  - Conduct the regional stakeholder demand management exercise that was cancelled in 2020 due to COVID-19, if public health restrictions do not pose undue constraints.
  - Conduct a Water Emergency Operations Centre (EOC) exercise to validate the Emergency Drinking Water Supply Plan (EDWSP) (tornado damage scenario), if public health restrictions do not pose undue constraints.
  - Review the current state of Emergency Response and Business Continuity Plans.
- EPCOR has replaced Heterotrophic Plate Count (HPC) bacteriological analysis with cellular Adenosine Triphosphate (ATP) bacteriological analysis.

## Drinking Water Safety Plan

EPCOR is committed to maintaining a source-to-tap, multi-barrier approach for providing safe drinking water to its customers. The Drinking Water Safety Plan (DWSP) addresses risks to public health associated with the supply of drinking water—other risks (i.e. employee safety, environmental, regulatory, reputation, financial) are addressed through other management systems EPCOR uses. DWSP risks are broken down into five “Source-to-Tap” areas: Source Risks, Treatment Risks, Reservoir Risks, Pipeline Risks and Customer Risks. The DWSP risk assessment was first completed for the Edmonton Waterworks System in 2013. At the time of the first DWSP evaluation cycle, over 40 EPCOR experts were involved in identifying and assessing these risks to the water system and public health. In our current annual review, we remain committed to assembling a group of subject matter experts from relevant areas across EPCOR to review, discuss and update risks within our DWSP.

The DWSP process is based on the concept of continuous improvement and the Plan-Do-Check-Act cycle that is inherent to the ISO14001 Environmental Management System. This system requires us to review regularly and re-evaluate the DWSP risks, and update as necessary. Since 2013, the DWSP is formally reviewed and updated on an annual cycle, however, new risks can be added at any time. In late 2020/early 2021, EPCOR convened a team of subject matter experts to once again review the entire DWSP in depth. The multidiscipline team reassessed all of the existing risks and action plans and was also asked to identify any new or emerging risks, or risks that required re-evaluation. When assessing risks, the team also looked at developing trends and issues in water treatment and supply and incidents that have occurred at EPCOR and in the industry in general. This in-depth review resulted in the addition of three new risks to the action plan registry:

- Reduction of transmission capacity due to air accumulation in main;
- Review demand management measures; and
- Long water outage impacting customers.

Action plans and programs will be developed in 2020 to mitigate these key risks. Twenty-three past key risks had been addressed and were removed from the action plan registry as the associated key action plans were completed and the risks reduced. There are now 27 risks on the key risk registry with action plans that are in progress. Identification of these key risks allows EPCOR to continuously reduce overall risk to water supplied in the Edmonton drinking water system.

# Protecting Our Drinking Water Supply

## EPCOR's Source-to-Tap Multi-Barrier Approach

### 1. Source Water Protection

EPCOR maintains a source water protection and monitoring program that identifies risks in the raw water supply (North Saskatchewan River). EPCOR's Source Water Protection Plan (SWPP) was first developed in 2008 to help mitigate potential risks to Edmonton's source water supplies by understanding the pressures on the watershed. An update to the plan, including enhanced land use maps, water quality assessment and incorporation of the Drinking Water Safety Plan Risk Assessment, was published in early 2021 (See section on Watershed and Source Water Protection Programs). Key SWPP risks were also reviewed in early 2021 as part of the annual Drinking Water Safety Plan review (see section on DWSP).

### 2. Treatment

Both Rosedale and E. L. Smith use conventional and direct filtration treatment methods. When raw water quality is good and stable, typically in the fall and winter months, the plants will shift to direct filtration. This requires a substantially lower dose of alum and results in a significant reduction in the amount of waste discharged to the North Saskatchewan River. (See details in the Reducing Environmental Impacts section of this report). Both conventional and direct filtration treatments remove harmful bacteria, viruses and parasites (especially *Giardia* cysts and *Cryptosporidium* oocysts) that might be present in the untreated river water as follows:

- EPCOR achieves at least 99.97% (3.5 log) physical removal credit for *Giardia* cysts and *Cryptosporidium* oocysts from the raw water during conventional operation by ensuring turbidity of the treated water produced by each filter in the water treatment plant is very low. Filter effluent turbidity is maintained at less than 0.1 Nephelometric Turbidity Units (NTU) on individual filters at all times. The internal target is to be less than 0.08 NTU. This performance readily exceeds the AEP requirement of less than 0.3 NTU for 99% of the time. Additional removal credits above 3.5 log are earned by meeting the lower filter turbidity targets consistently;
- During direct filtration operation, the individual filter effluent turbidity is still maintained at 0.1 NTU or less but the physical removal credit is reduced to 3.0 log removal. Although *Giardia* cyst and *Cryptosporidium* oocyst removal credit is slightly lower during direct filtration (99.9% versus 99.97% or 3 log versus 3.5 log), the concentration of these parasites in the river is low in the fall and winter months when we run direct filtration. We monitor the concentration of the parasites in the river and the filtered water at least biweekly during direct filtration operation and at least monthly at other times.
- Ultraviolet light (UV) disinfection provides an additional 99.9% (3 log) inactivation credit of any *Giardia* cysts and *Cryptosporidium* oocysts remaining in the water after filtration;
- Primary disinfection provided by free chlorine provides an additional barrier against *Giardia* cysts, and is the primary barrier against bacteria and viruses;
- The overall removal credit of *Cryptosporidium* oocysts is at least 99.99997% (6.5 log) during conventional operation and at least 99.9999% (6.0 log) during direct filtration operation. This exceeds the minimum regulator (Alberta Environment and Parks) requirement of 99.9997% (5.5 log) that is based on the raw water quality and a health risk assessment. *Giardia* cyst removal is slightly higher due to chlorination; and
- Bacteria and viruses are inactivated by chlorination but are also removed to some extent by filtration. Additional inactivation is achieved by UV disinfection. Virus log removal credit is determined by free chlorine CT (chlorine concentration x contact time) in the treatment plant. It is variable during the year as water temperature and pH fluctuates, but is always greater than the 99.99% (4 log) requirement.

Ammonia is added to the water to form chloramine, which provides a lasting disinfectant residual through reservoir storage and throughout the distribution system within Edmonton and the regional waterworks systems.

A summary of the log removal performance at the two water treatment plants in 2020 is provided below:

	Approval Requirement	Rosssdale WTP		E. L. Smith WTP	
		Minimum	Average	Minimum	Average
<i>Giardia</i>	5.5	6.5	14.0	6.0	7.0
<i>Cryptosporidium</i>	5.5	6.4	6.8	60	7.8
Virus	4.0	7.7	44	5.6	11

### 3. Distribution System

EPCOR ensures the safety of water in the distribution system by confirming that the piping system is maintained and that there is adequate supply pressure. Ongoing programs that safeguard distribution system integrity and water quality include:

- distribution system pipe and appurtenance replacement;
- main break repair;
- valve exercising and replacement;
- regular unidirectional water main flushing and hydrant servicing;
- distribution system leak detection; and
- distribution system pressure monitoring.

See details of distribution system activities in the [Industry Leadership section](#) of this report.

### 4. Cross Connection Control Program

A Cross Connection Control (CCC) program maintained by EPCOR provides an additional public health protection barrier. The goal of the CCC program is to minimize the potential for unintended backflow into the distribution system from moderate and severe risk customers in the multi-residential, industrial, commercial and institutional customer segments. EPCOR does this by ensuring Canadian Standards Association approved backflow prevention assemblies are in place for premise isolation and are tested annually as required by the National Plumbing Code of Canada, CSA B64.10 Standard, and the City of Edmonton Bylaw 17698 EPCOR Water Services and Wastewater Treatment EPCOR Bylaw. Every year, EPCOR adds facilities to the program.

Due to the risks associated with COVID-19, limited progress was made on the Cross Connection program in 2020. Only 280 facilities were added to the program in 2020 (compared to 607 in 2019) to bring the total number of facilities with reported backflow prevention devices in place to 12,702. In order to protect both EPCOR employee and customer health, on-site facility inspections to verify these counts were suspended in 2020 and none were completed. As a result, overall program compliance (tracking overdue tests and devices not installed) dropped from 77% at the end of 2019 to 47% at the end of 2020. EPCOR will resume the inspection program as soon as it is deemed safe to do so in 2021 and we expect a sharp increase in compliance to normal levels.

## 5. Lead Response Program

The Lead Response Program reduces the potential for exposure to lead in tap water for approximately 4,500 homes in mature neighbourhoods of the city that are supplied through lead service lines. See details on this program in the Lead Response Program section of this report.

## 6. Monitoring

To ensure safety of the drinking water up to customer taps, EPCOR monitors raw water entering the Rossdale and E.L. Smith WTPs, partially treated water and treated drinking water leaving our treatment plants and entering the distribution system. In addition, our monitoring program ensures water quality throughout the field reservoirs and distribution system. The water is also tested in response to customer inquiries and following system depressurizations due to main breaks or planned maintenance work.

EPCOR exceeds the minimum amount of monitoring and testing required by the regulator. In a city the size of Edmonton, Health Canada recommends bacteriological testing on 190 samples collected from the distribution system each month. In 2020, EPCOR collected 3,333 samples, or an average of 278 per month, from all parts of the city as part of our routine distribution system monitoring program. Of these, 2,611 were tested in the EPCOR accredited laboratory and 722 were tested in the Provincial Laboratory for Public Health. In addition, EPCOR sent an additional 627 duplicate samples to the Provincial Laboratory for Public Health each month for an inter-lab quality assurance check. When water quality inquiries and depressurizations are included, 4,360 samples were collected in the distribution system in 2020. This is an average of 323 per month, which is well above the Health Canada recommendation. In April 2020, many public places, buildings and facilities were closed because of the COVID-19 pandemic, and EPCOR was able to collect only 177 samples as part of the bacteriological sampling program for that month. In subsequent months, additional samples were collected from fire hydrants in targeted areas of low water use to ensure bacteriological monitoring requirements were met and that water quality was maintained across the distribution system. There were many areas of lower than normal water use due to facility shutdown or reduced occupancy during the pandemic.

In 2020, the EPCOR Water Laboratory carried out 113,474 tests on 7,155 samples of raw water that entered the water treatment plants, partially treated water, treated water that entered the distribution system and treated water from the field reservoirs and from various points within the distribution system. EPCOR tested for approximately 190 chemical, physical or microbial parameters for Edmonton water. In addition, EPCOR conducted 9,923 tests on another 1,183 samples and these included another approximately 200 supplementary parameters (including herbicides, pesticides and other trace organic compounds) by external commercial laboratories. These figures don't include testing conducted for special projects or initiatives such as EPCOR's home sniffing program or the lead response program. Full details of all testing and monitoring done are published in monthly and annual Edmonton Waterworks reports that are posted on [EPCOR's website](#).

In addition to laboratory testing, EPCOR also uses numerous online analyzers to continuously monitor critical treatment performance and water quality variables in the treatment plants, such as chlorine concentration and filtered water turbidity. Back-ups are provided for critical analyzers. There are about 140 online analyzers at the E.L. Smith WTP and about 80 at the Rossdale WTP with a quality assurance program in place to confirm they are reliable. Operators at the plants perform frequent bench tests to ensure the performance of these analyzers. In 2020, operators performed approximately 35,000 tests at each of the E. L. Smith and Rossdale WTPs.

## Our Stringent Water Quality Standards

### Meeting Regulatory Requirements and Health Canada Guidelines

EPCOR tests for the parameters listed in the [Guidelines for Canadian Drinking Water Quality](#). In 2020, EPCOR met the all of the applicable Guidelines Canadian Drinking Water Quality (GCDWQ) health-based limits for microbiological, radiochemical, chemical and physical parameters. Of the 59,271 applicable water quality tests EPCOR conducted, only 147 (< 0.25%) did not meet the requirements of EPCOR's internal water quality standards. None of these tests were confirmed to have failed to meet GCDWQ or the AEP Approval-to-Operate water quality parameter limits. EPCOR did not have any approval contraventions in 2019 involving a failure to meet drinking water guidelines. There was an exceedance of the GCDWQ limit for bromate in the treated water in February, however, that was concluded to have been the result of a testing anomaly. One sample collected from an external hose bib at a home tested positive for *E. coli*, however, an investigation including follow-up sampling and testing concluded that the original positive sample was due to sample contamination.

Whenever Health Canada contemplates adding new parameters to the guidelines, EPCOR will test for those parameters. In 2019, Health Canada set guidelines for two new parameters: Perfluorooctanoic Acid (PFOA) and Perfluorooctane Sulfonate (PFOS). These are man-made compounds used in the manufacture of stain/water/oil resistance coatings for various consumer products and in specialized applications such as firefighting foams, hydraulic fluids and carpet spot removers. They are increasingly detected in the environment and human health effects have been identified. The Maximum Acceptable Concentrations for these parameters were set at the very low levels of 0.6 µg/L (PFOS) and 0.2 µg/L (PFOA). EPCOR began quarterly testing for the presence of these compounds in the raw and treated drinking water in 2018 and continued through 2020. These compounds have not been detected in Edmonton water (<0.02 µg/L).

In March 2020, Health Canada confirmed a new guideline for aluminum in drinking water that sets a Maximum Acceptable Concentration (MAC) of 2.9 mg/L and an Operational Guideline (OG) of 0.050 mg/L. The MAC of 2.9 mg/L is based on health criteria. EPCOR water meets the MAC 100% of the time. The OG of 0.050 mg/L is set to optimize water treatment and distribution operations. An excess of aluminum in treated water can result in operational challenges and aesthetic issues in the water reaching customer taps. Recognizing that aluminum levels can vary seasonally and due to treatment conditions, both the MAC and OG are based on locational running annual averages (LRAA). An analysis of 10-year monthly aluminum testing data from our WTPs showed that the highest LRAA for aluminum was 0.106 mg/L and that the water met the LRAA more than 96% of the time.

In March 2021, Health Canada introduced a new health-based guideline for 1,4 dioxane of 0.050 mg/L. This substance is not found in EPCOR water.

Health Canada has proposed several other changes to drinking water guidelines in 2020, including:

- Withdrawal of health-based guidelines for 18 substances, including 14 pesticides, because these contaminants are no longer likely to be found in Canadian drinking water at levels that might pose a risk to health.
- A decrease of the health-based guideline for the herbicide Dicamba from 0.12 to 0.11 mg/L. This substance is not found in EPCOR water.
- An increase of the health-based guideline for the herbicide 4-Chloro-2-methylphenoxyacetic Acid (MCPA) from 0.1 mg/L to 0.4 mg/L. This substance is not found in EPCOR water.
- An increase of the health-based guideline for the insecticide Malathion from 0.19 to 0.29 mg/L. This substance is not found in EPCOR water.
- An increase of the health-based guideline for the herbicide Bromoxynil from 0.005 to 0.03 mg/L. This substance is not found in EPCOR water.

- An increase of the health-based guideline for the metal Cadmium 0.005 from to 0.007 mg/L. This substance is not found in EPCOR water.

In early 2021, Health Canada introduced a new Guidance document for waterborne pathogens that describes the different types of waterborne pathogens, their health effects, how they are transmitted and best practices to ensure safe drinking. EPCOR provides a minimum of 99.999% removal of the protozoan pathogens *Giardia* and *Cryptosporidium*, and the 99.99% removal of viruses through the treatment process. This level of treatment meets the recommendations in the guidance document (See Source-to-Tap section).

## The Water Quality Index

The Water Quality Index measures the number of treated water tests that meet EPCOR's internal water quality standards. EPCOR's standards are often more stringent than Provincial requirements or Health Canada Drinking Water Guidelines. In 2020, only 147 tests out of 59,271 tests of treated water did not pass EPCOR's internal quality standards. There were no confirmed water quality violations during the year. This resulted in an overall Water Quality Index score of 99.75%. We exceeded our target of greater than 99.70% that is set out in EPCOR's Performance Based Regulation (PBR) established through a City of Edmonton bylaw.

Of the 147 water quality variances reported during the year:

- 72 were exceedances of the EPCOR internal turbidity standard of one nephelometric turbidity units (NTU) in the distribution system. These exceedances are often related to localized water quality events where rust on the inside surface of older cast iron pipes is disturbed due to changes in flow or construction/maintenance work.
- 30 were due to chlorine concentrations in the distribution system that were below the EPCOR internal standard of 1 mg/L. This often happens in areas of the distribution system where there is low water use and low flow and the low chlorine is quickly resolved by moving fresh water into the area by flushing. In 2020, more areas of low use were identified than normal due to the impact of the COVID-19 pandemic on water use in industrial areas.
- Eight were due to the detection of total coliform bacteria in water samples collected in the distribution system. Each of these events was followed up by retesting at the same location and locations both upstream and downstream in the distribution system and each was determined through resampling to be contamination of the sample during collection. EPCOR collected over 5,000 samples for coliform bacteria testing in the distribution system during 2020 as part of routine monitoring, in response to complaints and following repair activities. The eight positive results means that the false positive rate of coliform detection was less than 0.2%.
- Six were due to exceedance of the operating objective for aluminum of 0.10 mg/L at the WTPs. Aluminum is naturally present in the source water and some is removed during treatment. The operational objective of 0.10 mg/L is well below the Health Canada health-based guideline of 2.6 mg/L. No results exceeded the health-based objective.
- Six were due to odour complaints from the use of pipe lubricant during pipe construction. The lubricant used is food grade and safe but imparts an unpleasant taste and odour if too much is used.
- Of the remaining 18 exceedances, many were due to high levels of iron arising from disturbance of rust in cast iron pipes.

EPCOR tracks the water quality index each year. The table below provides the results for the last five years. The index result has consistently exceeded the current target of greater than 99.7%. There was a modest reduction in the outcome in 2020 relative to previous years because EPCOR carried out additional proactive monitoring and water quality management in low water use areas of the distribution system network. The low water use areas that were identified for additional monitoring were mainly the result of reduction in water use in industrial areas due to the impact COVID-19 pandemic.

## EPCOR Water Quality Index Result 2016 – 2020

Year	Result	Target
2020	99.75%	99.7%
2019	99.82%	99.7%
2018	99.81%	99.7%
2017	99.84%	99.7%
2016	99.73%	99.6%

## Spring Runoff Program and the Home Sniffing Program

Spring runoff conditions in the North Saskatchewan River vary from year to year and can significantly affect the taste and odour of drinking water. Spring runoff (typically mid-March to mid-April) results in an increase in the turbidity, colour, taste and odour of the raw water supply drawn from the North Saskatchewan River. During the winter months, our WTPs use direct filtration and must transition back to conventional treatment mode of operation prior to spring runoff. This allows us to add powdered activated carbon (PAC) as a taste and odour control measure.

The onset of spring runoff in 2020 was later than usual and water quality conditions in the North Saskatchewan River posed treatment challenges that persisted longer than usual. Despite these challenges, EPCOR's monitoring and treatment protocols resulted in treated water quality that exceeded the targeted customer satisfaction level.

In 2020, spring runoff began around April 16 as indicated by a rapid increase in river water colour and turbidity. Both WTPs had converted to conventional treatment before spring runoff and began adding PAC as the ammonia, colour and odour in the raw water increased. PAC addition started on April 12, a few days before runoff started, and was stopped on May 8 making for a relatively long runoff period.

### Home Sniffing Program

This program measures the effectiveness of EPCOR's spring runoff water treatment strategy. A panel of EPCOR customer volunteers rate the odour of the treated water from the hot and cold taps in their home. A satisfied customer is one who rates the intensity of the odour as 0.5 or less on a scale of 0 to 3. This means the water has either a slight non-objectionable odour, trace odour or no odour.

In 2020, we ran the program for 89 days between February 18 to May 17, 2019 and on each day from samples tested by over 250 volunteer "home sniffers" from around the City of Edmonton. The overall Customer Satisfaction Rating for this period was 95.1% and exceeded our internal performance target of 94.4%. Overall, 2020 was considered a challenging spring runoff year but EPCOR was able to rise to the challenge and produce relatively odour-free water throughout.

## Performance-Based Rates Requirements

In addition to the Water Quality Index and the Home Sniffing Customer Satisfaction Rating, EPCOR strives to meet several other requirements set by the City of Edmonton Performance-Based Regulation (PBR) related to providing safe drinking water. These measures ensure EPCOR maintains performance in a number of areas. Overall water system operational performance is measured against the five aggregate measures:

- Water Quality Index
- Customer Service Index
- System Reliability and Optimization Index
- Environmental Index

- Safety Index

Each of these aggregate measures is comprised of between one and four components that are scored independently. The breakdown and the points awarded for each are described in the tables below. The overall score of 108.0 in 2020 exceeded the target score of 100 points. When compared with the 2014 to 2019 scores of 107.2, 106.0, 108.5, 107.6, 107.1 and 107.5 points, respectively, the 2020 score of 108.0 indicated consistent high performance in these performance measures.

EPCOR submits a yearly report to the City of Edmonton on the PBR (the PBR Progress Report), which includes detailed information on each of our performance measures, any challenges encountered during the year and our efforts to improve. The following tables present the 2020 PBR performance results for the water system for each of the five indices.

#### Water Quality Index

Index Component	PBR Performance Measure	Standard	Actual Score	Index
Water Quality Index	The percentage of the total number of water quality tests taken in the period that do not yield suspect results	>99.7%	99.8%	1.001
Average Index				1.001
Index Standard Points				25.0
Total Actual Points				25.0
Maximum Available Points Including Bonus Points				25.5
<b>Total Points Earned</b>				<b>25.0</b>

#### Customer Service Index

Index Component	PBR Performance Measure	Standard	Actual Score	Index
Post Service Audit Factor	The percentage of the customers responding as “completely” or “very satisfied” in the level of service received from the EPCOR Water Services Inc. (EWSI) Emergency group.	> 74.9%	74.2%	0.990
Home Sniffing Factor	The percentage result of customer satisfaction for the home sniffing survey.	> 94.4%	95.1%	1.008
Response Time Factor	The average number of minutes needed to confirm a water main break from the time a call is received at EWSI’s dispatch office.	< 25	17.8	1.290
Planned Construction Impact Factor	The percentage of the total planned construction events where EWSI complies	> 95.8%	97.3%	1.015

	with required construction notification procedures.			
Average Index				1.076
Index Standard Points				20.0
Total Actual Points				21.0
Maximum Available Points Including Bonus Points				23.0
<b>Total Points Earned</b>				<b>21.5</b>

### System Reliability and Optimization Index

Index Component	PBR Performance Measure	Standard	Actual Score	Index
Water Main Break Factor	The number of water main breaks that occurred in the reporting period.	< 419	201	1.520
Water Main Break Repair Duration Factor	The percentage of water main breaks repaired and confirmed by EWSI within 24 hours from the time that the flow of water is shut off, excluding main breaks on arterial or collector roads.	> 93.7%	98.2%	1.048
Water Loss Factor	The Infrastructure Leakage Index, a performance indicator quantifying how well a water distribution system is managed for the control of "real" water losses (i.e. leakage).	< 2.0	0.84	1.580
System Energy Efficiency Factor	The energy used at all water facilities in kWh divided by the average annual water production per residential customer account (ML/kWh/customer).	< 309	249	1.243
Average index				1.348
Index Standard Points				25.0
Total Actual Points				33.7
Maximum Available Points Including Bonus Points				28.5
<b>Total Points Earned</b>				<b>28.5</b>

## Environmental Index

Index Component	PBR Performance Measure	Standard	Actual Score	Index
Water Conservation Factor	The actual 10 year rolling average monthly Edmonton residential consumption per household.	<17.2	15.1	1.139
Environment Incident Factor	The number of reportable and preventable environmental incidents.	<6	6	1.000
Solids Residual Management Factor	The average number of days that the Rosssdale and E.L. Smith WTPs are operating in direct filtration mode.	> 120	167.8	1.398
Average index				1.261
Index Standard Points				15.0
Total Actual Points				18.9
Maximum Available Points Including Bonus Points				16.5
<b>Total Points Earned</b>				<b>16.5</b>

## Safety Index

Index Component	PBR Performance Measure	Standard	Actual Score	Index
Near Miss Reporting Factor	The number of near miss reports entered in the ESS <sup>1</sup> system.	>550	724	1.316
Work Site Inspections and Observations Factor	Number of Work Site Inspections and observations completed per year.	>1,032	3,140	3.043
Lost Time Frequency Factor	The actual lost time frequency rate.	<0.57	0.00	2.000
All Injury Frequency Factor	The actual all injury frequency rate	< 1.54	0.59	2.630
Average index				2.247
Index Standard Points				15.0
Total Actual Points				33.7
Maximum Available Points Including Bonus Points				16.5
<b>Total Points Earned</b>				<b>16.5</b>

<sup>1</sup>ESS was Essential Services Suite™, EPCOR's incident management system. EPCOR has since transitioned to the Enablon Event Reporting System (ERS)

# Public Involvement and Consultation

## Communication

EPCOR is committed to being a neighbour of choice in all the communities we work in. Working together with our stakeholders, we accomplish this goal through open communication and consultation with our customers. In 2020, EPCOR adapted engagement opportunities with the community to ensure compliance with COVID-19 safety protocols. EPCOR offered a variety of virtual engagement events to gather feedback, build relationships and maintain open communication with the community. Throughout 2020, EPCOR hosted virtual open houses, workshops, focus groups and meetings.

Using these online techniques, we demonstrated a commitment to two-way, transparent communication in a safe manner during the COVID-19 pandemic. In and around our plant sites, EPCOR continued engaging with the community leagues and residents to ensure we are keeping our neighbours involved and informed of our plans and construction activities they may notice and are always working towards building a positive rapport with community members.

Within the broader community of Edmonton, we engage with our customers and communicate about emerging issues through multiple channels such as our customer newsletters, broadcast media, news media, EPCOR's external website and social media. EPCOR's external communications encourage wise water use, promote environmental stewardship and create a broader awareness of the importance of safe and clean public drinking water.

## Corporate Accountability and Public Transparency

EPCOR keeps its customers informed about what we are doing to ensure a safe and reliable supply of tap water. A number of reports are made available to the public, including water quality reports:

- 2020 EnviroVista Report (this report);
- [2020 Waterworks Annual Report](#);
- [Monthly Waterworks Reports \(Operations and Water Quality\)](#); and
- [Monthly Water Quality Summary and Bacteriological Data Reports](#).

## Community Outreach

Many annual events that EPCOR participates in were cancelled due to the COVID-19 pandemic. Events such as the Water for Life Walk and the annual EPCOR RiverFest were both cancelled in 2020.

In 2020, EPCOR staff participated in the Winter Family Fun Day in Cameron Heights where we provided water treatment education to event attendees.

Enoch Cree Nation and EPCOR signed a memorandum of understanding (MOU) that formalizes their commitment to working together in the spirit of reconciliation. The MOU sets a strong foundation for both parties, creating a path forward on all projects, initiatives and joint-endeavors that cause ground disturbance at the E.L. Smith and Rossdale WTPs in Edmonton. As well, it provides a platform for meaningful, effective and transparent communication on issues of mutual interest. A signing ceremony took place on the former reserve lands of Enoch Cree Nation, at the E.L. Smith WTP on September 1, 2020 with social distancing and public health measures in place.

EPCOR conducted public engagement for the PBR application, asking the general public, Indigenous communities and stakeholder groups to provide insight on policy choices, priority-setting for operations and capital programs, performance measurement and rate strategy. This engagement was completed over three phases: visioning and

framing research, detailed consultation and validation. Stakeholders engaged throughout this process included customers from each customer class (residential, commercial, multi-residential, large water and high volume users); Métis Nation & Confederacy of Treaty Six Nations; EPCOR-engaged community groups (Gold Bar Community Liaison Committee, Water Community Advisory Panel, Water Quality Technical Advisory Committee and the Edmonton Federation of Community Leagues) and other groups (Homeward Trust, Infill Development in Edmonton Association, Canadian Homebuilders Association).

In Q4 2020, EPCOR began engaging local and Indigenous community members about how we operate our two Edmonton WTPs (E.L. Smith and Rossdale), and how we engage with the community. Two virtual workshops were held in 2020 with Rossdale community members and this engagement continues into 2021.

Our school tour program was cancelled in 2020 due to the COVID-19 pandemic. We look forward to resuming this activity and others when it is safe to do so.

### **Community Advisory Panel**

EPCOR places a high priority on obtaining public input into all aspects of water service delivery. Since 1993, a voluntary panel has provided feedback on EPCOR policies and programs impacting customers and the community in general. The panel gathers stakeholder input on emerging issues in the water utility and the impact on the community, water service area, customers and the environment.

During the COVID-19 pandemic, the Edmonton CAP met virtually to ensure the safety of members and staff.

We appreciate the participation of our 2019-2021 CAP Members, including those listed below, and other residential and commercial customers.

- Kim Falconer
- Robert N. Hainsworth
- Marnie Main
- Sarah Thomas
- Ahsan Ahmed, Government of Alberta, Alberta Infrastructure
- Brent Korobanik, Lehigh Hanson Materials Limited, Lehigh Cement
- Derek Krausher, Heritage Frozen Foods Ltd.
- Tessa Margetts, Gilead Alberta, Environment Health and Safety
- Robert Pollard, University of Alberta, Utilities Department
- Kendra Vander Kooy, Strathcona County, Utilities Department

The Water Community Advisory Panel (CAP) in 2020 provided input into EPCOR initiatives including:

- Home sniffing program and spring water quality;
- Planned construction notifications;
- PBR application: policy choices, priority-setting for operations and capital programs, performance measurement and rate strategy; and
- Planning for the future at the Edmonton WTPs.

### **Consultation with Industry Experts – Water Quality Advisory Committee**

The Water Quality Advisory Committee (WQAC) includes representatives from EPCOR, Alberta Health Services (AHS), Alberta Health, Alberta Environment and Parks, Alberta Emergency Management Agency, University of Alberta, City of Edmonton and the Regional Water Customer Group (RWCG) that represents the municipalities surrounding Edmonton supplied directly or indirectly by the EPCOR drinking water system.

The panel shares information, advises on water quality and treatment issues, reviews water quality standards and guidelines and develops joint risk management protocols. Its scope includes drinking water quality, drinking water emergency response planning, public communication about drinking water and related drinking water health issues.

The Water Quality Advisory Committee met on January 29, 2021 using remote conferencing technology. The topics discussed included:

- Drinking Water Emergency Management
- Flood Protection Plan for the WTPs
- Impact of COVID-19 on EPCOR and Maintaining Water Quality
- EPCOR Enhanced Lead Mitigation Strategy
- Adenosine Triphosphate (ATP) Testing in the Edmonton System
- Short Updates on Other Water Quality Topics

EPCOR continues to lead the initiative to develop and implement a drinking water emergency exercise plan for the Edmonton and region water system in participation with key stakeholders including Alberta Health Services, Alberta Environment and Parks, Alberta Emergency Management Agency, City of Edmonton and the Regional Water Customer Group. Due to the COVID-19 Pandemic, activity on this initiative slowed down in 2020, but EPCOR participated in the Provincial EMX020 exercise in February 2020 that involved a tornado damage scenario in Edmonton and an oil spill in the river scenario. The WQAC has approved a five-year plan of table top and live water quality emergency exercises starting in 2021.

The COVID-19 pandemic was an unprecedented challenge for EPCOR and the drinking water industry. In addition to ensuring that our employees were safe and drinking water operations, including monitoring, continued uninterrupted, EPCOR also proactively addressed the issue of water quality in buildings. The shutdown or significantly reduced occupancy of many businesses and institutions for extended periods introduced the risk of water quality deterioration in municipal distribution systems and/or building plumbing systems due to low flow and stagnation. EPCOR worked closely with Alberta Health, Alberta Health Services and the Canadian Water and Wastewater Association to develop guidelines for business and institutional customers to maintain water quality in their facilities and to prepare for re-entry after periods of little or no water use. This information was disseminated to customers through all avenues available including direct contact (phone calls and e-mails), through industry organizations, social media and website content. This required close coordination with our partners in public health protection. No water quality issues were reported in 2020.

In 2020, EPCOR introduced a new test for monitoring the general microbial quality of drinking water in Edmonton. This test is called Adenosine Triphosphate (ATP) and it measures bacterial metabolic activity in the drinking water. It is not directly related to health risk, but can be used to monitor changes in microbial quality and effectiveness of operational strategies like water age management and flushing. We shared this new testing method with our partners at the WQAC meeting.

Continued engagement with our stakeholders and government agencies on water quality issues and drinking water emergencies helps EPCOR plan for both new developments in water quality and for drinking water emergencies.

## Industry Leadership

### Working Partnerships with Alberta Environment and Parks / Advice and Support to Industry

In 2020, EPCOR continued to provide expertise and advice to Provincial Government agencies and the water and wastewater treatment industry in Alberta. Examples include:

- EPCOR continued to participate in the AEP-led Capital Region Industrial Heartland Water Management Framework initiative. Through this committee, EPCOR provides stakeholder feedback on AEP's initiative to develop a total loading management system for the stretch of the North Saskatchewan River between Devon (upstream of Edmonton) and Pakan (downstream of Edmonton and the Industrial Heartland). More information on Regional Planning in the North Saskatchewan river basin can be found [here](#).
- During the COVID-19 Pandemic, EPCOR together with the City of Calgary, contributed to an AEP-led initiative to ensure safe operation of water treatment systems across the province. Several meetings took place with representatives from the AEP Water and Wastewater Program, the City of Calgary and EPCOR in the early stages of pandemic response to ensure that information was shared and plans were in place to provide support to other communities if needed. EPCOR provided direct operational support to the Regional of Wood Buffalo during their flood crisis in the spring of 2020.
- The issue of potential water quality problems in large buildings and facilities that were experiencing no or very low water use due to pandemic restrictions came to the forefront in 2020. EPCOR initiated a water quality management program that included increased monitoring in lower-than-normal-use areas of the municipal distribution system and targeted communications to business customers about maintaining water quality during COVID shutdowns. EPCOR also contributed to the development of guidelines initiated by Alberta Health and the Canadian Water and Wastewater Association that provided recommendations for building owners and operators to maintain water quality in buildings.
- At AEP's request, EPCOR reviewed and commented on a draft of the updated Standard for Municipal Waterworks systems in late 2020. The new standard was released in early 2021.

### Laboratory Accreditation

The quality of water-testing data produced by EPCOR's Quality Assurance Laboratories is accredited to the International Organization for Standardization (ISO)/International Electrotechnical Commission (IEC) 17025:2017 "General requirements for the competence of testing and calibration laboratories" by the Canadian Association for Laboratory Accreditation (CALA). This accreditation demonstrates that water quality testing results produced by the water laboratory are reliable as well as technically and legally defensible.

Staff from within EPCOR's Quality Assurance Laboratories analyze water and wastewater samples in four different facilities: Rossdale Main Lab, Rossdale Operations Lab, E. L. Smith Lab and Gold Bar Lab. All four locations are accredited to the ISO/IEC 17025:2017 standard under one accreditation scope by CALA (CALA ID 3000) as of January 20, 2021.

The EPCOR Quality Assurance Laboratories have been accredited to ISO/IEC 17025 since 2001. The scope of tests and locations have expanded over the years. Accreditation has been successfully retained through CALA's biannual assessment program since our initial assessment. The most recent assessment was in October 2019 and the laboratories are now accredited to the new ISO/IEC 17025:2017 standard. The next full external assessment is scheduled for the week of October 25, 2021.

As part of our commitment to CALA, several EPCOR employees contribute to the CALA laboratory assessment program by volunteering as laboratory assessors. In 2020, EPCOR volunteer assessors conducted nine assessments in other external laboratories.

## Watershed and Source Water Protection Programs

### EPCOR's Watershed Protection Program has two primary goals:

- To provide a safe, secure drinking water supply through source water protection principles
- To manage effects from our operations on water quality and aquatic ecosystem health in receiving water bodies

In 2020, EPCOR drafted an Integrated Watershed Management Strategy and accompanying Source Water Protection Plan that outlined initiatives under four broad categories: watershed planning; monitoring; modelling and research; implementation; and education and awareness.

### 1. Watershed Planning

EPCOR recognizes the importance of working within multiple initiatives and/or frameworks to help meet its commitment to safeguard the health of customers from a source water protection perspective and to minimize the effect of its activities on local water quality and aquatic ecosystems. Planning initiatives and/or frameworks that EPCOR continued to support in 2020 include:

- **Source Water Protection Plan:** In 2020, we continued development of mitigation plans of the key risks outlined in the [Source Water Protection Plan](#) and Drinking Water Safety Plan. Key risks that remained action items in the Drinking Water Safety Plan included forest fires, climate change, source contamination from spills/releases from upstream oil and gas facilities, spills from an upstream bridge, contamination through intentional dumping or release into the storm water collection system. A literature review was conducted to better understand the risks of forest fires contributing to poor water quality; climate change research was continued with the Prairie Adaptation Research Collaborative; and work to develop a Geographic Response Plan/spill modelling project in partnership with Alberta Environment and Parks and the Alberta Energy Regulator continued.
- **North Saskatchewan Watershed Alliance (NSWA):** EPCOR provides both financial and in-kind support to the NSWA. In 2020, EPCOR employees were involved in the Headwaters Alliance; Modeste and Strawberry Creek Riparian Projects; and with the NWSA Board of Directors.
- **Capital Region-Industrial Heartland Water Management Framework:** The Government of Alberta continued to lead this framework through 2020 and EPCOR was directly involved through the Advisory Committee. This work will set environmental outcomes (including water quality) for the area just upstream of Edmonton to downstream of the proposed industrial development area. The next phase of the project is effluent characterization for storm water, wastewater and residuals.
- The **North Saskatchewan Regional Plan** is under development by Alberta Environment and Parks under their Land Use Framework initiative. EPCOR has been engaged in the development of the plan since the beginning, including participation in the Phase I consultation workshops, the Regional Advisory Council and the Environmental Quality Management Framework stakeholder engagement sessions. In early 2018, EPCOR also provided feedback on the Regional Advisory Council's recommendations.
- EPCOR, through representation on **Watershed Planning and Advisory Councils** and the **Alberta Lake Management Society**, is involved with several teams that are making recommendations for management and policy to the Alberta Water Council and, ultimately, Alberta Environment and Parks. In 2020, EPCOR co-chaired the Alberta Water Council's **Source Water Protection** working group and a final report was produced. In addition, an EPCOR employee acted as an alternate board member to the Alberta Water Council, representing the Lake Conservation sector.

## 2. Implementation

In 2020, EPCOR continued financial support of **Clear Water Landcare**, a watershed stewardship group which implements agricultural Beneficial Management Practices (BMPs) in the North Saskatchewan River basin, such as 'off stream' watering systems and fencing off of streams, as well as educational stewardship events. In 2020, Clear Water Landcare continued to distribute copies of the *Our Backyard* children's activity book while Sasquatch & Partners discussed activities in the headwaters. Educational signage regarding the importance of watershed protection while recreating in the headwaters was installed along Highway 11 and at visitor centers.

## 3. Research and Monitoring

EPCOR continued collaboration with AEP, the NSWA, and the City of Edmonton to develop an integrated, efficient and effective water quality monitoring program that meets the needs and interests of major stakeholders in the basin. The **WaterSHED (Saskatchewan Headwaters Edmonton Downstream) Monitoring Program** is supported by EPCOR contributing up to \$1 million per year for four years. This program involves building and operating a network of nineteen flow and water quality monitoring stations at strategic locations throughout the watershed. Funding for the monitoring program began in 2018, with the focus on developing the scope of work and procurement of monitoring equipment and associated infrastructure. Operation of the stations and collection of samples began in early 2019 and continued through the entire year.

In 2020, Alternative Land Use Services (ALUS) Canada, University of Guelph, and the NSWA continued to support research on evaluating the health and importance of riparian areas and beneficial management practices in two important watersheds upstream of Edmonton – the Strawberry Creek and Modeste Creek watersheds. EPCOR has provided funding through NSWA for riparian projects on both Modeste Creek and Strawberry Creek project and that funding was used to develop a riparian web portal. That work was also used to inform development of an Integrated Modelling for Watershed Evaluation of Beneficial Management Practices (IMWEBS) model to assess the impacts of BMPs water quality and quantity in these sub-watersheds and work is being done in collaboration with the University of Guelph.

EPCOR funded Year Four of the NSERC Network for Forested Drinking Water Source Protection Technologies, otherwise known as the ForWater Network. This network of researchers from across Canada will provide new knowledge on the impact of different forest management strategies on drinking water source quality and treatability and will assess their suitability for source water protection across the major ecological/forest regions of Canada. This initiative is led out of the University of Waterloo and is funded by the Natural Sciences and Engineering Research Council of Canada (NSERC) under its Strategic Partnerships Grants for Networks program.

In late 2019 EPCOR partnered with the University of Alberta on a groundwater project that will investigate the link between groundwater and NSR river flow as well as understand the quality and quantity of groundwater available in the region. It will also investigate the effects of climate change on groundwater recharge and river flows. This project is a three-year project that ends in 2021.

In 2019, EPCOR partnered with the University of Alberta to collect ice core samples to quantify and characterize organic contaminants within the Columbia Icefield. Climate change is expected to increase the melt of glacier ice and potential increase the release of contaminants into the North Saskatchewan River that have been stored in the ice for decades or even centuries. The project will evaluate the potential future concentrations of the organic contaminants in the North Saskatchewan River at Edmonton. EPCOR is funding this project for a total of three years.

Quarterly monitoring also continued for Pharmaceuticals and Personal Care Products in the raw and treated water at both the E.L. Smith and Rosedale WTPs. As well as providing information relevant to drinking water quality and public health protection, this monitoring program also provided environmental water quality data that was useful for the Industrial Heartland and Capital Region Water Management Framework.

#### 4. Education and Public Awareness

In 2020, EPCOR sponsored Alberta RiverWatch, which is a science education program for secondary students. As a corporate sponsor of RiverWatch, EPCOR subsidizes the fees for disadvantaged students so that they can participate in a guided river study along the North Saskatchewan River.

EPCOR developed a Watershed model as an interactive display to educate the public on the North Saskatchewan Watershed which serves as the source of drinking water for Edmonton. The Watershed model was used to educate the public at RiverFest and three community events (Highlandia, Prep in the Park, Edmonton Family Nature Night) in 2019 but all events were cancelled in 2020 due to the COVID-19 Pandemic.

EPCOR is a proud partner of the City of Edmonton's North Saskatchewan River Clean Up. This program works with various groups to help keep garbage and debris out of the river. In 2020 the Clean Up was cancelled.

In the past year, EPCOR staff has served on the Board of Directors for the Alberta Lake Management Society and RiverWatch, and as an alternate on the Board of Directors of the Alberta Water Council. Our professionals also gave seven presentations on the North Saskatchewan River and Source Water Protection. As well, EPCOR gave its 11<sup>th</sup> annual guest lecture at the University of Alberta to engineering students on watershed and land use management.

#### Distribution System Upgrades

EPCOR undertakes a number of annual capital and operating programs to maintain and continually improve water quality in the distribution system and to minimize unplanned customer disruptions. In 2020, the following water assets were replaced:

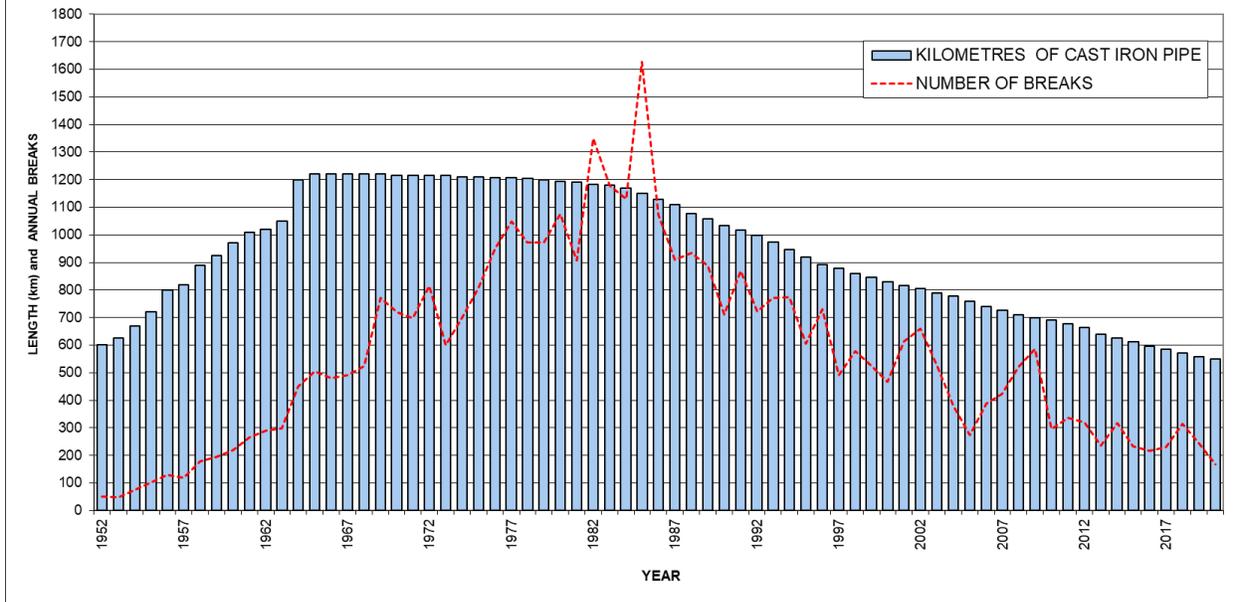
Water Asset	
Main Line Valves	228
Hydrants	134

#### Water Main Replacement

EPCOR has replaced more than 55% of cast iron water mains in Edmonton's distribution system. The ongoing replacement of the most deteriorated sections of cast iron pipe has led to continued improvements in overall system reliability and resulted in a significant drop in water main breaks as shown in the graph below. In 2020, 9.5 km of water mains were replaced in Edmonton, 7.4 km of which were cast iron.

More than 80% of all water main breaks occur on the cast iron portion of the distribution system, declining from 90% over the past decade. Despite this success, it is important to maintain water main replacement rates to keep up with Edmonton's aging water infrastructure. As the distribution system continues to age, asbestos cement (AC) mains will present an increasing challenge. In some European and American cities, AC mains currently surpass cast iron mains in break frequencies. The estimated useful lives of AC mains range from 60 to 70 years and a significant portion of Edmonton's AC mains will begin reaching this age within the next decade. Increased levels of main breaks continue to be experienced on both cast iron (CI) and AC pipes when extreme winter events occur.

**REMAINING LENGTH AND BREAKS OF CAST IRON WATER MAINS  
1952 to Present**



1952 to Present, Edmonton, Alberta  
Cast Iron Water Mains (km) blue bar, Compared to Number of Breaks (per year) red line

**Water Main Cathodic Protection**

Buried metallic water mains deteriorate by corrosion due to exposure to corrosive soil conditions, stray electric current in the ground, and/or from the use of dissimilar metal pipe materials. Cathodic Protection (CP) of metallic water mains is a proven and effective method of reducing break frequency and extending the useful life of those pipes. EPCOR first started the CP program in 1997. Since then, approximately 233km of metallic mains have been protected with at least one round of anodes.

Water Asset	Length Protected in 2020 (Km)
Cast iron distribution Mains	34.2
Steel Transmission Mains	0.87

**Transmission Main Blow-Offs**

Historically, it was standard practice to connect transmission mains to the sanitary or combined sewer system in order to drain the water main as needed for maintenance work. In 2007, there were more than 200 locations identified as potential “blow-off cross-connections” within Edmonton’s water network, which could present a cross contamination risk if certain conditions occur (for example, if a system depressurization occurs at the same time that a nearby sewer is surcharging due to high rainfall). In 2008, a program to systematically remove these connections from the water network was implemented. EPCOR had committed to Alberta Environment to eliminate all high, medium and low-risk blow-off cross connections, plus all negligible-risk cross connections discharging to sanitary

sewers by April 2016. In 2013, it was identified that five low-risk cross connections were in the direct path of the west leg of the future planned LRT, and Alberta Environment and Parks approved a proposal to wait until such time that the water mains are relocated or abandoned to complete this work, this has since been completed. All other negligible risk cross-connections were to be removed on an opportunistic basis as the mains qualify for replacement or rehabilitation. The number and type of blow-offs remaining at the end of 2020 are described below.

### Transmission Main Blow-Offs Cross Connections Remaining at the end of 2019

Risk Score	Characteristics	Number of Chambers	
		End of 2007	End of 2020
<b>High</b>	Connection to combined sewer that is in close proximity to a Water Treatment plant and a known surcharge area	7	0
<b>Medium</b>	Connection to combined sewer that is in close proximity to a Water Treatment plant or a known surcharge area	34	0
<b>Low</b>	Connection to combined sewer that is not in close proximity to a Water Treatment plant or a known surcharge area	84	0
<b>Negligible</b>	Connection to a storm or watercourse sewer that is not in close proximity to a Water Treatment plant or a known surcharge area.	96	24
	<b>Total</b>	<b>221</b>	<b>24</b>

### Main Break Repair

In 2020, Edmonton experienced 201 water main breaks as reported in the final 2020 Performance Based Regulation (PBR) progress report to City of Edmonton. Of these, 169 impacted water supply to customers, while 32 main breaks were able to be repaired without impacting water supply to customers. There was an overall decrease of 97 main breaks compared to 298 in 2019, which was mainly due to mild weather conditions during the first quarter of the year.

For the past 30 years, we have seen the number of main breaks generally decrease. Most of the main breaks in 2020 (167) occurred in cast iron water mains. Since 1985, EPCOR has had an aggressive program of renewal and cathodic protection of these cast iron mains. The long-term trend of a reduction in the number of breaks in the cast iron system since the mid-1980s directly reflects the effectiveness of these programs, in fact 2020 had the lowest recorded number main breaks in several decades. EPCOR also has a performance target to repair 93.7% of main breaks within 24 hours. In 2020, 98.22% of the 169 breaks affecting water supply to customers were repaired within 24 hours of the water being shut off, exceeding the target.

EPCOR is continuing with an in-depth review of high-risk transmission water mains that started in 2019 to determine which pipes would have the greatest impact to the system in the event of a failure. The results of this analysis have been used to identify potential repair strategies and procure a number of critical parts that will now be available to

expedite the repair time and minimize the impact of a future failure. These results will also be used to prioritize an ongoing pipeline inspection program for high-risk transmission mains using in-line inspection technology.

## Unidirectional Flushing and Hydrant Maintenance

Each year, water mains throughout Edmonton are flushed to remove sediment build-up and biological growth. In 2020, EPCOR continued with the Unidirectional Flushing (UDF) program and flushed 35% of the distribution system. There were 20,782 fire hydrants in the public water system at the end of December 2020. All fire hydrants located in public right of ways were operated and checked during the summer UDF\Hydrant Purging program and 16,740 were checked in the winter program. This ensures that the hydrants are functional in the event of a fire and the system is compliant with fire code recommendations. EPCOR also has performance measures limiting the amount of time a hydrant can be out of service (no more than 90 days) and limiting the total number of hydrants that can be out of service on any one day (no more than 120). In 2020, five hydrants were out of service for more than 90 days and 66 hydrants were out of service for more than 30 days. The maximum number of hydrants out of service on any one day was 80. The maximum number of days out of service for any one hydrant was 364.

A re-evaluation of UDF area frequencies was undertaken in 2020. Flushing data accumulated from previous years indicates the flushing frequencies for certain neighborhoods can be safely reduced without any impact on water quality. Previously, the maximum flushing gap for a UDF area was six years – the new optimization will extend this limit to eight years. The program will retain more frequent flushing cycles for areas prone to greater amounts of sediment accumulation due to cast iron pipes and restricted flows, while areas with low levels of sediment accumulation and consisting mostly of PVC pipe will be flushed less often. It is important to note that the areas with the greatest amount of sediment accumulation will see no reduction in flushing frequency through the implementation of this process.

Additional improvements and long-term planning will be implemented in 2021, such as valve inspection and quality assurance testing programs to offset reduced facility inspection frequencies and ensure water quality remains unaffected in areas of reduced flushing frequency.

### UDF Documentation

Previously, UDF daily reports were filled out on paper forms by field crews. These paper forms have been converted into an electronic format through the implementation of GeoFIT. The new process saves over 1000 sheets of paper annually, allows for immediate analysis of flushing data, and eliminates the redundant process of copying flushing data from the paper forms into electronic databases.

### High Risk Hydrant Inspections

A new initiative was developed in 2020 to provide a Q1 winter inspection to a large sample of previously identified high-risk hydrants in order to better identify the potential risk of re-freezing and to test the effectiveness of the hydrant winter inspection program. These hydrants were found full of water or frozen in Q4 of 2019, then re-inspected in Q1 of 2020 to see if the hydrants froze again. In total, 745 hydrants were re-inspected, and 45 of these hydrants were found frozen and subsequently taken out of service. The same 745 hydrants will be re-inspected again in 2021 to check for consistency, and to further assess the effectiveness of the hydrant winter inspection program and determine potential improvements.

### System Water Quality Assurance

When many employees began working from home due to COVID-19, the Quality Assurance & Environment (QAE) group was challenged to obtain the required number of random samples to meet EPCOR's environmental approval requirements. Operations began to assist with this effort, collecting 30-40 monthly samples for lab testing and reporting. This process will continue for the foreseeable future.

In addition, QAE identified some locations in which water stagnation was possible due to dead end piping routes and decreased water usage during COVID-19. Upon testing, it was determined some of these locations were experiencing low chlorine levels. Preventative Maintenance crews now flush at these locations every two weeks to refresh the chlorine levels and help prevent water stagnation.

## Lead Management Program

EPCOR has had a proactive lead management program in place since 2008, which aims to reduce exposures to lead in drinking water. For many years a major focus of the lead management program was dealing with lead service lines. The underground pipe that connects a property's plumbing to the water main in the street is called a service line. The EPCOR portion of the service line runs from the water main under the street or alley to the property line, and the homeowner (or business owner) portion of the service line runs from the property line to the water meter in the home or building. At the end of 2020, approximately 4,200 homes had lead service lines in Edmonton on either the EPCOR side or the homeowner side, or both. These are homes located in older neighbourhoods that were typically built before 1950. They represent about 1.5% of the approximately 274,000 homes in the City supplied with EPCOR water.

Since 2008, the lead management program has focused on those homes and businesses where there is a record of a lead service line or a suspected lead on either the public side, the private side or both. The program has consisted of:

- Annual notification to Edmonton customers with lead service lines;
- Offer to test for lead concentration in the tap water for those customers;
- Offer to provide customers with point-of-use filters that remove lead;
- Prioritized lead service pipe replacement of the EPCOR section; and
- Public education on the issue of lead in tap water.

In 2020, customers with a known lead service were once again reminded of the program by letter. Unfortunately due to the COVID19 Pandemic we were unable to safely enter customers' homes to collect samples as in past years, so in-home sample collection and testing was limited. We did keep our commitment of providing a filtration kit for customers who requested it throughout the year and these were delivered to the home.

## Testing for Lead in Homes in Older Neighbourhoods with Lead Service Lines

The table below summarizes the lead testing results from 2008 to 2020 from samples collected from homes/businesses in older neighborhoods where there is record that the building is supplied through a lead service line, either on the public side (EPCOR owned), private side or both. Water samples were also collected from a number of other homes/businesses in the same neighborhoods but where there is no record of a lead service line. All samples were collected using a sampling protocol that is designed to measure the impact of lead service pipes on lead levels measured at the tap. This involves collecting a 4 litre sample directly from the kitchen faucet after no use of water in the home for 30 minutes. This sampling protocol was recommended by Health Canada in 2009 and is designed to measure after exposure to lead in drinking water in homes where there is a lead service line (EPCOR has continued with this sampling protocol for homes with lead services).

The results of this testing have shown that the lead concentration in about 45% of samples collected from homes in older neighborhoods with lead service lines confirmed by records, they exceeded the Health Canada guideline line value of 0.005 mg/L (2019). Where there was no record of a lead service line or the lead service line had been completely replaced in those same older neighbourhoods, the lead concentration in about 13% of samples collected also tested greater than the 0.005 mg/L guideline. This indicates either lead contributed from plumbing materials inside these older homes or the presence of unidentified lead service lines on private property. EPCOR has implemented a new program to address the issue of lead service lines.

## Drinking water lead test results (at the tap) from 2008-2020

	Lead Service Line Identified	No Lead Service Line Record or Lead Service Line Completely Replaced
Number of Samples Collected and Tested <sup>1,2</sup>	5896	698
% where lead concentration was greater than 0.005 mg/L <sup>3</sup>	45%	13%
% where lead concentration was greater than 0.030 mg/L <sup>4</sup>	5%	1%
50th percentile lead concentration (mg/L)	0.004	0.0005
90th percentile lead concentration (mg/L)	0.024	0.007

<sup>1</sup>Includes all tap water lead testing results collected as part of this program since 2008. Many homes/businesses with LSLs have been tested more than once during this time.

<sup>2</sup>Samples collected using protocol recommended by Health Canada (Guidance on Controlling Corrosion in Drinking Water Distribution Systems, 2009 <https://www.canada.ca/en/health-canada/services/publications/healthy-living/guidance-controlling-corrosion-drinking-water-distribution-systems.html>)

<sup>3</sup>Health Canada Guideline (2019) for Canadian Drinking Water Quality, health-based Maximum Acceptable Concentration (MAC) for lead

<sup>4</sup>Based on Alberta Health and Wellness guidance for actions levels for lead in drinking water (March 2008)

### Testing for Lead in Random Homes Around the City of Edmonton

In 2015, EPCOR introduced a “Random Day Time” (RDT) sampling program for lead in Edmonton homes. This protocol differs from the sampling protocol used in homes with lead service pipes in that there is no requirement for water stagnation in the pipes before a one-litre sample is collected from the kitchen faucet. For this program, samples are collected between the months of May and September, when the water is warmer and lead levels in drinking water are likely to be higher. The goal of RDT sampling is to determine the impact of all plumbing materials in homes of all ages across the whole city, in terms of lead concentrations at the tap. EPCOR has used the results from this testing program to assess the need for adding a lead inhibitor to the Edmonton drinking water.

In 2020, EPCOR was unable to collect any RDT samples due to the ongoing pandemic, as it was deemed unsafe for both EPCOR employees and the public. The results of the RDT study are shown in the table below along with the results since the program began. The results indicate that lead concentrations may exceed the Health Canada guideline of 0.005 mg/L in about 7% of samples randomly collected from homes across the City. The source of lead in most in these homes is believed to be internal plumbing components and fixtures that contain lead.

## Results of Random Daytime Lead Testing at Homes Across Edmonton – 2015 to 2019

	2015	2016	2017	2018	2019	2015 – 2019
No. Sample Collected and Tested	167	269	169	205	231	1041
% where lead concentration was greater than 0.005 <sup>1</sup> mg/L	16%	12%	4%	5%	2%	7%
% where lead concentration was greater than 0.030 <sup>2</sup> mg/L	1%	2%	2%	0.5%	0%	1%
50th percentile lead concentration (mg/L)	0.001	0.001	0.0002	0.0002	0.0004	0.0004
90th percentile lead concentration (mg/L)	0.007	0.006	0.003	0.002	0.002	0.004

<sup>1</sup>Health Canada Guideline (2019) for Canadian Drinking Water Quality, health-based Maximum Acceptable Concentration (MAC) for lead

<sup>2</sup>Based on Alberta Health and Wellness guidance for actions levels for lead in drinking water (March 2008)

### EPCOR's New Lead Mitigation Strategy

On July 18, 2019 the City of Edmonton approved a new Lead Mitigation Strategy. The goal of the program is to ensure that the lead concentration at the tap in all homes and businesses supplied through lead service lines in the City of Edmonton is less than the Health Canada Maximum Acceptable Concentration (MAC) for lead of 5 ug/L and to reduce lead release from all other sources of lead, such as lead-containing plumbing components, in all homes across the city. The program has three main components:

1. **Adding a lead inhibitor (orthophosphate) to the Edmonton drinking water:** Orthophosphate creates a protective coating on the inside of lead pipes and plumbing that prevents lead from leaching into drinking water. It is commonly used for this purpose by water utilities across North America and the United Kingdom. It has no impact on the taste or odour of drinking water. It is naturally present in food and is a common additive to beverages and considered to be a safe additive. Orthophosphate addition systems are being designed and constructed at our two water treatment plants and will be operational by the end of 2022.
2. **Elimination of Partial Lead Service Line Replacements / Utility Funding of Private Portion Replacements.** EPCOR has ended the practice of replacing just the utility portion of a lead service line while leaving the private portion in place. These partial lead service line replacements are not effective for lead reduction and can sometimes result in higher lead levels at the tap. On a go-forward basis, EPCOR will replace from the LSL from "main to meter". That is, we will replace the private portion any time we replace the utility portion. Both the utility and private portion replacements will be funded through water utility rates at no cost to the recipient.
3. **Accelerated Replacement of High Priority Lead Service Lines / Utility Funding of Private Portion Replacements.** EPCOR will accelerate the replacement of any lead service lines (private and utility portions) that have been identified through testing as having lead levels in excess of the new Health Canada Guideline after the implementation of orthophosphate. Both the utility and private portion replacements for these "High Priority" LSLs will be funded through water utility rates at no cost to the recipient.

## **Progress on EPCOR's New Lead Mitigation Strategy in 2020**

Lead service line replacement work began in July 2020 and by end of October EPCOR completed 69 high priority service (public & private side) replacements. These were full replacements of both the public and private portion of the lead service line, from "main-to-meter". Homes or businesses where there is at least one tap water lead test result of 0.025 mg/L were identified for the program. Based on laboratory testing, we expect that orthophosphate will reduce lead at the tap in homes with lead service lines by more than 80%, so that a test result of 0.025 mg/L will be reduced to less than the Health Canada guideline of 0.005 mg/L.

EPCOR also completed 187 additional full service line replacements or abandonments during water main renewal or other maintenance work. As a follow up to the lead service line replacements, EPCOR offered and encouraged post construction (within 90 days) tap water sampling to confirm the reduction of lead levels to less than the Health Canada Guideline and to provide a clean "clean bill of health" to our customers.

EPCOR received approval from Alberta Environment and Parks to add the lead inhibitor, orthophosphate, to the drinking water in early 2020. Design of orthophosphate addition facilities at our two water treatment plants progressed in 2020 and testing of orthophosphate addition in our pilot plant facilities continued.

## **COVID-19 Health and Safety Measures**

Implementation of the new enhanced lead mitigation program was delayed in 2020 due to the COVID-19 pandemic and replacement work did not begin until EPCOR could be sure that the health risk to customers, EPCOR employees and contractors was properly managed. To ensure the health and safety of both customers and employees during the COVID-19 pandemic, EPCOR introduced a number of important measures. Instead of planned information open houses, EPCOR carried out virtual home tours within the homes of customers that were identified for lead service line replacement. Strict COVID-19 procedures, including health assessments, social distancing and PPE, were put in place for EPCOR employees and contractors that were required to enter homes during the construction phase. EPCOR introduced "do-it-yourself" instructions, sample kits and a helpful video to enable customers to collect the follow-up tap water samples themselves. EPCOR employees picked up the samples from the customer's doorsteps for lead testing at the EPCOR accredited lab.

## **Plans for 2021 and Beyond**

EPCOR is aiming to complete at least another 100 high priority full ("main to meter") lead service line replacements in 2021, but final numbers will depend again on the impact of COVID-19 pandemic restrictions. There are approximately 290 high priority lead service line homes/businesses remaining in the City and we plan to eliminate them with full replacements by 2023. EPCOR will continue the practice of full lead service replacements for replacement due to water main renewal or other maintenance work. EPCOR will also continue to replace the public portion of the lead service line any time a property owner chooses to proactively replace the privately owned portion.

EPCOR will complete the design and will begin construction of facilities to add the lead inhibitor orthophosphate to the Edmonton drinking water in 2021. Commissioning of those facilities and the start of orthophosphate is expected by end of 2022. Orthophosphate will ensure that lead levels remain low in all other homes/businesses with lead service lines, but ongoing customer communication and monitoring for lead at the tap will be required. EPCOR will continue to monitor for lead at the tap in 2023 and beyond to ensure effectiveness of lead reduction through the addition of orthophosphate.

## Membership in Industry and Research Organizations

EPCOR strives to be an active member of industry organizations that promote public health protection, such as the Water Research Foundation (WaterRF). WaterRF is a not-for-profit organization that coordinates and funds a comprehensive research program related to drinking water. WaterRF recently merged with the wastewater based Water Environment Research Foundation and the Water Reuse Foundation. EPCOR is involved in all aspects of the water cycle in Edmonton – water treatment and distribution, wastewater collection and treatment, water reuse and stormwater management. EPCOR supports this newly amalgamated research organization and has continued its subscription and financial commitment to WaterRF in early 2021.

EPCOR and its employees are currently involved in the following six active WaterRF projects as a participating utility\*:

- WRF Project 04666 Case Study Compilation on Applying Risk Management Principles and Innovative Technologies to Effectively Manage Deteriorating Infrastructure
- WRF Project 04713 Full Lead Service Line Replacement Guidance
- WRF Project 04717 Innovative Technologies to Effectively Manage Deteriorating Infrastructure
- WRF Project 04734 Real Life Enterprise Resilience
- WRF Project 04764 UV Disinfection Knowledgebase for Reuse Applications
- WRF Project 04907 WRF1729 Leading Water Utility Innovation

\*A participating utility is an organization that provides third-party contributions or other material support to a WRF research project but does not enter into a contractual relationship with WRF, the contractor or a subcontractor.

EPCOR also continued engagement in various university-led research efforts. These included:

- Financial and in-kind support for the Alberta Innovates funded project entitled *Characterization of undesirable water-soluble organics in source and drinking water using advance analytical technology* at University of Alberta
- Financial support for the *NSERC Senior Industrial Research Chair in Advancing Treatment and Reducing Risk* at University of Waterloo
- Financial support to for the *NSERC Network for Forested Drinking Water Source Protection led out University of Waterloo*
- Financial Support for the *NSERC Industrial Research Chair in Sustainable Urban Water Development* at the University of Alberta.

EPCOR renewed its membership with the Canadian Water and Wastewater Association and the Canadian Association on Water Quality. EPCOR or its employees were involved in various other industry organizations in different capacities, including:

- Canadian Water and Wastewater Association (board and committee chairs)
- Canadian Water Network (subscriber and member of Municipal Consortium)
- American WaterWorks Association (member)
- American WaterWorks Association—Western Canada Section (board)
- Water Environment Federation (committee chair)
- Western Canada Water (board)
- North Saskatchewan Watershed Alliance (board and executive committee)

## Participation in Water for Life and other AEP Initiatives

EPCOR continues to actively participate in Water for Life and other Alberta Environment and Parks initiatives. EPCOR is involved in Watershed Protection and Advisory Councils (WPACs) and supports Watershed Stewardship groups. Activities in 2020 included:

- Direct financial and in-kind support to the North Saskatchewan Watershed Alliance and representation on the board, executive (Treasurer) and technical committees; and
- Participation on the Advisory Committee for Capital Region – Industrial Heartland Water Management Framework.

## Climate Change Adaptation Planning on Source Water

In 2018, EPCOR completed work on the EPCOR Water Canada Climate Change Adaptation Strategy Discussion Paper and an accompanying a Climate Change Adaptation Strategy Action Plan for the Edmonton water system. The discussion paper includes a summary of the current state of knowledge on changes in water quality and quantity in the North Saskatchewan River, and recommends possible adaptation measures for water treatment operations and a research strategy to better understand and predict the impacts of climate change in the source water. Adaptation plans will be important to ensure resiliency of the Edmonton Waterworks System in the 21<sup>st</sup> century. The strategy recommends actions to better understand climate related risks, and recommends further actions to reduce risk. For example, one of the top climate-related risks for the Edmonton water system that would have a rapid onset is river flooding. A major flood in the river could have a significant impact on the operation of the two water treatment plants. Flood protection plans are being developed to mitigate this risk.

As part of the development of EPCOR Water Canada's Climate Change Adaptation Strategy, EPCOR is supporting a number of research studies related to some of the slow onset risks related to climate change. Together, these studies are aimed at better understanding these risks for our source water, the North Saskatchewan River, both in terms of probability and consequence. Below, we outline the research we supported in 2020.

**Effect of Climate Change on the North Saskatchewan River:** EPCOR continued to partner with the University of Regina and received a grant from the Natural Sciences and Engineering Research Council of Canada (NSERC) to continue work aimed at understanding the potential impact of climate change on water supply in the NSR basin. The funded study is entitled *Natural and Externally Forced Hydroclimatic Variability in the North Saskatchewan River Basin: Support for EPCOR's Climate Change Strategy*. This study will overlay future climate change scenarios onto historic flow rate data to project a range of possible future water supply scenarios for the decades ahead. It will build upon previous EPCOR-supported research that examined historical variability and generated a 900-year weekly flow reconstruction of the North Saskatchewan River. The study will include predictions of watershed yield for sub-basins that could then be used in water quality models to predict changes in water quality. EPCOR's financial contribution to this project ended in 2020 and a final report was submitted.

**forWater—the NSERC Network for Forested Drinking Water Source Protection Technologies:** In 2020 EPCOR continued to be a supporting organization of this network of Canadian researchers and other organizations that is funded by the NSERC Strategic Partnership Grant program. The network will look at source water protection for communities like Edmonton that depend on source water originating from forested landscapes. Healthy forests typically produce high quality water; however, climate change-associated disturbances such as wildfires and floods are causing increasingly variable or deteriorated water quality and challenging water treatment plants. This network of researchers will examine forest management practices in the context of drinking water treatment and source water protection. It will provide new knowledge on how different forest management strategies impact source water quality and treatability. We have committed our support for a total of five years.

**Characterizing Natural Organic Matter in the Watershed:** EPCOR has partnered with the University of Waterloo on a project to characterize Natural Organic Matter (NOM) in source water. NOM can have significant impact on water treatment processes and can challenge the ability to generate clean drinking water. Climate change and

extreme weather events, such as droughts and floods due to climate change, can have large impacts on organic material in source water. We know little, however, about the type of NOM present in river during different seasons and weather events. In this project, the NOM in the NSR at various times of year and during different conditions will be characterized using sophisticated analytical methods available at University of Waterloo. The next step is to determine how the various components identified affect the selection and optimization of water treatment processes.

**Groundwater Resources:** In late 2019, EPCOR partnered with the University of Alberta on a groundwater project that will investigate the link between groundwater and NSR river flow as well as understand the quality and quantity of groundwater available in the region. It will also investigate the effects of climate change on groundwater recharge and river flows. This work will continue into 2021.

**Sampling Contaminants in the Columbia Icefield:** In 2020, EPCOR continued to partner and fund with the University of Alberta, a project that will collect ice core samples to quantify and characterized organic contaminants within the Columbia Icefield. Climate change is expected to increase the melt of glacier ice and potentially increase the release of contaminants into the North Saskatchewan River that have been stored in the ice for decades or even centuries. The project will evaluate the potential future concentrations of the organic contaminants in the North Saskatchewan River at Edmonton. EPCOR is funding this project for a total of three years to 2021.

EPCOR has participated in the *City of Edmonton Climate Change Adaption and Resilience Working Group*. In 2018, the City of Edmonton completed their initiative to examine climate change risks and develop adoptions plans for various infrastructure and services in the city, including water supply and wastewater treatment. The working group generated predictions of climate change and assessed the risk of climate change on all services provided by a city. EPCOR's Climate Change Adaptation Strategy focuses primarily on the water supply – the North Saskatchewan River. Find out more about the *City of Edmonton's Climate Change Adaption and Resilience Plan* on its [website](#).

## Energy Efficiency Initiatives

In 2021, EPCOR's key energy efficiency initiatives will focus on:

- 1) Wrapping up the current energy management plan for the PBR period of 2017-2021. Envisioning the key concepts and initiatives of energy management for the next PBR period of 2022-2026.
- 2) Initiating and finishing the external energy audit of Edmonton Water Treatment Plants (WTPs), reservoirs, and booster stations to establish an energy efficiency baseline to benchmark against other utilities, to recommend an action plan for future capital improvements, and to envision a roadmap for WTP operations to potentially achieve net-zero carbon emissions.
- 3) Coordinating with other business units and assisting the steering committee to update the Water Canada Climate Change Adaptation and Mitigation Plan.
- 4) Continuing the implementation of office and reservoir off-hour temperature control. Continuing to improve the building envelop energy efficiency and reduce GHG emissions.
- 5) Completing the implementation of the pump health/efficiency visualization tool in the SCADA control.
- 6) Continuing the E.L. Smith Solar Farm project and the Battery Energy Storage System (BESS) project.

The key achievements in 2020 were:

- Several building envelop energy efficiency enhancement projects were completed:
  - The reservoir temperature control for non-occupied periods was in action for the whole year of 2020. The setting of 15°C at non-occupied times met all stakeholder needs and approval. As result of reducing room temperature, in 2020, the gas consumption of reservoir pump houses was reduced by 8.5%.
  - Phase II upgrade of Rossdale ATD building HVAC is in progress to install another much higher efficiency chiller for the building and implement multiple local zone temperature control to achieve

both energy efficiency and allow the customization of the zone temperature to enhance stakeholder comfort. The design was completed in 2020 and the project is to be completed in 2021.

- E.L. Smith WTP solar farm rezoning application was approved by City Council and the design is at the 90% stage. The solar farm is scheduled to be in service on March 31, 2022. The Battery Energy Storage System (BESS) project is also moving ahead with design, and is scheduled to be in service in late 2022.

### Energy Indices Performance in 2020

The overall system energy efficiency performance in 2020 was down compared to 2019 due to the impact of the COVID pandemic. As a result of many people working from home, the commercial and industrial consumption in the primary pressure zone decreased while the residential consumption in the tertiary and quaternary pressure zones increased. This required more energy to serve those higher pressure zones. These impacts are reflected in the energy indices shown in Figures 1 to 6.

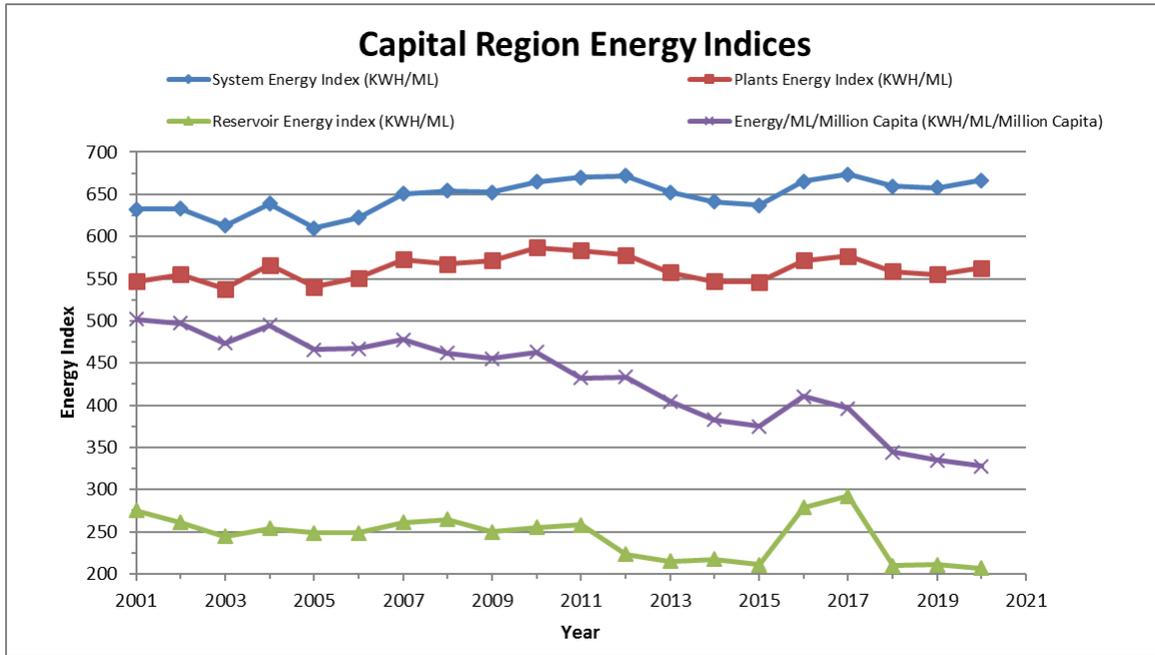
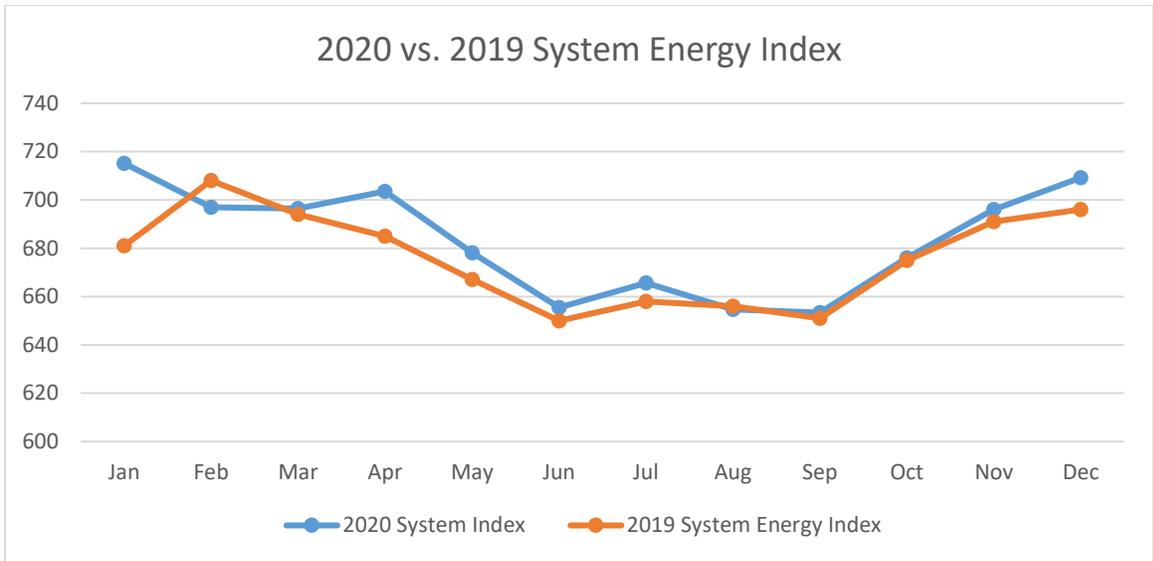
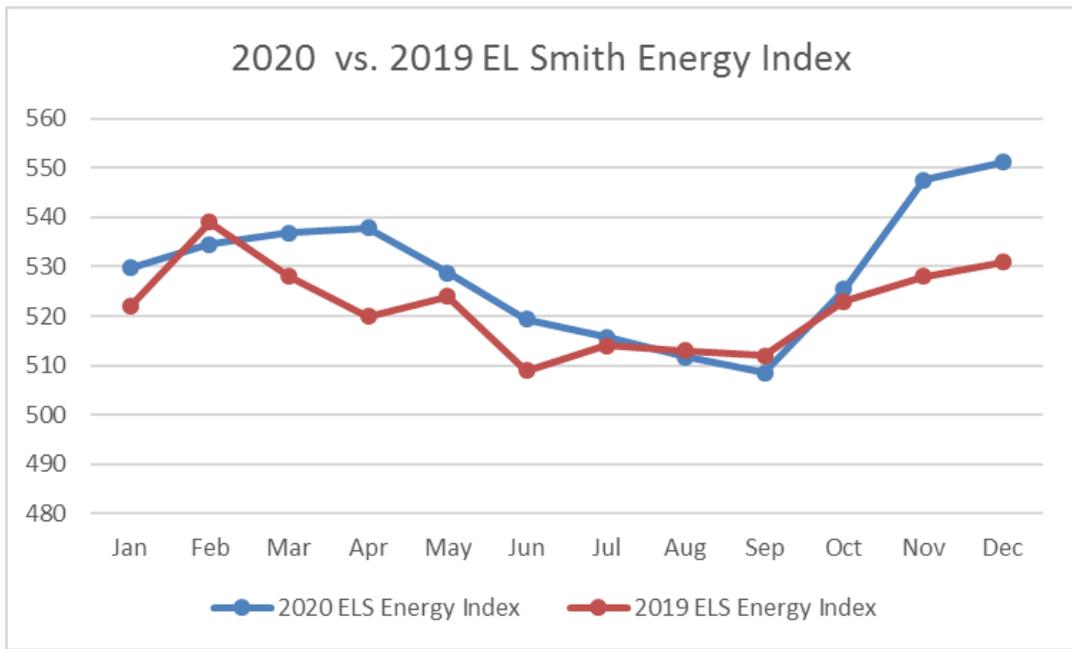


Figure 1 Capital Region Energy Indices with Population Impact Included

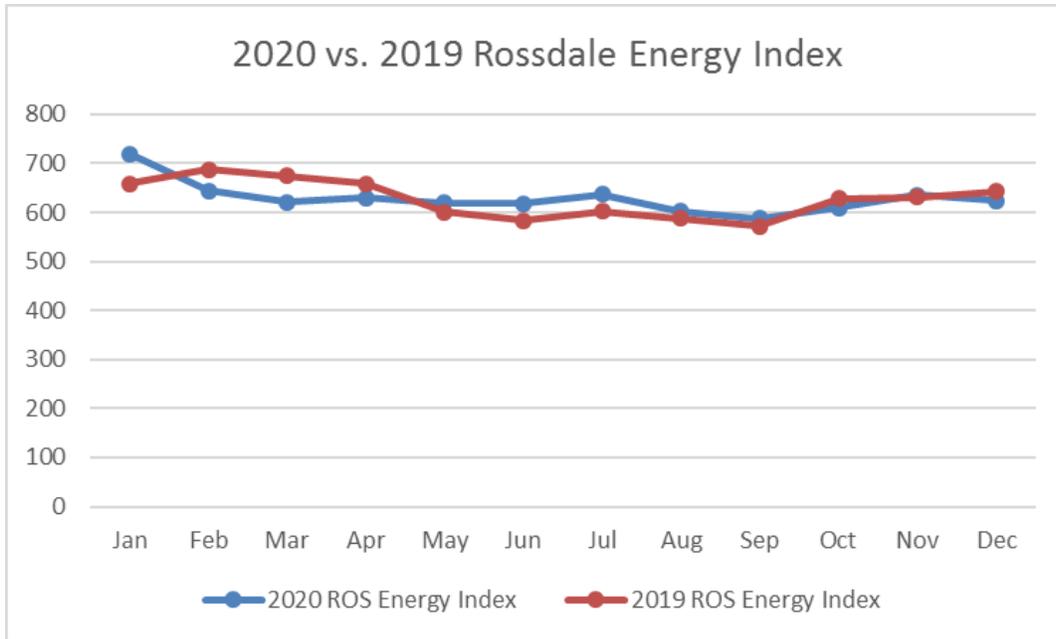


**Figure 2 Edmonton System Energy Index Comparison**

For the WTPs, E.L. Smith (ELS) continued to perform better in the energy index in 2020 than Rosssdale (ROS). However, ELS's 2020 energy index performance dropped compared to 2019, the production level in ELS was lower and the ROS production was back to the normal level after major repairs of clarifiers were completed (Figure 3 and 4).

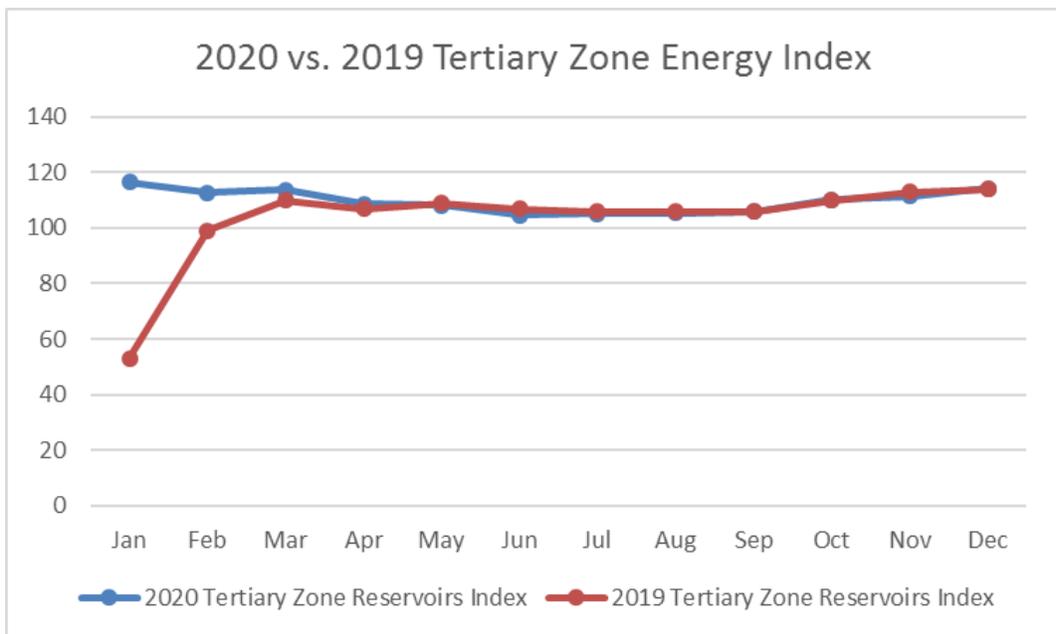


**Figure 3 ELS Energy Index Comparison 2020 vs. 2019**

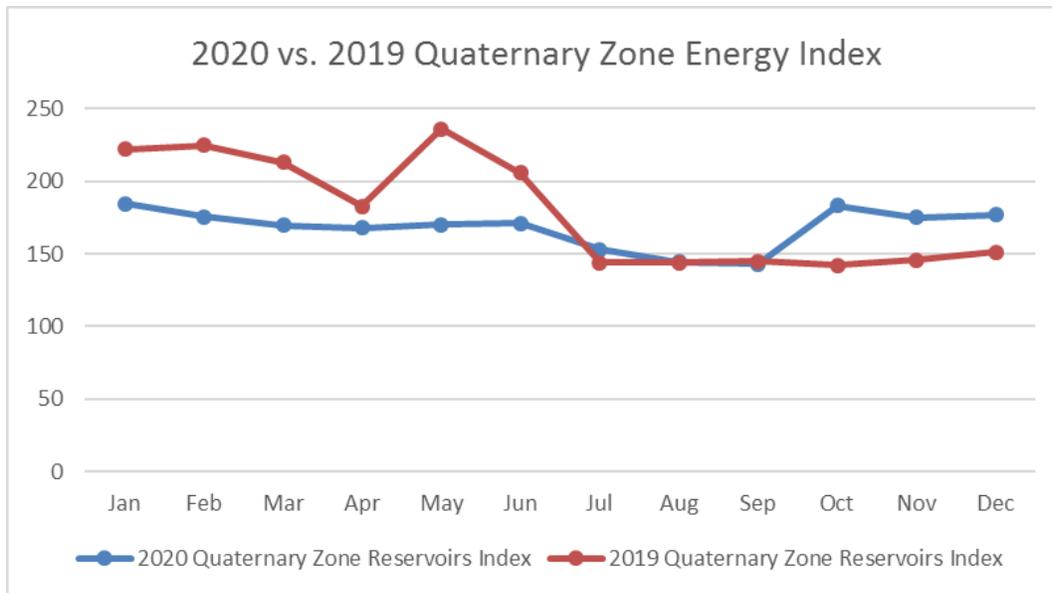


**Figure 4 ROS Energy Index Comparison 2020 vs. 2019**

The 2020 tertiary zone water consumption volume was 8,805 MLD, a 6.2% increase compared to 2019. The quaternary zone water consumption volume of 2020 was 586 MLD, a 10% increase compared to 2019. As a result (Figures 5 and 6), the tertiary energy index of 2020 was about 9.7% better compared to 2019; and the quaternary energy index of 2020 was 12% better compared to 2019.



**Figure 5 Tertiary Pressure Zone Energy Index Comparison 2020 vs. 2019**



**Figure 6 Quaternary Pressure Zone Energy Index Comparison 2020 vs. 2019**

### Key Initiatives for 2021

EPCOR leadership has committed to 100% green electricity for its operations in Edmonton by 2025, and an 85% reduction of GHG emission levels from its 2012 baseline by 2035. As such, EPCOR is integrating this strategic goal into its vision and goals for the next Performance Based Regulation rate application (2022 - 2026). New initiatives for energy management are under consideration to further reduce GHG emissions:

- Hired an external consultant to conduct Phase I of the energy audit for WTPs, reservoirs, and booster stations. The project was started in March 2021 and will be completed by November 2021.
- EPCOR is working to complete the ELS Solar farm and the BESS project, and will optimize solar power usage to shave power consumption peaks from the power grid.
- Complete the update of Water Canada Climate Change Adaptation Plan in 2021.
- A project has been initiated to investigate a second high lift pump house at the ELS WTP for higher energy efficiency and GHG emission reductions.
- Audit the waste streams and any water losses in the WTPs. Finding leaks and refurbishing those assets will reduce both the energy and the chemical cost.
- Audit the energy and chemical cost of the production to optimize the production split between the ELS and ROS WTPs for better energy efficiency and GHG emission reduction.

## Active Staff Recruitment

EPCOR strives to attain a variety of employment achievements in Canada. In 2020, EPCOR was named one of Alberta's Top 70 Employers for the 15<sup>th</sup> consecutive year, one of Canada's Top Employers for Young People for the 9<sup>th</sup> consecutive year and one of Corporate Knights' 2020 Best 50 Corporate Citizens in Canada.

We have a dedicated Talent Sourcing team that focuses on finding high quality external candidates as well as supporting Managers through internal recruitment processes. EPCOR managers are increasingly involved in succession planning to ensure we have a strong pool of talent, now and in the future.

EPCOR's Talent Development department operates the EPCOR School of Business, which hosts a multitude of leadership training and professional development courses. We have put emphasis on ensuring everyone on our team feels supported in their growth on a day-to-day basis, which is why we invest heavily in training for our employees. Over the past few years, we have created a centralized Learning and Development team that supports professional development from the front line to senior leadership. These efforts ensure that as we move forward our teams will remain strong and engaged and will provide our customers with safe and reliable water services while meeting and exceeding environmental requirements. In spite of restrictions on classroom training due to COVID, the School of Business delivered 5181 hours of learning in 2020.

Every two years, we measure employee engagement through our company-wide employee engagement survey. In 2020, we conducted the survey, and in 2021, we will be working on executing action plans cascading from our executive level to frontline leaders to strengthen engagement. In terms of results, we obtained 82% participation and our engagement score remained stable at 77%, keeping us on the cusp of being a top decile employer compared to other benchmark employers in our category.

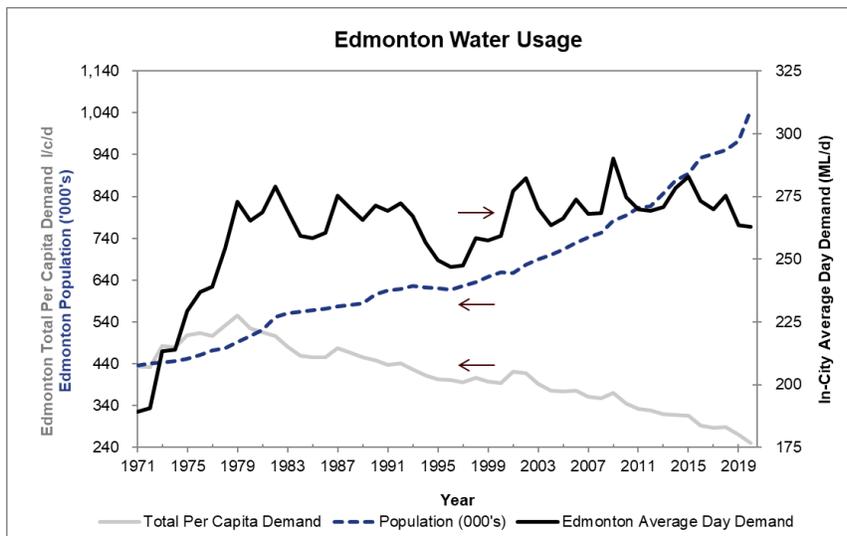
## Water Conservation Program

At EPCOR, we are dedicated to help ensure an abundant water supply remains in place for generations to come. We look for ways to increase awareness within our community regarding water usage and conservation. While most homes and businesses in the city are, generally, conservative water users there are still opportunities of improvement. EPCOR implements a variety of industry efficiency best practices that have resulted in significant water efficiency improvements in Edmonton. Below, are some of our conservation initiatives from 2020.

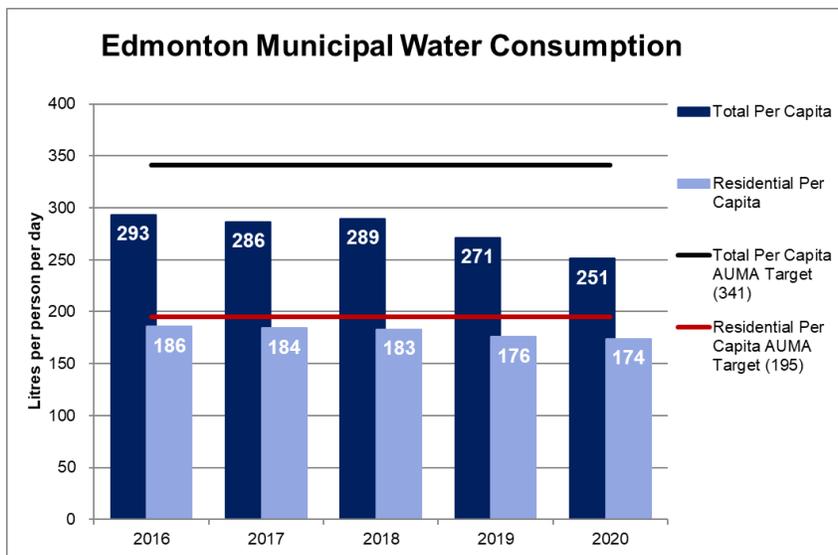
- In previous years, RONA and EPCOR partnered to host a Home\$aver Eco sale. This annual event focuses on educating customers and promoting the use of water efficient products for outdoor water conservation. EPCOR's participation in this event included sponsorship and promotion of rain barrels, soaker hoses and drought-resistant grass seed. This program was not held in 2020 as a result of the COVID-19 pandemic, but EPCOR is looking forward to continuing the program in 2021.
- EPCOR shares average water consumption information by city block area as well as by neighbourhood on the City of Edmonton's Open Data Portal.
- Throughout the year, conservation and water efficiency efforts were promoted through social media channels, and EPCOR's website.
- EPCOR supplied online tools and resources for teachers and students that support education around water and wise water use:
  - [Esmart Kids](#): An online resource for teachers and students built to encourage learning about using water wisely, and electricity safety/efficiency. During 2020, we saw 43,797 page views on this site.
  - [Water Quest](#): A joint project between EPCOR and Alberta Agriculture, Food and Rural Development. During 2020, we saw 1,658 sessions and 5,069 page views on this site.

Water usage trends are monitored regularly to ensure the conservation program is meeting operational objectives as well as customer needs. The figure below shows the trend of Edmonton's total water demand between 1971 and 2020. While population has steadily increased over this period, in-city average day demand has leveled off (with year-to-year fluctuations) and total per capita water use has been on the decline since the early 1980s. In 2020, the total per capita water use was 251 litres per person per day (L/p/d). Residential water use was 174 L/p/d. Edmontonians' continued conversion to high efficiency toilets and washing machines is projected to decrease per capita water use over the long term.

### Edmonton Water Usage 1971-2020



In comparison, the Alberta Urban Municipality Association has set targets to achieve a total per capita water use of 341 L/p/d and an average per capita residential water use of 195 L/p/d (which is 30% below Alberta municipal sector reported water use from 2001-2006) by 2020. As shown in the following figure, EPCOR has consistently met these targets since 2016.



Going forward, EPCOR's conservation platform will focus on identifying and addressing inefficient water use in different high use customer classes or groups.

## System Water Losses

EPCOR has a program for monitoring and controlling water losses in the distribution system and has adopted the Infrastructure Leakage Index (ILI) as the primary measure of water loss performance. The ILI is the ratio of real water losses compared to the lowest losses possible if all available best management practices were successfully applied. The ILI was developed by the International Water Association (IWA) and is the industry recommended metric to measure the effectiveness of managing and maintaining a municipal water system. It is considered a good overall measure of system performance because it adjusts for water system size and complexity and also enables comparisons between different water systems.

EPCOR set an ILI benchmark of below 2.0 as a reasonable goal in the 2017- 2021 PBR renewal. As shown below, EPCOR has consistently achieved an ILI below 2.0 in the past seven years.

	ILI	EPCOR Benchmark Target
2015	1.18	< 3.0
2016	1.06	< 2.0
2017	0.90	< 2.0
2018	1.19	< 2.0
2019	0.84	< 2.0
2020	0.90*	< 2.0

\*Preliminary metric. The 2020 Water Loss Audit is not yet published and therefore the ILI is subject to change.

**Consistently low ILI values indicate that EPCOR is managing real losses in a qualified manner. This can be attributed to the cumulative effects of the following factors:**

- EPCOR has been actively renewing water mains for 30 years and maintains a strong commitment to continually replace cast iron piping (that is more prone to breaking and leakage) with PVC piping.
- EPCOR maintains a proactive leak management strategy that targets areas with lead services and areas close to the river valley, where the slopes are unstable and susceptible to sliding. In 2013, the program was expanded to include leakage surveys of the older neighbourhoods that were selected for neighbourhood renewal by the City.
- EPCOR has an active customer meter replacement program that ensures average meter life remains low. This results in high levels of meter accuracy and confidence in sales figures.
- EPCOR has a Performance Based Regulation requirement regarding main break repairs. This ensures real losses associated with main breaks are minimized.
- EPCOR tracks a large portion of unbilled authorized consumption through the hydrant permit program. This ensures accurate volumes are used to calculate real losses.
- Edmonton's clay based impermeable soil conditions ensure that most major leakage seeps to the surface close to the leak. This allows citizens to promptly report main breaks.

## Reducing Environmental Impacts

The treatment of river water to produce clean, safe drinking water generates waste or “residual” streams. Some of these streams, such as the underflow from clarifiers and filter backwash, contain solid material that is a mixture of the suspended solid material removed from the river water and the solids produced by the addition of alum and, at times, powdered activated carbon. Some of these residual streams, such as filter backwash or treated water that does not meet the drinking water specification, also contain chlorine that can be toxic to fish. These waste streams had historically been released back to the river.

EPCOR has evaluated alternative strategies for managing these waste streams. Any successful strategy must result in a net environmental benefit and must balance the environmental benefit to the river against our primary objective to produce safe drinking water. Other environmental impacts, such as the energy footprint resulting from processing and transport of residuals to alternate disposal locations, must also be factored into the equation. Alternate disposal solutions may have larger environmental footprints than returning the material to the river.

### The Importance of Dechlorination

Drinking water contains residual chlorine, which is added at the treatment plants to disinfect the water. While it is important to ensure a minimum residual in the water delivered to all customers for protection of public health, the chlorine residual can be toxic to fish as it damages their gills. EPCOR has committed to eliminating all discharges of chlorinated water from its facilities to the river or any other water bodies. This includes routine discharges of chlorinated water from the E. L. Smith and Rosedale Water Treatment Plants arising from filter backwashes, filter-to-waste, release of other water that does not meet drinking water specifications and less frequent discharges of chlorinated water arising from activities at field reservoirs and in the water distribution system.

### Dechlorination at the Water Treatment Plants and Field Reservoirs

Bisulfite dechlorination systems have been in place and operating at the E. L. Smith and Rosedale WTPs since 2009 and 2012, respectively, and meeting AEP approval limits since 2010 and 2012. These systems remove chlorine from chlorinated water streams including filter backwash, filter-to-waste and plant bypasses before the water is returned to the river. As well, procedures are in place to ensure that all planned discharges of chlorinated drinking water from the field reservoirs are dechlorinated prior to release. In the past years, EPCOR has continued to improve procedures and to identify other potential sources of release of chlorinated water to the river at the water treatment plants. All sources of chlorinated water at both treatment plants (for example service water used for cleaning at the treatment plant) have been identified and labelled. Shutdown permits were updated to include environmental risks and procedures required to mitigate those risks. We are pleased to report that there were no releases of chlorinated drinking water from the treatment plants or reservoirs to the river or other water bodies in 2020.

### Dechlorination of Water Released to the Environment in the Distribution System

EPCOR has procedures in place to dechlorinate drinking water released into the environment. This includes both planned releases (e.g. flushing and draining of pipes for maintenance) and unplanned releases (e.g. water main breaks and other emergency events). While it may be difficult to ensure 100% dechlorination of all releases, the procedures will ensure the majority of water released from the distribution system is dechlorinated and that potential environmental impacts are mitigated. In 2020 there were no reported releases of chlorinated water to water bodies.

## Residuals Solids Management Program

EPCOR's Residuals Solids Management Program strives to reduce the impact of solids present in the residual streams released into the North Saskatchewan River from its water treatment plants. Complete, year-round diversion of all solid residual streams from both Edmonton water treatment plants would require building very large, expensive and energy intensive treatment facilities at both water treatment plants and would involve trucking large volumes of solid material to landfills. The volumetric flow and background solids concentration in the river fluctuates significantly during the year due to natural phenomena, which means that very large facilities would be required to manage the load during all seasons. This zero-discharge option was determined to be very costly and the net environmental benefit was not clear.

The EPCOR Residual Management program has emphasized minimizing the loading of solids to the river during the fall and winter seasons, when river flow and the background suspended solid concentration are lowest and the relative impact of the solids discharged on the river quality is greatest. This is achieved by reduction at source, that is by optimizing and minimizing the amount of alum added without compromising drinking water treatment. If less alum is added to the water for treatment, the amount of solid residuals produced and discharged to the river (especially the amount of chemical residuals) is reduced.

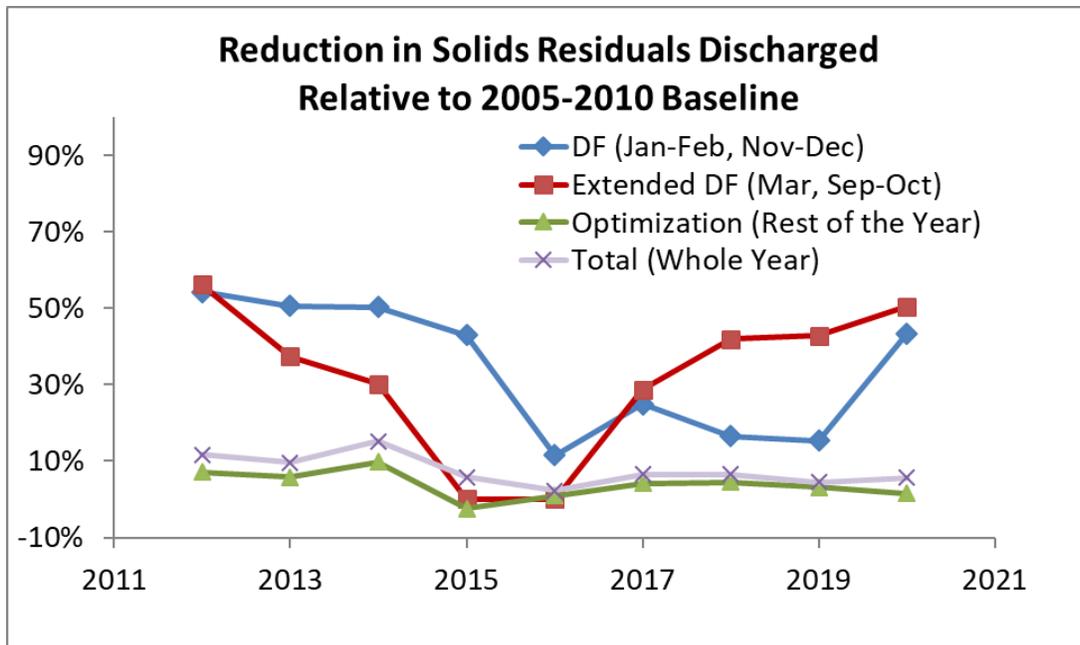
## Solids Residual Reduction Strategy

Since 2009, the Rossdale and E. L. Smith Water Treatment Plants have converted to direct filtration mode of operation during the winter months to reduce the amount of residuals released to the river. The switch from conventional mode to direct filtration mode involves reducing alum addition during treatment by up to 80%. This reduces the total mass of solids residuals produced during treatment that has to be discharged to the river by up to 50%. EPCOR's Stewardship Commitment was to operate in direct filtration (DF) mode from November to February. From several years of experience, we know that DF operation is successful only when the colour of the river water is very low (< 6 TCU) and stable. In late winter, early spring, DF operation is only feasible until spring runoff. Typically, we will convert the water treatment plants to conventional operation at least one week before we anticipate spring runoff to begin.

The graph below summarizes the solids discharged to the river from the two water treatment plants based on this strategy since 2012. In a given year, the amount of solids discharged to the river will depend on the raw water conditions and will, therefore, vary. To determine the effectiveness of the solids reduction strategy against this background variation, EPCOR determines the reduction in solids discharged from the two treatment plants relative to the amount that would have been discharged using the 2005-2010 conventional treatment strategy. As the graph shows, our success with this approach has varied from year to year and has depended heavily on river conditions. Reducing solids discharge in the range of 40 to 50% was achieved from 2012 to 2014 in the fall and winter when the river water conditions were favorable for DF operation. The most challenging year to date for DF was 2016 due to an early spring runoff and very high colour levels in the river in the fall and early winter. In 2016, we achieved a 12% reduction in solids released to the river during the normal DF season (Jan-Feb, Nov-Dec) and there was no extended DF operation.

Good residual reduction rates were achieved in 2020 compared to other years. Reductions of 43% and 50% compared to baseline were achieved during DF and extended DF periods, respectively. Chemical optimization during the rest of the year was limited to 1% reduction relative to baseline.

In 2017, EPCOR set an internal environmental performance target of a minimum of 120 days in DF operation at both water treatment plants. This performance target provides additional incentive for EPCOR to continue to find ways to improve DF operation. In 2020, raw water conditions were favorable and the WTPs were able to achieve an average of 168 days in DF (158 days at Rossdale and 178 days at E.L. Smith).



**DF = Direct Filtration**

**Baseline load is calculated using 2005-2010 conventional treatment strategy and actual raw water conditions**

### Continuous Improvements

EPCOR has committed to continuous investigation of alternatives and strategies to further reduce the discharges of residual solids to the river. In 2020, continuous improvement activities included:

- EPCOR is planning to eventually convert the filters at the E. L. Smith water treatment plant to deep bed filters to improve filter performance during Direct Filtration operation. Additional pilot-plant trials of deep bed filter operation were completed in 2020.
- An alternative filter media that showed some advantages over the anthracite-sand filter media currently in use was tested in the pilot-plant but the results were not promising for improving DF operation,
- Preliminary consideration was given to recycling the Filter-to-Waste and Backwash Water streams as a means of reducing alum requirements of volume of residuals discharged. This will be pursued further in 2021.

### Environmental Monitoring

EPCOR continued to measure the environmental impact of the solids discharged to the river in 2019 and to build on the work we completed in previous years (2013-2019). The focus of this program has evolved over the years, and has included monitoring of discharge toxicity, water quality in the river, sediment quality, benthic invertebrate communities and toxicity downstream of the discharge points. Below are the highlights of the 2020 monitoring program:

- Every year, EPCOR carries out quarterly monitoring of acute toxicity of residuals discharged from the Rosedale and E. L. Smith water treatment plants. All 23 samples of residuals discharges that were collected in 2020 were non-toxic according to a 96-h acute toxicity assay with rainbow trout. Together with similar results from previous years, this information is reliable evidence that the residuals discharge streams are not acutely toxic to fish.
- In 2020, EPCOR began collecting samples from the water treatment plant residual discharges to better characterize the variability under different raw water treatment plant operating conditions. Samples were collected across a range of river flows, colour and turbidity levels, and during conventional and direct

filtration operation of the water treatment plants. Sampled parameters included pH, total suspended solids, turbidity and metals, including dissolved and total aluminum ions. Flow was also measured. The water quality and quantity data will be used to better evaluate potential water quality impacts to the river. Additional samples will be collected in 2021 to better characterize residual discharges during spring runoff and large summer storm events. Analysis of the monitoring results will be completed in 2021.

## Strategy Moving Forward

In 2020, EPCOR completed work on a Triple Bottom Line (TBL) analysis to assess the social, economic and environmental costs and benefits of constructing, operating and maintaining residual management facilities at each of EPCOR's two water treatment plants. The outcome of the TBL analysis was that residuals management facilities to thicken and dewater the residuals solids streams, together with the associated trucking and landfill disposal of the dewatered solids, will likely have greater environmental costs than benefits. EPCOR concluded that residuals management facilities are not an effective solution for residuals management. The considerable financial resources that would be required to build and operate residuals management facilities are likely better invested to improve resiliency, safety, and flood mitigation for EPCOR's water treatment plants or to reduce releases to the river from other EPCOR operations such as stormwater systems.

EPCOR will continue to emphasize operation of the water treatment plants in DF mode whenever operationally feasible to reduce discharges to the river in the winter months when the environmental benefits are greatest, and to look for opportunities to maximize DF operation in the fall months. EPCOR has plans to convert filters at the E. L. Smith treatment plant to deep bed operation in future years to facilitate DF operation in the fall months, but structural issues with the filters must be addressed first.

EPCOR believes a residuals management strategy should ultimately align with the Alberta Environment and Parks Capital Region Industrial Heartland - Water Management Framework for the river and should be based on river outcomes. EPCOR is completing a more rigorous scientific assessment of the effects of residuals discharge on the river ecosystem. As part of our new 10-year operating approval for the Edmonton Water System (effective June 1, 2021), EPCOR has formally committed to continuing and improving the waste stream monitoring program and the assessment of impacts of the discharged residuals on the North Saskatchewan River.

## Looking Forward

As we move into the final year of Champion status, EPCOR will continue to improve environmental performance through various programs and initiatives in 2021 and beyond. Even though the Stewardship Agreement will come to an end formally on May 31, 2021, we will continue to strive to meet the spirit of the agreements. Going forward, EPCOR will:

- Continue to maintain registration to ISO14001:2015 at our Water Treatment Plants and in our Distribution and Transmission operations. The ISO systems are based on the Plan-Do-Check-Act principle and require regular auditing, review and continuous improvement.
- Continue to work with our partners to maintain and sustain WaterSHED: the network of water quality and flow monitoring stations in the North Saskatchewan River watershed. Our partners are Alberta Environment and Parks, the North Saskatchewan Watershed Alliance and the City of Edmonton as part of a comprehensive water quality monitoring initiative in the basin. EPCOR plans to secure funding to sustain the WaterSHED program beyond 2021. The data that is collected over time will contribute to a better understanding of changes occurring in the watershed and to the Edmonton drinking water source now and into the future.
- Complete the design and construction of a solar panel installation at the E. L. Smith Water Treatment plant to meet our commitment to the City that at least 10% of the water system energy is provided by green energy. Also, continue to evaluate other ways in which we can reduce our GHG footprint through improvements in our operations.
- Continue to work with our stakeholders to execute the five-year plan of “Troubled Water” emergency exercises based on the Regional Water Quality Emergency Framework that has been developed.
- Continue to make progress on the Enhanced Lead Mitigation Strategy that was approved in 2019 and initiated in 2020. This will include commissioning of facilities to add orthophosphate to the drinking water at both water treatment plants by the end of 2022, full removal of high priority lead service lines by the end of 2023 and ongoing full (main-to-meter) lead service line replacements during water main renewals and maintenance work.
- Continue to engage with Alberta Environment and Parks on the Capital Region Industrial Heartland Water Management Framework and ensure that our Water Treatment Plant residuals management strategy is aligned with that framework.
- Implement a more rigorous and science-based monitoring program and environmental impact assessment for the water treatment plant residuals discharged to the North Saskatchewan River and develop a strategy to meet environmental water quality guidelines by modifying how residuals are discharged.