

July 12, 2012  
**WATER EFFICIENCY STRATEGY**  
APPENDIX I

# WATER EFFICIENCY STRATEGY UPDATE

July 2012

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## **Executive summary**

The Region of Peel is growing by approximately 35,000 persons per year; however average annual water demands within the Region in recent years are significantly lower than projected. The Region's average water demand in 2010 was 44 million litres per day (MLd) lower than projected demands. In response to lower than projected demands, the Region has reduced its future demand forecast. The contributing factors for these water savings are the Region's 2004 water efficiency plan (WEP) and naturally declining demand.

There have been many technological and marketplace changes since the WEP was developed in 2004. To account for these changes and align the strategy with current Regional Strategic Plan and Term of Council Priorities, the WEP underwent review in 2011. The new strategy, the 2012 Water Efficiency Strategy (WES), accounts for the recent marketplace changes, Regional direction, and is in line with current legislation including the 2010 Ontario Water Opportunities Act and the Ontario Water Resources Act.

The 2012 WES has five primary objectives:

1. reduce peak day water demands;
2. meet legislation requirements and goals for water efficiency;
3. keep Regional residential per capita water demands in line with other leading GTA municipalities;
4. help nonresidential customers manage their water demands more effectively; and,
5. manage system water loss.

To achieve these primary objectives, the Region has established 3 specific water efficiency targets:

1. maintain an average peak day ratio of no more than 1.55;
2. reduce single-family indoor water demands to an average of 150 Lcd by 2025; and,
3. maintain a distribution system infrastructure leakage index (ILI) rating of less than 2.0.

## Water Efficiency Targets

### #1: Maintain Average Peak Day Ratio of no More than 1.55

Although current average annual day demands are significantly lower than projected, peak day water demands remain high. Peak day water demands, which typically produce less than 1% of annual water sales revenues, are expensive demands to meet as they often drive infrastructure expansion (many infrastructure elements are designed and sized to meet peak demands). It is expected that a leading cause of high peak day water demands is the growing number of automatic irrigation systems within the Region.

The Region currently plans infrastructure expansion projects based on a peak day ratio of 1.55. The peak the ratio is the ratio of the highest daily water production volume in any year to the average daily water production in that same year. Because peak water demands within the Region are not declining in the same manner as average annual day water demands, the WES places an increased emphasis on reducing the excess irrigation demands that lead to high peak day ratios. The 2012 WES sets a specific peak day ratio target of no more than 1.55.

### #2: Reduce single-family indoor water demand to 150 Lcd by 2025

Peel's average indoor single-family residential water demand in 2004 was approximately 291 litres per capita per day (Lcd). By 2010 this demand dropped to approximately 235 Lcd, a reduction of 56 Lcd or about 9.3 Lcd per year during this period. Approximately half of this reduction can be attributed to the effectiveness of Peel's WEP, and to the growing market share for water-efficient technologies. This rate of decline is expected to decrease as the number of homes replacing inefficient fixtures and appliances with efficient models begins to decline.

The Region's single-family indoor water efficiency target aligns with the Ontario Water Opportunities Act's target of 150 Lcd by 2025.

### #3: Maintain a distribution system ILI rating of less than 2.0

Peel's water system is relatively new and, therefore, has a high level of integrity. The Region is committed to continuing to optimize the operation efficiency of the water distribution system and to maintaining an infrastructure leakage index value of less than 2.0. An infrastructure leakage index, or ILI, is the ratio of the volume of actually lost in a system compared to the volume of water loss that could be reasonably recovered. An ILI value of 2.0 is considered relatively low, indicating that the system is operated efficiently.

## Recommended water efficiency measures

To achieve the targets established in the 2012 WES, Peel intends to implement the following water efficiency measures:

1. Toilet rebates - while installing efficient toilets is typically one of the most effective measures in any municipal water efficiency program, the growing market preference for high-efficiency toilets has resulted in fewer and fewer inefficient models being available in the marketplace. As such, the Region will phase out its current rebate program by September 2013. Alternatively, the purchase of water efficient fixtures will be encouraged and promoted through education and outreach initiatives.
2. Fusion landscaping - this new approach to landscaping offers homeowners alternative landscape designs that meet their aesthetic beliefs while achieving the Region's water savings targets. To encourage program uptake, the Region, in partnership with local municipalities, conservation authorities, and garden centres, will offer fusion landscape consultations and workshops to homeowners.
3. Residential automatic irrigation consultations - the Ontario Water Works Association's 2005 Outdoor Water Use Reduction Manual states that customers that practice manual irrigation tend to apply an average of only 8 to 10 mm of water per week, whereas customers using automatic irrigation systems often apply 50 mm or more per week to their landscape. Residential automatic irrigation consultations will educate homeowners about proper irrigation practices including proper installation and maintenance of the system and how to set irrigation schedules. This measure targets peak day water demands by reducing excess irrigation.
4. Industrial, Commercial and Institutional (ICI) automatic irrigation consultation - The Region will provide facilities that participate in this program with an irrigation audit and a follow-up report detailing opportunities for system improvements. Facilities that make recommended system changes may be eligible to receive a rebate of up to \$3,500 to offset the installation costs for a weather-based irrigation control system.
5. Indoor water audit program for ICI customers - the Region will offer the indoor water audit program for ICI customers. Customers that participate in this program will receive an indoor water audit and follow-up report, and may be eligible to receive a one-time rebate based on their level of sustained water savings. Rebates will remain at \$0.25 per litre per day of sustained water savings or up to 50% of the cost of measure implementation.
6. Water loss management - the Region of Peel currently has a proactive water loss management program to mitigate the negative effects of water loss in

the distribution system. That said, the Region intends to utilize the International Water Association and American Water Works Association's Water Audit Method to maintain an infrastructure leakage index (ILI) value of less than 2.0.

7. Water efficiency at Regional facilities - the Region intends to complete water audits of select Regional facilities, including water and wastewater treatment facilities, to ensure that water is used as efficiently as possible in Regional buildings.
8. Education and outreach programs - the Region intends to implement effective education and outreach programs, and marketing strategies that raise awareness of the importance of water conservation and that resonate with target audiences. Education and outreach program support complements the WES by continuing to foster environmental stewardship within the Region and by building capacity within the community to empower residents and businesses to make positive changes.

The WES builds upon the success of the 2004 WEP Plan and re-focuses water saving priorities based on recent changes in the marketplace and updated demand projections. By implementing the measures identified in the WES, the Region of Peel expects to meet its primary water efficiency targets of maintaining an average peak day ratio of no more than 1.55, reducing single-family indoor water demands to an average of 150 Lcd by 2025, and maintaining a distribution system ILI rating of less than 2.0. Water demands within the Region will continue to be monitored and measured to assess projected savings and verify that targets are met. The 2012 Water Efficiency Strategy will be treated as a living document where programs will continue to be evaluated and amended as necessary to ensure program success.

## **1.0 Background and Context**

The Region of Peel is one of the largest and fastest-growing regions in Canada. With a population growth rate of approximately 35,000 people per year, water demands within the Region are expected to increase. The Region expects to meet these growing demands through both infrastructure expansion and implementation of the various water efficiency initiatives and education and outreach programs identified in this 2012 Water Efficiency Strategy (WES).

The updated WES builds upon the solid foundation and success of the Region's 2004 Water Efficiency Plan (WEP). The 2012 WES acknowledges recent technological, marketplace and legislative changes; focuses on peak day demands to better align with new water demand trends and forecasts; and places a greater emphasis on education and outreach programming.

The WES update was undertaken in consultation with a number of internal and external stakeholders. Stakeholder feedback was crucial to the formation of the updated WES, evaluation of industry best practices, and alignment of the WES with Regional goals, work plans, initiatives and long term forecasts. The result is a living document that can be added to or changed overtime to reflect new technologies, practices, legislation, and regional direction.

In consideration of the recent marketplace changes, current Regional priorities, demand projections, and stakeholder feedback, the 2012 WES focuses on reducing peak water demands, targeting indoor water savings for residential customers, and maintaining efficient water loss management.

## **2.0 Benefits Associated with Improved Water Efficiency**

Improving water efficiency has multiple benefits to the Region, its customers, and to the environment.

Improving water efficiency through the WES supports the Region's Vision, Strategic Plan, and Term of Council Priorities (TOCPs). Strategic initiatives implemented will continually be evaluated to ensure they align with future TOCPs. Specifically, the WES supports:

- Regional Vision that Peel is a safe, healthy, prosperous, sustainable and inclusive community that protects its quality of life;
- Regional Strategic Goal 1, protect, enhance and restore the environment, by demonstrating leadership in responsible environmental management practices, protecting and restoring water resources, promoting low impact development, and improving air quality and adapting to climate change;
- TOCP3, reduce per capita water consumption, by optimizing existing infrastructure and minimizing negative impacts to the natural environment;



- TCOP1, reduce greenhouse gas emissions, by treating and pumping less water and wastewater;
- TCOP4, improve storm water management, by addressing outdoor water use and promoting alternatives to traditional landscape management practices; and,
- TCOP5, assessing water and wastewater capacity, by helping ensure water and wastewater capacity continues to meet a growing community's need.

Meeting growing water demands through water efficiency also has the added benefits to the Region of:

- Meeting legislation requirements such as the Ontario Water Opportunities Act by reducing water demands;
- Being economically and environmentally desirable compared to meeting growth demands through infrastructure expansion alone<sup>1</sup>;
- Providing enhanced system effectiveness by allowing Peel's system to maintain full effectiveness even in times of exceptionally high irrigation demands, or when major maintenance is being carried out at the Region's water treatment facilities;
- Providing flexibility, as water efficiency initiatives can be expanded or scaled back as required to reflect changes in demands, budgets, and staffing. The same level of flexibility is not available with infrastructure expansion projects;
- Demonstrating Regional leadership and a clear vision for ensuring a sustainable water supply;
- Reducing energy demands and greenhouse gas emissions. Treating and pumping less water and wastewater saves significant amounts of energy; and,
- Reducing the ecological impact of drawing water and discharging wastewater.

Improving water efficiency through the updated WES also benefits Regional water customers by providing them with an opportunity to reduce their water bill, and conserve energy when reducing hot water consumption.

### **3.0 Legislation**

The updated WES reflects and supports provincial legislation through demonstrating environmental responsibility and undertaking watershed stewardship. Table 1 outlines how the WES supports multiple pieces of legislation.

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<sup>1</sup> City of Toronto Water Efficiency Plan, City of Guelph Water Efficiency Plan, and Region of Peel's 2004 Water Efficiency Plan.

**Table 1: Legislation**

<b>Legislation</b>	<b>Description</b>	<b>WES Connections</b>
<b>Ontario Water Opportunities Act, 2010<sup>2</sup>.</b>	<p>Requires municipal service providers to prepare, approve and submit water sustainability plans for all municipal services. Plans may include a water conservation plan.</p> <p>The Minister may require municipalities to achieve prescribed performance targets. An indoor single-family water consumption target of 150Lcd has been suggested by many municipalities.</p>	<p>The WES aims to reduce indoor water consumption to 150Lcd for single family households. This is in line with suggested targets of the Act.</p> <p>The WES will also help fulfill the regional requirements for a water conservation plan.</p>
<p><b>Ontario Water Resources Act (last amendment: 2011)<sup>3</sup>: And Amended by Safeguarding and Sustaining Ontario's Water Act, 2007</b></p>	<p>Provides for the conservation, protection and management of Ontario's waters and for their efficient and sustainable use. The act also regulates water taking.</p> <p>Amendments made by the Safeguarding and Sustaining Ontario's Water Act prohibit inter-basin water transfers and set regulatory authority to establish fees for commercial and industrial users of non-municipal water.</p>	<p>Peel's WES demonstrates the Region's dedication to conserving and protecting its waters and promoting its sustainable use.</p>
<b>Ontario's Water Taking Regulation O.Reg 387/04<sup>4</sup></b>	<p>Requires permits for Ontario water takers who withdraw more than 50,000 litres of water a day from a lake, river, stream, or groundwater source.</p>	<p>The WES satisfies requirements for permit holders to have a water efficiency plan in place.</p>
<b>Green Energy Act, 2009<sup>5</sup></b>	<p>The act may require municipalities to achieve prescribed targets and meet energy and environmental standards including standards for energy conservation and demand management.</p>	<p>Reducing regional energy demands through water conservation (reduced pumping and treatment of water) will help Peel meet these requirements.</p>

<sup>2</sup> Information obtained from following website:

[www.e-laws.gov.on.ca/html/statutes/english/elaws\\_statutes\\_10w19\\_e.htm](http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_10w19_e.htm)

<sup>3</sup> Information obtained from following website:

[www.e-laws.gov.on.ca/html/statutes/english/elaws\\_statutes\\_90o40\\_e.htm](http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90o40_e.htm)

<sup>4</sup> Information obtained from following website:

[http://www.ene.gov.on.ca/environment/en/industry/assessment\\_and\\_approvals/water\\_taking/STDPROD\\_075554.html](http://www.ene.gov.on.ca/environment/en/industry/assessment_and_approvals/water_taking/STDPROD_075554.html)

<sup>5</sup> Information obtained from the following website:

[www.ebr.gov.on.ca/ERS-WEB-](http://www.ebr.gov.on.ca/ERS-WEB-External/displaynoticecontent.do?noticeId+MTEzMjQ1&statusId+MTY5NzQ2&language=en)

[External/displaynoticecontent.do?noticeId+MTEzMjQ1&statusId+MTY5NzQ2&language=en](http://www.ebr.gov.on.ca/ERS-WEB-External/displaynoticecontent.do?noticeId+MTEzMjQ1&statusId+MTY5NzQ2&language=en)

#### 4.0 Water Demands in Peel Region

Water demands have been significantly impacted by the implementation of Peel's WEP, in conjunction with changes in the water efficiency marketplace and increased public environmental awareness. Although most studies conclude that water demands are largely price inelastic<sup>6</sup>, significant increases in Peel's combined water and wastewater rates since 2004 (Table 2) may have also contributed to lower customer demands, especially discretionary use such as irrigation.

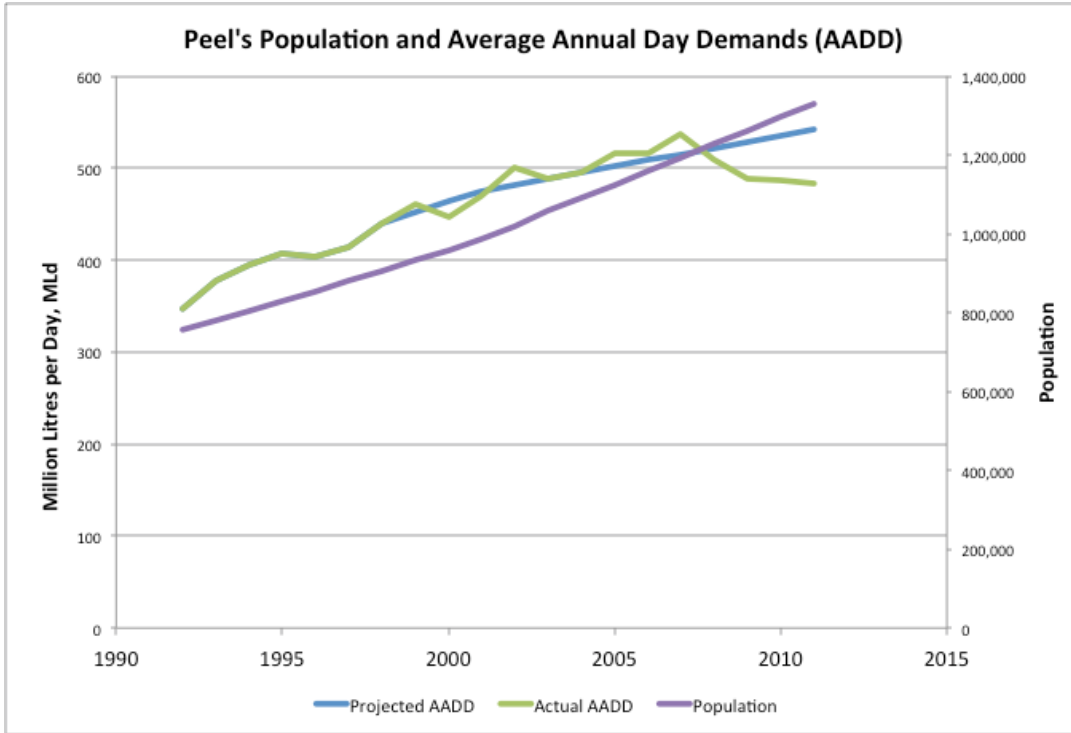
**Table 2: Combined Water and Wastewater Rates**

	2004	2005	2006	2007	2008	2009	2010	2011
Rate per m <sup>3</sup>	\$0.96	\$1.01	\$1.06	\$1.15	\$1.26	\$1.33	\$1.40	\$1.53
Annual Increase	5%	5%	5%	9%	9%	6%	5%	9%

The effectiveness of Peel's 2004 WEP is showcased by significantly reduced per capita demands compared to original demand projections. Based on the population growth rate in Peel during the early 2000s, it was projected that an AADD of 535 Mld would be reached in 2010; however, the actual AADD in 2010 was only 491 MLd, or about 44 MLd lower than projected. Almost 24 MLd (55%) of this savings is attributed to direct savings from WEP (19MLd) and indirect savings achieved by Peel's various education and outreach programs (5MLd). These indirect savings are achieved when customers make behaviour changes such as improving their indoor water use habits, or purchasing more water efficient technologies without applying for a rebate. Figure 1 below illustrates Peel's projected and actual AADD since 1992, and population growth. Note the significant deviation in actual vs. projected demands beginning in approximately 2006-2007.

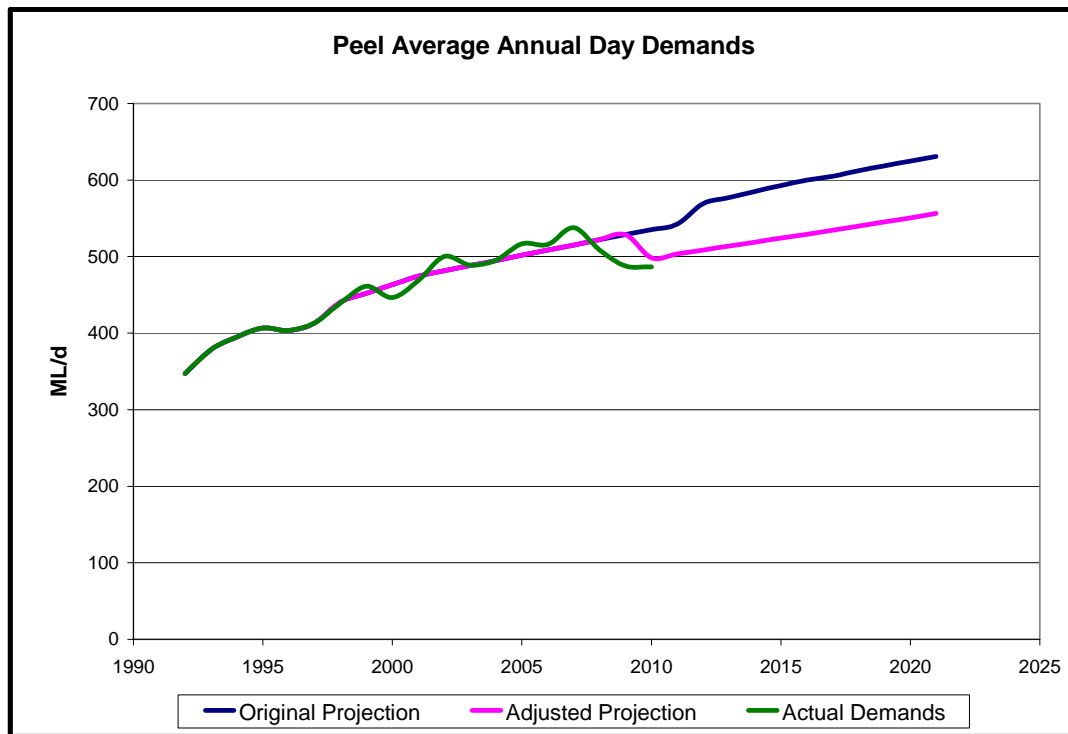
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<sup>6</sup> White Paper Water Rates and Conservation, March 13, 2009, David Mitchell and Tom Chestnutt.



**Figure 1: Population and Average Annual Day Demands**

In response to observed lower per capita demands, the Region reduced the projected average annual day demand by almost 9% as shown in Figure 2.



**Figure 2: Projected vs. Actual Average Annual Day Demands**

Currently, Peel relies on historical trends when projecting future water demands. It is anticipated that future water demand projections will also consider reductions in per capita demands due to improvements in technology (e.g., development of high efficiency toilets and clothes washers) or customer behavioural patterns.

## **5.0 Water Efficiency Strategy Update Goals**

### **5.1 General Objectives**

The primary objectives of the 2012 Water Efficiency Strategy are to:

- Reduce peak water demands;
- Meet legislation requirements and goals for water efficiency;
- Keep Regional residential per capita water demands in line with other leading GTA municipalities;
- Help non-residential customers (industrial, commercial, institutional) manage their water demands more effectively; and,
- Manage system leakage.

These objectives have been created with consideration to current Peel water demand trends, legislative requirements, and are in line with the 2011 to 2014 Regional Strategic Plan and Term of Council Priorities.

Note that the 2012 WES does not include a wastewater objective as reducing irrigation demands does not impact wastewater flows, and reducing indoor water demands has little effect on organic loading.

### **5.2 Specific Water Efficiency Targets**

The WES sets three water efficiency targets:

1. Maintain Average Peak Day Ratio of no more than 1.55
2. Reduce single-family indoor water demand to an average of 150 Lcd by 2025
3. Maintain a distribution system Infrastructure Leak Index (ILI) rating of less than 2.0

Each target is described in detail in the following sections.

## 6.0 Water Efficiency Target #1: Maintain Average Peak Day Ratio of no More than 1.55

Based on the population growth rate in Peel during the early 2000s, it was projected that an AADD of 542 MLd would be reached in 2011; however, the actual AADD in 2011 was only 483 MLd, or about 59 MLd lower than originally projected. Although AADD is declining, peak day water demands are not.

Peak day demand is the highest volume of daily water production during a calendar year, usually caused by an increase in customer irrigation after extended periods of hot, dry weather. These demands typically produce less than 1% of annual water sales revenues<sup>7</sup>, but are the most expensive demands for a municipality to meet as they often drive the need for infrastructure expansion because many infrastructure elements are designed and sized to meet the peak day demands.

The Region currently completes infrastructure planning activities based on a Peak Day Ratio of 1.55. The Peak Day Ratio is the ratio of highest daily water production volume in a year to the average daily water production volume in the same year. Lower Peak Day Ratios allow a water provider to operate their systems more efficiently. Although indoor demands are declining in Peel, outdoor water demands are not; therefore, it is important that the Region implement water efficiency measures that specifically target irrigation demand reductions to keep the Peak Day Ratio as low as possible.

Peak day demands vary from year to year depending on short- and long-term weather patterns. It is relatively difficult to predict peak day demands because of their significant relation to weather patterns. Peak demands will be lower during a cool and wet summer and greater during a hot and dry summer.

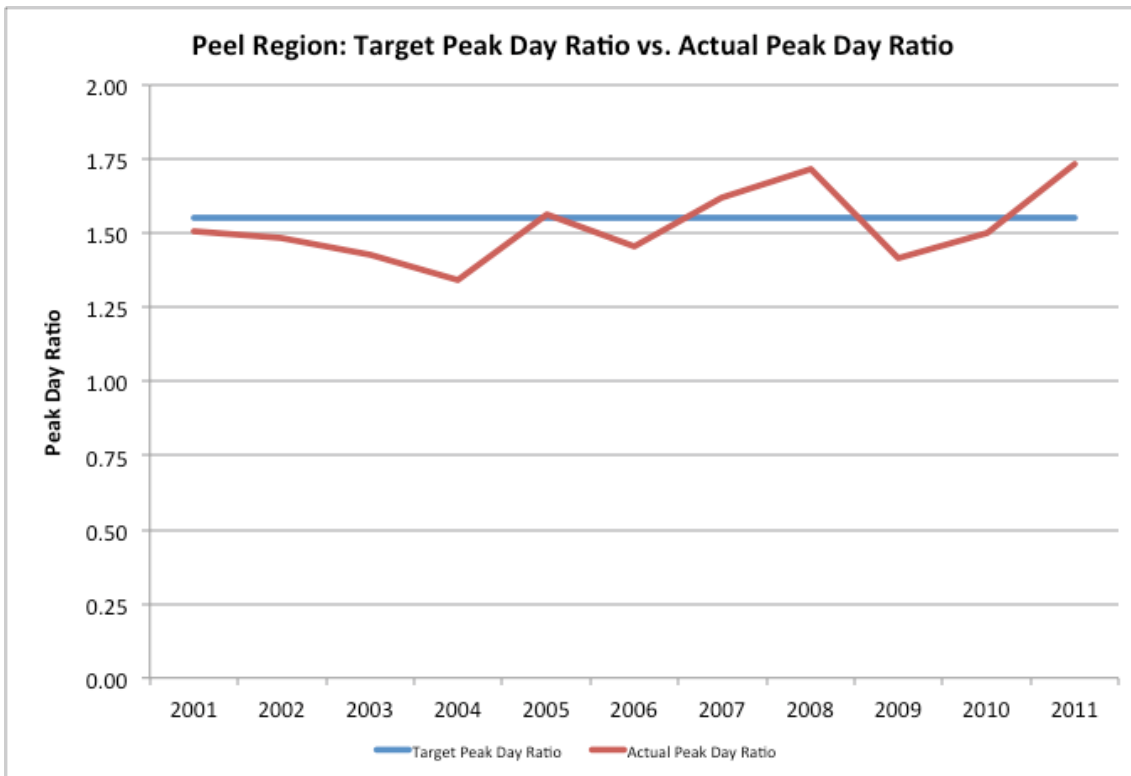
Table 3 lists historical average annual day demands, peak day demands, and annual peak day ratios from 2001 until 2011.

**Table 3: Historical Peak Day, AADD and Peak Day Ratio**

	Historical Peak Day and Average Annual Day Water Demands in MLd, and Peak Day Ratio										
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
AADD	482	506	494	500	522	521	543	512	486	491	486
Peak Day	727	750	706	670	815	758	880	878	687	738	842
Peak Day Ratio	1.51	1.48	1.43	1.34	1.56	1.45	1.62	1.71	1.41	1.50	1.73

Figure 3 compares the actual Peak Day Demand Ratio (the ratio of peak day demand to AADD) to the Region's planning ratio of 1.55 since 2004. Note that the actual peak day demand ratio is often above the planning value of 1.55. Higher than projected peak demands can result in the need to expand certain infrastructure elements sooner than expected.

<sup>7</sup> Ontario Water Works Association, *Outdoor Water Use Reduction Manual*, June 2008.



**Figure 3: Target vs. Actual Peak Day Ratio**

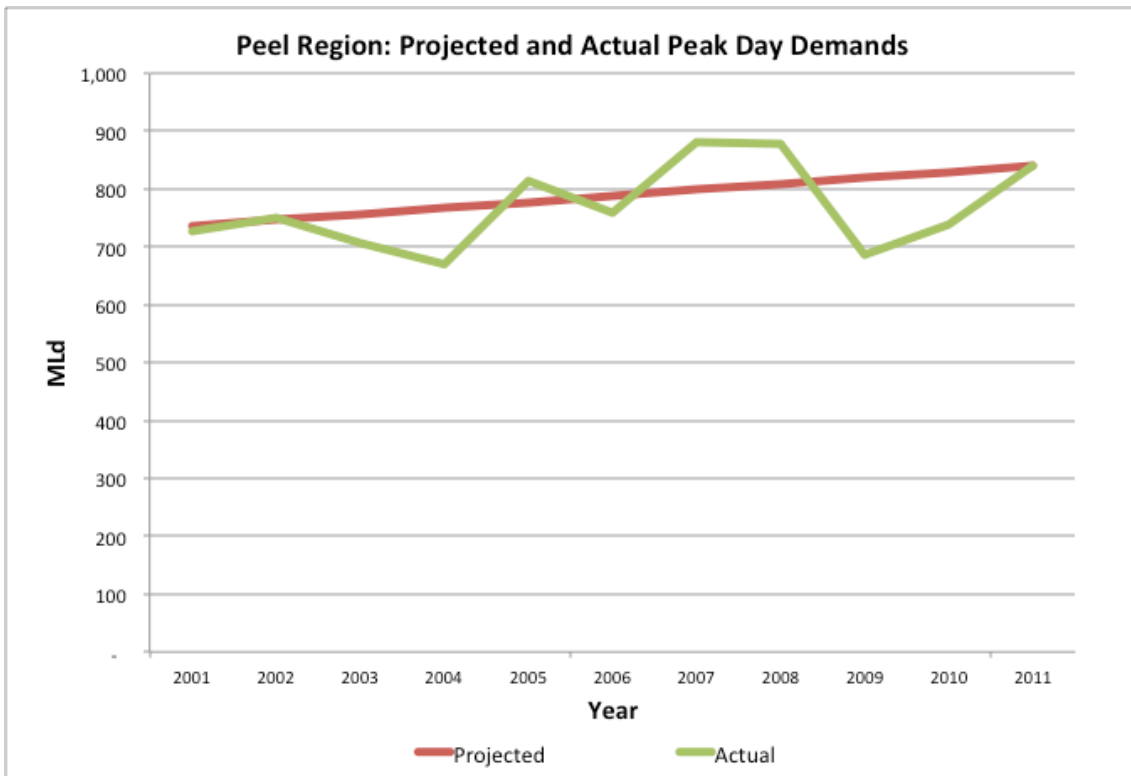
It is anticipated that peak day demands, and thus the peak day demand ratio, have remained relatively high because of a growing customer preference for automatic irrigation systems. Historically, automatic irrigation systems were installed mainly on large commercial properties or large residential estate lots. Now, automatic irrigation systems are installed at a growing number of small to average sized residential lots, largely due to lower equipment costs and the increasing availability of “do-it-yourself” underground automatic irrigation systems available at hardware stores<sup>8</sup>. The increasing number of automatic irrigation systems is a concern as, compared to the average homeowner that applies 8 to 10 mm (1/3 inch) of water per week by practicing manual irrigation methods<sup>9</sup>, it is not uncommon for homeowners with automatic irrigation to apply greater than 50 mm (2 inches) of water per week to their landscape during the summer<sup>10</sup>. As a result, an increase in the number of automatic irrigation systems within the Region would almost certainly result in higher peak day demands and higher peak day ratios.

Figure 4 illustrates that, unlike Peel’s AADD, which is far lower than projected, the Region’s peak day demand is highly variable and is essentially following the projected growth rate.

<sup>8</sup> Chris LeConte, Smart Watering Systems

<sup>9</sup> Ontario Waterworks Association 2003 - *Outdoor Water Use Reduction Manual*.

<sup>10</sup> Peel ICI Irrigation Audit Pilot Program, 2010



**Figure 4: Peak Day Projected vs. Actual Demand**

The updated WES recognizes the importance of the relationship between irrigation systems and peak day demand and sets a specific peak day ratio target.

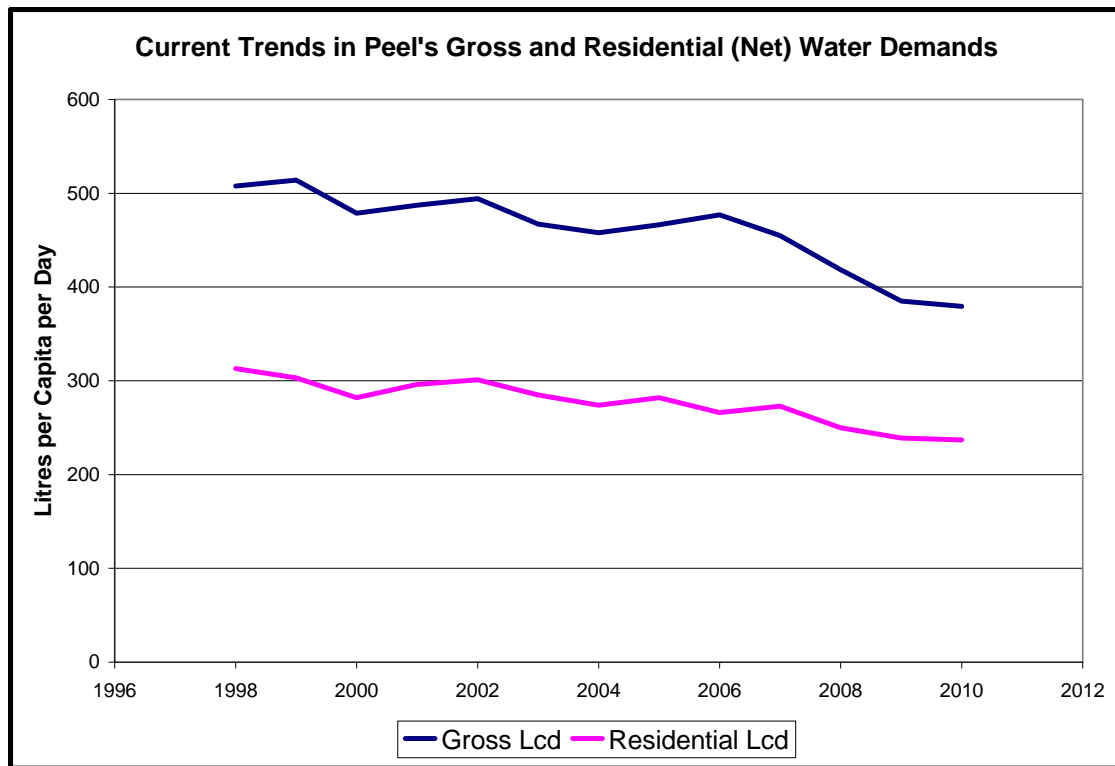
### **7.0 Water Efficiency Target #2: Reduce single-family indoor water demand to an average of 150 Lcd by 2025**

While total residential demands in Peel increased by almost 3% between 2004 and 2010, the per capita indoor single-family residential demand has decreased by about 56 Lcd from approximately 291 Lcd in 2004 to only 235 Lcd in 2010 – a reduction of about 9.3 Lcd per year. Research has shown that residential indoor demands are naturally declining at a rate of approximately 4.5 Lcd per year because of the improved efficiencies related to toilets, clothes washers, showerheads, etc. (see Appendix D). Implementation of Peel’s WEP is a major reason why demands in the Region are declining at almost twice the natural rate.

The rate of decline in per capita indoor single-family residential demand is expected to decrease as the number of homes replacing inefficient fixtures and appliances with efficient models declines. The ability of the Region to meet this target will be affected by marketplace changes, legislative requirements, and the number and type of water efficiency measures implemented. Per capita water demands will continue to be monitored and tracked on an annual basis to gauge progress.



Figure 5 shows Peel’s gross per capita demand (average daily water production divided by total residential population) and residential or net per capita demands (average daily residential demand divided by residential population) between 1998 and 2010. Note that per capita demands have declined on a relatively consistent basis between 1998 and 2010 but that the rate of decline is greatest beginning in 2006. Gross per capita demands fell below 400 Lcd in 2009 for possibly the first time ever.



**Figure 5: Gross and Residential (net) Water Demands**

The declining trend in customer consumption is consistent with findings reported to Council in the October 28, 2009 Council Report *Background Information on Utility Rate Process*. This background report cited the three main contributors to the declining rate of water demands: weather, lower ICI consumption, and efficiency.

The Region’s water efficiency target is inline with the Ontario Water Opportunities Act proposed performance target of 150 Lcd for single-family indoor water consumption by 2025.

## 8.0 Water Efficiency Target #3: Maintain a distribution system ILI rating of less than 2.0

The International Water Association (IWA) and American Water Works Association (AWWA) have developed a systematic methodology (IWA/AWWA Water Audit Method) to audit a water system to determine how much water is lost in the system and what volume of water loss that can be recovered. The ratio of these two values is called the Infrastructure Leakage Index or ILI. ILI values range from 0-15. For example, an ILI value of 2.0 means that a system loses two times as much water through leakage as it should. An ILI Index of 2.0 is low and is considered an efficiently operated system. Peel's water system is relatively new and, as such, it has a relatively low ILI. Peel's historical ILI ranges from 1.4 – 2.1. The current average is 1.63. The Region is committed to investigating opportunities to maintain and improve the future operation efficiency of their system and to maintain an ILI value of less than 2.0.

Table 4 illustrates Peel's historical ILI from 2003 until 2011

**Table 4: Historical Infrastructure Leak Index**

	Historical Infrastructure Leak Index								
	2003	2004	2005	2006	2007	2008	2009	2010	2011
ILI	1.57	1.57	1.74	2.11	1.82	1.94	1.38	1.40	1.06*

\* validation of value pending

## 9.0 Recommended Water Efficiency Measures

Each water efficiency measure included the WES update was screened based on the following criteria:

1. Technical Feasibility – Measure must be based on proven technology and experience, and must reduce water demand as intended.
2. Applicability - Measures must address inefficient water use practices within Peel and be within the municipality's jurisdiction.
3. Social Acceptability - Measures must satisfy the values and priorities of the community.

The following recommended water efficiency measures meet all of the above screening criteria. A detailed description of savings projections and program costs by measure is included in Appendix E. Assumptions used to calculate water savings are included in Appendix B. Additional potential water efficiency measures were identified but failed to meet one or more of the screening criteria. Justification for their exclusion in this updated WES is included in Appendix C.

## 9.1 Efficient Toilet Rebates

The Region of Peel currently offers rebates to residents and businesses that purchase and install WaterSense certified toilets. WaterSense toilets have an effective flush volume of no more than 4.8L (i.e., 20% less than the code-required 6L models). These fixtures are called High-Efficiency Toilets or HETs.

The success of the Region's Toilet Replacement Program, along with the success of other municipal and regional toilet rebate programs, has resulted in a market shift towards more affordable and efficient toilet models, and increasing consumer acceptance of high efficiency models.

Recognizing these changes and the decreasing need for a rebate to impact toilet purchasing decisions, the Region is phasing out the toilet replacement program as follows.

### Residential Program

1. Effective September 1st, 2012, residential rebates will be reduced from \$60 to \$25 per unit with a limit of two rebates per household.
2. Peel's Residential Toilet Replacement Program will end September 1st, 2013.
3. All eligible rebate applications for toilets purchased before September 1st, 2013 will be accepted until December 1st, 2013.

### Business Program

1. Effective September 1st, 2012, gravity flush toilet rebates will be reduced from \$60 to \$25 per unit. Flush valve combination toilet rebates will remain \$140 per unit.
2. Peel's Toilet Replacement Program will end September 1st, 2013.
3. All eligible rebate applications for toilets purchased before September 1st, 2013 will be accepted until December 1st, 2013.

The Region will continue to encourage water efficient fixtures through a variety of initiatives including in-store education and outreach initiatives, and promoting Water Sense® labeled products and water efficiency training initiatives such as Green Plumbers in Canada.

## 9.2 Residential Outdoor Consultation Programs

### 9.2.1 Fusion Landscaping®

Traditional landscaping design requires significant irrigation, fertilization and maintenance. Recent market research conducted within the greater Toronto area identified a common, deeply held belief amongst most single-family home owners regarding what defines an ideal home landscape.

Ideal landscapes are viewed as being neat and well organized, having lush weed-free lawns, and having colour mainly provided by annual flowers. The research studies also found that homeowners hold a negative perception of the terms *water efficient*, *sustainable*, and *natural* landscapes.

Fusion Landscaping® offers homeowners alternative landscape designs that meet their aesthetic beliefs while achieving Peel's water saving targets. The new approach to landscaping significantly minimizes the need for supplemental irrigation and, as a result, reduces energy use and related greenhouse gas emissions.

To encourage program uptake, the Region offers Fusion Landscape Consultations and workshops to homeowners. These consultations and workshops use onsite and hands-on experience to educate homeowners about the benefits of Fusion Landscaping®. Partnerships with local municipalities, Conservation Authorities and garden centres are leveraged to further promote Fusion Landscaping® and educate the public about its benefits.

### 9.2.2 Automatic Irrigation Consultations

Single-family homes with automatic irrigation systems often over-irrigate, applying as much as 50 mm (2 inches) of water to their lawns each week, compared to the typical single-family home that applies only 8 to 10 mm (about 1/3 of an inch). Reasons for over-irrigation include ease of application, improper setup of the irrigation controller, improperly designed systems, and mechanical faults including broken heads and system leaks. By correctly adjusting irrigation schedules and repairing system leaks, it is anticipated that irrigation depths can be reduced by an average depth of 25 mm (1 inch) per home per week.

To educate the public about the importance of a properly adjusted irrigation system, automatic irrigation audits may be provided to single-family homeowners. Homeowners are informed about proper irrigation practices through onsite experience with their own irrigation system, including identifying system components, common problems and fixes, and the importance of a properly scheduled controller. This program will help achieve peak day reductions by reducing the amount of irrigation water consumed through identifying system efficiencies.

## 9.3 ICI Water Audit Programs

### 9.3.1 Outdoor Irrigation Audits

Most ICI facilities with large landscapes are equipped with automatic irrigation systems. Outdoor Irrigation audits identify areas of potential peak day water savings that may be achieved through irrigation system upgrades. Outdoor water audits of ICI facilities completed by the Region in 2009 and 2010 identified a

significant opportunity for water savings at these sites, with an average of almost 25,000 litres saved per day per site over the summer months. The water savings are a result of system optimization, repair, and software improvements.

ICI facilities that participate in the Outdoor Irrigation Audit program receive an irrigation audit and report detailing opportunities for system improvements. Company officials or their contracted irrigation consultants are requested to attend the outdoor irrigation audits to learn more about their systems and be educated on common system issues. Facilities who make recommended system changes may also be eligible for a rebate of \$2,000 or \$3,500 to offset the installation costs for a smart or central controller. The feasibility and benefit of providing rebates for the program will be evaluated on an ongoing basis, and an increasing emphasis will be placed on stakeholder and contractor education and training in the field of ICI water efficiency.

### 9.3.2 Indoor Water Audit Program

There are different ways to encourage water efficiency for ICI customers. Some municipalities simply provide their ICI customers with information on ways to reduce demands (e.g., bill stuffers). It is also possible for municipalities to take punitive measures against ICI customers with excessive water demands (e.g., enact bylaws or charge extremely high water rates). Peel, however, takes a more supportive role to help its ICI customers save water through permanent process changes. As such, the Region operates an ICI Indoor Water Audit Program.

ICI customers that participate in the program receive an indoor water audit and are eligible to receive a one-time rebate based on their level of sustained water savings. The objective of the rebate is to incent facilities to adopt water efficient processes and technologies by increasing the facility's return on investment. Rebates are calculated at the rate of \$0.25 per litre per day of sustained water savings, up to 50% of the cost of measure implementation.

By participating in the Indoor Water Audit Program companies and their employees are educated about where they use water and how they can use it more efficiently while continuing normal levels of business.

The feasibility and benefit of providing rebates for the program will be evaluated on an ongoing basis, and an increasing emphasis will be placed on stakeholder and contractor education to build capacity for water efficient practices within the industry.

### 9.3.3 Water Loss Management

The Region of Peel has proactive water loss management programs to mitigate the negative effects of water loss in the system, including:

- Maintaining and improving the integrity of water system infrastructure through regular preventative maintenance programs, comprehensive condition assessments, and infrastructure renewal programs;
- Managing system water pressure;
- Integrating proactive water leak detection in Peel's annual water system valve and fire hydrant inspections; and,
- Conducting responsive water leak repair, i.e., all identified leaks repaired as soon as possible.

The Region intends to utilize the IWA/AWWA Water Audit Method to maintain an ILI value of less than 2.0. This method is effective because it features sound, consistent definitions for the major forms of water consumption and water loss found in drinking water systems. It also features a set of rational performance indicators that evaluate utilities on system-specific attributes such as the average pressure in the distribution system and total length of water mains.

The performance indicators used by the IWA/AWWA Water Audit Method allow water utilities to make a meaningful assessment of their water loss standing, benchmark themselves with other water utilities, and set performance targets. The key concept of this method is that all water is quantified – either directly measured or estimated – and a cost is assigned to each component to assess its financial impact to the water utility.

#### 9.3.4 Efficiency at Regional Facilities

As part of the holistic approach to water efficiency and in support of the Water Opportunities Act, Peel plans to complete water audits of select Regional facilities, including water and wastewater treatment facilities, to ensure that water is used as efficiently as possible and that the Region can continue to lead by example. This program will help support the requirements of the Ontario Water Opportunities Act and it may be expanded to include other municipal facilities within the Region.

## 10.0 Education and Outreach

Success in meeting the targets of the WES depends largely on the participation by residents and other stakeholders in each of the recommended water efficiency categories. Effective education and outreach programs and marketing strategies that raise awareness of the importance of water conservation and resonate with target audiences are critical to the Strategy's success.

Education and Outreach is not only about creating public awareness of Peel's water, wastewater, and water efficiency programs and services, it is also an important tool for raising awareness of environmental issues and establishing desired behavioral changes. Education and outreach supports and complements the WES by continuing

to foster environmental stewardship in Peel, and building capacity within the community to empower residents and businesses to make positive changes.

Education and outreach initiatives will be specific to desired actions and will consider key program messages and appropriate audiences.

#### 10.1 In-class Peel Water Story Presentations

These curriculum based in-class presentations complement the Ontario Curriculum's learning expectations for social studies and science and technology. Students learn about water treatment processes and water conservation initiatives. In-class presentations are available throughout the school year, with an average of 4,000 presentations booked per year.

#### 10.2 Peel's Water and Wastewater Treatment Facility Tours

These guided tours of the Region's leading-edge water and wastewater treatment facilities are offered to middle and secondary school students, adult education groups, and professional associations. The tours showcase how water and wastewater are treated by the Region of Peel. Over the course of a year, approximately 1,000 individuals participate in the tours.

#### 10.3 The Peel Water Story Curriculum Resource and Bus Tour

The Peel Water Story is an interactive, multimedia resource that goes beyond the classroom to show teachers how to connect their existing water education to the world around them and link lessons and knowledge about water to the schoolyard and community. To complement the curriculum resource, the Peel Water Story Bus Tour was developed to provide teachers with a full day tour of Peel's natural and human water systems. Experts in the field bring to life water concepts covered in the classroom.

#### 10.4 Peel Children's Water Festival (PCWF)

The PCWF is an annual environmental education event, which provides learning opportunities to elementary school students and Peel residents. This event offers more than 50 practical and interactive activities that teach participants about important environmental issues related to the protection and stewardship of water resources and water and wastewater treatment. The PCWF welcomes approximately 5,000 students to the event annually.

#### 10.5 Community Events

Peel's Public Works Department participates in over 100 special events annually in the Peel community. These events range from Councilor forums to fall fairs. On a

yearly basis, Region of Peel representatives have the opportunity to highlight water conservation programs and services to over 15,000 people at these events.

#### 10.6 Watersmartpeel.ca

The Water Smart Peel website offers more than just program details: it provides residents with the opportunity to learn more about water efficiency within their homes, such as how to check for and repair leaks. The website is a resource for customers applying for the rebate programs and registering for Fusion Landscaping® Consultations. For Industrial, Commercial, and Institutional customers it provides information on programs and case studies on indoor and outdoor water reduction.

### **11.0 Partnerships**

Within Peel, community environmental projects focused on water efficiency and storm water management are undertaken by numerous groups including area municipalities, conservation authorities, and community groups. Peel will continue to support and pursue partnerships with these groups to leverage resources, provide consistent messaging, and enhance joint initiatives.

Joint environmental initiatives demonstrate municipal and Regional environmental responsibility and help satisfy requirements of a Water Sustainability Plan under the Ontario Water Opportunities Act by increasing co-operation with other municipal service providers to maintain and improve the municipal service.

### **12.0 Future Program Research and Development**

To ensure that the measures related to the WES remain current and relevant, the following are proposed for future program research and development. Further research is required to remain current in water efficiency practices and determine the effectiveness of the proposed programs and whether they meet all screening criteria before they are considered viable water savings measures for Peel's WES. Existing and future programs will continue to be evaluated to ensure that resources are used appropriately, follow industry best practices, and that programs achieve the greatest benefit.

Future programs will place a greater emphasis on education and outreach initiatives that build capacity for change within the community and encourage behaviour change through educating customers about the importance of water and how its used.



## 12.1 ICI Irrigation Audit Tool

Significant water savings can be achieved by reducing irrigation demands through system optimization, repair, and software improvements. In 2009 the Region of Peel developed a template for large ICI commercial customers to quantify their potential irrigation savings on a zone by zone basis. In practice, the methodology has proven successful in accurately assessing potential water savings.

To use the template, field data is entered into a spreadsheet which compares the facility's weekly depth of irrigation to the theoretical depth required to maintain a healthy landscape. Further support of the development of this template into a software tool could expedite the ICI Outdoor Irrigation audit process and increase the efficiency of program delivery by efficiently identifying sites with significant potential water savings.

## 12.2 ICI Rainwater Harvesting

Historical rainfall data and minimum landscape irrigation requirements for local landscapes suggest that rainwater collected from a facility's roof should be sufficient to properly irrigate an area approximately 180% the size of the facility's collection (roof) area. In some cases, this irrigation water can also be supplemented by relatively clean, non-contact cooling water that would otherwise be sent to the sewer.

This research will verify the potential of using rainwater to irrigate ICI landscapes. Research will include quantifying the volume of water that can be collected through a rooftop rainwater harvesting system, verifying the average depth per week of irrigation required by ICI landscapes, determining the costs associated with installing, operating, and maintaining a rainwater harvesting system, and ultimately assessing the cost-effectiveness of such systems.

The program will involve selecting and auditing interested ICI facilities with automatic irrigation systems, and ultimately selecting one or more facilities to participate in the pilot program. The Region may support these facilities by providing financial incentives and on-site assistance to purchase and install rainwater harvesting systems. In return, participating facilities will allow the Region of Peel to install all necessary monitoring equipment on the system. Information collected during the research project will be used to determine the viability of including rainwater harvesting systems at ICI facilities in the Region's long-term water efficiency strategy.

## 12.3 Green Plumbers

Green Plumbers USA is an innovative national training and accreditation program that assists plumbers in understanding their role concerning the environment and public health. The organization's goal is to train thousands of plumbers to promote

the benefits of water conservation and to reduce greenhouse gas (GHG) emissions by changing consumer and plumbing behavior through the use of energy efficiency and water saving technologies.

The United Association of Plumbers & Pipefitters (UA), the recognized plumbing industry training authority with more than 340,000 members in the United States and Canada, partnered with Green Plumbers in a common effort to provide the highest possible quality of green plumbing certifications in the country. As part of this project, Peel, in partnership with other Ontario and Canadian municipalities, will evaluate whether it would be effective to support the growth of the Green Plumbers program in the Region and Canada.

#### 12.4 New Home Construction

New home construction represents the most cost-efficient opportunity to achieve long-term sustainable water and energy savings as new efficient appliances, fixtures, and technologies can be more cost-effectively included in new home construction than in renovations and retrofits. Currently, the majority of new home construction is built to minimum water efficiency requirements as outlined by the Ontario Building Code. The Region hopes to meet with community developers and new home builders to encourage them to adopt “better than code” practices. Water efficient upgrades may include the installation of toilets that flush with no more than 4.8 litres of water, showerheads that flow with no more than 7.6 litres per minute, and rough-in piping for hot water recirculation systems, and underground cisterns. The Region will also work with area municipalities to help guide greater consideration for water efficiency considerations in development.

#### 12.5 New and Emerging Technologies

As new and emerging technologies come available in the marketplace, Peel will consider the feasibility of introducing select viable technologies as pilot programs and where applicable work in partnership with interested municipalities in Ontario and North America. Because water efficiency is considered a relatively new field, research and development are key components to advancements in water efficiency and conservation.

### **13.0 Unit Cost of Infrastructure Expansion**

Due to rapid population growth, Peel will implement some supply-side measures (infrastructure expansion and operations management). However, since demand-side (water efficiency) measures are flexible and typically much less expensive to implement than infrastructure expansion on a litres per day basis, it is fiscally responsible of Peel to meet as much of its increasing water demands as possible through the implementation of water efficiency programs.

By using the costs (insured value) associated with constructing water treatment infrastructure within Peel and the associated treatment capacities of the plants, it is possible to approximate unit costs for infrastructure expansion<sup>11</sup>. These water treatment expansion projects, which will ensure that Peel can meet water demands until at least 2031, are fully funded, and are currently being implemented. The associated unit costs are identified in Table 5.

**Table 5: Water Treatment Unit Costs<sup>12</sup>**

Insured Value of Plant (\$million)	Capacity ML/d	Cost per L/d Capacity
\$1,079	1,650	\$0.65

Any water efficiency measure that can be implemented for less than a cost of \$0.65 per litre per day of savings would be considered a more cost-effective option than infrastructure expansion. Utilizing the least expensive source of water will help the Region maintain competitive water rates.

#### **14.0 Target Water Savings, Implementation Costs, and Schedule**

Target water savings, implementation costs, and the implementation schedule associated with the 2011 WES are detailed in Appendix E. Program and water savings assumptions are detailed in Appendix B. Energy and greenhouse gas emission savings will be calculated for each measure included in the updated WES.

To ensure the continued relevance of the updated WES, the Strategy has been developed as a living document that can be revised and adjusted as needed.

#### **15.0 Measurement**

Measurement indicators for each water efficiency goal will be developed to track the success of the Strategy. Effective measurement will also ensure that all programming and services implemented in support of the Strategy remain effective, relevant, and evidence-based.

Measurement indicators will vary by measure, but may include both quantitative and qualitative measurement including:

<sup>11</sup> No similar analysis was done for wastewater treatment facilities because there will be no reduction in the biological loading.

<sup>12</sup> Includes: Lakeview WTP (current plant) - \$407 million & 820 MLd capacity, Lakeview (expansion) - \$325 million & 330 MLd capacity, Lorne Park WTP (current plant) - \$141 million & 345 MLd capacity, Lorne Park (expansion) - \$206 million & 155 MLd capacity,

- Quantitative savings: peak day and residential indoor per capita water demand will be tracked and compared to the Strategy goals to analyze progress. A quantitative assessment of water savings resulting from particular programs may also be appropriate for some measures including ICI indoor water audits and outdoor irrigation audits. This may include billing data analysis, site data logging, customer surveys, and Regional production data.
- Participation rates: Participation rates will be used to measure the success and uptake of the Water Efficiency Strategy. For example, participation rates for classroom water presentations, Fusion Landscape Consultations, and pilot program participation may be used as an indication of how well marketed the programs are, how relevant the programs are to the intended audience, and how program messages resonate with their intended audience. Similarly, the number of residents who visit a booth at an event indicates how beneficial the particular show was to attend and how many people had the opportunity to learn more about water efficiency and the Region's role in water treatment.
- Program feedback: Customer feedback will be encouraged for all measures and programs. Feedback will be used to ensure that programs are socially acceptable and messaging is clear. Feedback will also be requested throughout the implementation of the WES to ensure that programming continues to meet the needs of both residents and business and the goals of the Strategy.
- Best Practices and Industry Trends Comparison: Through the implementation of the WES, best practices and industry trends will be identified to improve and modify existing programming where applicable. Best practices for performance metrics and program implementation will also be tracked to ensure the programs are fully effective.

## Appendix A - Glossary of Terms

Automatic irrigation system	An irrigation system, usually underground, that is turned on and off automatically via a programmable control system
Average annual day water demand (AADD)	Total annual water production divided by 365 (days per year).
Conservation Authority	A local, community-based environmental agency representing a group of municipalities on a watershed basis and working in partnership with other agencies to manage their respective watersheds.
Demand-side management	Reducing water demands via implementing efficiency measures and conservation.
Effective flush volume	The average flush volume of a toilet based on a total of one 'full flush' and two 'reduced flushes'.
Fusion Landscaping®	Blending traditional landscape designs with eco-friendly innovations while requiring little or no irrigation.
Gross per capita water demand	Average daily water production divided by population.
Hot water recirculation systems	An electric water pumping system that brings hot water to the plumbing fixture by pulling water from the hot water tank and returning cooler water back to the hot water tank, thereby reducing the waste of water down the drain as the homeowner waits for hot water at the fixture.
Living document	A document that may be continually edited and updated as required.
Minimum landscape irrigation requirements	The minimum level of irrigation or precipitation required by a landscape to remain healthy.
Price elasticity	A measure used in economics to show the responsiveness, or elasticity, of the quantity demanded of a good or service to a change in its price.
Rainwater harvesting	Collecting and storing precipitation for reuse either indoors or outdoors.
Supplemental irrigation	Water provided to plants in addition to natural precipitation.
Supply-side management	Meeting increasing demands for water via purchasing water or expanding water treatment facilities.
Unit Cost of Infrastructure Expansion	The cost to construct or expand infrastructure divided by the total additional daily volume of production, e.g., dollars per litre per day.
Watershed	An area of land where all surface water within that area drains to a single point.

## **Appendix B - Assumptions, Values & Calculations**

### RESIDENTIAL PROGRAMS

#### Toilet Replacement Program

- Each person flushes an average of 5 times per day at home (AWWA RF REUS, 1999)
- The average flush volume of an inefficient toilet is 15 litres.
- Each residential toilet is flushed an average of 8 times per day (5 flushes/capita x 3.35 pph / 2.1 toilets/home)
- Savings per 4.8 L HET =  $8 \times (15 - 4.8) = 81.6$  L/toilet/day
- Rebate for HET fixtures = \$25
- Maximum of 2 rebates per home
- Maximum of 20,000 rebates per year

#### Fusion Landscaping @ Consultations

- Region completes 1,500 consultations per year
- Region pays for cost of consultations - Average cost = \$100
- Homeowner responsible for making recommended landscape changes
- Target a 30% irrigation reduction in participating homes
- Average home applies ~250 L/day irrigation during summer months
- A 30% savings = 75L/day savings for participating homes

#### Automatic Irrigation Consultations

- Total of approximately 2,500 qualified customers
- Region pays for cost of audit. Average cost = \$300
- Homeowner responsible for making recommended system repairs and changes
- Average lot size = 0.5 acres = 0.2 hectare = 2000m<sup>2</sup>
- Average irrigated area = 50% = 1000m<sup>2</sup>
- Average savings = 1 inch/week = 25mm/week = 3.5mm/day

### INDUSTRIAL, COMMERCIAL and INSTITUTIONAL PROGRAMS

#### Indoor Water Audit Program

- Program will continue as currently designed
- Rebate = \$0.20 per L/day savings, to maximum 50% cost of implementation or \$250,000 (whichever is less)
- Two consultants performing audits, each consultant completes avg. of one audit per month (total 24 audits/year)
- Region pays for cost of audit. Average cost = \$4,000
- Facility responsible for making recommended process changes
- Average savings per year = 0.75 MLd

#### Toilet Replacement Program

- Rebate = \$140 per fixtures (must include both bowl and new flush valves)
- Average savings of 210 L/toilet/day (approximately 25 flushes per day per toilet)
- Gravity flush toilets for ICI applications use same assumptions as Single Family Toilet Rebate Program.

#### Outdoor Irrigation Audit Program

- Number of audits in 2012 = 6
- Number of audits per year increases by 2 each year to maximum of 20 per year
- Save average of 20,000 L/day at participating sites

- Region pays for cost of audit. Average cost = \$4000
- Facility responsible for making recommended changes
- Region provides rebate towards purchase and installation of central control system = \$3500

## **Appendix C - Measures Not Included in Updated Strategy**

There are several measures that are often touted as being effective water efficiency measures that are not included in Peel's 2011 Strategy. Although a number of measures fail to meet the screening criteria identified earlier, a special explanation is provided for the following measures because of their often misunderstood applicability for inclusion in Regional water efficiency strategy.

### Residential Greywater Reuse Systems:

Residential greywater systems typically collect greywater from showers, baths, and sometimes clothes washing to flush the toilets within the home. Greywater can also be used outdoors for irrigation but the short irrigation season in Canada restricts the potential for savings. While a home fitted with inefficient showers and toilets would be able to both capture and reuse a relatively large volume of greywater each day – thus saving an equivalent volume of potable water – the volume of water saved in a home fitted with efficient showers and toilets is relatively small. For example, a typical family of four people living in a home fitted with high-efficiency toilets that flush with only 4.8 litres of water would be able to save approximately 96 L/day via utilizing greywater for toilet flushing. This equates to about 35 m<sup>3</sup> per year in savings or a reduction of less than \$60 on the home's water bill. Based on an installed cost of about \$3,500 for a residential greywater system, the payback to the homeowner would be about 58 years. Although water rates are expected to continue to increase each year, thereby reducing the payback period, when the operations and maintenance costs are included, the concerns with dual-plumbing, along with the time and effort required by the homeowner to clean and maintain the system each month, residential greywater systems are not considered as a viable water efficiency measure<sup>13</sup>.

### Residential Rain Water Capture Systems:

Like residential greywater reuse systems, residential rain water capture systems have extremely long payback periods and significant operations and maintenance requirement. As such, residential rain water capture systems used to provide water used for toilet flushing are not considered feasible for inclusion in Peel's updated Strategy. In addition, because the Region is responsible for treating wastewater discharged through toilet flushing, there would be a need to quantify the volume of rain water discharged by each home and to have the homeowner pay a fee for discharging this water into the Region's sewer system (the Region receives no revenue from the use of residential rain water).

### Rain Barrels:

Because of their relatively small size, rain barrels are not generally considered effective tools to reduce summer demands or Peak Day water demands. A typical single-family household applies an average of approximately 1.6 m<sup>3</sup> of irrigation to their lawns and gardens each week. Even a relatively large rain barrel of 400 L would only hold about one quarter of a week's irrigation supply – plus rain barrels are typically not equipped with a pump and, therefore, cannot be used with a lawn sprinkler. As such, the use of rain barrels to reduce landscape irrigation and is not practical. The main purpose and use for rain barrels is to provide water to irrigate hanging plants and for educational purposes. It is likely that the Region will be able to secure good pricing because of buying in bulk and pass on the savings to the homeowners but it is not expected that the Region will heavily subsidize rain barrels.

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<sup>13</sup> Several participants in a small Ontario-based pilot residential greywater re-use study mentioned to Veritec Consulting Inc. that they intend to remove or stop using their system after the pilot study is completed.



#### Residential Clothes Washers:

Replacing inefficient top-loading residential clothes washers with efficient front-loading models has been proven to save considerable amounts of both water and energy. The Region has decided, like most other municipalities, not to offer rebates to homeowners replacing their inefficient washer. The primary reason for this approach is that there is already a clear preference for front-loading washers in the marketplace regardless of whether or not a rebate is offered, so a large percentage of program participants would be expected to be “free riders”.

#### Showerheads:

Virtually all showerheads currently available in the marketplace have maximum flow rates of 9.5 litres per minute (Lpm) or less, i.e. they meet the water efficiency criteria established in the Ontario Building Code. Many of the new models are designed with maximum flow rates of 7.6 Lpm or less to meet the requirements of the U.S. EPA’s WaterSense program. At least one study<sup>14</sup> has shown that flow rates below 7.6 Lpm may not meet performance expectations of consumers. Because of the limited opportunity to achieve substantial water savings, the Region has decided, like most other municipalities, not to offer rebates to homeowners purchasing efficient showerheads.

#### Watering Bans / Watering Restrictions:

Watering bans are typically considered an emergency drought response rather than a water efficiency measure and are not included in Peel’s Strategy. Although some municipalities implement season-long watering restrictions such as odd-even day watering or day of the week watering, there is question regarding how effective these types of restrictions actually are. Peel’s Strategy focuses on improving the efficiency of customers’ automatic irrigation systems and reducing homeowners’ irrigation demands through the adoption of Fusion Landscaping® techniques vs. attempting to restrict the days or times when homeowners are allowed to water their lawns and gardens.

#### Water Rates:

A comprehensive utility rate structure review has been identified as a Term of Council Priority and is being conducted by the Billing group (Operations Support) concurrently with the Water Efficiency Strategy update.

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<sup>14</sup> *High-Efficiency Showerhead Performance Study*, December 2009, Bill Gauley (Veritec Consulting Inc.), Dr. Jim Robinson (Associate Professor, University of Waterloo), and Kurtis Elton (graduate student, University of Waterloo).

## Appendix D - Declining Water Demands in North America

Bill Gauley, P.Eng., Principal, Veritec Consulting Inc.

Whereas as little as 10 to 15 years ago, a municipality's water demands tended to rise and fall in concert with population. Currently, however, per capita water demands are declining in virtually every municipality in Canada and the U.S.A.<sup>15</sup> The primary reason for this apparent de-coupling of population growth and water demands is quite simple – recent improvements in technology have made two of the main water demands within the home – toilets and clothes washers - *much* more efficient.

Based on recent research completed by Veritec Consulting Inc. in Canada and Aquacraft Inc. in the U.S.A.<sup>16</sup>, it appears that indoor residential water demands of 150 Lcd will be attainable (over time) due to the adoption of new water efficient technologies. For example, the toilet marketplace in North America is quickly moving towards the adoption of high-efficiency toilets (HETs) with effective flush volumes of 4.8 litres or less, and the marketplace for clothes washers is moving almost as quickly towards the use of front-loading machines with Water Factors of 5.0 or less (i.e., washer uses 5 U.S. gallons of water per cubic foot of washer volume or less).

HETs save about 67% of the water used by non-efficient toilets and at least 20% of the water used by 6-L models. Efficient front-loading clothes washers can save up to 60% of the water and 50% of the energy used by top-loading models<sup>17</sup>. The market shift in North America to HETs and efficient front-loading clothes washers will ultimately reduce per capita demands by approximately 80 litres per day vs. demands in the 1990s. What's more, at least one manufacturer is now offering WaterSense-certified single-flush toilets that operate with only 3 litres of water.

The migration to HETs would be expected to save approximately 50 Lcd vs. inefficient toilets based on achieving an average savings of 10 L/flush and five flushes per capita per day. The migration to efficient clothes washers would be expected to save about 30 Lcd based on a 60% water savings. Assuming a life-cycle of 25 years for toilets and 12 years for clothes washers (industry standards), the average per capita demand should decline at a rate of about 4.5 litres per year if there are no government incentives or programs to increase product uptake beyond their natural replacement rate.

50 Lcd ÷ 25 years = 2.0 Lcd per year savings

30 Lcd ÷ 12 years = 2.5 Lcd per year savings

Total expected reduction in demands = 4.5 Lcd per year.

With these advancements combined with other technical improvements (e.g., the use of residential hot water recirculation systems, efficient humidifiers, etc.) and a growing environmental awareness across North America, it is likely that residential indoor per capita demands will continue to decline to no more than approximately 150 Lcd. Many new homes are already experiencing similar demand rates.

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<sup>15</sup> "Declining Residential Water Use Presents Challenges, Opportunities", AWWA Opflow, May 2011, Margaret Hunter, Kelly Donmoyer, Jim Chelius, and Gary Naumick. Article states, "Overall, residential water use across the company's largest state subsidiaries declined about 1.4 percent/yr/customer between 2001 and 2010. The trend of declining use was consistent across widely ranging geographic locations and demographic characteristics."

<sup>16</sup> American Water Works Association Research Foundation's 1999 Residential End Use Study

<sup>17</sup> Including energy used to dry clothes.



**APPENDIX E: Implementation Costs and Goals**

**Annual Program Implementation Costs and Program Goals - Costs in 000's**

<b>Programs and Initiatives</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>Totals</b>
Toilet Rebate Program	\$375	-	-	-	-	-	-	-	-	-	-	-	-	<b>\$375</b>
Residential Irrigation Audits	\$100	\$100	\$100	\$100	\$100	\$100	\$100	\$100	\$100	\$100	\$100	\$100	\$100	<b>\$1,300</b>
Fusion Landscaping ®	\$100	\$100	\$100	\$80	\$60	\$40	\$20	\$20	\$20	\$20	\$20	\$20	\$20	<b>\$620</b>
ICI Indoor Water Audits	\$75	\$75	\$75	\$75	\$75	\$75	\$75	\$75	\$75	\$75	\$75	\$75	\$75	<b>\$975</b>
ICI Outdoor Water Audits	\$125	\$125	\$125	\$125	\$125	\$125	\$125	\$125	\$125	\$125	\$125	\$125	\$125	<b>\$1,625</b>
Operational Initiatives	\$100	\$100	\$100	\$100	\$100	\$100	\$100	\$100	\$100	\$100	\$100	\$100	\$100	<b>\$1,300</b>
Education and Outreach	\$100	\$150	\$150	\$150	\$150	\$150	\$150	\$150	\$150	\$150	\$150	\$150	\$150	<b>\$1,900</b>
Research and Development	\$250	\$250	\$250	\$250	\$250	\$250	\$250	\$250	\$250	\$250	\$250	\$250	\$250	<b>\$3,250</b>
<b>Total Program Costs</b>	<b>\$1,225</b>	<b>\$900</b>	<b>\$900</b>	<b>\$880</b>	<b>\$860</b>	<b>\$840</b>	<b>\$820</b>	<b>\$820</b>	<b>\$820</b>	<b>\$820</b>	<b>\$820</b>	<b>\$820</b>	<b>\$820</b>	<b>\$11,345</b>

<b>Program Goals</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>
Residential Indoor Per Capita Demand (Lcd)	197	193	189	185	181	177	174	170	166	162	158	154	150
Peak Day Ratio	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Infrastructure Leak Index	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0