2022 YORK REGION

WATER AND WASTEWATER MASTER PLAN

Appendix C
Demand Management Programs

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York Region

VOLUME 3

Appendix C
Demand Management Programs

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APPENDIX C.1 2021 LONG-TERM WATER CONSERVATION STRATEGY UPDATE

Summary

Demand management approaches are integral to long-term service planning as they help stretch water and wastewater infrastructure by influencing available capacity within Regional and local systems. Water conservation programming is a key demand management program in York Region since the Water For Tomorrow program began in 1998. Building upon the successes of the past, this document reflects the most recent water conservation strategy, updated in 2021.

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September 30, 2021

2021 **YORK REGION**

LONG-TERM WATER CONSERVATION STRATEGY UPDATE

SEPTEMBER 2021

York Region

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1.0 EXECUTIVE SUMMARY

The Regional Municipality of York (the Region) is committed to providing sustainable long-term water servicing to its residents and businesses for current and future generations. Recognizing this, the Region has implemented demand management programming for more than two decades. Since 1998, the Water for Tomorrow and Long-Term Water Conservation Strategy programs have contributed to saving more than 27 megalitres per day (MLD). Understanding the need for smart water management, the Region has integrated its water conservation and infrastructure planning into its sustainable growth plans and policies. The Region is also mandated by the Province of Ontario to develop and implement the water conservation strategy.

This 2021 Long-Term Water Conservation Strategy Update (the 2021 Update) builds on previous 2016 and 2011 strategies. It refines long-term goals and sets out updated programs to achieve them. The 2021 Update was developed based on insight from a review of existing and historical programs, best-in-class research, stakeholder engagement and cost-benefit analysis. Going forward, the Region will maintain its previous aspirational goal of 150 litres per capita per day (LCD) by 2051, while focusing more holistically on reducing bulk water supply volumes (including residential, business and Regional/local municipal demands). This will help to ensure demands align with the Water and Wastewater Master Plan projections and support use of the existing Intra-Basin Transfer volumes beyond 2031.

Long-Term Water Conservation Strategy Objectives

The Region's Long-Term Water Conservation Strategy objectives and targets were revised to align with internal and external drivers. The four overarching objectives for the 2021 Update are:

1. Promote the responsible use of water as a resource
2. Apply a One Water approach to enhance water system sustainability and drive efficiency
3. Reduce water consumption as population increases for sustainable long-term servicing
4. Be a water efficiency and conservation influencer for our residents, the industry and regulatory partners

Long-Term Water Conservation Strategy Programs

The updated Long-Term Water Conservation Strategy programs place emphasis on cost-effective opportunities to realize long-term water savings. The Strategy is organized around five program areas:

1. **York Region and local municipal non-revenue water** – support regional and local municipalities' efforts to manage system losses and other sources of non-revenue water
2. **Residential water use** – continue to raise awareness and engage residents and students on water conservation, reducing outdoor water use and encourage water efficiency in new residential developments
3. **Industrial, Commercial and Institutional (ICI) water use** – support ICI customers to manage their water use through programs and targeted incentives
4. **Water reuse** – continue to advance research into centralized municipal and decentralized water reuse
5. **Corporate Social Responsibility** – demonstrate leadership by improving the efficiency of York Region's own facilities and operations

To successfully deliver the 2021 Update, the Region will require support from its local municipalities and the Province. Collaboration with other jurisdictions and stakeholders will also support the Region in advancing its programs. The Region will evaluate and refine its programs over the next five years and continue to demonstrate leadership in the field of water conservation and efficiency.

2.0 BACKGROUND

The 2021 Long-Term Water Conservation Strategy provides an update to the 2011 and 2016 Long-Term Water Conservation Strategies. These strategies enhance and extend the Region's commitment to leading water conservation programming, protecting water resources and providing sustainable long-term servicing.

2.0 BACKGROUND

2.1 YORK WATER SYSTEM

Centrally located in the Greater Toronto Hamilton Area (GTHA), York Region is one of the fastest growing regions in Canada. The Region is a two-tiered municipality comprised of nine local municipalities. The Region is exclusively responsible for bulk water supply, treatment and storage and acts as a wholesale water supplier to the local municipalities. Regional transmission mains transfer the water to infrastructure owned and operated by the local municipalities. Local municipal systems distribute water directly to end users.

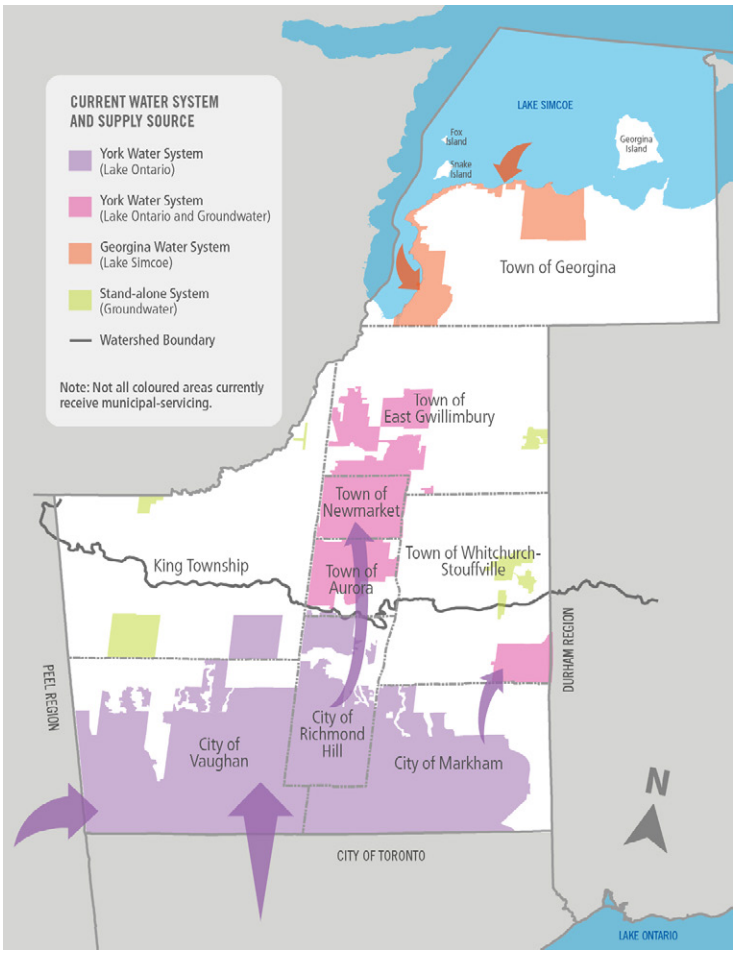
Similarly, the Region acts as a wholesale provider of wastewater services, collecting wastewater from local municipal sewers and conveying it through a network of trunk sewers and pumping stations to treatment plants.

The Region delivers drinking water through:

- Two surface-water treatment plants
- 24 groundwater treatment facilities (including 40 production wells)
- 22 pumping stations
- 44 elevated water tanks and reservoirs
- 360 kilometres of transmission mains

York Region has no direct access to Lake Ontario for its water supply. The Region purchases water from the City of Toronto and the Region of Peel via long-term water supply agreements. The Region also draws water from Lake Simcoe and groundwater sources through a system of production wells (Figure A).

Figure A: 2021 York Water System and supply source



2.0 BACKGROUND

2.2 HISTORY OF WATER CONSERVATION AND SUSTAINABLE GROWTH

Since implementing York Region's 1998 Long-Term Water Supply Master Plan and the Water for Tomorrow program, water conservation planning has been integral to the Region's water demand management. In 2011, the Region developed its first Long-Term Water Conservation Strategy, which was updated in 2016. These strategies expanded on existing Regional plans and set the stage for innovative and jurisdiction-leading water conservation programming.

Over the past 23 years, an estimated 27 megalitres per day (MLD) has been saved because of the Region's Water for Tomorrow and Long-Term Water Conservation Strategy programming; this is enough water to meet the daily needs of approximately 135,000 people. A summary of historical program achievements as of 2020 is presented in Figure B.

Known as *A Place to Grow: Growth Plan for the Greater Golden Horseshoe*, the Provincial Growth Plan sets out population and employment forecasts. In 2020, the Ontario Ministry of Municipal Affairs and Housing updated and extended the Growth Plan's population and employment forecasts to 2051.

By 2051, York Region is expected to grow to approximately 2,020,000 people and 990,000 jobs, resulting in increased demand on the water supply system. Water supply and wastewater servicing capacities significantly impact Regional growth considerations. The Region has integrated water conservation and infrastructure planning into its sustainable growth plans and policies to meet these future water demands.

2.0 BACKGROUND

Figure B: Historical programs and achievements (1998 to 2020)

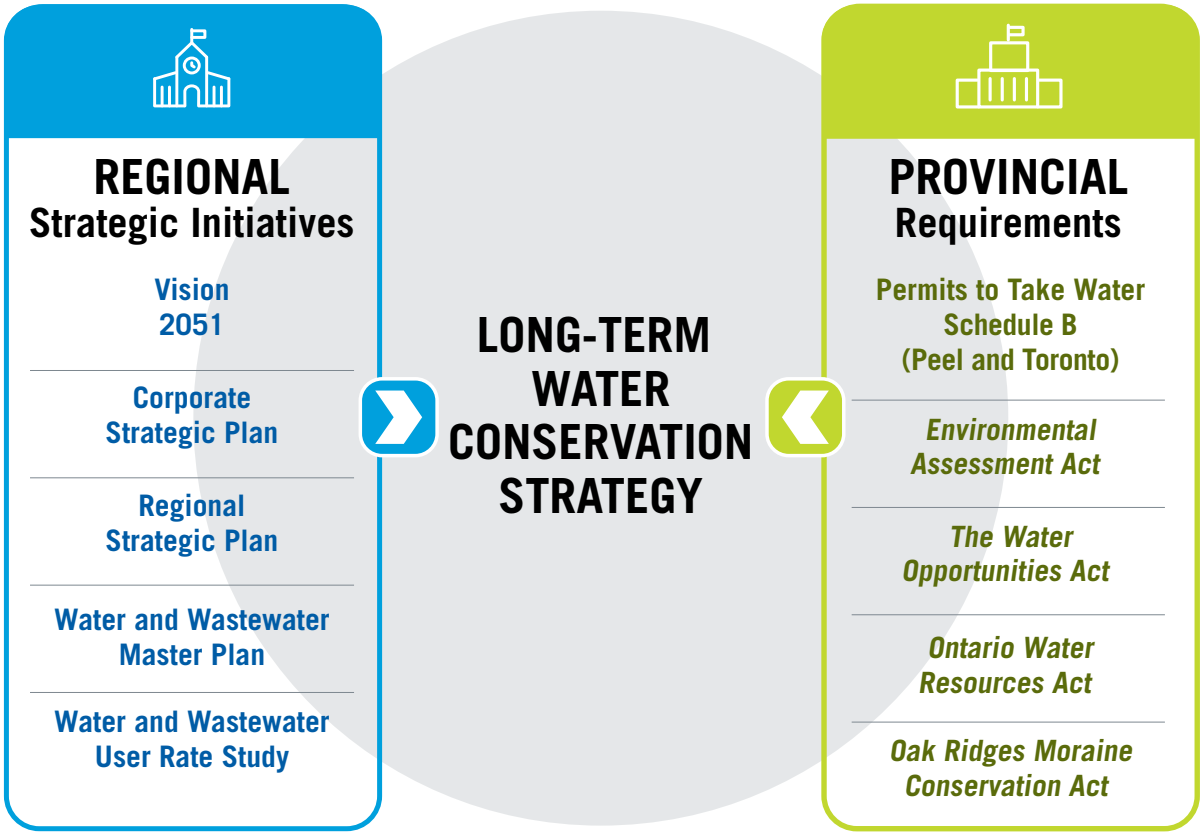
2.0 BACKGROUND

2.3 REGIONAL STRATEGIC INITIATIVES AND PROVINCIAL REQUIREMENTS DRIVING WATER CONSERVATION

The Region's sustainability goals are set out in Regional strategies and plans. The water conservation strategy translates these commitments into actionable and innovative demand management programming. Water conservation planning is also mandated by the Province of Ontario under multiple statutes and regulatory approvals (Figure C). Of notable importance to the Long-Term Water Conservation Strategy are the Region of Peel and City of Toronto's Permits to Take Water, which regulate York Region's intra-basin transfer requirements including the implementation of a water conservation strategy and permitted volumes. Several other provincial, regional and local municipal laws and policies influence water conservation planning and program delivery more indirectly. Additional information on Regional strategic initiatives and regulatory requirements can be found in Appendix A and B, respectively.

While the Region is mandated by the Province to develop and implement the water conservation strategy, the Region is committed to delivering demand management programs as part of its Water and Wastewater Master Plan and recognizes the wide range of benefits from conserving water as further outlined in Section 2.4.

Figure C: Strategic initiatives and Provincial requirements



2.0 BACKGROUND

2.4 WATER CONSERVATION BENEFITS

Water conservation has many benefits beyond simply reducing demand on water supply and on water and wastewater infrastructure. Associated advantages include reduced energy consumption, lower greenhouse gas emissions, deferred infrastructure costs and reduced operational costs, among others. Table A outlines how these benefits apply to the Region.

Table A: Benefits of water conservation

Societal benefits	Environmental benefits
• Ensures clean, safe drinking water is available to all Regional customers in a sustainable manner • Promotes stewardship within the community by offering ways for individuals to reduce or mitigate their own ecological footprint • Provides opportunities for education and awareness about local drinking water • Supports equity and fairness: those who conserve will have lower bills compared to those who waste and put excessive demand on the system	• Allows a greater number of customers to be serviced within the Region's current Permits to Take Water • Reduces or avoids impacts from construction of new infrastructure • Reduces chemical use in water and wastewater treatment • Reduces treated wastewater discharged to the environment • Reduces energy use and greenhouse gas emissions due to reductions in water treatment and pumping • Reduces peak demand on supply sources • Enhances resilience to prolonged drought and a changing climate
Financial benefits	**Legislative and policy linkages**
• Defers capital investment in new bulk water supply and treatment infrastructure (that is, needs are met with conservation rather than new supply) • Reduces operations and maintenance costs • Reduces energy costs for the Region (less pumping and treatments) and for residents (less heating) • Reduces water bills for residents and businesses • Improves chances of Provincial and Federal government infrastructure funding and other grants by adoption of best practices • Reduces or defers investment in wastewater infrastructure	• Supports goals of the Regional Official Plan and Vision 2051 • Meets requirements under Schedule B of York Region's Permits to Take Water regulating the intra-basin transfer under Ontario Regulation 387/04 • Meets requirements under Province's Conditions of Approval for the Southeast Collector Trunk Sewer Individual Environmental Assessment • Ensures compliance with conservation planning requirements in the *Oak Ridges Moraine Conservation Act* • Supports other Regional strategies, policies, and plans (for example, the Water and Wastewater Master Plan and Inflow and Infiltration Reduction Strategy)

3.0 2021 LONG-TERM WATER CONSERVATION STRATEGY UPDATE

3.0 2021 LONG-TERM WATER CONSERVATION STRATEGY UPDATE

In 2020, the Region began assessing the previous water conservation strategy, engaged with stakeholders, completed a best-in-class review and evaluated potential opportunities for water conservation programming. This work culminated in this 2021 Long-Term Water Conservation Strategy Update (the 2021 Update).

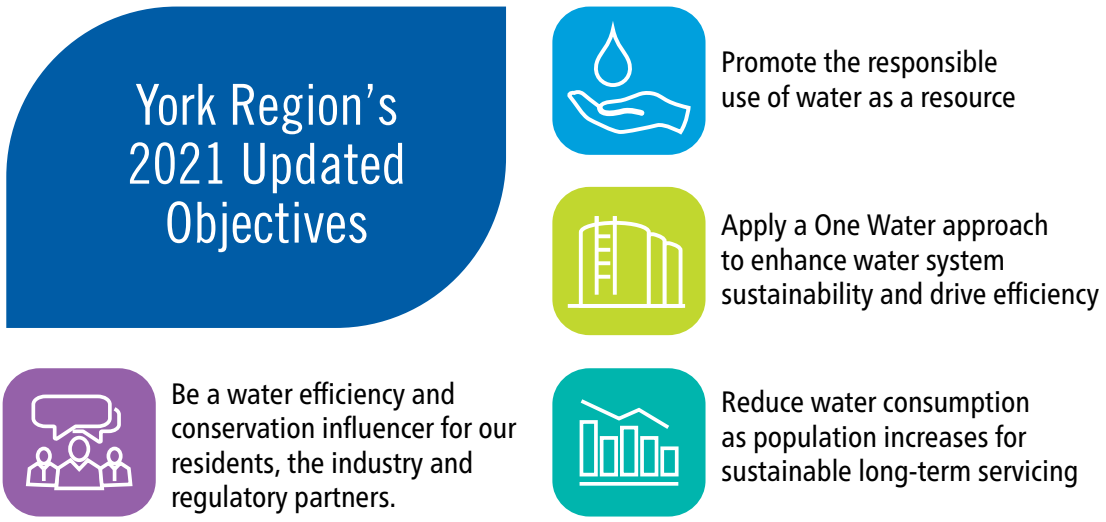
Many factors influence how water is used within the Region, as well as in each local municipality. These factors create both opportunities and challenges for water conservation. A changing marketplace, new technologies and processes, better data analytics, weather variability, climate change, intensification of development in municipal corridors and new growth projections are some of the many factors impacting water use now and in the future.

The 2021 Update builds on the Region's past successes and significant reductions in per capita demand. The 2021-2025 demand management programming targets cost-effective water saving opportunities for residential, industrial, commercial, and institutional (ICI) customers and enables the Region to continue maintaining and realizing additional long-term water savings that support the Water and Wastewater Master Plan growth projections.

3.1 2021 UPDATED OBJECTIVES

The objectives for the 2021 Update were updated and streamlined with input from key stakeholders (Figure D). Water conservation programming will embody a One Water approach in tackling water savings, efficiency and optimization. One Water is an integrated planning and implementation approach that considers our local municipal and regional systems as part of one water system, which services all the Region's residents. Reviewing all options from a One Water approach will promote strategic system-wide benefits. This list provides a concise mandate for conservation work, while encompassing the longer list of objectives found in the 2011 and 2016 strategies (see Appendix C).

Figure D: Water conservation strategy objectives



3.2 DEVELOPMENT OF THE 2021 UPDATE

3.2.1 SCREENING OF POTENTIAL WATER CONSERVATION MEASURES

To inventory current demand management programs, evaluate and inform potential water conservation measures, the Region utilized Econics' proprietary Measures Assessment Tool (MAT). This tool compiles over 160 water conservation measures based on the examination of programs across North America and a review of leading best practices manuals and guidelines. The MAT also includes criteria that enable evaluation of water conservation measures based on their potential contribution to various desired outcomes, such as:

- Financial cost to water savings ratio
- Energy conservation and greenhouse gas reduction
- Peaking factor reduction
- Participation rate
- Implementation control and ease
- Measurability

Application of these screening criteria helped rank potential water conservation measures, which were then investigated further through best-in-class research (Section 3.2.4).

3.2.2 STAKEHOLDER ENGAGEMENT AND CONSULTATION

York Region engaged internal and external stakeholders through consultation and engagement sessions, as well as telephone and online surveys, to help inform programming direction. External stakeholders engaged included the local municipalities and over 600 York Region residents and businesses.

During development of the 2021 Update, meetings with the Water Conservation Advisory Committee (WCAC) members were held to solicit feedback and guidance. Advisory members represent community groups, environmental non-government organizations, the Lake Simcoe Region Conservation Authority (LSRCA), local business representatives, local municipalities, the Ministry of Environment, Conservation and Parks (MECP), the Toronto and Region Conservation Authority (TRCA), York Region Public and Catholic District School Boards and York Region residents.

York Region also engaged its nine local municipalities through a series of workshops. Non-revenue water (NRW) and leak detection activities are top of mind for the local municipalities.

3.2.3 INDIGENOUS COMMUNITY ENGAGEMENT

Engagement with Indigenous communities (The Chippewas of Rama, Curve Lake First Nation, Hiawatha First Nation and Mississaugas of the Credit First Nation) occurred through the Water and Wastewater Master Plan process in coordination with the Municipal Comprehensive Review and update to the Transportation Master Plan. The role of demand management programs and their integration in long-term service delivery planning through the Water and Wastewater Master Plan was shared, including the Long-Term Water Conservation Strategy Update. The communities were appreciative of the Region's focus on water conservation as part of the holistic approach to long-term planning and were invited to provide input to the 2021 Long-Term Water Conservation Strategy Update. Although no community opted to provide specific input to the Strategy, communities provided feedback on the value of water more generally which included that:

- Indigenous people have a unique historic and cultural relationship to water that gives rise to important perspectives on how to manage water resources
- Water is viewed as more than just a valuable resource and is recognized as a sacred gift
- Water must be protected considering anticipated future growth

York Region acknowledges the central importance of water in the culture and lives of Indigenous people and is committed to sustainable management and use of this essential resource not only in the present, but also over the long term for future generations. More information about Indigenous community engagement can be found in the 2021 Water and Wastewater Master Plan (available in early 2022).

3.2.4 WATER CONSUMPTION TRENDS

The 2021 Update evaluated water consumption trends over the last decade to inform targets. With the forecasted population and employment growth, the Region will continue to track bulk water demands over time to ensure alignment with the Water and Wastewater Master Plan projections.

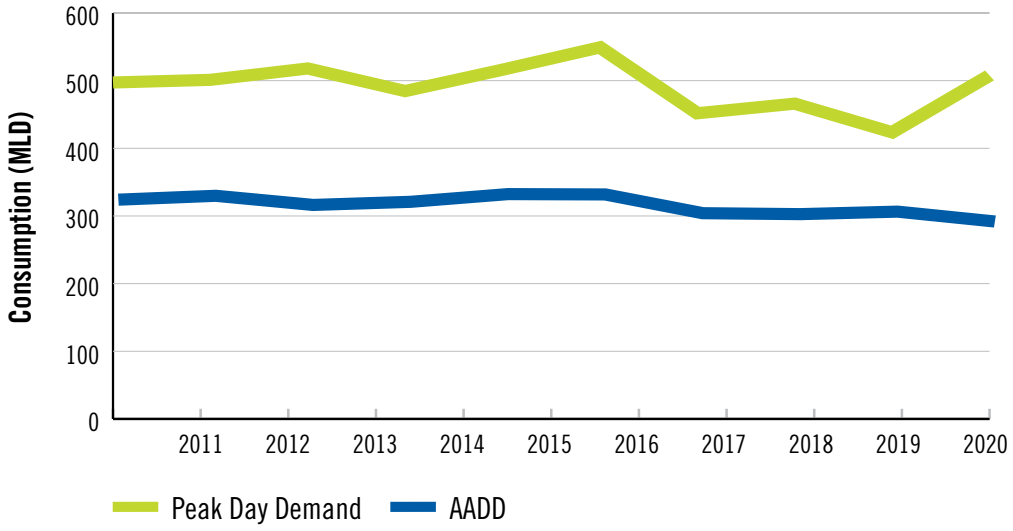
For many years, the Region has focused on achieving full-cost recovery pricing for water and wastewater services with the goal of ensuring long-term financial sustainability. This included a focus on fully funding long-term asset management needs in a manner that is fair to current and future generations. While the intention of reaching full-cost recovery is not to reduce per capita water demand, the effect of pricing on consumption will continue to be considered as part of financial sustainability plans for Regional water and wastewater rates.

3.2.4.1 AVERAGE ANNUAL DAY WATER DEMAND (AADD) AND PEAK DEMANDS

Average annual day demands reflect the total volume of water delivered during the given year. AADD values are impacted by changes in both indoor and outdoor consumption, however reductions in indoor demands (since they occur 365 days per year) are the most impactful. Between 2012 and 2020, peak day demand represented 156% of average annual day demand in the York Water System (Figure E). The York Water System does not include the Georgina Water System or other stand-alone systems and is the Region's largest drinking water treatment and supply system. In 2020, it provided approximately 95% of the total water supplied.

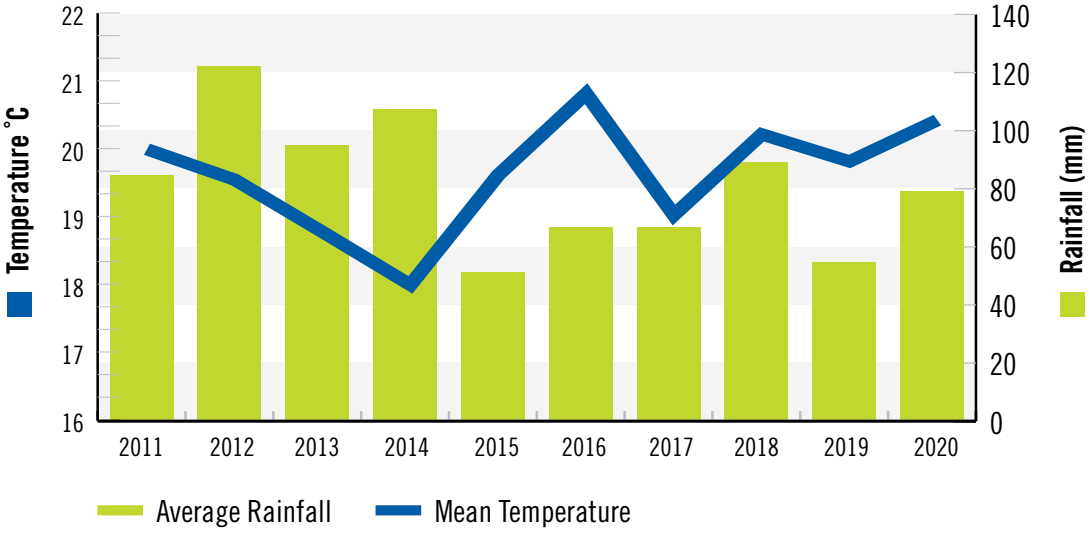
Each year, the single day when water demands are greatest is known as "peak day" demand. The "peak day" generally occurs in summer during an extended period of hot and dry weather when outdoor water use is the greatest. As such, the magnitude of the "peak day" demand is dependent on weather conditions and can vary significantly from year to year.

Figure E: York Water System peak day and average annual day demands



Mean temperature and average rainfall help showcase this correlation, however the periods between rainfall or the duration of consecutive hot/dry days are likely more accurate indicators. Figure F shows the average temperature and rainfall between July to September from both Buttonville Airport and Udora weather station[1]. Both 2016 and 2020 were comparably hotter and drier summers, with "peak day" demand increases in these years.

Figure F: Temperature and rainfall (July to September) 2011 to 2020



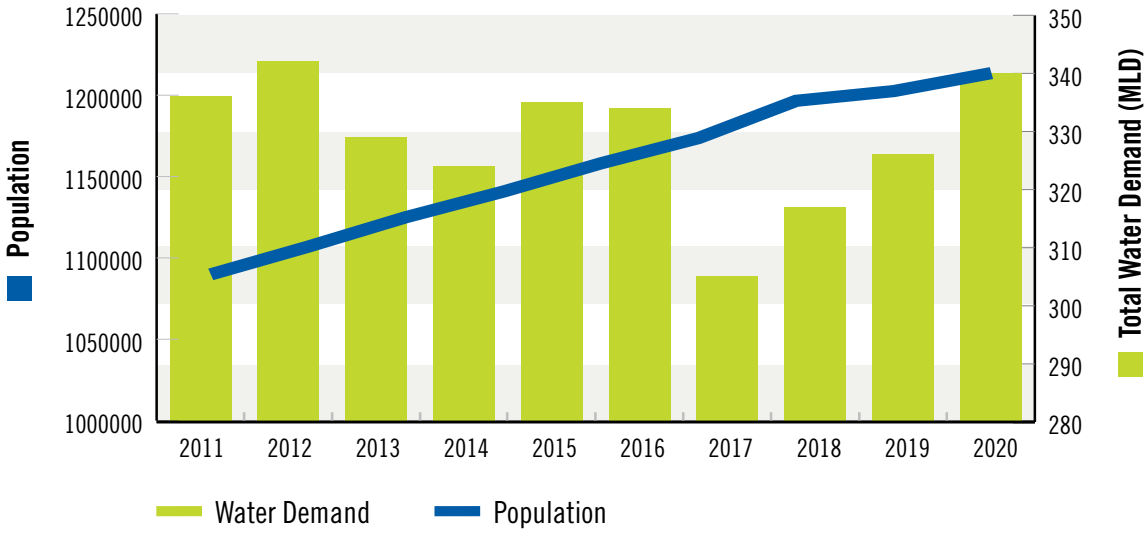
[1] Weather data obtained from https://climate.weather.gc.ca/historical_data/search_historic_data_e.html

3.2.4.2 POPULATION GROWTH VERSUS WATER DEMAND

Total water supply volumes over the last decade fluctuated between 305 MLD to 342 MLD despite continued population growth (Figure G). In December 2018, one of the main bulk water supply meters was replaced with new technology which increased the accuracy and confidence in total water demand volumes (this meter measures approximately 25-30% of the Region's total bulk water supplied). Initial estimates show consumption between 2011 to August 2016 may be lower than total water demand reported, whereas 2017 and 2018 are likely higher than reported demands. Overall, the data over the last decade supports the trend of increasing population while total water demand remains relatively flat.

The significant population increases expected in the Region will result in higher total supply volumes, even if residential demands per person decrease, unless a portion of future water demand can be provided by water reuse.

Figure G: Population versus total water demand



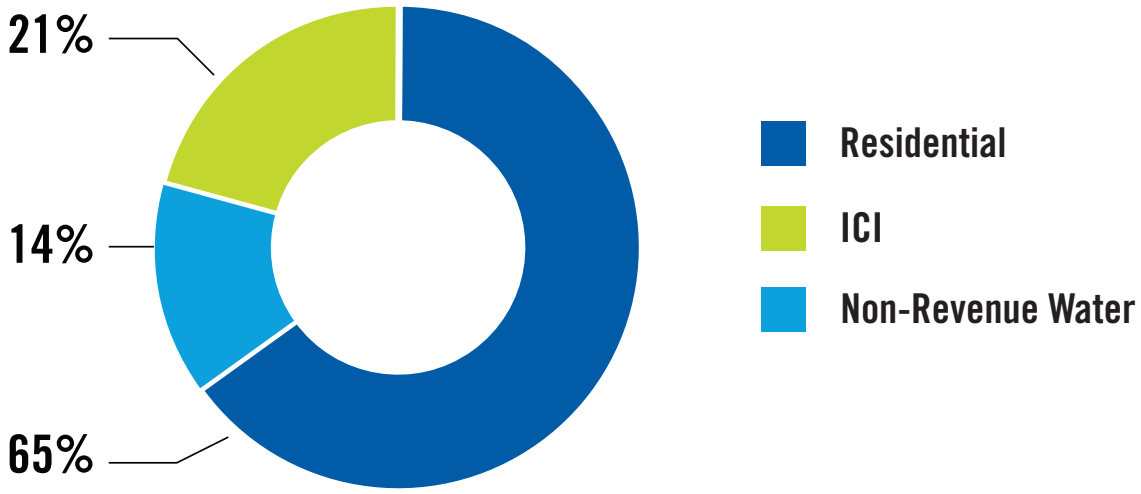
*In December 2018, a water supply meter was replaced with new technology which increased accuracy and confidence in the volumes going forward.

3.2.4.3 WATER DEMAND BY SECTOR

York Region breaks down water consumption into three categories – residential, ICI and non-revenue water[2]. Non-revenue water occurs in both Regional and local municipal water systems. This usage reflects the aggregate of all non-revenue water losses in both supply and distribution systems. Tracking water consumption by sector enables the Region to understand how usage is distributed among sectors and how it changes over time. Distribution among the three categories has remained relatively consistent since 2010. On average residential use represents 65% of total consumption followed by ICI at 21% and Regional/local municipal non-revenue water at 14%[3] (Figure H). Sectoral consumption fluctuations have been minimal (+/-3% change) over the last decade.

Due to COVID-19 pandemic restrictions starting in 2020, residents worked and studied more from home and some businesses operated remotely or at reduced capacities, while others were closed. In 2020, there was an increase in residential consumption and a decrease in commercial consumption when compared to the average water usage by sector. This shift in consumption may impact sectoral demands during the ongoing pandemic and potentially in future years if changes in business practices persist post-pandemic.

Figure H: 2010* to 2020 average water usage per sector



* 2010 data was used in lieu as 2011 data was not available

[2] Non-revenue water consists of the volumes of water that are not billed to residents and/or businesses and produce no revenue; this is equal to watermain flushing, firefighting and street cleaning (referred to as unbilled authorized consumption) plus theft and metering inaccuracies (apparent or paper losses) and leaks (real losses). Refer to page 16 or section 3.2.4.5 for additional information.

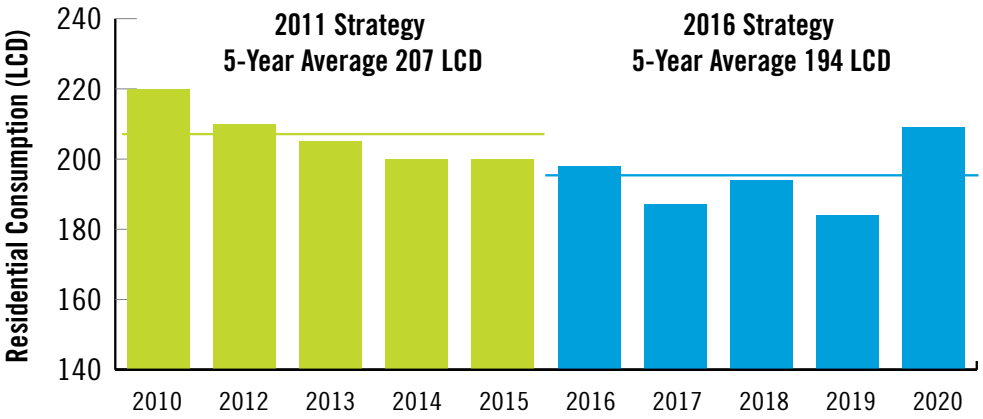
[3] The 14% represents a combination of both Regional and local municipal non-revenue water.

3.2.4.4 SINGLE-FAMILY RESIDENTIAL CONSUMPTION

Single-family residential per capita water demands have declined over the last decade due to Regional water conservation measures, the growing presence of efficient plumbing fixtures and appliances in the marketplace and updated Provincial Building Code requirements.

The Region is trending towards continued residential water savings and decreasing per capita demand, with 2011 to 2015 averaging 207 litres per capita per day (LCD), and 2016 to 2020 averaging 194 LCD for single-family households (Figure I). In 2020, single-family residential consumption increased to 209 LCD which is likely due to the pandemic restrictions, which saw an increase in residents working and studying from home, as well as the hot and dry weather. It is uncertain at this time how the pandemic and subsequent restrictions will impact residential water consumption in 2021 or in future years.

Figure I: Single-family residential consumption per capita



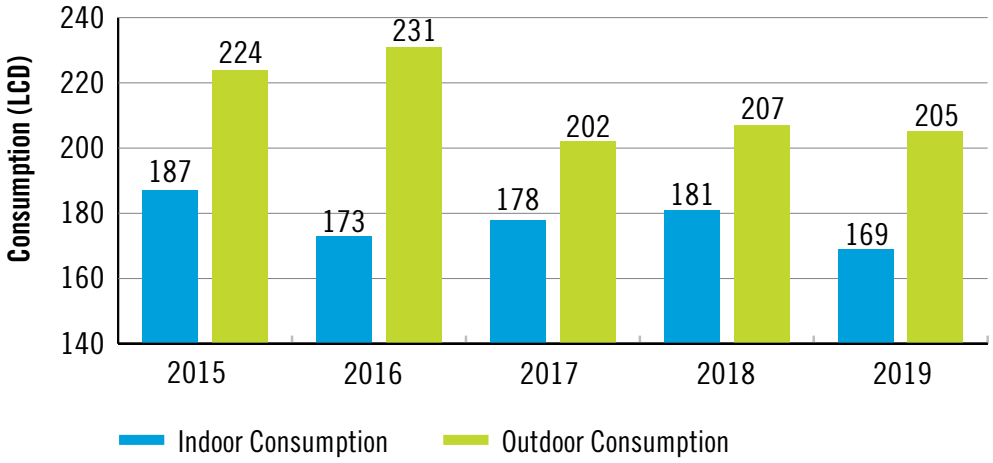
*2010 data was used in lieu as 2011 data was not available

Weather plays a significant factor in seasonal water use, particularly in the summer months. Seasonal residential demand increases are primarily related to lawn and garden watering and other outdoor uses. Typically, the hotter and drier the weather and the longer the duration of hot and/or dry events there is a greater amount of water consumed. Therefore, increases in residential consumption could also be attributed to a hot and dry summer season in 2020.

A review of 2015-2019 indoor/outdoor residential water consumption data shows that residents use an average of 36 LCD more in the summer than in the winter (Figure J). This analysis assumed consumption between January and March represents indoor water use only and July to September represents both indoor and outdoor consumption. Data is not available for historical outdoor consumption prior to 2015.

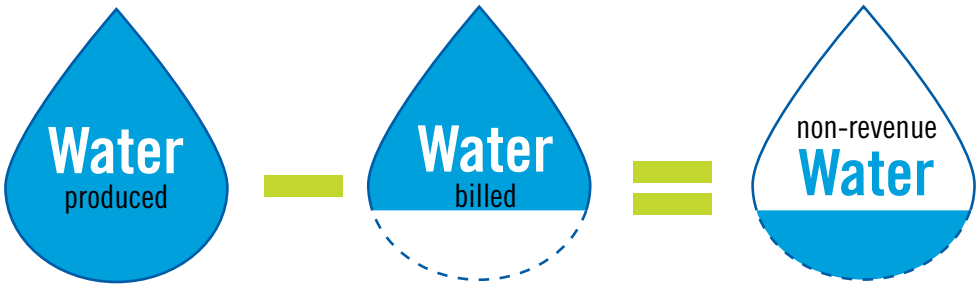
Residential outdoor demand is relatively low compared to many other Canadian regions, primarily due to Southern Ontario's relatively wet summers. Further reducing outdoor demands will be challenging, but opportunities do exist and may be warranted due to anticipated impacts of climate change.

Figure J: Indoor versus outdoor residential consumption



3.2.4.5 NON-REVENUE WATER

Non-revenue water consists of the volumes of water that are produced but not billed to residents and/or businesses and produce no revenue. Non-revenue water can occur in both the Regional and local municipal distribution systems.



York Region and its local municipalities have worked in partnership over the last decade to understand and reduce non-revenue water. Based on the kilometres of watermains, the local municipalities are an important partner in reducing non-revenue water as they own approximately 83% of the system.

The need to manage non-revenue water better has become increasingly important. In addition to reducing water consumption, non-revenue water management allows the Region and its municipalities to drive efficiencies in operations, enhance financial performance and increase climate resilience.

Non-revenue water is broken down into three main categories:

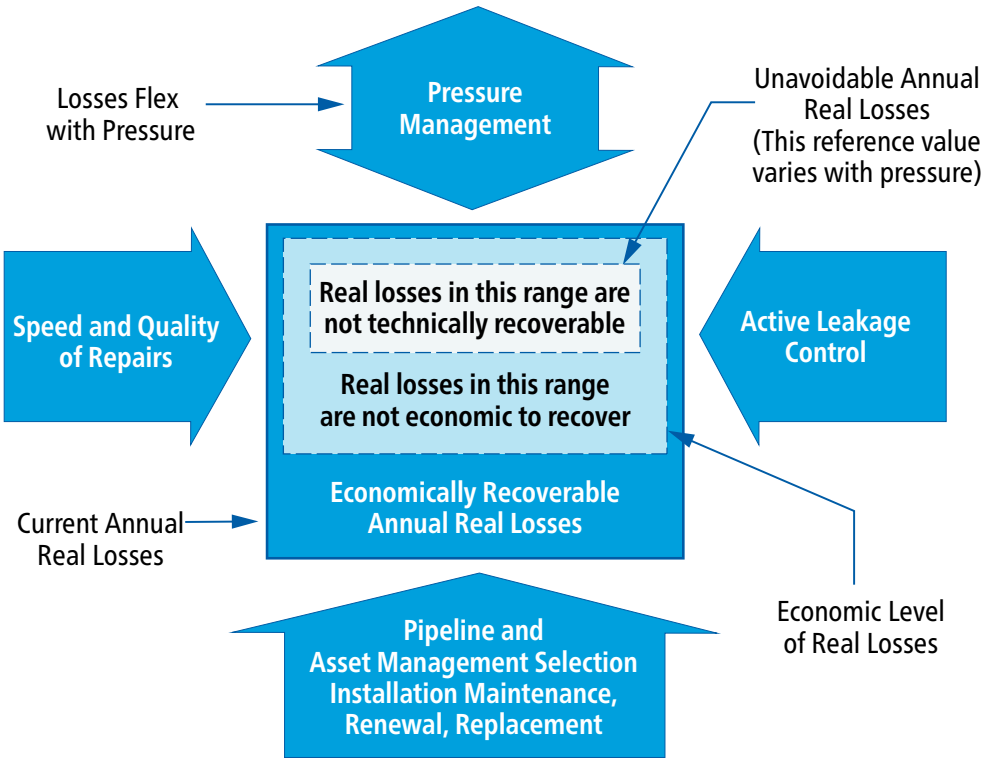
- **Unbilled authorized consumption** such as water for operation and maintenance activities (for example, watermain flushing for water quality purposes) and for emergency services
- **Apparent or "paper" losses** such as theft and metering inaccuracies
- **Real losses**, which are leaks in the water distribution system

Strategies to help minimize non-revenue water include:

- Understanding non-revenue water through the compilation of the International Water Association (IWA)/American Water Works Association (AWWA) Water Audit at the local municipal level
- Reducing real loss or leakage through:
  - Conducting leak detection inspections on water infrastructure
  - Implementing permanent or temporary District Metered Areas (DMAs), which involves comparing the theoretical demand of an isolated area of the distribution system to the measured actual demand. A high actual demand compared to the theoretical demand can indicate leakage and warrant further investigation
  - Pressure reduction/management to reduce leakage in the distribution system, as leakage can vary in relation to pressure, meaning higher pressures result in increased leakage rates, and even higher watermain burst rates

A multi-prong approach is required for reductions in non-revenue water (Figure K).

Figure K: Control of real losses (AWWA, 2016)



3.0 2021 LONG-TERM WATER CONSERVATION STRATEGY UPDATE

HISTORICAL NON-REVENUE WATER ACHIEVEMENTS INCLUDE:

LOCAL MUNICIPALITIES

Some or all municipalities have:

- Adopted IWA/AWWA Water Audit methodology
- Implemented meter verification and change out programs
- Improved data collection and tracking for water balance
- Completed leak detection activities
- Developed and implemented asset management strategies including replacement of watermains

YORK REGION

- Partnership with local municipalities for leak detection
- Partnership with local municipalities on pilot mobile, temporary, and permanent district metered areas
- Replacement of City of Toronto and the Region of Peel's wholesale billing meters for increased accuracy of bulk water supplied
- Inspection, leak detection and repairs of Regional pipes and valve chambers
- Developed and implemented asset management strategy including replacement of high-risk watermains
- Support for local municipal IWA/AWWA Water Audit

For the last decade, each of the Region's local municipalities have completed an annual review of its water balance (Figure L) and related non-revenue water using the IWA/AWWA Water Audit software tool. This tool assesses the volume of non-revenue water by category as well as establishes an infrastructure leakage index (ILI), a performance indicator quantifying how well a distribution system is managed for the control of real losses (leakage) at the current operating pressure. The IWA/AWWA Water Audit is an internationally-accepted best practice methodology that enables tracking and improving losses over time.

In addition, the Region and its local municipalities have developed and implemented strategies to help minimize non-revenue water such as conducting leak detection investigations.

Historically, the Region tracked the local municipalities percentage of non-revenue water and ILI. In 2019, AWWA discontinued non-revenue water as a percentage indicator; AWWA will be using new key performance indicators to quantify real and apparent losses. ILI will continue to be calculated as a key performance indicator. ILI is the ratio of Current Annual Real Losses (CARL) to Unavoidable Annual Real Losses (UARL) (ILI = CARL/UARL). Therefore, an ILI of 1.0 signifies that the current level of leakage equals the technical minimum level of leakage. Although possible, achieving an ILI of 1.0 or lower requires a high level of diligence towards active leakage management practices and is considered a "best managed" system. A target ILI value between 1.0 and 3.0 was established for the nine municipalities in the 2016 Long-Term Water Conservation Strategy and aligned with best practices. The Region will be re-evaluating ILI as a performance target as part of an ongoing consulting assignment in 2021.

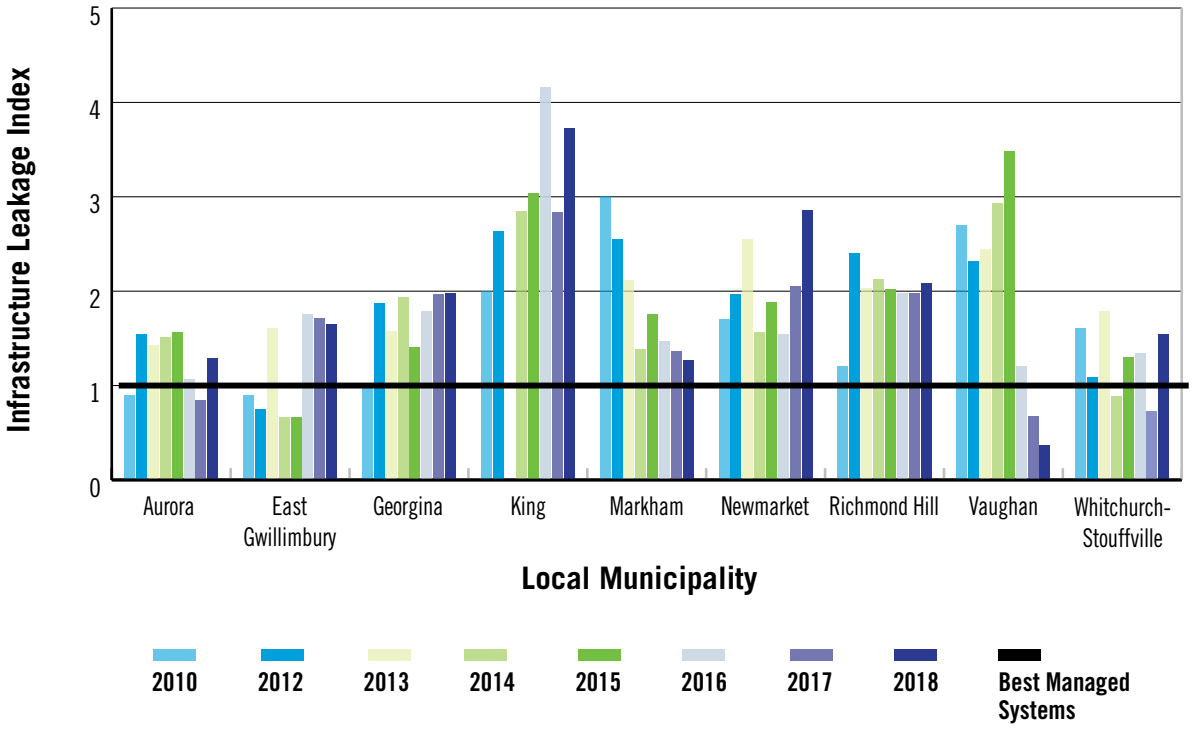
Figure L: IWA/AWWA Water Balance

<table>
<tr><th colspan="7">IWA/AWWA Water Balance</th></tr>
<tr><td rowspan="10">Volume From Own Sources (corrected for known errors)

Water Imported (corrected for known errors)</td><td rowspan="10">System Input Volume</td><td>Water Exported (corrected for known errors)</td><td></td><td colspan="2">Billed Water Exported</td><td>Revenue Water</td></tr>
<tr><td rowspan="9">Water Supplied</td><td rowspan="3">Authorized Consumption</td><td rowspan="2">Billed Authorized Consumption</td><td>Billed Metered Consumption</td><td rowspan="2">Revenue Water</td></tr>
<tr><td>Billed Unmetered Consumption</td></tr>
<tr><td rowspan="2">Unbilled Authorized Consumption</td><td>Unbilled Metered Consumption</td><td rowspan="8">Non-revenue Water</td></tr>
<tr><td>Unbilled Unmetered Consumption</td></tr>
<tr><td rowspan="6">Water Losses</td><td rowspan="3">Apparent Losses</td><td>Customer Metering Inaccuracies</td></tr>
<tr><td>Unauthorized Consumption</td></tr>
<tr><td>Systematic Data Handling Errors</td></tr>
<tr><td rowspan="3">Real Losses</td><td>Leakage on Transmission and Distribution Mains</td></tr>
<tr><td>Leakage on Overflows at Utility's Storage Tanks</td></tr>
<tr><td>Leakage on Service Connections up to the Point of Customer Metering</td></tr>
<tr><td colspan="7">NOTE: all data in volume for the period of reference typically one year.</td></tr>
</table>

By improving data management and quantification of non-revenue water, water loss volumes and ILI values may increase or fluctuate. For this reason, US EPA Best Practices suggests that trends should be measured over a five-year period.

Figure M: Local municipal infrastructure leakage index (ILI) [4]



*2010 data was used in lieu as 2011 data was not available
2013 data for King was not available

The infrastructure leakage index (ILI) shows variations year-to-year which are expected (Figure M). Many of the municipalities have remained in the target range of 1.0-3.0 with some larger variations occurring in King and Vaughan. The variations and spikes in King can likely be attributed to the increased flushing in Schomberg which is necessary to maintain water quality and flow within the system. In Vaughan it was determined that a main water billing meter needed replacement to increase accuracy in the volumes; this meter was replaced in 2018. Improving data quality will continue to be a priority to ensure results can be tracked with confidence over time.

With the updated AWWA Water Audit software's key performance metrics and data grading tools, it will be important to evaluate and update the non-revenue water metrics as well as industry benchmarks. These metrics will support the identification and prioritization of reductions in non-revenue water, along with areas of data improvement. Proactive programming will be important to ensure systems are well-managed and maintain and/or improve current ILI trends.

[4] 2019 water balances not completed by some local municipalities due to pandemic in 2020.

3.2.5 BEST-IN-CLASS RESEARCH

To assist in the development and improvement of the Region's programs, a detailed review of case studies from North American and international communities leading in water conservation programming was conducted. This review included current trends and best practices in water demand management. Specific attention was given to jurisdictions with targeted residential and ICI sector programming, as well as regional or municipal programming targeting non-revenue water management. Key program highlights are provided in Table B.

Table B: Best-in-class key program highlights

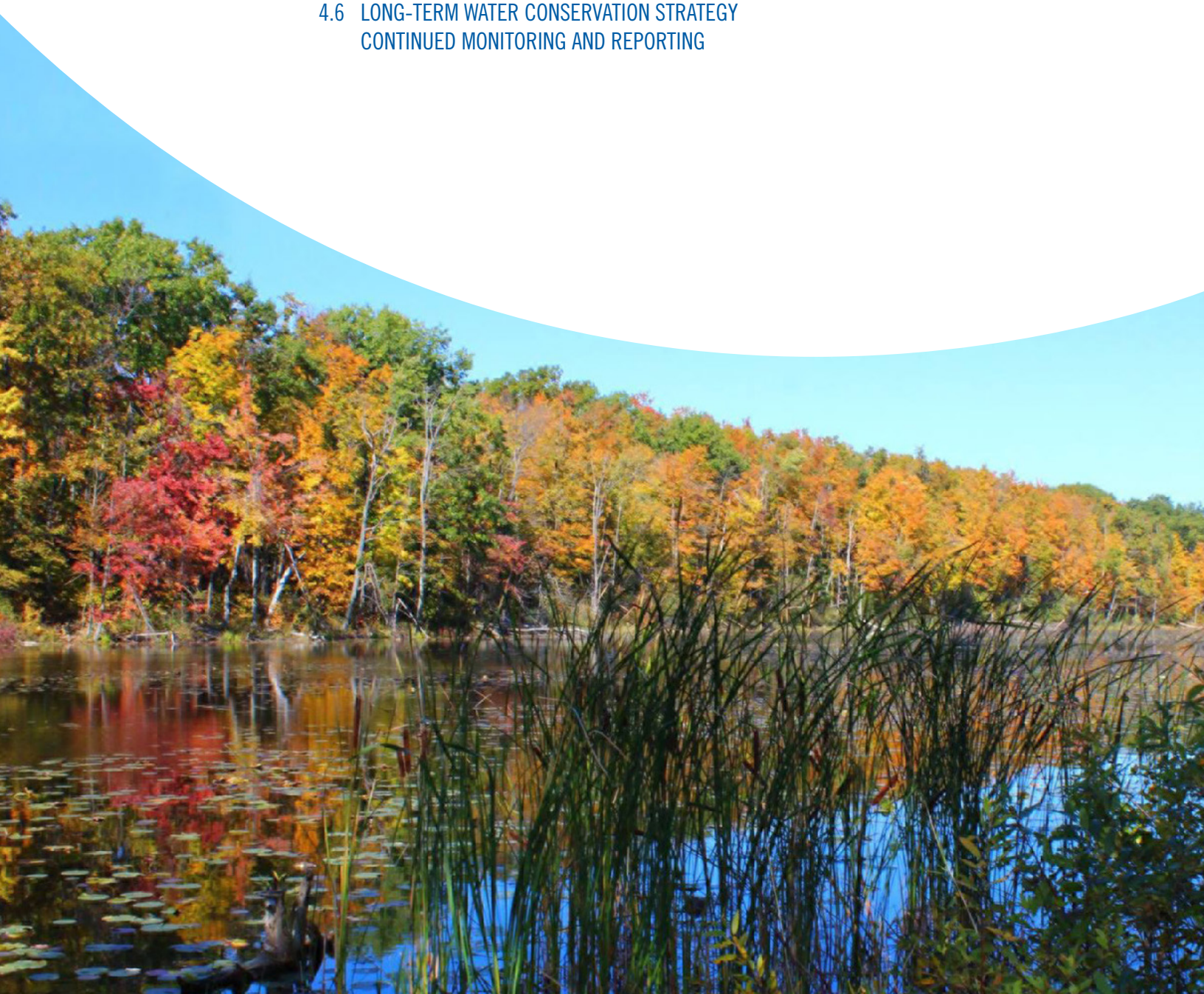
Program	Key Highlights
Targeted residential programming	• Leading jurisdictions often use specific branding to establish an identity • Typically offer third-party software platforms for residents to use independently • Typically offer in-home water audits • Marketing is done primarily through online, billing inserts, letters and customer service desks • Easily scalable simply by modifying the level of promotion and the value of incentives • Requires significant staff resources to deliver
ICI programming	• Leading jurisdictions often use specific branding to establish an identity • York Region's current model remains a best-in-class example ◆ Other best-in-class models include a more targeted approach, for example, offering resources on specific end uses and for precise market segments • Leading jurisdictions provide support tools such as benchmarking data and water efficiency calculators to help businesses determine potential water savings independently • Building relationships with businesses and ICI sectors to foster word-of-mouth promotion of programs and ongoing water savings at facilities is important
Regional or Municipal non-revenue water management	• Requires a holistic system-wide approach to be effective • The IWA/AWWA Water Audit software tool is used for understanding of data and non-revenue water reduction opportunities • Local municipal partnership is required for implementation • Best-in-class programs include the use of complimentary technology such as district metered areas, advanced metering infrastructure, hydrant loggers and pressure management

These best-in-class examples provide short-and long-term strategies and implementation plans that were taken into consideration as part of the 2021 Update. Some of the key highlights were included as part of the 2021 updated programming such as strengthening local municipal partnerships and providing support for the use of complementary technology for non-revenue water management. However, the Region will not be moving forward with all components, including offering in-home water audits for residents. As the Region continues to refine and update its programs, these examples will be further evaluated to determine feasibility of implementation.

3.2.6 EVALUATION OF 2016-2020 WATER CONSERVATION PROGRAMS

In developing the 2021 Update, the Region evaluated the progress between 2016 to 2020 on the water conservation program areas and measures. The review showcased that the Region has investigated and/or executed a wide range of program areas and measures from the 2016 Strategy and will continue many of these in some capacity as part of this Update, including engagement and outreach to residents, non-revenue water management and exploring water reuse opportunities. Section 4 details the 2021 program updates.

4.0 2021 UPDATE MEASURES AND PROGRAMS



4.0 2021 UPDATE MEASURES AND PROGRAMS

4.1 LONG-TERM WATER CONSERVATION STRATEGY PROGRAMS

This 2021 Update will continue to emphasize supporting businesses and institutions to reduce water use, helping residents continue to be efficient and further reduce outdoor demands. There will also be a renewed focus on updating non-revenue water key performance metrics, improving water audit data quality, and reducing non-revenue water and system losses in both the Regional and local municipal distribution systems.

While many of the programs will continue from the 2016 Strategy, the Region will execute in a more targeted approach, such as focusing on areas with potential or current infrastructure constraints, independent systems and/or areas with high outdoor water use.

The 2021 Update measures and programs identified herein include both existing and new initiatives. For ease of reference the measures and programs have been categorized into five areas as follows:

York Region and local municipal non-revenue water – support Regional and local municipalities efforts to manage system losses and other sources of non-revenue water through targeted local municipal programming support, funding opportunities and through building a community of practice

Residential water use – continue to raise awareness and engage residents and students on water conservation, support residential customers manage their water use through programs and targeting incentives, including developer incentives to encourage water efficiency in new residential developments[5]

ICI water use – continue to support ICI customers to manage their water use through programs and targeted incentives

Water reuse – continue to advance the viability of both centralized municipal and decentralized water reuse through targeted research, advocacy and incentives

Corporate Social Responsibility – demonstrate leadership to the broader community by improving the efficiency of York Region's own facilities and operations

[5] Servicing Incentive Program (SIP), Sustainable Development Through LEED® (Leadership in Energy and Environmental Design), and Sustainable Development Incentive Program (SDIP) offer servicing capacity assignment credits to the local municipalities, who may assign these credits as an incentive to promote sustainable residential development. York Region is undertaking a comprehensive review of these programs. The updated program will implement all goals and objectives established in plans and strategies related to: Water Conservation, Climate Change, Community Energy Management, Healthy Built Environment, Inflow and Infiltration Reduction, Integrated Waste Management and Urban Forest Management.

4.0 2021 UPDATE MEASURES AND PROGRAMS

4.2 PROGRAM MEASURES AND IMPLEMENTATION PLAN

Many of the program measures proposed in the 2021 Update are a continuation, extension or refinement of the programs outlined in the 2016 water conservation strategy. Non-revenue water programming will continue from previous strategies and increase in priority over the next five years, including staffing and resource allocation towards its delivery.

Table C highlights the program areas and measures to be undertaken between 2021 and 2025 and the forecasted timelines for research, refinement or implementation of each.

Implementation of the 2021 Update and its program areas will follow an adaptive management framework. This means that the Region will continue to learn from experience and respond as needed to finetune delivery. The objectives, targets, and key performance indicators will guide the delivery. The Region may also periodically engage with residents and other stakeholders as appropriate to continue to seek feedback and enhance programming.

4.0 2021 UPDATE MEASURES AND PROGRAMS

Table C: Long-Term Water Conservation Strategy 2021 updated program and measures

Research | Refinement | Implementation

PROGRAM AREA			2021	2022	2023	2024	2025
1 Region and Local Municipal Non-Revenue Water	Local Municipal Non-Revenue Water	• Region to continue support for the IWA/AWWA water audits					
		• Region to continue to support local municipal non-revenue water projects, pilots or initiatives, including leak detection or distribution system optimization					
		• Region to establish a community of practice with local municipalities					
	Regional Non-Revenue Water	• Continue asset management plan implementation to minimize losses					
		• Monitor industry for advanced condition assessment technologies					
		• Conduct a study on relevant key performance indicators (KPIs) for Regional non-revenue water and Regional non-revenue water opportunities					
2 Residential Water Use	Outdoor Water Conservation	• Target areas of water supply or wastewater capacity constraints					
		• Continue to promote the Fusion Landscape Professional (FLP) and Water Smart Irrigation Professional (WSIP) certification programs and support program expansion to other jurisdictions in collaboration with the Region of Peel and Landscape Ontario					
		• Offer smart or central irrigation controller incentives to WSIP certified contractors					
		• Continue to support the local municipal outdoor water conservation bylaws through education and promotion					
	Sustainable New Development	• Continue to implement the Region's Servicing Incentive Program and Sustainable Development Through LEED® programs, which offer servicing capacity as an incentive to promote sustainable grade-related and high-rise residential developments					
		• Complete a comprehensive review of these programs					
		• Work with local municipalities and builder/developer industry to identify opportunities for development-scale water reuse or rainwater harvesting projects for non-potable purposes					
	Community Engagement	• Continue to promote and educate residents on water conservation at community events					
		• Continue to educate new Canadians and students on water conservation					
		• Continue to implement the York Children's Water Festival in partnership with the Conservation Authorities and other partners					
		• Develop alternative (online or hybrid) models for engagement and the York Children's Water Festival delivery					
	Community Research	• Continue to conduct public surveys to gain insight into knowledge, understanding and impressions of York Region's water system; as well as track trends over time					
3 ICI Water Use	ICI Water Audits and Incentive Programs	• Conduct a comprehensive review of existing ICI programs including uptake and delivery model for improvements					
		• Continue to offer water audits, including wastewater audits, where applicable, for industrial facilities and modified support to institutional/commercial facilities in York Region					
		• Continue to offer equipment replacement incentives to businesses					
4 Water Reuse	Centralized Reuse	• Undertake an economic study to understand cost implications of a centralized water reuse and evaluate reuse options in York Region for a variety of sectors					
		• Continue to conduct research into the viability of large- and small-scale reuse projects					
	Decentralized Reuse	• Continue to research, support and promote decentralized reuse projects where feasible in the residential and non-residential sectors and in new and existing development					
		• Offer incentives and/or tailored advice for reuse projects through ICI programming					
5 Corporate Social Responsibility	Region-owned Facilities	• Identify and implement opportunities to increase water efficiency at Region-owned facilities, such as York Housing buildings					
		• Continue to build and renovate Region owned facilities following internal technical standards and guidelines and third-party rating systems including LEED® to create sustainable buildings					

4.0 2021 UPDATE MEASURES AND PROGRAMS

4.3 LONG-TERM WATER CONSERVATION STRATEGY TARGETS

The 2021 Update will focus on targeting further reductions in total bulk water demand, which includes residential, business and Regional and/or local municipal water consumption. Targeting all sectors contributing to the Region's total water demand will ensure demands continue to align with the Water and Wastewater Master Plan projections, as well as support the use of the existing Intra-Basin Transfer volumes beyond 2031.

The Region will continue to target and track single-family residential reductions, with a long-term aspirational target of 150 LCD by 2051.

4.3.1 SINGLE-FAMILY RESIDENTIAL TARGET

The 2011 and 2016 Strategies included single-family residential demand targets according to three scenarios. These scenarios have been simplified into Expected Scenario A and Aspirational Scenario B (Table D). The Region will continue to support efforts in alignment with Scenario A through continued implementation of Regional programming and existing Provincial regulations.

However, achieving Aspirational Scenario B requires advancements outside of the Region's influence such as new technologies, Provincial or Federal regulatory updates, increase in water reuse or very aggressive fixture replacement. York Region will continue to advocate for relevant water reuse and regulatory changes to support this scenario.

Table D: Single-family residential targets for expected and aspirational scenarios

Scenarios	Conditions	2021	2031	2041	2051
		Consumption Rate (LCD)			
Expected Scenario A	• Regional programming • Existing Provincial legislation and policy • Existing and future development intensification	190	183	176	170
Aspirational Scenario B	• Regional incentive programs • Changes to Provincial legislation and policy • Existing and future development intensification • Increase residential reuse • Market behaviour / technology advances	190	180	165	150

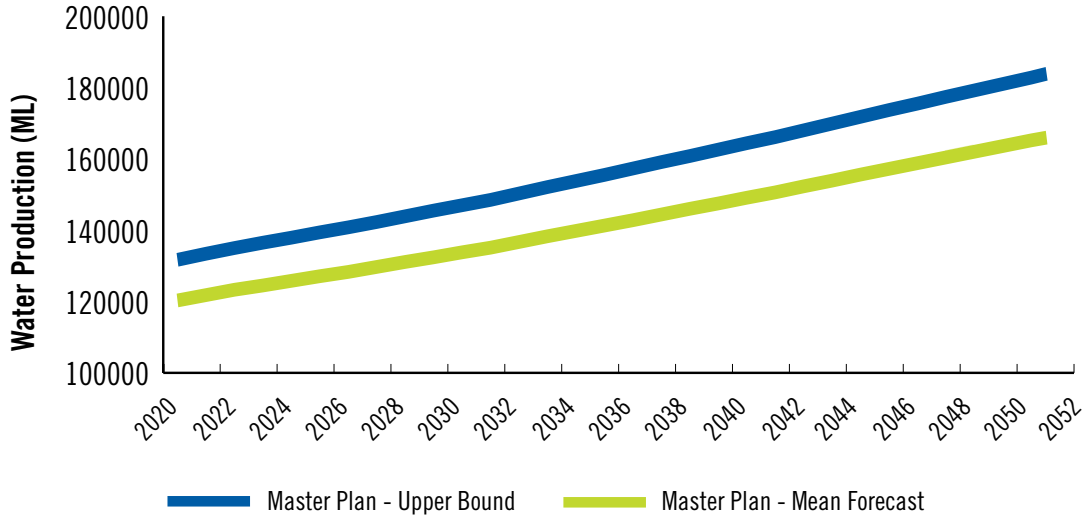
As fluctuations in water consumption are expected due to weather, the Region will update its residential consumption per capita tracking methodology to include a rolling three-year average, for comparison to the targets listed in these scenarios. In addition, it is uncertain at this time how the trajectory on residential water consumption will be impacted by the pandemic or future changes related to the pandemic (for example, an increase in working and/or studying from home). The Region will track these trends an re-calibrate targets and programming accordingly.

4.3.2 WATER AND WASTEWATER MASTER PLAN PROJECTIONS

Non-infrastructure solutions including water conservation are integral parts of the Region's Water and Wastewater Master Plan servicing strategy and play an important role in demand management. The Master Plan leverages a water flows forecast model based on a regression analysis considering historical demand data and the elasticity of water demand to various demand factors such as population growth, climate, water prices, etc. The model produces a range of forecasted outcomes (predicted future flows). To conservatively plan for future servicing, the Master Plan Update uses the upper bound of the 95 per cent confidence interval of forecasted water flows – that is, the highest predicted flow that is statistically expected 95 per cent of the time. This upper bound of forecasted water flow, together with expected population, is used to estimate per capita design rates for drinking water.

The Region will track bulk water production to ensure it is within the Water and Wastewater Master Plan forecasted bounds as shown in Figure N below. This target supports performance measurement across all sectors (residential, ICI and Regional/municipal non-revenue water).

Figure N: Water and Wastewater Master Plan bulk water production projections



4.3.3 WATER CONSUMPTION TRENDING

The Region will continue to analyze water consumption trends to further support and understand consumption behaviours and target water conservation programming accordingly. This will include:

- Bulk water supply (ML) per 100,000 serviced population, a key performance metric in the Region's Corporate Strategic Plan
- Annual bulk water supply compared to York Region's population over time
- Sectoral analysis of residential, ICI, and non-revenue water based on annual bulk water supply
- Average annual day demand and "peak day" demand analysis
- Residential billing consumption analysis to determine average litres per capita consumption and estimated outdoor demands

4.4 WATER SAVINGS

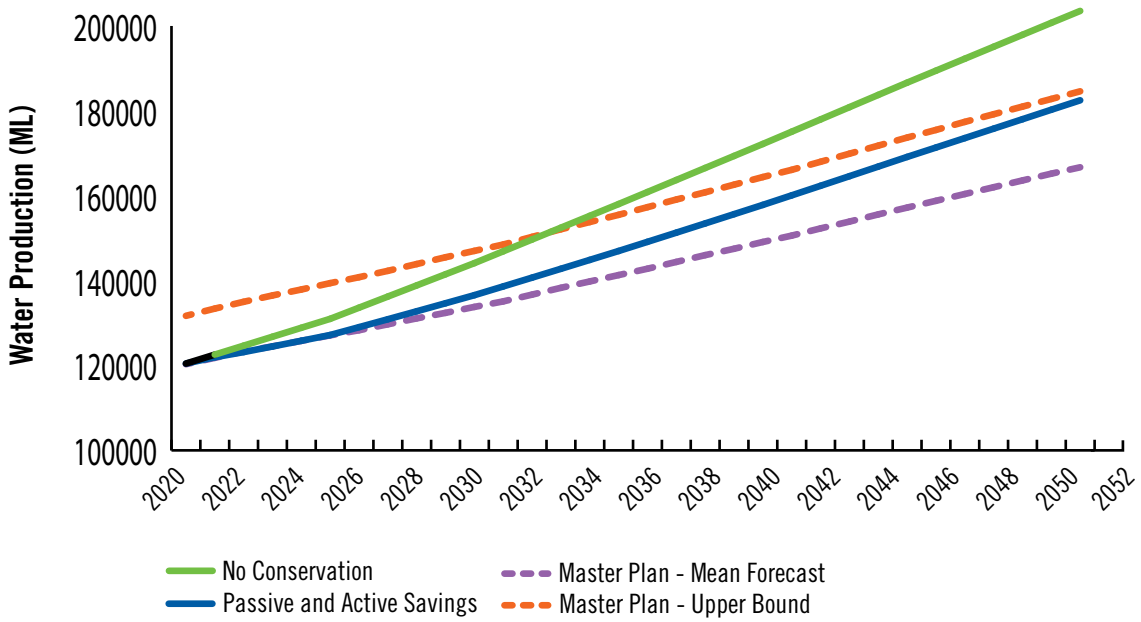
Water conservation delivers a range of environmental, social and economic benefits. The primary goal of the water conservation strategy is to realize water savings over time resulting in sustainable long-term servicing.

Over the last two decades, many utilities saw a decline in per capita demand due to changes in building codes and standards, new technology, increasing public awareness and conservation programs. It is important to differentiate between 'passive' and 'active' savings. Passive savings occur as fixtures and appliances are replaced by more efficient models based on advanced standards, codes and market transformation. Since there is a lower limit of fixture efficiency, market saturation will be reached over time and these savings are expected to plateau. The goal of the water conservation strategy is to develop programs that contribute to reductions beyond this, referred to as active savings.

The Water and Wastewater Master Plan Update assumes that per capita demand will continue to decline as a result of water conservation, through both passive and active savings. The mean and upper projections to 2051 are shown below in Figure O. In addition, the Alliance for Water Efficiency's Conservation (AWE) tracking tool was used to quantitatively evaluate proposed programs and estimate long-term demand impacts. Figure O also showcases two water conservation projections: no conservation, and passive and active savings through the water conservation strategy in contrast to the Master Plan projections.

Passive and active savings through the implementation of the water conservation strategy ensures that total demand projections stay within the upper bound of the Master Plan projections in the long-term. Therefore, water conservation programs are key to achieving savings beyond natural replacement and align with the Master Plan demand projections.

Figure 0: Water savings versus 2021 Water and Wastewater Master Plan projections



4.0 2021 UPDATE MEASURES AND PROGRAMS

4.5 PARTNERS AND GOVERNANCE

The 2021 Update implementation will be led by the Region but will require support from other governing bodies including local municipalities and the Provincial government.

The Region will require support from the nine local municipalities in:

- Ensuring the financial sustainability of water and wastewater servicing
- Customer metering and sharing accurate records with the Region
- Collaborating on targeted outdoor water-use programs
- Developing and enforcing local building codes
- Partnering to implement developer incentive programs
- Managing local non-revenue water

The Region will require support from the Province with:

- Continuing to implement policies, programs, and regulations that encourage water conservation
- Pursuing opportunities to enhance the Ontario Building Code as they arise
- Providing regulatory guidance on water reuse applications

Working in partnership with a variety of stakeholders expands the scope and reach of Regional programs. The Region will continue to work collaboratively with its servicing partners – the City of Toronto, the Region of Peel and the Region of Durham – and will continue to build on partnerships with other stakeholders, including:

- Other regions or municipalities
- Conservation Authorities
- Service providers
- Industry associations, such as the Ontario Water Works Association and Canadian Water Network

4.6 LONG-TERM WATER CONSERVATION STRATEGY CONTINUED MONITORING AND REPORTING

Moving forward, the Region will continue to integrate the Long-Term Water Conservation Strategy and Inflow and Infiltration Reduction Strategy into comprehensive demand management programs under the Water and Wastewater Master Plan, which is generally updated on a five-year cycle to reflect changing conditions and new information. An annual report related to intra-basin transfer amounts will continue to be publicly reported and shared with the MECP and the Ministry of Natural Resources and Forestry by March 31, in fulfillment of the Region's permit to take water Intra-Basin Transfer reporting obligations.

5.0 CONCLUSION

CONCLUSION

The 2021 Update expands on existing Regional plans, strategies and policies and sets the stage for innovative and best-in-class water conservation programming. It was developed based on a review of existing and historical programs, market and best-in-class research, stakeholder engagement and cost-benefit analysis.

Implementation of the 2016 Strategy has resulted in enough water savings to supply approximately 5,000 people per day, resulting in a total water savings since 1998 of enough to supply 135,000 people per day, equivalent to 27 MLD. Despite increases in the Region's population, water demand has been relatively consistent since 2011. The Region will continue to partner and advocate for relevant water reuse and regulatory changes to support long-term water savings and reductions.

The 2021 Update builds upon the extensive water conservation programming York Region has implemented, with this Update further refining programs to achieve remaining cost-effective opportunities for reductions in total bulk water supplied. This strategy includes an emphasis on non-revenue water reduction in partnership with our local municipalities by focusing on initiatives such as completing the IWA/AWWA audits and managing real losses within the systems.

The Region will continue to engage and educate residents through various approaches such as community events and online surveys and provide support through audits and incentives to the ICI sector to realize long-term savings. While many programs, such as the ICI Water Audits and Incentives program and the Outdoor Water Use program, will continue from the previous water conservation strategies, they will be refined and updated based on comprehensive reviews, research, and a targeted approach for their delivery and implementation, for example by targeting areas where there are water supply or wastewater constraints.

Conservation has many benefits beyond simply reducing demand on potable supplies and wastewater infrastructure, including reduced energy consumption, lower greenhouse gas emissions, deferred infrastructure costs, and reduced operational costs for drinking water treatment and wastewater management. By continuing to promote the responsible use of water resources, the water conservation strategy plays an integral role in achieving the Region’s aspirational long-term target of 150 LCD by 2051 and demonstrates its leadership in water conservation and efficiency.

6.0 REFERENCES AND APPENDICES

6.0 REFERENCES AND APPENDICES

REFERENCES

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6.0 REFERENCES AND APPENDICES

APPENDIX A: REGIONAL STRATEGIC INITIATIVES

York Region Vision 2051 (released in 2011)

Vision 2051 is the blueprint for York Region's future and helps guide Regional Council and staff decisions. It sets out goals and actions to the year 2051 to achieve the vision of creating strong, caring, and safe communities. Efficiency is a guiding principle, including the goal that "in 2051, sustainability can be practiced in everyday life through climate resiliency, innovative water conservation and reuse, water resource protection, waste reduction, energy conservation and greenhouse gas reduction".

Corporate Strategic Plan (2019-2023)

The 2019 to 2023 Strategic Plan: From Vision to Results is the roadmap emphasizing the Region's priorities over the next four years. This plan aligns with the Regional Council term and contains specific, measurable, achievable, and time-based objectives and action plans.

This Strategic Plan reports annually on the megalitres of treated water consumed per 100,000 serviced population, as a key performance metric of delivering and promoting environmentally sustainable services.

Regional Official Plan (2021)

The Regional Official Plan describes how York Region plans to accommodate future growth and development while meeting the needs of existing residents and businesses in the Region. It sets out policies that guide economic, environmental, and community planning decisions.

York Region Water and Wastewater Master Plan (2021)

The York Region Water and Wastewater Master Plan sets out an integrated long-term approach detailing how York Region will provide water and wastewater services to meet the needs of the Region's growth as identified in the Regional Official Plan. The Master Plan integrates One Water thinking in providing a long-term integrated water and wastewater servicing plan to support growth to 2051 and beyond in a way that is safe, reliable, cost efficient, and sustainable.

The Master Plan has historically incorporated the water conservation strategy and water conservation programming as an integral part of the preferred servicing alternative to support the Region's growth. In 2021, the Region integrated its Master Plan, Long-Term Water Conservation Strategy and I&I Strategy into one comprehensive document. Moving forward, the Region will continue to review and update the Long-Term Water Conservation Strategy as part of the Master Plan.

York Region Water and Wastewater User Rate Study (2021)

In 2021, the Region will undertake a user rate study to assess operational business needs, refine forecasts and align the rate structure with corporate priorities. This work will inform recommendations to Council for a multi-year rate approval for achieving full cost recovery pricing, which includes building sufficient reserves for future rehabilitation and replacement projects. The Region has approved between three to six years of rate increases as part of recent rate studies.

6.0 REFERENCES AND APPENDICES

APPENDIX B: PROVINCIAL REQUIREMENTS

Ontario Regulation 387/04 - Water Taking and Transfer

Ontario Regulation 387/04 under the Ontario Water Resources Act outlines the factors the MECP takes into account when considering an application for a Permit to Take Water, or cancelling, amending, or imposing conditions on a permit. Among its requirements, it provides direction on conservation in permitting decisions.

Schedule B of the Region of Peel's and City of Toronto's Permits to Take Water (PTTW) regulating York Region's intra-basin transfer requires implementation of a water conservation strategy and annual reporting on the monthly volumes of its intra-basin transfer in the preceding calendar year. The Region continues to operate within permitted volumes based on its current population. Ongoing implementation and annual reporting of this strategy is required to comply with permit requirements.

Conditions of Approval for the Southeast Collector Trunk Sewer Individual Environmental Assessment

The *Environmental Assessment Act* sets out a planning and decision-making process so that the potential environmental effects of a project are evaluated before an infrastructure project begins. Condition 8 of the Minister's Conditions of Approval for the Southeast Collector Trunk Sewer Individual Environmental Assessment requires the Region to prepare a water conservation and efficiency strategy.

Oak Ridges Moraine Conservation Act (2001)

The *Oak Ridges Moraine Conservation Act* also include general requirements for municipalities within their boundaries to develop water conservation plans as a component of watershed plans.

Water Opportunities Act (2010)

The *Water Opportunities Act*, identifies three primary purposes:

- To foster innovative water, wastewater and stormwater technologies, services, and practices in the private and public sectors
- To create opportunities for economic development and clean-technology jobs in Ontario
- To conserve and sustain water resources for present and future generations

The Act also permits the province to pass regulations that require municipalities and municipal service providers to prepare municipal water sustainability plans. The Region's Long-Term Water Conservation Strategy is consistent with the purposes of this Act.

6.0 REFERENCES AND APPENDICES

APPENDIX C: LONG-TERM WATER CONSERVATION STRATEGY 2011 AND 2016 OBJECTIVES

The objectives of the 2011 Strategy are summarized as follows:

1. Be a municipal leader in water conservation
2. Maximize sustainability of the water supply through applying best-in-class technology and practices
3. Minimize energy consumption and reduce the Region's carbon footprint
4. Maximize the use of energy efficient technologies, processes, and practices
5. Minimize the financial costs to York Region water customers
6. Maximize partnerships with local municipalities and utilities for cost-effective delivery of Region's water conservation programs
7. Maximize reliability of the water supply system
8. Minimize risk of water service disruptions
9. Maximize system flexibility to respond to change
10. Ensure the Region's drinking water supply meets all existing and future Regional, Provincial and Federal public health and drinking water quality standards
11. Ensure the Region meets future Provincial standards for water reuse for non-potable or potable purposes
12. Align with York Region strategic goals as set out in the Regional Official Plan, Water and Wastewater Master Plan
13. Deliver effective water conservation and protection outreach and education programs to York Region residents, students, and the business community
14. Develop and deliver multicultural water conservation and protection programming and resources to effectively engage the Region's diverse demographics

The 2016 Strategy included these additional objectives to the 2011 list:

1. Enhance integrated water management planning under the Region's "One Water" approach
2. Integrate water and energy conservation to mitigate climate change impacts
3. Enhance and expand data analytics and improve Data Quality Assurance and Quality Control (QA/QC) process
4. Enhance water conservation tracking and reporting framework
5. Strengthen and establish strategic partnerships, committees, and working groups to foster innovative ideas in water conservation
6. Increase water efficiency in new developments/buildings
7. Increase focus on water reuse

APPENDIX C.2 2021 INFLOW AND INFILTRATION REDUCTION STRATEGY UPDATE

Summary

Demand management approaches are integral to long-term service planning as they help stretch water and wastewater infrastructure by influencing available capacity within Regional and local systems. Reducing inflow and infiltration has been a key demand management program in York Region since 2011. Building upon the successes of the past, this document reflects the most recent inflow and infiltration reduction strategy, updated in 2021.

Disclaimer

September 30, 2021

2021 **YORK REGION**

INFLOW AND INFILTRATION REDUCTION STRATEGY UPDATE

SEPTEMBER 2021

York Region

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Development of the 2021 Update included an assessment of the progress made since 2011, evaluation of program opportunities and challenges, and extensive stakeholder engagement and consultation. The I&I Reduction Strategy Industry Best-in-Class Review was revisited as part of the 2021 Update.

The Region's 2021 I&I Reduction Strategy Update Objectives

1. Ensure continuous progress is made towards reaching the 2031 target of 40 million litres per day I&I reduction required to meet Southeast Collector Individual Environmental Assessment condition of approval set by the former Ministry of Environment in 2010.
2. Support Regional growth and sustainability goals while balancing overall cost and benefits.
3. Refine Partnership Framework to enhance I&I reduction programming at both the Region and its nine local municipalities.
4. Continue to be an I&I reduction leader, promoting innovation, adaptation, and digital integration in data collection and analysis to drive actions towards the long-term reduction target.

Building on experience and lessons learned over the past decade of strategy implementation, and to align with the 2021 Update objectives, the eight program area structure developed in the 2011 Strategy has been refined into a streamlined structure consisting of five overarching program areas (2021 Program Areas) as shown in **Table A**. The 2021 Program Areas will allow resources to be focused on activities necessary to meet the 2031 I&I reduction target and water demand management goals. Further details of the key activities and timing can be found in Section 4.

Table A: 2021 Programs Areas and key activities

2021 Program Areas	Original Program Areas	Key activities and outcomes
Program Area 1: Enhance Partnerships (Section 4.1)	Reporting Communication, education and advocacy	• Increased collaboration, interaction and coordination between York Region, local municipalities, and the development community through workshops and existing partnership meetings.
Program Area 2: Leverage flow monitoring data to set local municipal I&I reduction targets (Section 4.2)	Set goals and targets	• Establish short-term and long-term reduction targets for local municipalities and the Region based on flow data and I&I analysis to drive implementation of localized improvement efforts in high priority areas. • Track progress towards meeting targets.
Program Area 3: Advance data collection and analytics (Section 4.3)	Monitor and analyze flows Innovation and adaptation Financial management	• Add meters in Regional trunk sewers to complement existing flow monitoring and isolate flows by municipal boundaries. • Advance data analytics through innovative tools and technologies to support planning of I&I work and tracking reductions.

1.0 EXECUTIVE SUMMARY

2021 Program Areas	Original Program Areas	Key activities and outcomes
Program Area 4: Enhance programming for existing sanitary sewer systems (Section 4.4)	Investigate and rehabilitate	• Refine sanitary sewer assessments, policies and bylaws, and private-property incentives. • Enhance Public and Private Partnerships (P3) initiatives for I&I considerations.
Program Area 5: Expand programming for new sanitary sewer systems (Section 4.5)	Design and commissioning	• Develop and adopt I&I New Development Standard consistent across the Region and introduce monitoring requirements.

The Region's long-term flow monitoring program is one of the largest and most advanced flow and rainfall monitoring programs in North America. By 2020, the Region installed and maintained more than 70 rain gauges and 290 flow monitors in the Regional and local municipal wastewater systems, covering approximately 90% of the municipal wastewater system within the Region. The monitoring program provides accurate, continuous, near real-time and reliable flow and rainfall monitoring data. The collected data is used for analysis of peak wet weather flows and average dry weather flows to locate areas highly responsive to I&I.

The flow monitoring program and analysis not only support I&I reduction priority mapping but have also expanded to support many other Regional initiatives such as hydraulic modelling calibration, operational support, major storm event analysis, and wastewater system capacity planning. Moving forward, the Region will continue to leverage these data and analysis, in concert with the recently developed cost-benefit analysis model and other decision-making tools, to focus on tracking I&I reductions and driving investigative and rehabilitative work in the high I&I response areas in the existing wastewater system. Targets for each municipality have been established to focus efforts in localized high priority areas.

With greater focus on prevention, the Region's strategy for new developments is to ensure sanitary sewers are built to watertight standards at the time of construction. Development and implementation of the I&I New Development Standard will ensure consistent design, construction, inspection and testing requirements for new developments across the Region. Effectiveness of the I&I New Development Standard will be assessed through flow monitoring.

The 2021 Update includes a plan to monitor, review, update and report on the I&I Strategy moving forward. The Region will continue to monitor program activities, review lessons learned and achievements against goals and targets and update the I&I Reduction Strategy when necessary to ensure progress towards meeting long-term goals. Reporting will be a key component of the plan as York Region integrates the Long-Term Water Conservation Strategy and I&I Reduction Strategy into one comprehensive demand management program under future updates of York Region's Water and Wastewater Master Plan.

2.0 BACKGROUND

2.0 BACKGROUND

The 2021 Inflow and Infiltration (I&I) Reduction Strategy Update provides the second five-year update to the Region's 2011 I&I Reduction Strategy. It enhances and York Region's commitment to leading I&I reduction programming, meeting regulatory requirements, and supporting growth in a socially, financially, and environmentally sustainable manner. The 2021 I&I Reduction Strategy Update also supports York Region's Water and Wastewater Master Plan under demand management programming.

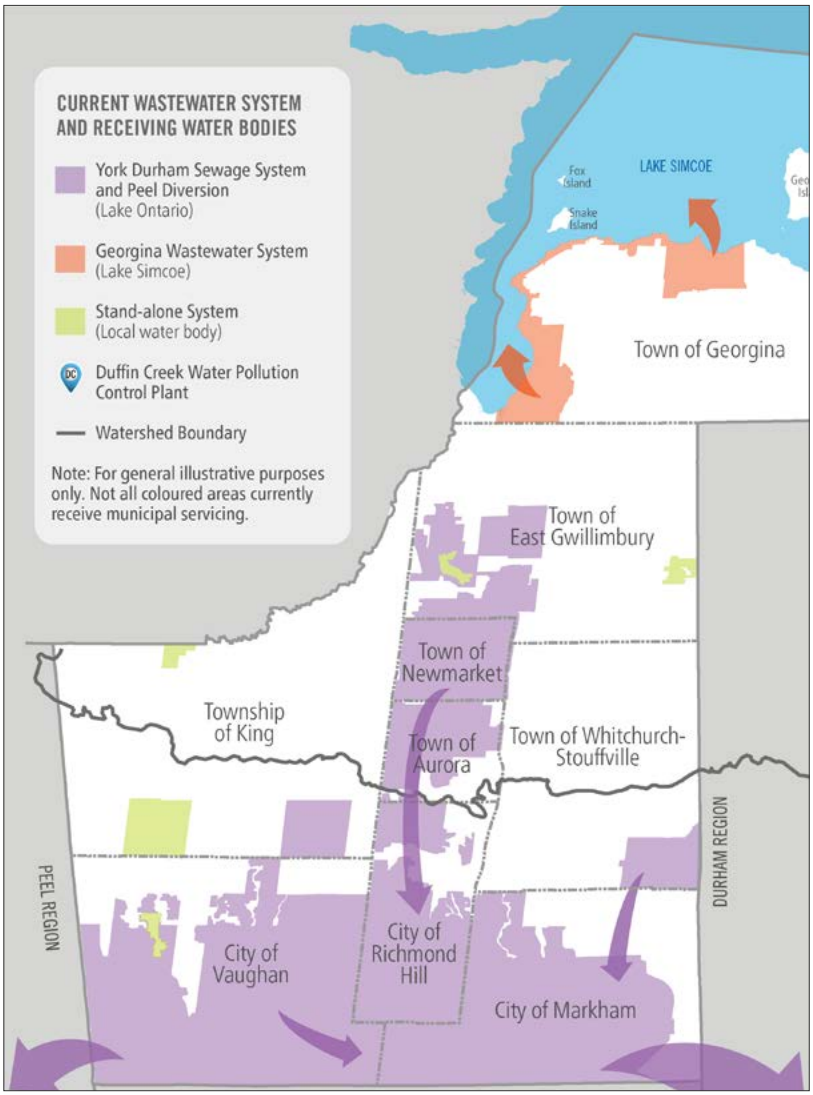
2.1 YORK REGION'S CURRENT WASTEWATER SYSTEMS

Centrally located in the Greater Toronto and Hamilton Area (GTHA), York Region encompasses nine local municipalities including the Cities of Markham, Vaughan and Richmond Hill, the Towns of Aurora, East Gwillimbury, Georgina, Newmarket, and Whitchurch-Stouffville and the Township of King.

Wastewater service in York Region is multi-jurisdictional and based on a two-tier governance structure. The Region is responsible for treatment, major pumping and trunk sewers while the nine local municipalities are responsible for local sewers and local pumping. Private property owners are also an important part of the wastewater system and are responsible for private sanitary sewers on their properties.

The Region's wastewater system comprises York Durham Sewage System (YDSS) and Peel Diversion, Georgina Wastewater System and stand-alone systems as shown in **Figure A.**

Figure A: York Region 2021 wastewater system map



2.0 BACKGROUND

2.2 HISTORY OF I&I REDUCTION STRATEGY AND ACHIEVEMENTS

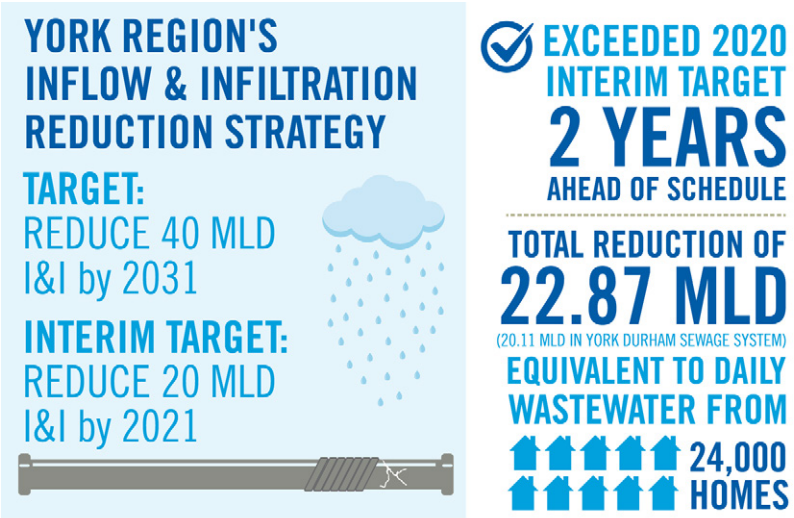
What is Inflow and Infiltration?
(I&I) happens when water, groundwater, stormwater or snowmelt enters the sewage system through sump pumps, downspouts, foundation drains and/or holes and cracks in the pipes. For more information about what the Region is doing about I&I, check out york.ca/iandi

York Region's inflow and infiltration (I&I) program framework is founded on best-in-class approaches and has evolved to meet the various wastewater system needs from across York Region. Over the last decade, several overarching and award-winning programs were originated here in York Region, including one of the largest and most advanced flow and rainfall monitoring programs in North America. These programs have been effective in managing I&I in both existing sewer systems and new construction. The Region has been an I&I leader and will continue to demonstrate leadership in the industry through regular review and advocacy of industry initiatives, programs and practices and through continuous advancement and innovations in data collection and analysis to drive effective actions to meet the long-term reduction target.

In 2011, the Region developed its first 2011 I&I Reduction Strategy in collaboration with its nine local municipalities to meet a condition of approval of Southeast Collector Individual Environmental Assessment (SEC IEA) set by the Ministry of Environment, Conservation and Parks (MECP). The Region was mandated to achieve 40 million litres per day (MLD) I&I reduction[1] in the YDSS by 2031. The I&I Reduction Strategy is required to be updated every five years, with the first five year update completed in 2016. The 2016 I&I Reduction Strategy Update reaffirmed the 2031 reduction target of 40 MLD and the overall program direction, as well as established a 2021 interim reduction target of 20 MLD.

Since implementation of the I&I Reduction Strategy in 2011, York Region, local municipalities and development industry partners have reduced I&I by more than 22 MLD. A summary of program achievements to-date is presented in **Figure B.**

Figure B: Program achievements (2011 to 2020)

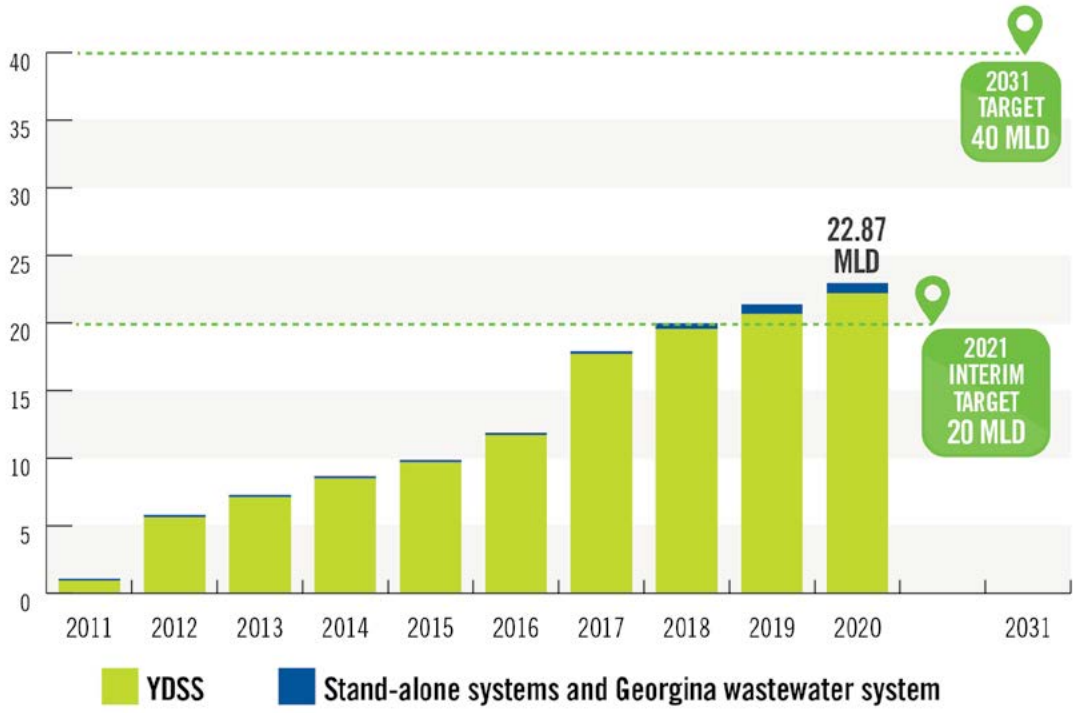


[1] Reduce peak wastewater flows entering the YDSS by 10% or 71 MLD by 2031, with 40 MLD achieved through I&I reduction and 31 MLD achieved through water conservation efforts.

2.0

Figure C shows the progressive reductions achieved since 2011 within the YDSS as well as reductions in the stand-alone systems and Georgina Wastewater systems servicing satellite communities (Holland Landing, Mount Albert, Schomberg, Nobleton, Kleinburg, Keswick and Sutton). By 2019, York Region achieved the 2021 interim reduction target – two years ahead of schedule.

Figure C: York Region's progress to meeting I&I reduction targets



The flow and rainfall monitoring program was first developed in 2012 to support the audit, measurement and monitoring process required to identify I&I target areas and track reductions. By 2020, the Region installed and maintained more than 70 rain gauges and 290 flow monitors in the Regional and local municipal wastewater systems, covering approximately 90%[2] of the municipal wastewater system within the Region.

The flow monitoring program provides accurate, continuous, near real-time and reliable flow and rainfall monitoring data. The collected data are used for analysis of peak wet weather flows and average dry weather flows to locate areas highly responsive to I&I. Priority maps pinpointing areas with high or medium I&I responses for each local municipality were introduced in 2015. These maps have been shared with local municipalities annually to help support planning I&I work in these high and medium priority areas.

Figure D compares the 2015 and 2020 Region wide priority map where data collection has been improved and a positive trend of reduced high priority areas can be observed.

[2] The coverage percentage is estimated based on total contributing sanitary catchment area monitored out of the total sanitary catchment area potentially monitorable (excluding septic or other sanitary systems not owned and operated by York Region or its local municipalities)

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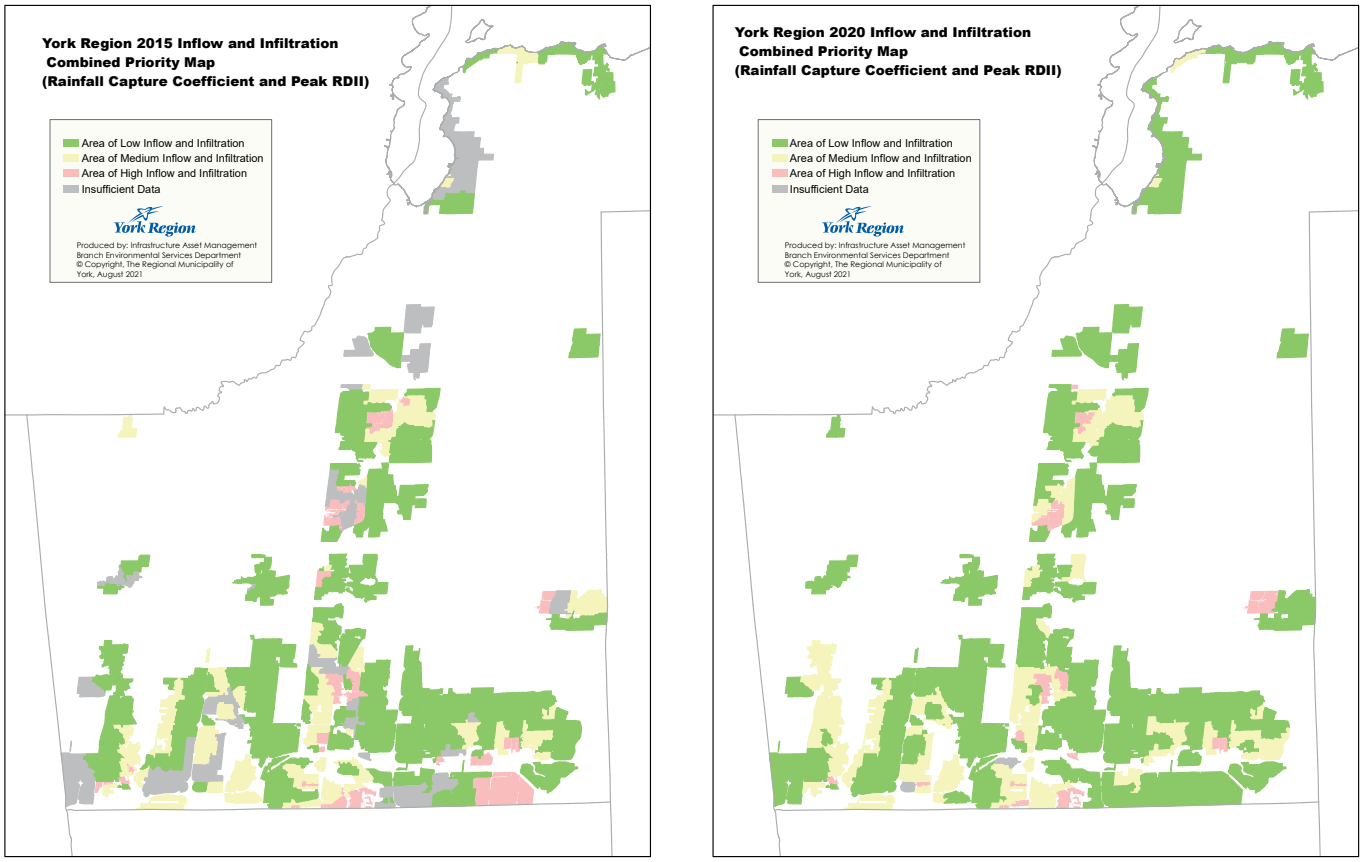
Figure D: York Region inflow and infiltration priority map 2015 versus 2020 (combined KPIs of rainfall capture coefficient and peak RDII)



The flow monitoring program and analysis not only support I&I reduction priority mapping but have also been expanded to support many other Regional initiatives such as hydraulic modelling calibration, operational support, major storm event analysis and wastewater system capacity planning. I&I reduction has been an integral part to York Region's One Water Approach and supports its goal of innovation, integration, and infra-stretching[3]. I&I reduction enhances system resilience to climate change and supports infra-stretching the current wastewater system by reducing extraneous flows, freeing up capacity and deferring the need for new infrastructure to service growth. Moving forward, the Region will continue to leverage these data and analysis, in concert with the recently developed cost-benefit analysis model and other decision-making tools, to focus on tracking I&I reductions and driving investigative and rehabilitative work in the high I&I response areas in the existing wastewater system.

[3] Maximize the useful life and capacity of built infrastructure to defer capital investment

2.0 BACKGROUND

2.3 REGIONAL STRATEGIC INITIATIVES DRIVING I&I REDUCTION

An important part of the I&I Reduction Strategy and its five-year updates has been establishing and growing links to several important Regional plans, programs and initiatives.

"Living Sustainably" is one of eight goal areas in York Region's Vision 2051 to create strong, caring and safe communities. The path to meet this goal has been set out through the Corporate Strategic Plan and Regional Official Plan. The I&I Reduction Strategy aligns with sustainability goals in Vision 2051 and translates these commitments into actionable and innovative demand management programming as part of its Water and Wastewater Master Plan. Starting in 2021, the Water and Wastewater Master Plan Update will be the central strategy York Region uses to communicate updates to the I&I Reduction Strategy.

Over the last decade, beneficial outcomes of the I&I Reduction Strategy have forged new links with other Regional programs, plans and initiatives supporting York Region's One Water Approach. The One Water approach is an integrated planning and implementation approach that considers the urban water cycle as a single integrated system and is a key strategic component in water and wastewater service planning.

A significant linkage is provided by wastewater flow and rainfall data collected by the I&I flow monitoring program. These data and information have been used to support various Regional initiatives including master planning, capacity assessment, hydraulic modelling and operations. Another important tangible benefit is capacity gain realized through I&I reduction efforts which supports planning and capacity allocation. **Appendix A** provides further details on these links as well as the significance and benefits of I&I reduction to York Region.

Implementation of the I&I Reduction Strategy is an integral part of One Water approach and supports its principles by:

- **Innovation** through applying the advancements in technology, programming and intelligent information systems to respond to Regional and municipal wastewater system needs;
- **Integration** with day-to-day operational needs and decision making throughout the Region and local municipalities; and
- **Infra-stretching** the current wastewater system by reducing extraneous flows, freeing up capacity, and deferring the need for new infrastructure to service growth.

2.0 BACKGROUND

2.4 BENEFITS OF REDUCING I&I

I&I reduction brings a wide range of benefits beyond simply reducing the cost of treating clean water from rain and groundwater in sewage. It improves the resiliency and ability of our system to cope with extreme weather, while supporting growth through deferred infrastructure needs. **Table B** outlines benefits of I&I reduction.

Table B: Benefits of I&I reduction

Social benefits	Environmental benefits
• Reduces risk of basement flooding which can have a major impact on communities • Maximizes use of existing wastewater system and defers or minimizes capital investment in infrastructure to accommodate growth • Promotes environmental stewardship and protection • Ensures sustainable and cost-effective long-term water and wastewater servicing	• Reduces risk of wastewater bypasses and spills to environment at treatment facilities • Reduces or avoids environmental impacts due to construction of new infrastructure • Reduces chemical use in wastewater treatment • Reduces treating wastewater discharged to the environment • Reduces energy use and greenhouse gas emissions due to reductions in wastewater treatment and pumping • Enhances resilience to climate change
Financial benefits	**Policy and legislative linkages**
• Defers capital investment in new wastewater infrastructure • Frees-up capacity for future growth • Reduces operations and maintenance costs. • Reduces energy costs for wastewater treatment and pumping • Improves chances of obtaining federal and provincial funding and grants through adoption of best practices	• Supports goals of the Regional Official Plan and Vision 2051 • Meets Conditions of Approval for SEC IEA required by MECP • Supports other Regional strategies, policies and plans including the Water and Wastewater Master Plan and the Long-Term Water Conservation Strategy, which are guided by the principals of integration, infra-stretching and innovation to achieve greater system sustainability and better decision making

3.0 2021 I&I REDUCTION STRATEGY UPDATE

3.0 2021 I&I REDUCTION STRATEGY UPDATE

To meet approval condition 8.10 of the SEC IEA, the second five-year update to the I&I Reduction Strategy (2021 Update) has been completed for submission to MECP by September 30, 2021. Development of the 2021 Update included an assessment of the progress made since 2011, evaluation of program opportunities and challenges, and extensive stakeholder engagement and consultation. The I&I Reduction Strategy Industry Best-in-Class Review was revisited as part of the 2021 Update with a focus on the successes and lessons learned from other agencies with a similar two-tier governance structure.

Consultation with stakeholders, including York Region staff and local municipal staff, were conducted to explore alternatives in addressing challenges and opportunities. Stakeholder engagement and consultation with First Nations was conducted as part of York Region's 2021 Water and Wastewater Master Plan Update process, which presents I&I reduction as a demand management program.

All these assessments have been culminated in this 2021 Update of the I&I Reduction Strategy.

3.1 2021 UPDATE OBJECTIVES

Program objectives were developed in 2011 to help realize reduction goals throughout the Region and these objectives were reaffirmed in the 2016 I&I Reduction Strategy Update. Since 2011, I&I reduction programming has evolved to respond to the needs of our partners while exploring new initiatives following new technologies and demands. Over the past decade, I&I reduction has become integrated into day-to-day operational activities and decision making throughout the Region and local municipalities.

The objectives were updated in 2021 to capture refined program needs from new and emerging links between the I&I Reduction Strategy and other Regional strategic initiatives and plans, and moved towards integrating I&I reduction within standard asset management practices and specifications.

York Region's 2021 I&I Reduction Strategy Update objectives (2021 Update Objectives) are:

1. Ensure continuous progress is made towards reaching the 2031 target of 40 MLD I&I reduction
2. Support Regional growth and sustainability goals while balancing overall cost and benefits
3. Refine Partnership Framework to enhance programming at both the Region and local municipalities
4. Continue to be an I&I reduction leader, promoting innovation, adaptation, and digital integration in data collection and analysis to drive actions towards meeting the long term reduction target

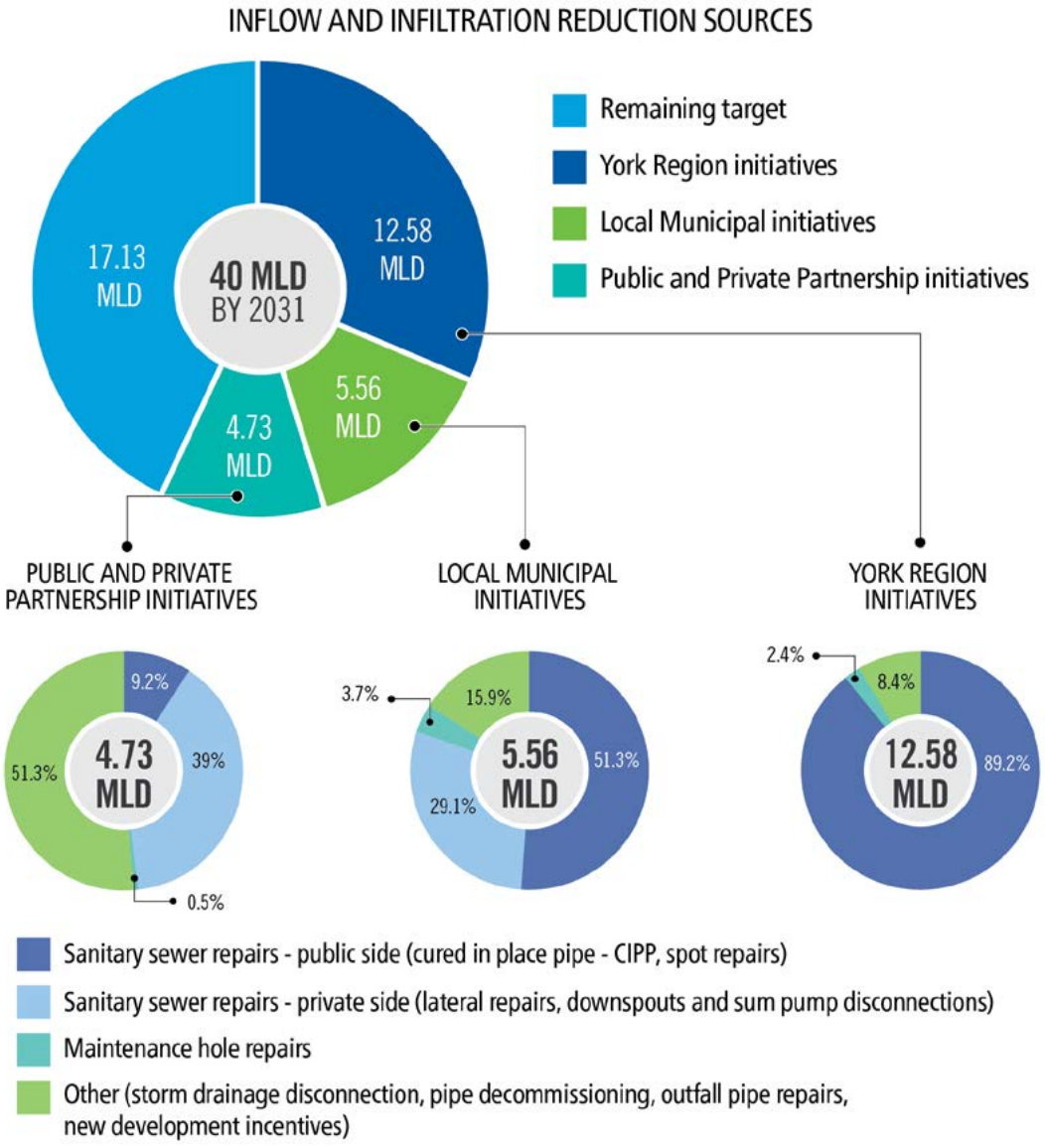
3.0 2021 I&I REDUCTION STRATEGY UPDATE

3.2 2026 INTERIM REDUCTION TARGET

York Region and its partners have achieved significant progress towards meeting the 2031 I&I reduction target of 40 MLD. At the end of 2020, 22.11 MLD of I&I were reduced in the YDSS and a further 0.76 MLD were reduced in the Georgina Wastewater System and stand-alone Systems. This brings the total reduction to 22.87 MLD throughout the Region, which exceeded the 2021 interim target (of 20 MLD). Most of the reductions have been achieved through rehabilitation and remediation work in Regional and local municipal systems and have included sewer repairs, replacement, elimination of storm-cross-connections and private property works such as downspout disconnections and sewer lateral repairs.

Figure E shows the reductions achieved to date and the detailed breakdown of I&I work completed by each partner.

Figure E: Breakdown of I&I reductions by partners (in MLD)



3.0 2021 I&I REDUCTION STRATEGY UPDATE

The Region will continue to identify and rehabilitate I&I sources within Regional Infrastructure and maintain a good state of repair, and will focus on leveraging flow monitoring data and analysis to support local municipalities and development industry partners in identifying and rehabilitating I&I sources in high priority areas. Opportunities to incentivize development industry partners to identify and complete more difficult and more costly I&I repair work will be explored.

An interim cumulative reduction target of 31.44 MLD has been set for 2026 on the basis that 50% of the remaining targets will be achieved in the next five years. This translates to interim reduction target of 8.57 MLD between 2021 and 2026 to be achieved by the Region and the nine local municipalities. To set this 2026 interim target, it has been assumed that York Region and its partners will continue to make progress consistent with what has been achieved since 2011. Progress towards meeting the 2026 interim target will be monitored and reviewed over time and program refinements may be necessary to ensure this interim target is met. Minor program refinements will be considered on an annual basis and, if necessary, more significant refinements can be contemplated in 2026 as part of a Strategy Update. A Plan for monitoring, reviewing, and updating the 2021 I&I Reduction Strategy has been developed and is described in **Section 5**.

3.3 REFINING PROGRAM AREAS

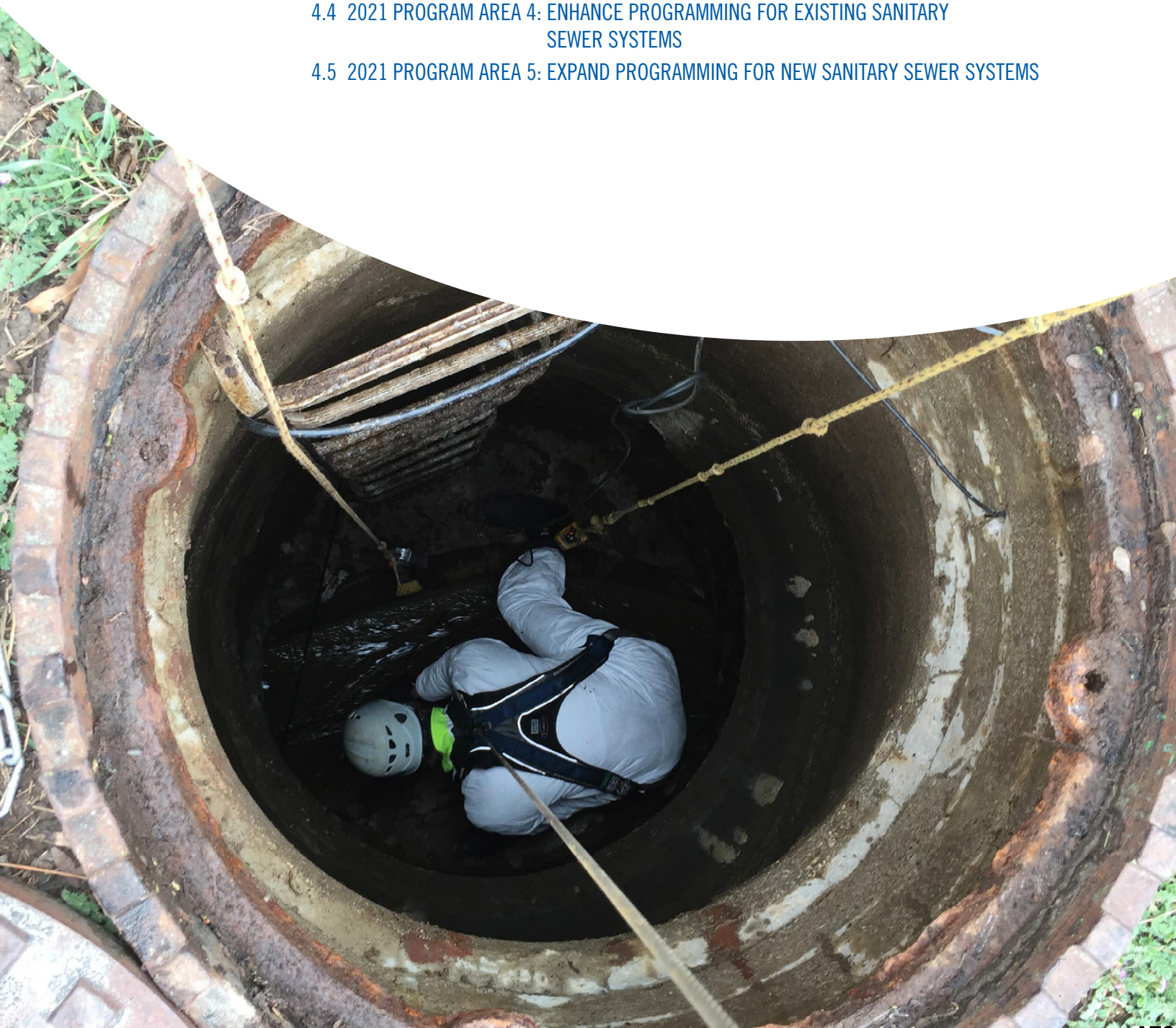
Building upon experience and lessons learned over the past decade of strategy implementation and to align with the 2021 Update Objectives, the eight program-areas developed in the 2011 Strategy have been refined into a streamlined structure consisting of five overarching program areas (2021 Program Areas). **Table C** presents the 2021 Program Area structure and its connection and alignment to the 2021 Update Objectives and the original eight program areas. The 2021 Program Areas will allow resources to be focused on activities necessary to meet the 2031 I&I reduction target and water demand management goals. Detailed program components are described in **Section 4**.

3.0 2021 I&I REDUCTION STRATEGY UPDATE

Table C: Refined Program Area structure - 2021 Program Areas

2021 Program Areas	Original Program Areas	Timing	Rationale
Program Area 1: Enhance Partnership (Section 4.1)	Reporting Communication, Education and Advocacy	2021-2031	• Supports 2021 Update Objective #1, #3 and #4. • Increased collaboration, interaction and coordination between York Region, local municipalities, and the development community through workshops and existing partnership meetings.
Program Area 2: Leverage flow monitoring data to set local municipal I&I reduction targets (Section 4.2)	Set Goals and Targets	2021-2026 (2026 interim target) 2026-2031 (2031 target) Post 2031 (long-term target that meet the system needs)	• Supports 2021 Update Objective #1 and #3. • Establish short-term and long-term reduction targets for local municipalities and the Region based on flow data and track progress towards meeting targets to drive implementation of localized improvement efforts in high priority areas.
Program Area 3: Advance data collection and analytics (Section 4.3)	Monitor and Analyze flows Innovation and Adaptation Financial Management	2021-2031	• Supports 2021 Update Objective #3 and #4. • Add meters in Regional trunks to complement existing flow monitoring and isolate flows by municipal boundaries; advance data analytics through innovative tools and technologies.
Program Area 4: Enhance programming for existing sanitary sewer systems (Section 4.4)	Investigate and Rehabilitate	2021-2031	• Supports 2021 Update Objective #2 and #4. • Refine sanitary sewer assessments, policies and bylaws, and private-property incentives and enhance Public and Private Partnerships (P3) initiatives for I&I considerations.
Program Area 5: Expand programming for new sanitary sewer systems (Section 4.5)	Design and Commissioning	2021-2031	• Supports 2021 I&I Reduction Strategy Update Objective #2 and #4. • Develop and adopt new standards for new systems- consistent across the Region and introduce monitoring requirements.

4.0 2021 I&I REDUCTION PROGRAM AREAS



4.0 2021 I&I REDUCTION PROGRAM AREAS

This section expands on the five overarching program areas introduced in Section 3.3 and will guide implementation and monitoring of the I&I Reduction Strategy in the next five to ten years to ensure goals, objectives and targets are met. Continued collaboration between York Region and its partners as well as integration with the Water and Wastewater Master Plan will ensure successful implementation to 2031 and beyond. Key updates of this 2021 I&I Reduction Strategy Update have been presented and reviewed with local municipal staff through a number of virtual engagement sessions.

4.1 2021 PROGRAM AREA 1: ENHANCE PARTNERSHIPS

Refine partnerships to enhance collaboration amongst the Region, local municipalities, and development industry.

The 2021 Program Area 1 focuses on refining partnerships to enhance collaboration amongst the Region, local municipalities, and development industry. **Table D** summarizes key activities, timing and anticipated outcomes identified for 2021 Program Area 1.

Table D: 2021 Program area 1 – activity and outcomes

Activity	Timing	Outcomes
Implement a refined partnership framework, organize themed I&I workshops and provide a platform to discuss new and emerging issues, technology advancement, collaboration and support with stakeholders	2021-2026	Workshops as required for improved information sharing between partners and customize Region's support to local municipalities.
Share outputs from the workshops through existing partnership meetings and working groups	2021-2026	Leverage existing venues to provide technical recommendations and drive informed decision making.

Partnerships are critical to the success of I&I reduction efforts in York Region. Through the development and implementation of a Regionally adopted Strategy in 2011, the Region and its nine local municipalities have been able to demonstrate leadership in I&I reduction. The commitment of the Region and its local municipalities to I&I reduction continues to serve as a major building block of the I&I Reduction Strategy.

Since 2011, collaboration amongst the Region, the local municipalities, the development industry and residents has been instrumental to achieving successes. **Appendix B** presents a high-level overview of the updated roles and responsibilities of the different partners as identified through this update.

Recognizing the need to continue leveraging and enhancing these partnerships, a refined partnership framework has also been developed as part of this update. **Figure F** demonstrates the refined partnership framework and how values are created and exchanged between the Region and its local municipal partners.

4.0 2021 I&I REDUCTION PROGRAM AREAS

Figure F: Refined partnership framework

Refining the Partnership Framework and focusing on aligning partner values will:

- Enable more effective information sharing
- Customize Regional support for operationalizing I&I reduction work at a local municipal level
- Drive better decision making

Values shared, offered, desired and created through the partnership between York Region, its nine local municipalities, the development industry and residents were further refined based on successes already achieved and lessons learned.

To ensure these values continue to be met and evolve to meet the 2021 Update Objectives, workshops have been proposed and will focus on continuous improvement. **Appendix B** includes possible topics of the workshop. Workshops will be organized by the Region's I&I team on a quarterly, annually or as-needed basis depending on the topic of discussion and will leverage available resources. These workshops will provide a venue and an opportunity for collaboration, interaction, and coordination between York Region, the nine local municipalities, and industry partners who will provide technical recommendations to drive decision making.

4.0 2021 I&I REDUCTION PROGRAM AREAS

Key outputs from these workshops will be shared through a number of existing venues including the Public Works Liaison Committee, the Local Municipal/ York Region Quarterly Partnership meetings and other existing working groups and taskforces to drive decision making.

4.2 2021 PROGRAM AREA 2: LEVERAGE FLOW MONITORING DATA TO SET LOCAL MUNICIPAL I&I REDUCTION TARGETS

Leverage monitoring and measuring of incoming wastewater flows from local municipalities to establish short-term and long-term local municipal I&I reduction targets.

The 2021 Program Area 2 focuses on leveraging monitoring and measuring of incoming wastewater flows from local municipalities to establish short-term and long-term local municipal I&I reduction targets. Key activities, timing and anticipated outcomes are summarized in **Table E.**

Table E: 2021 Program Area 2 – activity and outcomes

Activity	Timing	Outcomes
Set 2026 I&I reduction targets based on 2019 priority area results and a Region-wide reduction target of 8.57 MLD to be achieved between 2021 and 2026.	2021-2026	A recommended 2026 reduction target for each local municipality and the Region. These targets are minimum reduction requirements to be achieved in a 5-year timeframe. Progress will be tracked annually and reported to existing partnership meetings.
Expand data acquisition for 2031 target development through importing data currently available in SCADA and installing new flow monitors in the Regional trunk sewers to monitor I&I by municipal boundary.	2021-2031	A new dataset to complement existing audit basin flow monitoring and isolate flows and I&I by municipality.
Set long-term I&I reduction targets and track progress towards meeting long-term targets using analysis of the boundary flow data.	2026-2031 and beyond	Leverage information gained from existing and expanded data collection to update long-term targets and track progress of local municipalities and York Region in meeting those targets. Progress will be tracked annually and reported to existing partnership meetings.

The original 2011 I&I Reduction Strategy was endorsed by York Region and all local municipal Councils in 2011. The I&I programs have been applied to all sanitary sewer systems throughout York Region beyond just the YDSS. Moving forward, the Region will track progress in reducing I&I in all local municipalities, including those with stand-alone systems and the Georgina Wastewater System and incorporate reductions achieved in these systems into the total reduction achieved. This change recognizes the importance of I&I reduction and the benefits it provides to all wastewater systems within the Region.

4.0 2021 I&I REDUCTION PROGRAM AREAS

As shown in **Figure E**, York Region and its local municipalities have succeeded in achieving a reduction of 22.87 MLD of the 40 MLD I&I reduction target, leaving a reduction of another 17.13 MLD to be achieved over the next 10 years.

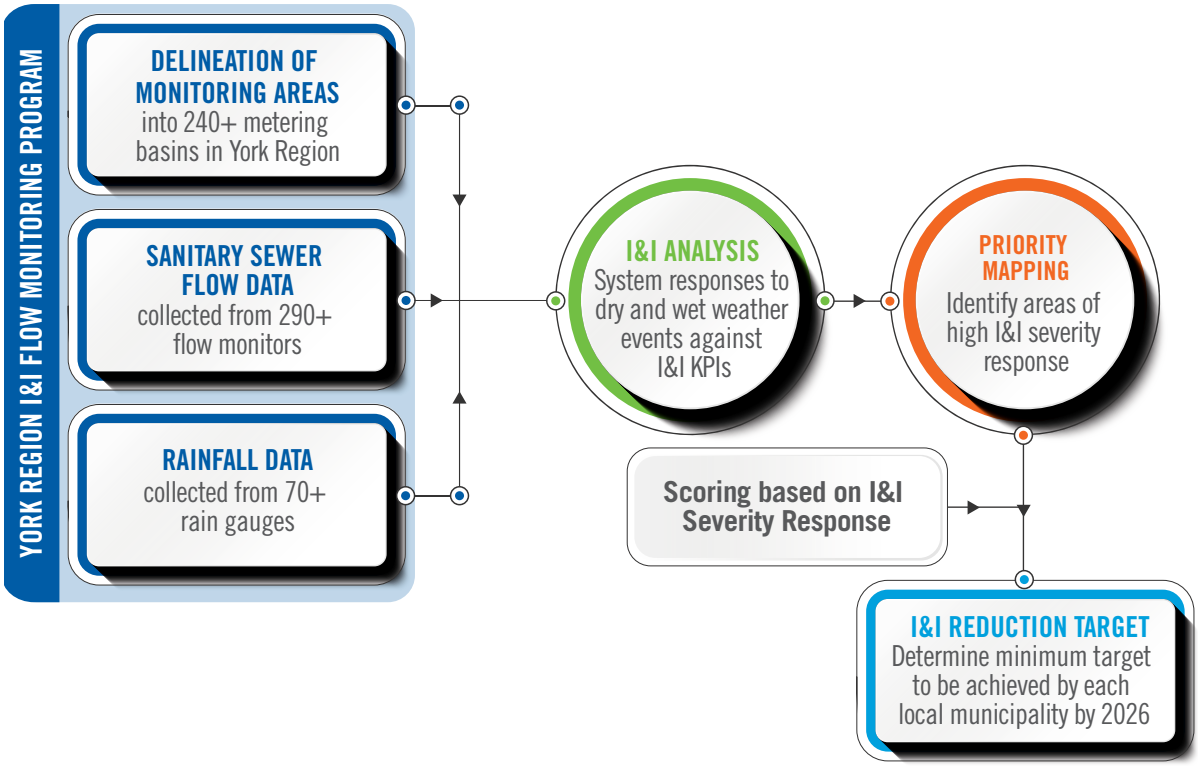
It is anticipated that achieving the remaining 17.13 MLD reduction will become more challenging as sources become more difficult and costly to locate and remediation also becomes more difficult and costly to complete. With more than 40% of the wastewater linear system owned and operated by the local municipalities, a collaborative effort with enhanced partnership is imperative to build on I&I reductions achieved to date and to continue to drive future reductions in our collective system.

In assessing the benefits and challenges, York Region identified an opportunity to introduce I&I reduction targets for each local municipality to encourage I&I reduction programs and focus work in areas with the highest levels of I&I. A virtual engagement session was held in February 2021 with staff from all local municipalities to present this new target framework. Feedback collected was used to develop the framework.

4.2.1 2026 I&I REDUCTION TARGETS

Leveraging sanitary sewer flow and rainfall monitoring data collected from monitoring locations in the local wastewater systems across the Region, a methodology and framework for recommended I&I targets to 2026 was developed. Targets have been developed based on a rationale that used I&I analysis and priority mapping (**Figure G)** in response to the feedback received from local municipal stakeholders.

Figure G: Process chart to setting recommended I&I reduction targets



4.0 2021 I&I REDUCTION PROGRAM AREAS

The 2026 I&I reduction targets presented in **Table F** are minimum recommended targets to ensure the interim reduction target of 8.57 MLD between 2021 and 2026 is met and can be increased to meet other local municipal needs such as flood protection or deferral of new or existing infrastructure upgrades needed to service growth. These targets have been shared, discussed and reviewed with local municipalities through several stakeholder engagement sessions.

Table F: 2026 Recommended I&I reduction targets

Municipalities	Recommended five-year I&I reduction target (To be achieved by 2026) (MLD)
Town of Aurora	0.64
Town of East Gwillimbury	0.14
Town of Georgina	0.27
Township of King	0.12
City of Markham	1.61
Town of Newmarket	0.52
City of Richmond Hill	1.55
City of Vaughan	1.36
Town of Whitchurch-Stouffville	0.21
York Region	2.15
Total	**8.57**

Having individual targets will help all nine local municipalities and York Region better define future I&I reduction program needs, provide a stronger rationale for new projects and initiatives, and give all nine local municipalities flexibility to develop and implement successful programs to best meet the needs of their systems.

Recommended targets will be supported with I&I priority area mapping and continuous analysis of flow data collected in the local municipal system, together with the Region's support on:

- Progress tracking and analysis of reductions made in the local municipal sanitary sewer systems through annual I&I discussions with individual local municipalities and on an as-needed basis
- Knowledge sharing of different studies and pilot projects completed by the Region or any of the local municipalities
- Development of recommended work plans in priority areas supported by sanitary sewer flow monitoring and I&I analysis
- Workshops aimed at continuous improvement of technology, new and emerging issues, to drive informed decision making

4.0 2021 I&I REDUCTION PROGRAM AREAS

4.3 2021 PROGRAM AREA 3 - ADVANCE DATA COLLECTION AND ANALYTICS

Advance I&I monitoring and analysis frameworks and methodologies to ensure continuous improvement and innovation and more alignment with Regional plans.

The 2021 Program Area 3 focuses on advancing I&I monitoring and analysis frameworks and methodologies to ensure continuous improvement and innovation and more alignment with Regional plans. Key activities, timing and anticipated outcomes identified for 2021 Program Area 3 are summarized in **Table G.**

Table G: 2021 Program Area 3 – activity and outcomes

Activity	Timing	Outcomes
Continue with cost-benefit model development and estimate return on investment specific to I&I reduction projects **Refine and share cost-benefit model with local municipalities through partnership framework identified in Section 4.1 and scale up to meet program needs/updates identified in Section 4.4**	2021-2022 2022-2026	A tool to identify where the greatest I&I reduction benefits can be achieved while maximizing return on investment and informing decision making. Leverage tool to inform local and municipal I&I remediation works and capital investments and set/update KPIs to track progress e.g. $/MLD/year.
Maintain long-term and short-term monitoring and update existing I&I Key Performance Indicators (KPIs) to incorporate capacity and/or operational constraints and growth demands into I&I prioritization/mapping.	2023-2031	Updated KPIs for enhanced tracking of program performance and standardized comparisons to support efforts for Infra-stretching. Updated matrices and I&I analysis and priority mapping incorporating the new KPIs.
Implement visualization tools supporting self-serve analytics and dashboards to streamline data analysis and automate production of I&I priority mapping. **Continue exploring the use of Artificial Intelligence based methods /machine learning models for predicative analysis. Provide data for advanced hydraulic model calibration and support Digital Twin development efforts.**	2021-2023 2023-2031 2021-2026	Pilot a tool for streamlined/automated analysis and optimized resource allocation. And scale up to include the whole Region and opportunities for AI following pilot success (2023-2031). Tool to align with York Region digital transformation efforts and strategies
Increase monitoring in Regional trunks and integration of data collected at Regional facilities through Supervisory control and data acquisition (SCADA) into a one cloud-base data management system **Use data collected to support efforts at developing long-term municipal targets identified in Section 4.2.1.**	2021-2023 2023-2026	A new dataset for Quality Assurance/Quality Control and flow mass balance calculations. Integration with existing SCADA data will provide easy access to real-time data to monitor system response to rainfall at the local collection system and Regional facilities within a particular sewer shed of Regional facility and by municipal boundary.

4.0 2021 I&I REDUCTION PROGRAM AREAS

The flow monitoring program was first defined in the early stages of the 2011 I&I Reduction Strategy implementation. The program is designed to support the audit, measurement and monitoring process required for identifying I&I targets and tracking reductions realized in the YDSS and stand alone Wastewater systems.

As the monitoring program has evolved over the years, so have the datasets and analyses used to inform delivery of work. Continual advances in data collection, analysis methods and analysis tools have improved efficiencies, streamlined efforts and increased confidence in decision making. These advances align with York Region's digital transformation efforts by putting an emphasis on defining processes, optimization, digitization, automation, mapping technologies and data analytics.

Continual advances will help to:

- Identify and monitor areas with I&I and evaluate rainfall response in both existing local and York Region systems and in new developments
- Provide accurate, continuous, near real-time and reliable flow and rainfall monitoring data for analysis of peak wet weather flows and average dry weather flows
- Support to identify deficiencies in the wastewater system and the state of infrastructure information, as well as review capacity constraints
- Quantify I&I in the system, identify priority areas and identify costs for conveying and treating I&I
- Explore opportunities to track I&I reductions, at a audit basin level or for specific projects, through flow monitoring and analysis
- Identify system capacity constraints to inform capital programming and support efforts to maximize the useful life and capacity of built infrastructure and potentially defer capital investments through infra-stretching

York Region will continue to advance data collection, management and analytics over the next five years while also supporting efforts to optimize resource use in all aspects of its programming.

4.3.1 FINANCIAL MANAGEMENT

The 2011 I&I Strategy envisioned a collaborative long-term funding model based on a cost shared approach between the two tiers of local government. The 2011 I&I Strategy estimated that a funding target of $100 million over a 20 year period would be needed to meet the 2031 I&I reduction target. This equates to annual investment of $5 million per year across the Region. The proportionate share based on average cost of $0.04 per m3 of water sales ($0.02 of the local municipal rate and $0.02 of the Regional rate). Since 2011, the Region has invested more than $2.5 million per year for the Regional program and initiatives.

The 2021 Update recognizes the importance of financial management at the Regional and local municipal level and has identified the need to incorporate consideration of return on investment (ROI) and cost effectiveness into decision making. To that end, York Region recently developed a cost benefit model and will be sharing this model with the local municipalities. This model takes a holistic approach and allows a fulsome consideration of both the costs and benefits of I&I reduction efforts to inform decision making and prioritization. From 2021 and onward, York Region plans to utilize this model to assess the target investment needed to meet 2031 targets and to establish the overall ROI of the I&I program. These assessments and future funding sources and investments will continue to be evaluated with York Region's partners through the enhanced partnership framework to ensure sustainable program funding to 2031 and beyond.

4.0 2021 I&I REDUCTION PROGRAM AREAS

4.4 2021 PROGRAM AREA 4: ENHANCE PROGRAMMING FOR EXISTING SANITARY SEWER SYSTEMS

Expand on programming in existing sanitary systems through refined sanitary sewer assessments, policies and bylaws, private-property incentives in focused high priority areas and increased Public and Private Partnership (P3) initiatives like developer funded I&I programs.

The 2021 Program Area 4 focuses on expanding programming in existing sanitary sewer systems. **Table H** summarizes key activities, timing and anticipated outcomes identified for 2021 Program Area 4.

Table H: 2021 Program area 4 – activity and outcomes

Activity	Timing	Outcomes
Scale-up the use of the Cost Benefit Analysis model and RDII source modelling and expand uses to better inform decision making.	2021 to 2031	A tool for improved decision making on the selection of areas for rehabilitation, rehabilitation techniques and potential reductions that can be achieved from private property programs.
Review Bylaws and develop sample clauses for consideration by local municipalities to address mitigation of private and non-residential property sources and limit dewatering activities.	2021 to 2026	Sample Bylaw clauses for use by local municipalities to address private property sources and facilitate their removal and ensure limits are set for flows from dewatering activities in capacity constrained or high I&I response areas.
Develop a toolkit containing standardized messaging to ensure consistency across York Region, data analysis support to target specific sources and administrative processes.	2021 to 2026	Key tools for use by the local municipalities to identify sources of I&I to be targeted and to develop and implement successful private property programs. Tool to be leveraged for information sharing and developing engagement and communication strategies and messaging that align with sources identified as well as demographic, cultural and political perspectives on I&I reduction and basement flooding prevention.
Enhance developer-funded projects for I&I considerations.	2021 to 2031	Updated Guiding Principles for developer-funded programs targeted to high priority-areas for mutual benefit.

4.0 2021 I&I REDUCTION PROGRAM AREAS

York Region and its local municipalities have been completing sanitary sewer evaluation studies and associated remedial work on assets deemed critical for rehabilitation and replacement in areas identified as high priority per York Region's hydraulic modeling and analyses. The sewer evaluation work includes annual CCTV inspections of the municipal system, as well as field surveys and tracer studies on private properties. Most remedial works completed to date have included relining and spot-repair of sanitary sewers and lateral sewers, maintenance hole repairs on public infrastructure, and downspout and/or sump pump disconnections on private properties.

Completing private property investigations, an innovative hydraulic and hydrologic model has been piloted in 2018 and further refined in 2020 for a study area in Newmarket to quantify I&I from various private sources and to estimate I&I reductions that could be achieved through remediation activities.

York Region has also engaged in developer-funded I&I reduction agreements with several local municipalities and the development industry for the mutual benefit of reducing I&I in existing sanitary sewer systems since 2010. Developer-funded agreements permit completion of I&I reduction work in exchange for capacity allocation at a two-to-one ratio of achieved reductions to allocation credits. The program allows a level of planned growth to continue without additional infrastructure investment. The portion of recovered capacity retained by York Region helps mitigate future capacity risks by buffering against the effects of ageing infrastructure and climate change.

I&I remedial works completed have included disconnection of residential and commercial downspouts from the sanitary sewer system, sanitary sewer spot repairs, maintenance hole repairs, modifications to drains on reverse-sloped residential driveways, disconnection of sewer cross-connections and disconnection of residential sump pumps from the sanitary sewer system. Details of the rehabilitation activities, location and I&I reduction quantification estimates have been reported annually to MECP. These annual reports are also posted on the Region's I&I webpage.

Building on these programs and initiatives, the following sections provide details on expanded programming in existing sanitary sewer systems included in this 2021 I&I Reduction Strategy Update. The Region has been preparing financial budget and tracking expenditures of I&I programs and capital works on an annual basis.

4.4.1 SCALE-UP PILOTS AND EXPAND USES TO BETTER INFORM DECISION MAKING

An I&I source model was piloted in 2018 to identify and quantify sources of I&I on private properties. This pilot study combines hydraulic modelling with Geographic Information System (GIS) mapping and real data to estimate the volume and identify the sources of I&I present based on flow patterns. Data from the model was verified with field data and show that flow patterns can be used to gain a deeper understanding of what kinds of I&I sources are present in an area.

The pilot study completed extensive field program and site investigations in 2019/2020 and generated results that can help reduce the requirements for costly Sanitary Sewer Evaluation Surveys (SSES) work. Expanding application of the I&I source model in upcoming years will allow municipalities to better direct SSES work to locate I&I sources. Information gained from the pilot I&I source modelling will be made available to the local municipalities.

York Region initiated development of a Cost-Benefit Analysis (CBA) model tool in 2020, calibrated using wastewater flow data collected to:

- Estimate the return on investment of I&I reduction projects
- Inform decision making to select areas for rehabilitation and/or rehabilitation techniques that will result in the highest benefit for the lowest cost
- Quantify project specific I&I reductions achieved and associated cost savings, which can be used to obtain York Region and/or local municipality council support

The CBA tool considers both direct and indirect costs and benefits of various remediation works. It will be made available to local municipalities to enhance decision making in 2022. The model has the flexibility to be updated over time and to integrate future information.

Expansion of these tools will allow for more focused SSES work and result in resource savings both in time and cost, leading to more successful I&I reduction projects.

4.4.2 REVIEW EXISTING SEWER USE BYLAWS AND DEVELOP SAMPLE CLAUSES FOR LOCAL MUNICIPAL BYLAW UPDATES

York Region's Sewer Use Bylaw requires a permit for temporary dewatering prior to discharging. The Region is developing a Standard Operating Procedure (SOP) for reviewing and monitoring temporary dewatering applications. The SOP will include permit criteria that will incorporate I&I considerations and limit discharge of flows from dewatering activities in capacity constrained or high I&I response areas. The Region will work collectively with local municipal staff to develop an integrated process aimed at improving the efficiency of the temporary dewatering application process for the discharge of flows to local sanitary sewers first and eventually into the Regional system.

In collaboration with the local municipalities, York Region will also investigate opportunities to develop sample Bylaw clauses for consideration of inclusion by the local municipalities, consistently across the Region. Sample Bylaw clauses will focus on mitigating private property sources (such as connected foundation drains), sources from non-residential land uses (ICI) and potential enforcement activities for illegal cross connections on private properties.

4.4.3 DEVELOP PRIVATE-SIDE I&I REDUCTION TOOLKIT WITH INCENTIVIZED PROGRAM MODELS FOR LOCAL MUNICIPAL IMPLEMENTATION OF PRIVATE-SIDE I&I REDUCTION PROGRAMS

Sanitary sewers located on private properties make up more than 50% of York Region wastewater conveyance system in length. Experience in other municipalities has indicated that I&I sources on the private side can contribute 60% to 80% of I&I in a wastewater system. Working with residents to address these issues is imperative to the successful implementation of the I&I Reduction Strategy.

In 2018, York Region launched a private-side I&I reduction pilot project in partnership with the local municipalities in two study areas. Out of the 1,398 total residents in the pilot study areas, 63% engaged with the Region and its representatives, resulting in 42% of residents signing up to participate in property inspections. Remediating private-side I&I sources is generally beyond York Region's jurisdiction and relies on local municipal efforts, programs, and enforcement. This pilot project generated important lessons on how to achieve a high resident participation rate including a flexible program model, a rigorous residents' communication platform, and focused programs to allow targeted communications. Additional input, such as education and enforcement, would be required to increase residents' participation in uptake of incentives and rehabilitation work.

Built on the knowledge gained by the Region through its private-side I&I reduction pilot project and analyzing reductions from local municipal-lead programs such as City of Markham's Downspout Disconnection Program and Flood Protection Program, the Region is committed to support local municipalities in the development and implementation of new private-side programs, or enhancement of their existing private-side programs, through a toolkit consisting of:

- Standardized materials and messaging across the Region as education and outreach is critical to drive resident participation
- Program models that can be customized for program planning and initiation
- Analysis of results through Region's flow monitoring program
- Administrative processes and applications

Private-side programs will be directed to high-priority and ageing residential neighborhoods. The toolkit will be continually updated with lessons learned through municipal use to develop best management practices and to promote a culture of information sharing. I&I workshops will be used to further develop toolkit requirements and expansion options in this area.

4.4.4 ENHANCE EXISTING PARTNERSHIP INITIATIVES TO PROVIDE FURTHER GAINS

Enhancement of Private and Public Partnerships (P3) will be an important tool, available to local municipalities, to drive I&I reduction in existing sanitary sewer systems. The current York Region Council-approved Guiding Principles for developer-funded I&I reduction projects allows for some flexibility, and individual agreements can be customized to suit the unique situations of local municipalities. Potential refinements could include:

- Definition of areas for inclusion in tri-party agreements based on I&I priority mapping
- Customized agreements to achieve additional benefits to the local municipalities
- Consideration of changes to the benefit structure of these agreements to incentivize development industry partners to identify and complete more difficult and more costly I&I repair work
- Reassignment of repairs identified but not completed by individual developers

4.5 2021 PROGRAM AREA 5: EXPAND PROGRAMMING FOR NEW SANITARY SEWER SYSTEMS

Expand on programming in new sanitary sewer systems to minimize I&I in new construction through updated standards and advanced technologies.

2021 Program Area 5 focuses on expanding programming in new sanitary sewer systems. **Table I** summarizes outcomes identified for 2021 Program Area 5.

Table I: 2021 Program area 5 – activity and outcomes

Activity	Timing	Outcomes
Finalize I&I New Development Standard	2021 to 2022	Release I&I New Development Standard for implementation consistently across the Region to replace the 2011 Sanitary Sewer System Inspection, Testing and Acceptance Guideline.
Develop flow monitoring requirements to measure effectiveness of the I&I New Development Standard	2021 to 2022	
Bring report to Regional Council for endorsement	Q1 2022	Seek Regional Council endorsement in 2022 and full implementation by all local municipalities by end of 2024. By 2026, new infrastructure will be constructed in accordance with new standards and specifications.
Full implementation by all local municipalities	2022 to 2024	
Pilot flow monitoring in new development	2023 to 2026	Initiate implementation of monitoring requirements following standardized monitoring procedures and I&I allowance thresholds.
Update the I&I New Development Standard for lessons learned from implementation and flow monitoring results	2026 to 2031	Continually update and maintain New Development Standard that reflects innovations and improvements and following monitoring results.

4.0 2021 I&I REDUCTION PROGRAM AREAS

Activity	Timing	Outcomes
Retire I&I reduction component from current incentive programs, given the roll out of the I&I New Development Standard	2022 to 2024	Ensure I&I SIP/SDIP performance requirements for enrolled developments are achieved. Allow for a transition period for applications already in-place before retiring I&I component from incentives.
Conduct research and in-field pilot of new materials and technologies to reduce I&I in new development	2021 to 2031	Utilize refined partnership framework, in-field pilots and workshops aiming at continuous improvement in new development.
Advocacy aimed at improving National and Provincial Codes and Standards to prevent I&I in New Systems	2021 to 2031	Utilize refined partnership framework and workshops to advocate for Code change requests that focus on continuous improvement of minimum standards promoting I&I reduction provincially and nationally and that will drive improved design and construction methods.

I&I = Inflow and Infiltration; SDIP = Sustainable Development Incentive Program; SIP = Servicing Incentive Program.

To support York Region's commitment to delivering and promoting sustainable services, adoption of best practices for the management of I&I in new developments became a proactive and cost-effective means to avoid future expenditures and promote sustainable growth and development.

The plan for new construction is to ensure sanitary sewers are watertight at the time of construction using sound engineering requirements in design, and vigilant inspection and monitoring during construction and commissioning and before assumption.

The I&I New Development Standard is being finalized for adoption by the nine local municipalities by 2024 with a focus on four main categories including design and construction, inspection, testing, and flow monitoring procedures and performance conformity for site plans and new subdivision service permits. Components of the I&I New Development Standard have been tested and tried in over 5,000 built units through the Region's incentive programs promoting sustainable new residential developments such as York Region's Servicing Incentive Program (SIP) and the Town of East Gwillimbury's Sustainable Development Incentive Program (SDIP).

To continue York Region's demonstrated leadership and commitment in this area, the 2021 I&I Reduction Strategy Update identified the need to expand on programming in new sanitary sewer systems. Continuous improvement through updated standards, and monitoring procedures along with Region-wide application of new technologies, will help achieve continued reductions in I&I in new construction.

4.5.1 A REGION-WIDE IMPLEMENTATION OF I&I NEW DEVELOPMENT STANDARD FOR PUBLIC AND PRIVATE INFRASTRUCTURE

The I&I New Development Standard has been developed to address gaps and inconsistencies identified in current practices and to specify minimum standardized requirements in design, construction, testing and inspection in both the public and private right-of-way. The I&I New Development Standard will be implemented in a phase-in approach and will be applicable to all new development sites throughout all local municipalities within York Region starting in 2022/23.

The I&I New Development Standard has been developed in close collaboration and with extensive consultation with the local municipalities and the development industry. Representatives from the nine local municipalities, building officials, plumbing inspectors and industry partners including the Building Industry and Land Development Association (BILD), Greater Toronto Sewer and Watermain Contractors Association (GTSWCA), Ontario Concrete and Drain Contractors Association (OCDCA) and Ontario Concrete Pipe Association (OCPA) have all been engaged in developing this I&I New Development Standard through multiple committees formed in the past two years.

Once fully implemented by all local municipalities, flow monitoring will be conducted to evaluate success, following standardized new development monitoring procedures and thresholds. Lessons learned from the rollout, implementation and results of monitoring in new development will be reviewed with municipal and development industry partners and the I&I New Development Standard will be updated as needed. New technologies becoming available or proven will also be assessed.

To date, the Region in collaboration with the local municipalities and the development industry have used incentives through P3 initiatives such as SIP and SDIP to implement more stringent and watertight practices and technologies. Incentives include offering sanitary sewer allocation credits in exchange for proven low I&I rates (less than 0.12 litres per second per hectare (L/s/ha), under a 25-year design storm). With the New Development Standard roll-out, York Region will be looking into retiring the incentive from I&I reduction component of these initiatives with some transition period for applications already in-place.

4.5.2 UPDATE GUIDELINES, POLICIES AND STANDARDS

With the knowledge gained through the development of the I&I New Development Standard, York Region will continue its advocacy to enhance National and Provincial codes and standards to reduce I&I in new sanitary systems.

5.0 PLAN FOR MONITORING, REVIEWING AND UPDATING THE 2021 I&I REDUCTION STRATEGY

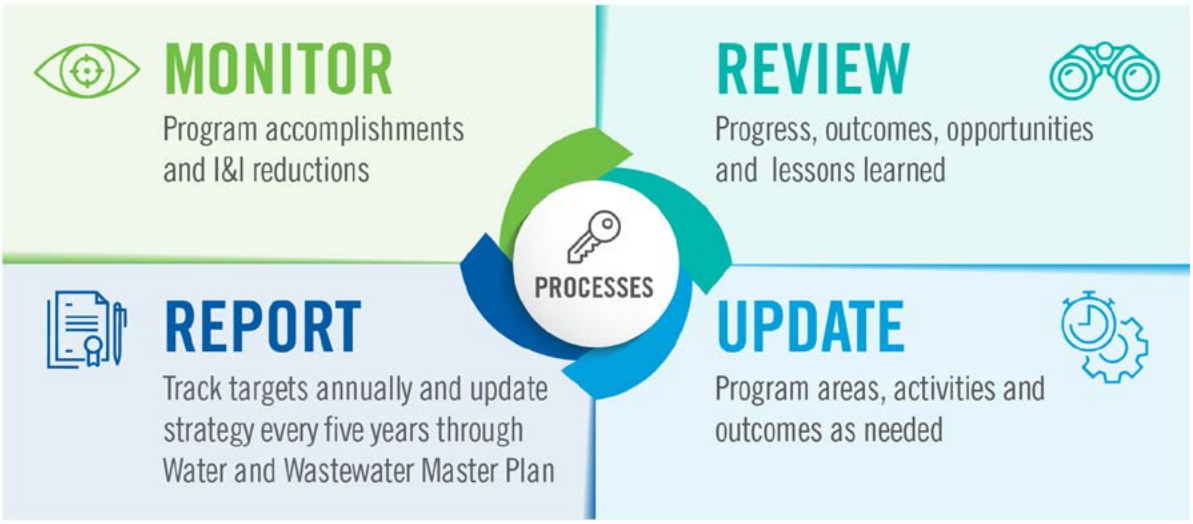
5.0 PLAN FOR MONITORING, REVIEWING AND UPDATING THE 2021 I&I REDUCTION STRATEGY

York Region will continue to monitor program activities, review them against goals and targets and update the I&I Reduction Strategy when necessary to ensure progress towards meeting the 2031 I&I reduction target of 40 MLD. Reporting will also be a key component of the plan as York Region will continue to integrate the Long-Term Water Conservation Strategy and the I&I Reduction Strategy into one comprehensive demand management program under the Water and Wastewater Master Plan updates to 2031 and beyond.

Annual reports will continue to be prepared and shared with York Region's partners and stakeholders. The 2020 Annual I&I Report summarizing I&I reduction activities and accomplishments in 2020 is posted on Region's website. York Region will continue with this reporting style in the future.

Figure H presents a summary of the key elements of the process that will be followed to monitor, review, update, and report on the I&I Reduction Strategy. **Table J** builds on the information provided in **Figure H** and provides furthers details planned for each activity.

Figure H: Plan for future I&I strategy updates



5.0 PLAN FOR MONITORING, REVIEWING AND UPDATING THE 2021 I&I REDUCTION STRATEGY

Table J: Strategy monitoring, review, updating and reporting

Activity	Description	Frequency	Outcomes
Monitor	Monitoring and tracking of program accomplishments, I&I reductions achieved and implementation and schedule of program refinements.	Progress reports to be prepared annually and used as a tool to track progress towards meeting the 2026 interim targets.	Annual reports to be shared with Public Works Liaison Committee and presented at the Local Municipal/York Region Quarterly Partnership Meetings.
Review	Review program issues and successes, identify opportunities for advancement and enhancement, and consolidate lessons learned.	Yearly reductions to be included in the annual report. Lessons learned are consolidated on a five-year basis.	Reductions will be reviewed at the Local Municipal/York Region Quarterly Partnership meetings. Annual reductions achieved and five-year consolidation of lessons learned will be presented to Public Works Liaison Committee.
Update	Update I&I programming based on consolidated lessons learned and progress made towards meeting the reduction targets.	Updates will be captured every five years through the Water and Wastewater Master Plan Update.	Updated implementation plans will include program refinements and will be completed, as recommended through Strategy review.
Report	Reporting of a Strategy Update and financial spending information.	Updated programming will be presented in York Region's Water and Wastewater Master Plan under demand management programming every five years.	Reports will be shared with Public Works Liaison Committee and other stakeholders and will be posted online. Report will follow a new format following the 2020 Annual I&I Report card now posted on york.ca/iandi.

6.0 CONCLUSION

6.0 CONCLUSION

The 2021 I&I Reduction Strategy Update is the second five-year update to the Region's 2011 I&I Reduction Strategy and satisfies SEC IEA approval condition 8.10. It enhances and extends the Region's commitment to leading I&I reduction programming, meeting regulatory requirements, and supporting growth in a socially, financially, and environmentally sustainable manner. The 2021 I&I Reduction Strategy Update also supports York Region's Water and Wastewater Master Plan under demand management programming.

Since 2011, York Region in collaboration with the local municipalities and development industry has reduced a significant 22.87 MLD I&I in the sanitary sewer systems across York Region. This is equivalent to wastewater flow generated from approximately 24,000 homes, in addition to providing a range of social, environmental and financial benefits to the residents and partners. Moving forward, York Region is committed to achieving the 2031 reduction target of 40 MLD through program refinement and enhancement presented in this 2021 Update.

I&I reduction Program Areas have been streamlined from the original eight-program area structure to a new five-program area structure (2021 Program Areas) to align with the 2021 Update objectives and enable focused efforts and optimum resource allocation. Key activities, timelines and outcomes have been identified for each of the 2021 Program Areas and will be used to guide implementation of the I&I Reduction Strategy in the next five to ten years.

Finally, this 2021 Update also includes a plan for monitoring, reviewing, updating, and reporting of Strategy updates. Monitoring and reviewing will occur and reported within York Region on an annual basis. Strategy and programming updates will be consolidated into York Region's Water and Wastewater Master Plan under demand management programming every five years.

7.0 APPENDICES

APPENDIX A: DRIVERS FOR I&I REDUCTION
APPENDIX B: UPDATED ROLES AND RESPONSIBILITIES AND WORKSHOP TOPICS

7.0 APPENDICES

APPENDIX A: DRIVERS FOR I&I REDUCTION

Table K: Drivers for I&I reduction

Drivers for I&I reduction		Related Regional plans, programs, and activities	Significance/benefits
Reduction drivers	*NEW* Free up capacity to meet growth demands	• Water and Wastewater Master Plan • Capacity Assessment • One Water Action Plan • Service incentive programs • Hydraulic modelling	• **Reduce** I&I in existing systems and **prevent** I&I in future systems to maintain wastewater system capacity through infra-stretching • **Develop** wastewater system capacity for future growth and allow system relief while capital projects are underway • Flow monitoring data reflect efforts made towards I&I reduction and capacity gains which are tangible benefits and feed into hydraulic model calibration and planning activities
	NEW Meet wastewater system regulatory requirements in satellite systems	• Wastewater operations • Long-Term Water Conservation Strategy	• **Ensure** satellite wastewater treatment systems and facilities meet compliance requirements for bypasses and effluent quality • **Support** environmental stewardship activities related to York Region wastewater treatment facilities
	NEW Provide wastewater system-related operational support	• Wastewater operations • Sewer-Use Bylaw • Water resources	• **Track** system responses and surcharges during wet weather events • **Provide** analysis and support on significant rainfall events and I&I analysis • **Provide** monitoring and analysis support to Sewer Use Bylaw group and other groups such as Water Resources
	NEW Adapt to climate change	• Climate Change Adaptation Plan	• Flow monitoring and rainfall data **characterize** area-specific wet weather events and system's responses to these events • **Support** York Region's climate change adaptation approaches though the identification of system vulnerabilities and enhanced system resiliency
	NEW Deliver and promote environmentally sustainable services	• Vision 2051 York Region Corporate Strategy • 2019-2023 York Region Strategic Plan • York Region Official Plan • Energy Conservation Plan	• **Continue to implement** I&I reduction programs to work toward achieving reduction targets • **Continue to provide** a range of social, environmental, and financial benefits resulting from reduced flooding risks, energy costs associated with pumping and treating extraneous flows, and delayed need for new infrastructure
	ORIGINAL Meet wastewater system regulatory requirements in the YDSS	• Wastewater operations • Capital planning and delivery • Long-Term Water Conservation Strategy	• **Meet** the IEA SEC conditions of approval (2031 I&I reduction target) • This is core requirement of I&I Reduction Strategy
	ORIGINAL Reduce basement and wastewater system flooding	• Wastewater operations • Local municipal wastewater operations	• **Reduce** flows during large rainfall events and **reduce** the risk of flooding • **Support** nine local municipalities by reducing the risk of local basement flooding

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APPENDIX A: DRIVERS FOR I&I REDUCTION

Table K: Drivers for I&I reduction

Drivers for I&I reduction		Related Regional plans, programs, and activities	Significance/benefits
Program drivers	*NEW* Develop local municipal target framework	• Business planning and financial support	• **Develop** target framework that assigns specific targets to York Region and the nine local area municipalities • **Support** partnership while eliminating duplication at York Region and nine local municipalities and enhance overall cost effectiveness • Additional flow monitoring data from boundary metering will provide basis for future water rate studies as I&I has been identified as a risk in the recent water rates study
	NEW Implement and enforce new guidelines and bylaws	• Capital planning and delivery	• **Enforce** design, inspection and acceptance standards and guidelines for wastewater systems • **Maintain** uniform standards for plumbing and private-property system inspections • **Prevent** I&I from new systems and private-property systems
	ORIGINAL Maintain Council support and endorsement	• Water and Wastewater Master Plan	• **Maintain** support and the endorsement of York Region Council and the nine local municipal councils • **Integrate** future Strategy Update with the Master Planning process
	ORIGINAL Refine partner roles and responsibilities	• Strategy and innovation	• **Reaffirm** York Region leadership and **redefine** roles and responsibilities of partners • **Ensure** clarity and commitment of York Region and the nine local municipalities • **Provide** platforms for continuous improvement through workshops

7.0 APPENDICES

APPENDIX B: UPDATED ROLES AND RESPONSIBILITIES AND WORKSHOP TOPICS

Figure I: Updated Partners' roles and responsibilities

YORK REGION

- Lead implementation of the I&I Reduction Strategy and track and update goals, budgets and Regional funding requirements
- Ensure alignment with Regional plans and initiatives
- Lead I&I system monitoring and analysis to direct delivery of I&I reduction programs in the local and private-side systems
- Provide guidance and support to local municipalities and development industry partners on I&I reduction and liaise between different stakeholder
- Provide provincial advocacy
- Develop and update standards and Bylaws
- Develop communication material & promote program outreach
- Address program improvement needs
- Conduct pilot inspection & rehabilitation studies and share knowledge
- Explore incentives and/or enforcement of programs
- Track implementation status and the I&I reduction achieved
- Ensure continuous improvements through advanced technologies and digital tools

LOCAL MUNICIPALITIES

- Reduce I&I in the local sanitary system
- Ensure alignment with local municipal plans and initiatives
- Build program to address private side I&I sources
- Conduct inspection & rehabilitation studies to identify sources and reduce I&I in the local and private-side systems.
- Address basement flooding concerns associated with I&I
- Lead communication and outreach to residents
- Participate in I&I reduction meetings and working groups liaised through the Region
- Provide updates on I&I reduction initiatives and track reductions
- Ensure LM I&I reduction targets are met and funding and resources are available to meet program needs

RESIDENTS

- Eliminate or rehabilitate I&I sources on private prosperities
- Adhere to sewer-use Bylaw requirements

DEVELOPMENT INDUSTRY

- Collaborate with the Region and local municipalities to address I&I in both existing and new systems
- Provide input to help create solutions to I&I issues
- Adhere to I&I standards and conformity requirements

7.0 APPENDICES

APPENDIX B: UPDATED ROLES AND RESPONSIBILITIES AND WORKSHOP TOPICS

Figure J: I&I Reduction proposed workshop topics for continuous improvement