To: Emily Stahl
From: Sam Ziemann
Cc: Wayne Galliher, Julie Anne Lamberts
Subject: Mass Fixture Retrofit Programs for Multi-Residential Settings

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CITY OF GUELPH

MASS FIXTURE RETROFIT PROGRAMS FOR MULTI-RESIDENTIAL SETTINGS

C3 WATER INC.
31 August 2015

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<th>VERSION</th>
<th>DATE</th>
<th>DESCRIPTION OF REVISIONS</th>
<th>REVISED BY</th>
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<td>1</td>
<td>July 20, 2015</td>
<td>Draft Mass Fixture Retrofits for Multi-Residential Settings TM</td>
<td>Andrea Williams</td>
<td>Bill Gauley</td>
</tr>
<tr>
<td>2</td>
<td>August 31, 2015</td>
<td>Final Mass Fixture Retrofits For Multi-Residential Settings TM</td>
<td>Bill Gauley</td>
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1.0 INTRODUCTION
The 2015 Water Efficiency Strategy Update will identify a set of preferred program alternatives, associated water savings, program implementation forecasts, and supporting program resources required to achieve the water demand reduction of the 2014 Water Supply Master Plan. As part of the strategy scope, a series of technical memos are being prepared on technology and policy areas of opportunity, as identified through ongoing program operation, industry best practice research, and common areas of customer/stakeholder inquiry. The objective of this report is to summarize mass fixture retrofit programs that could be implemented in Guelph’s multi-residential buildings.

2.0 MASS FIXTURE RETROFITS
2.1 Definition
Mass fixture retrofits consist of replacing or retrofitting all or part of the existing plumbing fixtures in a multi-residential apartment building, e.g. toilets, faucets, showerheads, and clothes washers, with water-efficient models. Replacing existing fixtures with water-efficient products can typically reduce a multi-residential apartment building’s water demand by 30 to 40 percent (Water Matrix, 2014). Multi-residential buildings contain numerous plumbing fixtures and present a significant opportunity to implement meaningful water savings for multi-residential building owners and/or condo corporations. Evidently, multi-residential buildings are less likely than single family homes to have water efficient fixtures installed. According to Statistics Canada, only 42 percent of apartments and 58 percent of multi-unit housing had water efficient fixtures by 2006, compared to 63 percent of single family housing (Gibbons, 2009).

Programs can be implemented to incentivize property owners to capture potential water savings through education, water auditing, and fixture replacement.

2.2 Program Details
2.2.1 Education
Information can educate owners on which fixtures provide the greatest water savings, return on investment, and installation (United States Environmental Protection Agency, 2010). Technology continues to evolve to produce better products and educational programming can be a valuable tool to inform owners of the latest trends. For example, owners who had previously participated in water saving retrofits would see increased savings with the new 3-litre flush toilets compared to 6-litre flush toilets that were once the benchmark for water efficiency technology (Water Matrix, 2014).

2.2.2 Audits
Audits are used to investigate and evaluate existing water usage. They are instrumental in determining water saving potential. Typically, historical water data is reviewed to determine if further on-site investigation is warranted. One item to consider for an audit is the age of the building. As of January 1, 1996, the Ontario Building Code has mandated 6-litre or less toilets, and the newer 2012 Building Code requires new residential construction or renovation to implement high efficiency 4.8 litre toilets. Other items to consider include number of units and seasonal or other influences on water demand (i.e. times of higher occupancy – such as in local student housing). An on-site audit will measure flows for
each fixture, check for leaks and calculate potential water savings if replacements and retrofits are implemented.

2.2.3 Toilets

Inefficient toilets flush with more than 13.25 litres of water (volume is a conversion from the United States standard of 3.5 gallons). The United States Energy Policy Act of 1992 mandated that by January 1, 1994, all toilets sold in the United States could flush with no more than 1.6 gallons (6 litres). Due to the size of the United States marketplace compared to the Canadian marketplace, toilet manufacturers began to focus on developing new 6-litre toilet models, though many continued to produce 13.25-litre models for sale in Canada. On January 1, 1996 the Ontario Building Code required that all toilets installed in new construction projects flush with no more than 6 litres of water. This requirement prompted a complete shift in the Ontario toilet marketplace towards 6-litre toilet fixtures, and was finalized by the ban on 13-litre toilets in the province in 2010. As of January 1, 2014, the 2012 Building Code requires new residential construction or renovation to implement 4.8 litre toilets, and this will likely prompt a further shift towards the higher efficiency toilets.

In 2006 the United States Environmental Protection Agency initiated their WaterSense® product labeling program for water efficient products. To qualify for WaterSense® certification, toilet models flushed with no more than 4.8 litres of water and clear at least 350g of simulated waste in a single flush. Almost immediately, toilet manufacturers began to focus on developing 4.8-litre toilets. Therefore, virtually all new toilet models being developed for the Canada/United States market flush with 4.8 litres or less. The most water-efficient WaterSense® certified toilet model (developed by the Canadian company Hennessey & Hinchcliffe Inc.) flushes with only 3.0 litres of water and yet has a flush performance rating (i.e., a Maximum Performance score) of almost twice the minimum requirement for WaterSense®. Over the last five years more than 120,000 of these 3.0-litre toilets have been installed in Ontario – most of these in multi-family residential apartment buildings (Water Matrix, 2014).

Several field-studies have identified that the average person flushes a toilet in their home about 5 times per day (American Water Works Association, 1999). As such, switching from a 13.25-litre toilet model to a 4.8-litre or 3.0-litre model will save an estimated 42.25 litres per capita per day or 51.25 litres per capita per day respectively. It is estimated that in the Greater Toronto area approximately 80 percent of the toilet fixtures being replaced in multi-family buildings are older 6-litre models, yet the overall water savings in these buildings is still generally between 20 and 35 percent, largely because many of the early-model 6-litre models provided poor flushing performance (sometimes requiring more than a single flush to remove waste), flushed with more than six litres of water, or had trim components that were susceptible to leakage (Water Matrix, 2014).

2.2.4 Showerheads

Showering constitutes one of the largest residential indoor water uses. A comprehensive 2013 single-family water demand monitoring program (Residential End Uses of Water 2013 Update) completed by the Water Research Foundation (United States) included two greater Toronto area municipalities,
Waterloo Region and Peel Region. The original 1999 Residential End Uses of Water Study by the American Water Works Association studied the residential water uses of 1000 residences in each of 14 study cities, with a final study group of 100 in each, throughout North America. Some of the results of these studies is summarized below in Table 2-1.

**Table 2-1: Average Results from National Research Center Inc. and American Water Works Association studies on residential water use.**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Showers Per Capita Per Day</td>
<td>0.55</td>
<td>0.68</td>
<td>0.75</td>
</tr>
<tr>
<td>Shower Duration</td>
<td>7.1 minutes</td>
<td>7.6 minutes</td>
<td>8.2 minutes</td>
</tr>
<tr>
<td>Shower Flow Rate</td>
<td>7.4 litres per minute</td>
<td>7.5 litres per minute</td>
<td>8.3 litres per minute</td>
</tr>
<tr>
<td>Volume Per Shower</td>
<td>53.4 litres</td>
<td>57.2 litres</td>
<td>65 litres</td>
</tr>
</tbody>
</table>

Based on these results, there is an indication that the volume of water used for showering was approximately 15 percent lower in 2013 than in 1999. It is likely that a significant portion of these savings is related to the development of a WaterSense® certification for showerheads in 2010 and changes in the Building Code.\(^2\)

The national standard for showerhead flow rate in both the United States and province of Ontario at this time (2015) is 9.5 litres per minute (2.5 gallons per minute). This is compared to the maximum flow rate allowed for a WaterSense® certified showerhead which is 20 percent lower at 7.6 litres per minute (2.0 gallons per minute).

In addition to water savings, using a more efficient showerhead will save energy by reducing hot water usage. It is estimated that an average family can save about $30 per year in reduced energy costs (Environmental Protection Agency, 2015). If both energy and water savings are considered, a typical home could save as much as $75 per year by installing a WaterSense® certified showerhead. This is based on multiplying the following factors together: a 20 percent savings on 65 litres per capita per day; 3 persons per home; 365 days per year; and $3.18 per cubic metre equals $45.27 per year. The expected savings in multi-residential buildings may be slightly lower because water and wastewater costs are typically incorporated in rental fees and so there is less motivation for tenants to reduce demands.

### 2.2.5 Faucet Aerators

There are two main types of faucet use in the multi-residential customer sector: lavatory (i.e., bathroom) faucet use and kitchen faucet use. The water use patterns for lavatory and kitchen faucet use is quite different. Kitchen faucets are commonly used to supply certain volumes of water by filling vessels such as sinks, pots, jugs, etc. As such, reducing the flow rate from a kitchen faucet has very little effect on water demands. Reducing flow rates will, however, increase the time required to fill the vessel and could potentially inconvenience the homeowner. This could perhaps cause the homeowner to revert

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\(^2\) Note that Codes and Standards identify the maximum flow rates allowed for showerheads and, as such, flow rates measured in the field tend to be less than the maximum allowed.
back to a higher flow rate fixture. This is the primary reason that WaterSense® has no plans to certify low flow rate kitchen faucets. Conversely, people often use lavatory faucets to wash their hands or face, or to rinse their toothbrush or razor. As such, reducing the flow rate of a lavatory faucet can reduce water demands; but since water demands associated with lavatory faucet use in the home is thought to be much less than demands associated with kitchen faucet use, the total volume of savings is not expected to be significant (69 percent of residential faucet use occurs in the kitchen versus the remaining 31 percent in the bathroom) (American Water Works Association, 1999).

2.2.6 Clothes Washers

A 2002 study by the National Research Center Incorporated (United States) found that clothes washer water use was 3.3 times greater in multi-residential buildings with in-suite laundry facilities than for buildings with shared or common laundry areas (123 versus 37 litres per suite per day) (National Research Center Inc., 2002). This study also identified that the number of loads per week was much higher for buildings with in-suite laundry. However, a report by the Multi-housing Laundry Association identifies an average duty factor of 2.2 loads per day per washer for buildings with common laundry areas (Multi-housing Laundry Association, 2006). As such, the potential water savings is 2.2 times greater in multi-residential buildings with common laundry areas than in buildings with in-suite laundry. Energy Star estimates that inefficient washers use about 87 litres per load and efficient models use only 49 litres per load; representing a savings of about 38 litres per load (Energy Star, 2015). Based on these values, a clothes washer replacement program would be expected to save about 38 litres per day per machine in buildings with in-suite washers and about 84 litres per day per machine in buildings with common laundry areas.

2.2.7 Leakage

While reducing leakage is not specifically a “retrofit” action, in many cases changing out toilets, showerheads, and faucet aerators results in a significant reduction in leakage. In some cases, the volume of water saved through reduced leakage can equal or even exceed the water savings directly related to the fixture change-out. For example, a toilet leaking at 0.06 litres per minute will lose 86 litres per day. Replacing a 13.25-litre toilet with a 4.8-litre model will save 85 litres per day in an apartment with 2 occupants. Companies specializing in multi-family fixture retrofit programs (e.g., Water Matrix) will record and repair any plumbing leaks they find as they move from suite to suite (the client is billed a set fee for each leak repair). As such, actual water savings are generally higher for multi-residential buildings than what would be predicted based on the fixture change-out alone.

2.2.8 Return on Investment: Customer

Mass fixture retrofit programs involve a capital investment by the customer to upgrade existing fixtures. The return on investment is a result of the savings from reducing water and energy demands. Financial incentives offered by municipalities will lessen the capital investment requirement of the property owner and, therefore, improve the return on investment for the property owner. The return on investment for

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3 1 load per day per suite for in-suite laundry versus 0.4 loads per week per suite for common laundry facilities
4 Values based on difference of 13.25 litres to 4.8 litres per flush, 5 flushes per capita per day, with 2 occupants.
any building is dependent on the financial value of the water and energy (if any) savings, the cost of the retrofit (materials and labour), and the size of financial incentive, if any.

Examples

**Toilet Change-out:** there are essentially three levels of water-efficient toilet types: WaterSense® certified 4.8-litre models, Maximum Performance PREMIUM 4.0-litre models, and Ultra-High-Efficiency 3.0-litre models (not yet adapted as an industry standard). Note that Maximum Performance PREMIUM and Ultra-High-Efficiency fixtures are also WaterSense® certified. As such, the following three levels of savings, summarized in Table 2-2, are possible.

### Table 2-2: Return on Investment: Customer Levels

<table>
<thead>
<tr>
<th>Level</th>
<th>Water Savings</th>
<th>Annual Cost Savings5</th>
<th>Return on Investment6</th>
<th>Return on investment with $75 Royal Flush incentive</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Replacing a 13.25-litre toilet with a 4.8-litre model will save 84.5 litres per day7 or 30.8 cubic metres per year</td>
<td>$98</td>
<td>2.6 years</td>
<td>1.8 years</td>
</tr>
<tr>
<td>2</td>
<td>Replacing a 13.25-litre toilet with a 4.0-litre model will save 92.5 litres per day or 33.8 cubic metres per year</td>
<td>$107</td>
<td>2.3 years</td>
<td>1.6 years</td>
</tr>
<tr>
<td>3</td>
<td>Replacing a 13.25-litre toilet with a 3.0-litre model will save 102.5 litres per day or 37.4 cubic metres per year.</td>
<td>$119</td>
<td>2.1 years</td>
<td>1.5 years</td>
</tr>
</tbody>
</table>

**Shower Change-out:** replacing a 9.5 litres per minute showerhead with a 7.6 litres per minute WaterSense® certified showerhead in an apartment suite will save approximately 22.8 litres per day8. In Guelph this water savings equates to a reduction of $26 in annual water costs. Assuming that 70 percent of the water used in the shower is hot water9, the new showerhead would save approximately 5.8 cubic metres of hot water per year. If this water were heated by natural gas, the cost savings would be about $8 per year10. Total savings in this example, therefore, is about $34 per year. Since the cost of a new WaterSense® certified showerhead can range from a low of about $10 to over $100, the return on investment could range from only 3 or 4 months to more than 3 years.

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5 At a volumetric cost of $3.18 per cubic metre.
6 Based on an average cost for a new water-efficient toilet (supply and install) of $250, the return on investment would be about 2.5 years with no City incentive. Both 4.8-litre and 3.0-litre toilets have a fairly wide variation in price.
7 Based on 2 occupants at 5 flushes per capita per day, 13.25 to 4.8 litres per flush.
8 Based on 2 occupants taking 0.75 showers per day for 8 minutes, or 8.3 cubic metres per year.
9 Based on cold water temperature of 50 degrees and hot water temperature of 120 degrees (Celsius).
10 Based on a savings in natural gas of about 41.5 cubic metres per year.
**Clothes Washer Change-out:** replacing an inefficient top-loading clothes washer with a high-efficiency model is expected to save about 38 litres per day per machine in buildings with in-suite washers and 84 litres per day per machine in buildings with common laundry areas, or 13.9 and 30.7 cubic metres per year respectively. In Guelph this water savings equates to a reduction in annual costs of $44 per machine for buildings with in-suite laundry and $97 per machine for buildings with common laundry areas. Assuming that 22 percent of the laundry water is hot, the new washer would also save about $20 of hot water per year for in-suite laundry buildings and $44 per year for common laundry area buildings (National Research Center Inc., 2002). Total savings to the customer is about $64 per machine per year for in-suite laundry buildings and $141 per machine per year for common laundry room buildings.

2.2.9 Return on Investment: Municipality

The City of Guelph currently uses a value of $4.68 per litre per day when estimating the cost of adding additional water supply and wastewater treatment to their system\(^\text{11}\) (AECOM and Golder Associates, 2014) (CH2M Hill, 2009). As such, water efficiency measures that affect both water and wastewater (e.g., toilet or shower replacement) need to cost the City less than $4.68 litres per day of savings to be considered cost-effective.

**Examples**

**Toilet Change-out:** as stated above, there are three levels of water-efficient toilets readily available in the marketplace: 4.8-litre models, 4.0-litre models, and 3.0-litre models. Since toilets with lower flush volumes would save more water, the City would be able to provide a higher rebate to those models. For example\(^\text{12}\):

- Replacing a 13.25-litre toilet with a 4.8-litre model will save approximately 84.5 litres per day. To be considered cost-effective, any rebate offered for this measure would need to cost the City less than $396 (i.e., 84.5 litres per day times $4.68 per litres per day = $396).
- Replacing a 13.25-litre toilet with a 4.0-litre model will save approximately 92.5 litres per day. To be considered cost-effective, any rebate offered for this measure would need to cost the City less than $433.
- Replacing a 13.25-litre toilet with a 3.0-litre model will save approximately 102.5 litres per day. To be considered cost-effective, any rebate offered for this measure would need to cost the City less than $480.
- Replacing an older 6.0-litre toilet with a 4.0-litre model will save approximately 20 litres per day. To be considered cost-effective, any rebate offered for this measure would need to cost the City less than $94.
- Replacing an older 6.0-litre toilet with a 3.0-litre model will save approximately 30 litres per day. To be considered cost-effective, any rebate offered for this measure would need to cost the City less than $140.

\(^{11}\) Based on $1.46 per litres per day for water supply infrastructure and $3.22 per litres per day for wastewater infrastructure.

\(^{12}\) Based on 2 occupants and a single toilet per suite
Shower Change-out: replacing a 9.5 litres per minute showerhead with a 7.6 litres per minute WaterSense® certified showerhead in an apartment suite will save approximately 22.8 litres per day\(^\text{13}\). This savings would be worth $107 to the City, i.e. any rebate less than $107 that is offered by the city to achieve this level of water and wastewater savings per day would be considered cost-effective\(^\text{14}\).

Clothes Washer Change-out (in-suite buildings): based on an equivalent cost of supply in Guelph of $4.68 per litres per day and a projected savings of 38 litres per day, the ‘value’ to the City is about $178 per efficient washer installed, e.g., any rebate less than $178 that is offered by the city to achieve this level of water and wastewater savings per day would be considered cost-effective.

Clothes Washer Change-out (common laundry room buildings): based on an equivalent cost of supply in Guelph of $4.68 per litres per day and a projected savings of 84 litres per day, the ‘value’ to the City is about $393 per efficient washer installed, e.g., any rebate less than $393 that is offered by the city to achieve this level of water and wastewater savings per day would be considered cost-effective.

These examples of return on investment are summarized in Table 2-3.

<table>
<thead>
<tr>
<th>Maximum Possible Rebate (City should offer less than for cost effectiveness)</th>
<th>Water Savings (litres)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Toilet Change-out</strong></td>
<td></td>
</tr>
<tr>
<td>13.25-litre to 4.8-litre</td>
<td>$396</td>
</tr>
<tr>
<td>13.25-litre to 4.0-litre</td>
<td>$433</td>
</tr>
<tr>
<td>13.25-litre to 3.0-litre</td>
<td>$480</td>
</tr>
<tr>
<td>6.0-litre to 4.0-litre</td>
<td>$94</td>
</tr>
<tr>
<td>6.0-litre to 3.0-litre</td>
<td>$140</td>
</tr>
<tr>
<td><strong>Shower Change-out</strong></td>
<td></td>
</tr>
<tr>
<td>9.5 litres to 7.6 litres</td>
<td>$107</td>
</tr>
<tr>
<td><strong>Clothes Washer Change-out</strong></td>
<td></td>
</tr>
<tr>
<td>In-suite Buildings</td>
<td>$178</td>
</tr>
<tr>
<td>Common Laundry Room Buildings</td>
<td>$393</td>
</tr>
</tbody>
</table>

2.3 Current Municipal Practice

Calgary, Alberta, currently offers rebates of $50 per toilet to multi-unit buildings with three or more living units that replace 13-litre or more toilets with WaterSense® certified fixtures (The City Of Calgary, 2015).

Richmond, British Columbia, offers a $100 utility tax rebate to both single-family and multi-family customers replacing older toilets flushing with 6-litre or more with 4.8-litre models (new toilets do not

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\(^{13}\) Based on 2 occupants each taking 0.75 showers per day for 8 minutes.

\(^{14}\) Based on the equivalent cost of supply of $4.68 per litres per day.
have to be WaterSense® certified). There is a limit of 2 toilets per dwelling (City of Richmond British Columbia, 2015).

Red Deer, Alberta, provides rebates to customers that replace 13-litre toilets - $50 rebates if the new toilet flushes with 4.8-litre or less and $25 if the new toilet flushes with 6-litre (The City of Red Deer, 2015).

Seattle, Washington offers toilet rebates to multi-family buildings based on the flush volume of the toilet being installed; $75 per fixture for 4.8-litre models and $150 per fixture for 4.0-litre or less Maximum Performance Premium fixtures. All toilets must be WaterSense® certified. Buildings must have at least four living units and all toilets in the building must be replaced. Existing toilets must be pre-2004 models (Long Beach Water Department, n.d.).

Long Beach, California is currently offering an increased rebate to multi-residential apartments and condos to install very efficient 3.0-litre toilets and 5.7-litre per minute showerheads because of the impact of the historic drought in the area. The rebate has historically been $50 but has been increased to $200 per toilet-showerhead combination to increase participation. Buildings must have a minimum of five living units and existing toilets must flush with 6-litre or more. The website also notifies customers that, starting in 2017 in California, all multi-family housing must be fitted with water-efficient plumbing fixtures (e.g., 4.8-litre toilets) (Long Beach Water Department, n.d.).

British Columbia Hydro offers a $50 rebate to customers installing front-loading clothes washers with an Integrated Modified Energy Factor between 2.76 and 2.94 or top-loading washers with an Integrated Modified Energy Factor of 2.30 or higher. They also offer $100 rebates if the new washer has an Integrated Modified Energy Factor greater than 2.94 (British Columbia Hydro, 2015).

Pacific Gas and Energy Company has teamed up with approximately 30 water agencies in California to offer up to $150 rebates to customers purchasing and installing a qualifying Energy Star certified clothes washer. The new washer must be purchased and installed in 2015. Commercial models do not qualify for a rebate (Pacific Gas and Electric Company, 2015).

The City of Denver Colorado provides free water audits to their multifamily residential customers. A city inspector visits each apartment suite for about 3 to 5 minutes to complete the water audit (check for leaks and water savings potential). They note that some property managers conduct standard annual inspections at the same time (smoke detector checks, energy-efficient lighting improvements, vandalism, etc.) to decrease the disturbance to the residents. The city inspectors can typically complete 100 units per day. Each apartment suite is provided with a free water-efficient showerhead, lavatory faucet aerator, and kitchen aerator. The property manager is also provided with historical water consumption information for the site and information on available rebates (note that the City only offers toilet rebates to single-family customers and individual units in condos or townhomes, not for multi-residential apartment buildings) (Denver Water, 2015).

City of Winnipeg posts water savings tips for multi-family residential buildings on its website (City of Winnipeg, 2014). A number of indoor water savings tips are identified, including: reading the building...
water meter weekly, posting signs within each building promoting water efficiency, installing suggestion boxes in prominent areas within the building, replacing inefficient toilets, showerheads, and faucet aerators with efficient models, and using automatic dishwashers only for full loads.

WaterSense® labeled multi-family apartment buildings are fitted with WaterSense-labeled toilets, faucets, and showerheads as well as ENERGY STAR® qualified dishwashers and clothes washers (where applicable). Outdoors, WaterSense-labeled homes have water-smart landscapes that include regionally appropriate plant choices and, if irrigation systems or pools are installed, efficient technologies that help keep water use low (Environmental Protection Agency, 2012).

The Arizona Water Company (public utility) operates a multi-family residential indoor water audit program that offers free water audits to identify water savings opportunities in space cooling, sanitation, and other indoor water uses upon request from the customer. The auditor will present the customer with water savings recommendations along with a number of conservation pamphlets (Arizona Water Company, 2012).

Note: It appears that fewer municipalities are offering plumbing fixture rebates currently than, say, ten years ago. For example, Toronto, Peel Region, and York Region have recently phased out their toilet fixture rebate program. The reasons for cancelling their rebate programs may include a perception of no longer requiring the associated water savings or preferring to let the declining availability of inefficient fixtures in the marketplace lead to the installation of efficient fixtures over time. It should be pointed out that all three of these municipalities take all (or the majority) of their water supply from the Great Lakes.

2.4 Benefits and Barriers of Mass Retrofit Programs for Multi-Residential Settings

The following benefits and barriers (Table 2-4) are presented with respect to the mass retrofit programs for multi-residential settings.

Table 2-4: Summary of benefits and barriers associated with mass retrofit programs for multi-residential settings.

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce installation costs for customers (property owners/managers for bulk-metered buildings and individual tenants for individually-metered buildings), potentially leading to more retrofits.</td>
<td>Very few multi-residential apartment buildings have sub-meters on the water supply to each suite so the building’s overall cost of water and wastewater is included in the monthly rental costs and divided equally among the suites. As such, there is no direct financial benefit to tenants to reduce water demands (though water savings may indirectly reduce the magnitude of future rent increases).</td>
</tr>
<tr>
<td>Most multi-residential apartment buildings and many condos are bulk-metered at the point where the water supply enters the building. As such, any reduction in water demand would reduce the overall water bill (cost of operations)</td>
<td></td>
</tr>
</tbody>
</table>
for the building vs. for individual tenants. For apartment buildings, this could either increase the profit for the building owner or reduce future rent increases for the tenants. For condos, a reduction in the cost of operations could be passed on to the tenants via reduced monthly maintenance fees.

- Lower municipal water demands, which results in lower operational costs related to energy and chemical demands, as well as, potentially lower capital costs related to avoiding, downsizing, or deferring infrastructure.

- One multi-residential owner can decide to retrofit numerous units (lower administrative cost per fixture change-out than for single-family customers).

- Increase exposure for City water efficiency / conservation programs.

- Multi-residential buildings are typically bulk-metered at the point where the water supply enters the building and it is not generally possible to differentiate between any water saved by installing new toilets (for example) and water saved by installing new showers, faucet aerators, or clothes washers, or water savings achieved as the result of a tenant awareness program. As such, if more than one measure is implemented it is difficult to assess the return on investment for individual measures.

- Perception of reduced flushing performance of low volume toilets and reduced “force” from low flowrate showerheads and aerators.

- Tenants can easily and inexpensively remove/replace low-flow showerheads and aerators with higher flow rate models if they are not satisfied with the performance (it is unlikely that a tenant would replace a toilet or clothes washer).

- City may be subsidizing a measure that may eventually be completed even with no rebate due to declining availability of inefficient fixtures in the marketplace.

### 2.5 Local Feasibility

As part of their Royal Flush program, the City of Guelph currently offers $75 rebates to multi-residential customers replacing toilets flushing with 13-litre or more with WaterSense® certified models. Offering a free multi-residential water audit could instigate a mass fixture retrofit where property owners have otherwise shown no initiative and be a well-received compliment to the Royal Flush Rebate Program. The City may also wish to consider offering rebates to customers that replace 6-L toilet models with WaterSense® certified fixtures that flush with no more than 4.8 litres or with MaP Premium fixtures that flush with no more than 4.0 litres (note that MaP Premium fixtures are also WaterSense® certified). Note that the City may wish to offer a lower rebate level if the rebate is based on water savings.
The City may also wish to develop a marketing program – possibly directly marketing applicable property management companies or City-wide broadcast marketing - outlining the water and cost savings, as well as the high level of customer satisfaction associated with multi-residential fixture change-out programs.

3.0 KEY CONSIDERATIONS

In bulk-metered apartment buildings tenants don’t pay for the water they use and, therefore, they are less likely to be concerned with the efficiency of their plumbing fixtures or if their fixtures are leaking (unless the leak is noisy or otherwise disturbing). Property owners and managers are generally more inclined to replace old and inefficient plumbing fixtures if doing so is financially beneficial to them and the return on investment is relatively short. In bulk-metered buildings any City rebate would be sent directly to the property owner/manager.

In individually-metered apartment buildings tenants do pay for the water they use and the City’s rebate program would be similar to their single-family program, i.e., the rebate would be sent directly to the tenant replacing their toilet.

Condo buildings may or may not be individually metered. Some condos may allow tenants to make certain physical changes inside their unit without condo board approval and others may not. As such, programs developed for the condo market will need to be flexible to allow for various different scenarios.

Any rebate provided by the City to a multi-residential customer for the replacement of inefficient plumbing fixtures with high-efficiency models will reduce the upfront retrofit purchase and installation costs; the resulting water savings (from reduced flow rates, flush volumes, and leakage) will reduce the customers’ ongoing utility costs. Payback periods of less than two years are easily achievable for toilets and showerheads, payback periods for clothes washers are typically greater than 7 years. The installation of new fixtures may also increase tenant satisfaction and the value of the property.

Helping customers reduce their water demands is also a benefit to the City. Lower demands means lower energy and chemical costs for treatment and pumping, and potentially lower capital costs related to avoiding, downsizing, or deferring infrastructure expansion projects. Based on an equivalent cost of supply/treatment construction (water and wastewater) of $4.68 per litres per day of capacity, the value of the water savings achieved by mass fixture change-outs in multi-residential buildings can be significant, e.g., over $400 per toilet when 13-litre fixtures are replaced and approximately $100 per toilet when 6-litre fixtures are replaced. Note that these savings values do not include any reductions in demands because of reduced leakage. As such, the City may wish to consider offering rebates (albeit lower value rebates) for the replacement of older 6-litre toilet fixtures.

The replacement of inefficient (and potentially leaking) plumbing fixtures and appliances in multi-residential apartment buildings with new WaterSense® and/or Energy Star certified high-efficiency products has the potential to benefit the customer, the tenant, and the City.
4.0 REFERENCES


http://www.pge.com/includes/docs/pdfs/shared/saveenergymoney/rebates/clotheswasher_application.pdf


http://www.reddeer.ca/city-services/environment-and-conservation/your-home/toilet-rebate/

http://www.epa.gov/owow/nps/nps-conserve.html

http://www.watermatrix.com/blog/?p=748