

Region of Peel

Gravity Locks

Contamination Abatement Study for Front-End Recycling
Containers used at Multi Residential Building Sites

CIF Project 1021
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Prepared for:
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Introduction

In the Region of Peel (Region) and Municipalities across Ontario, contamination, meaning non-recoverable items in the recycling stream, is a growing concern. Contamination is more pronounced in the multi-residential (MR) sector than in single-family households as there is less accountability for occupants of apartments and condos to recycle properly. Contamination increases collection and processing costs and reduces the quality of recovered material being sold to end markets.



Figure 1 – Installed Gravity Lock – 53 Church St. Brampton

To address this issue, the Region secured partial funding from the Continuous Improvement Fund to run a pilot aimed at:

- Decreasing recycling contamination in the recycling program through a change in resident behavior (set out practices) at MR buildings, without chutes, that use Front End Loading (FEL) recycling containers using gravity locks. Gravity locks deter MR residents from placing large contaminants in FEL recycling containers. Bagged materials, both garbage bags and small grocery bags, make up a significant part of the contamination category in Peel Region's program. The goal was to encourage residents to use the openings on the front face of the container which were sized to receive only accepted materials, preventing residents from lifting lids and dropping in the bagged materials.
- Reducing the amount of litter left on the ground around FEL recycling containers to encourage superintendents to keep the containers locked. When residents could not open the lids, they would often drop the items on the ground beside the container, leaving them for superintendents to deal with. This often deterred superintendents from locking their FEL recycling containers.
- Decreasing recycling collection costs by reducing the amount of contamination tonnage incorrectly set out for collection as recycling and subsequently processed at Peel's Material Recovery Facility (MRF).

This project aimed to accomplish these goals through a pilot where a mechanical device called a gravity lock was installed on FEL recycling containers in a selected group of MR buildings that did not have chutes. To prevent bagged and large materials from being dropped into the recycling containers, the Region's Waste Collection By-Law requires that FEL recycling containers be locked at all times except on the scheduled collection day. In keeping the lids of the FEL recycling container locked, the desired outcome was that this would redirect the residents to place their recycling in the built-in slot on the face of the FEL. As the gravity locks unlock and re-lock automatically, it eliminates the need for building superintendents to unlock recycling containers on collection day and re-lock them immediately following collection. This in turn minimizes the chances of the superintendent leaving the bins unlocked to avoid missed collection and residents disposing of large items or bagged materials (main sources of contamination).

For this pilot, gravity locks were installed at 11 MR buildings with poor recycling quality and monitored over a period of 7 months. An education and enforcement component was also carried out. The education and enforcement work was complimentary to the gravity locks installation. Education materials were delivered by the by-law team to residents and on-site superintendents to ensure everyone was aware of the gravity locks installation and how to set out their materials correctly for collection. Data was gathered through a measuring and monitoring plan for the participating buildings. Due to a technical malfunction resulting from a suspected error with the installation process, the gravity locks were re-installed and further monitored on a subsection of 3 buildings.

The project approach, measuring and monitoring methodology, results and analysis are discussed in more detail in the sections below.

1. Background

The Region is located within the Greater Toronto Area (GTA) and is comprised of the municipalities of Brampton, Caledon and Mississauga, having a total population of 1.4 million people. The Region serves 338,000 single family households and 101,000 multi-residential units as further illustrated in table 1 below.



Figure 2 – Map of Region of Peel

Table 1: Number of Households in Region of Peel (2018)

Municipality	Population	Single Family Households	Multi Residential Units	Total Combined Households
Total	1,421,000	338,568	100,758	439,326

The Region is in the early stages of a 20-year strategic plan (2015-2035). The 20-year vision for the Region is "Community for Life". Community for Life is a place where everyone enjoys a sense of belonging and has access to the services and opportunities they need to thrive throughout each stage of their lives. Community for Life came from citizen feedback and reflects their priorities and hopes for life in Peel. Part of the Strategic Plan's Term of Council Priorities is ensuring waste collection is reliable and managed in a safe and environmentally responsible manner. The Region is focusing on increasing the waste diversion rate to reduce the negative impacts on our environment.

1.1 Waste Management System

The Region provides waste collection services to 338,000 residential households, 740 MR buildings and 2000 Industrial, Commercial & Institutional (IC&I) locations. Please refer to the tables 2 and 3 below for a detailed breakdown of the various collection and processing services provided to residents.

Table 2: Waste Management Curbside System Overview for Region of Peel (2018)

Single Family Service	Service Description	Collection Provider	Processing Provider
Garbage	Bi-weekly cart collection	Emterra & Waste Connections of Canada	Waste Management of Canada Corporation (Warwick Landfill), Emerald Energy From Waste Inc.
Recycling	Single Stream Bi-weekly cart collection	Emterra & Waste Connections of Canada	Canada Fibers
Organics Collection	Weekly cart-based collection	Emterra & Waste Connections of Canada	Region of Peel, Cornerstone Renewables and Alltreat Farms
Yard Waste Collection	Seasonal wkly Service (Spring/Summer/Fall)	Emterra & Waste Connections of Canada	Region of Peel, Alltreat Farms
Bulky Item Collection	Bi-weekly collection	Emterra & Waste Connections of Canada	Waste Management of Canada Corporation (Warwick Landfill), Emerald Energy from Waste Inc.

Table 3: Waste Management Curbside System Overview for Region of Peel (2018)

Multi-Residential Service	Service Description	Collection Provider	Processing Provider
Front-End Garbage	Twice per week	Miller Waste Systems	Waste Management of Canada Corporation (Warwick Landfill), Emerald Energy from Waste Inc.
Front-End Recycling	Once per week	Miller Waste Systems	Canada Fibers
Cart Garbage	Once per week	Miller Waste Systems	Region of Peel, Cornerstone Renewables and Alltreat Farms
Cart Recycling	Once per week	Miller Waste Systems	Region of Peel, Alltreat
Bulky Items	Once per week	Miller Waste Systems	Waste Management of Canada Corporation (Warwick Landfill), Emerald Energy from Waste Inc.

1.2 Current Waste Management Performance

The Region strives to provide service for waste that is collected on time and managed in a safe and environmentally responsible manner.

In 2018, the Region responsibly managed 511,996 tonnes of waste and diverted 248,697 tonnes, with a 48.6% diversion rate. The performance information is summarized in table 4 below.

Table 4: Waste Management System Overview for Region of Peel (2018)

	Units	Blue Box Recycling		Total Waste Diversion		Disposal		Generation (Total)	
		rate	% of total	rate	% of total	rate	% of total	rate	%
GAP Reported	tonnes	82,092	16.0%	248,697	48.6%	263,299	51.4%	511,996	100%
	Kg/hhld	187 kg/hhld	58 kg/cap	566 kg/hhld	175 kg/cap	599 kg/hhld	185 kg/cap	1,165 kg/hhld	100%

1.3 Program Challenges

Contamination in the recyclables is one of the biggest challenges for the Region's Blue Box program. Currently the average contamination rate for the multi-residential FEL recycling program is 33%, with many poor performing buildings reaching as high as 50%. This is significantly higher than 10 years ago.

Staff noticed an increase to the level of contamination after the changeover to a single stream recycling program in 2006. Prior to this the Region had a dual stream service where residents were required to source separate paper and fiber from plastic and glass containers. The introduction of new, and the evolution existing consumer packaging over the past few decades may have caused confusion among residents leading them to think certain types of non-recyclable packing are recyclable which may also increase contamination.



Figure 3 – Contamination in an FEL Recycling Container

Another cause of contamination, specifically in the Region's MR sector, was the implementation of an FEL recycling collection program in 2009. Since the introduction of the FEL containers for recycling, approximately 480 residential apartments/townhouses and 226 IC&I locations have transitioned away from cart-based recycling systems. The benefits of using FEL containers for recycling include reduced collection costs as one 6 cubic yard front-end container is equivalent to 12 plastic 95-gallon carts and can be collected in less than 1 minute. It also increases convenience for both residents and building staff making participation in the recycling program easier.

A drawback however is that the front-end recycling containers are more susceptible to increased levels of contamination when left unlocked due to greater accessibility to residents to dispose of unacceptable oversized items such as black garbage bags, construction material and bulky items to name a few. As shown in the image to the right, FEL recycling containers have a built-in slot located on the front of the container which is intended for the disposal of recyclable items. Many properties however leave the top lids of the container



Figure 4 – Region of Peel FEL Recycling Container

unlocked which makes them accessible for large non-recyclable items

In the Region of Peel, the average contamination level for recycling generated in FEL containers is 33%, compared to multi-residential cart-based recycling which is 27%. The added weight of this contaminated material increases costs for the collection of recycling material and makes recovering and marketing quality material more difficult.

Despite efforts over the years to promote and educate residents on proper recycling habits through lobby displays, distribution of reusable recycling bags to every multi-dwelling unit and signage, recycling contamination has not significantly decreased.

Gravity locks, supplied through a company called SERIO-US LOCK, prevent the top lids of the FEL recycling container from being opened by residents, leaving the built-in slot opening as the only access point. With gravity locks the building superintendent is not required to lock and unlock the mechanism as it will automatically unlatch when the container is tipped during the collection process and re-latch once the container is returned to the ground. The gravity lock can be unlocked by superintendents to gain access to the container through the top lids of the container, when needed, by using a padlock and key. For photos of the gravity locks please see **appendix 1** attached to this report.

Gravity locks help reduce contamination from illegal dumping and make it more convenient for superintendents to comply with the Region of Peel's Waste Collection By-Law, which requires front-end recycling containers to be locked.

3. Approach

3.1 Set Up and Implementation

For this project, 11 multi-residential buildings having a total of 17 FEL recycling containers were selected to test the impact of gravity locks on reducing recycling contamination. *Please refer to appendix 2 for a list of buildings.*

The setup, implementation, measuring and monitoring approached is summarized in Table 5 below.

Table 5: Gravity Lock Pilot Implementation

Item	Time Line	Description
Select Buildings	2 Weeks	<ul style="list-style-type: none">• Eligible buildings were selecting by filtering an internal database to determine buildings that did not have chutes and that were on FEL recycling collection (i.e. FEL recycling containers that are stored outdoors or within a recycling room).• Buildings were selected that were on the same collection routes, so they were grouped together so that no additional cost was incurred form the collection contractor for audits.• Buildings were selected where historical material composition audit data was already available from previous education campaigns to use as a baseline for recycling contamination rate.

Building Inspections	1 Week	<ul style="list-style-type: none"> • Ensure FEL recycling containers are in good working order. • High contamination in the recycling was confirmed through visual inspections prior to the gravity locks being installed. Refer to <i>appendix 3</i> for a visual inspection form.
Develop and Distribute Education Material & Surveys	1 month	<ul style="list-style-type: none"> • Draft letter to property managers and superintendents to inform them of the study. • Develop survey and distributed prior to the gravity locks being installed to gain insight on residents recycling habits. (refer to <i>appendix 4</i> for a copy of the survey questions and <i>appendix 5</i> for the results). • Develop door hangers to engage and educate residents on the new gravity locks and encourage them not to leave items on the ground once the top lids are locked. • Posters were also developed and distributed promoting recyclable items to be disposed of loose and not in tired plastic bags. Refer to <i>appendix 6</i> to view the education material.
One-On-One with Supers	1 week	<ul style="list-style-type: none"> • Prior to the gravity lock installation, staff meet with superintendents individually for 30 minutes to an hour to explain the new gravity locks to ensure they understood how to use them.
Pre – Material Composition Audit	1 week	<ul style="list-style-type: none"> • Conduct a material composition audit to obtain the baseline contamination rate. Sort a 100-200 KG sample from the collection vehicle. Conduct one audit minimum; two-three audits are ideal to obtain an average baseline contamination rate.
Gravity Lock Installation	3 weeks	<ul style="list-style-type: none"> • The gravity locks were purchased and installed through the Regions FEL recycling container supplier, Metro Compactor. The gravity locks are manufactured by a company called Serious Lock. Refer to <i>appendix 7</i> for installation instructions.
Monitoring	1 month	<ul style="list-style-type: none"> • Monitored locations weekly through visual inspections to ensure the locks are working correctly. • Observed the collection process to ensure the locks were disengaging and reengaging properly and that the superintendents were properly using them. The recycling material was also inspected, and any visual contamination was documented. Refer to <i>appendix 8</i> for a copy of the post inspection form.
1 Month Post Material Composition Audit	1 week	<ul style="list-style-type: none"> • After the gravity locks had been installed and operating for a few weeks, the recycling material was collected in a dedicated load and taken to the Region's MRF for auditing to determine the contamination rate.
Continued monitoring	3 months	<ul style="list-style-type: none"> • Periodic monitoring occurred for 3 months following the installations (once per month).
Post audits	1 week	<ul style="list-style-type: none"> • Another post audit was conducted 3 months after the gravity locks had been installed to test if the results were sustained over time. Another audit will be conducted after a 1-year period, again to ensure sustained results. • Note: for this project, the goal was a 5-year payback period. Achieving this is contingent on maintaining a reduced level of contamination for a 5-year period.
Total Time	7.5 Months	

3.2 Monitoring and Measurement Methodology

As summarized in the table above, the monitoring and measurement methodology for this pilot included conducting pre and post recycling material composition audits and visual inspections. The Region is fortunate to have an internal audit team to conduct these audits on top of their regular duties. The monitoring plan also included visual inspections of the FEL recycling containers throughout the pilot to assess the quality of the contents of the material and determine if any repairs were required. After the gravity locks were installed visual inspections continued to be conducted to monitor condition of the locks and that the locks were working properly during the tipping cycle. Refer to *appendix 3* and *appendix 8* for the pre and post inspection forms.

4. Project Results and Analysis

4.1 Monitoring and Measurement Methodology

The table below shows the gravity lock pre and post audit results as displayed in weights and percentage of non-recyclable material (contamination). Please refer to *appendix 9*, for a detailed breakdown of the pre and post material composition audits.

Table 6: Gravity Lock Recycling Audit Results

Material	Fiber Material		Container Material		Contamination	
	Weight	%	Weight	%	Weight	%
Pre-Audit – Jan, 2018	86.16 KG	44.17%	41.12 KG	21.08%	67.80 KG	34.75%
Post Audit 1, May 2018	55.90 KG	44.45%	31.18 KG	24.97%	38.68 KG	30.76%
Post Audit 2, Dec 2018	51.39 KG	47.15%	25.98 KG	23.84%	31.60 KG	29.00%

3.99% decrease from pre audit

5.75% decrease from pre audit

Quantitative Results:

- As shown in the table above, based on the first post material composition audit results, the overall contamination in recycling dropped from 34.75% to 30.76%, and further dropped to 29.00 % based on a second post audit.
- A second post audit was conducted in December 2018 on 3 out of the 11 pilot locations which had new gravity locks installed to correct an issue with the original installation.
- The total reduction in contamination was 5.75 percentage points (34.75% to 29.00%) which represents a 16.54% decrease.
- The gravity locks were effective at eliminating the black garbage bags from the recycling stream. Black garbage bags represented 15.30 KG's of the original 195.08 KG audit sample (7.84%) and 0.92KG's of the 125.76 KG post audit sample (0.73%).

Qualitative Results:

- Based on the visual inspection completed after the installation, the recycling material appeared less contaminated. Initial site inspections within the first few weeks indicated that the

superintendents were engaged with using the gravity locks. Upon visual inspection, 71% of the FEL recycling containers were not lock prior to the installation of gravity locks which reduced to 12% after the gravity locks were installed. Staff also confirmed that the locks were re-engaging after collection. Please see *Appendix: 3 & 8* for the pre and post inspection forms

- By-law enforcement staff assisted when necessary. When there were a few buildings where items were being left on the ground, by-law staff issued a notice to residents to help address this issue.

4.2 Analysis of Results

Based on the quantitative data above, the pilot resulted in a contamination decrease up to 16.54% in the FEL recycling stream. If these results were to be replicated into a full-scale program, the Region of Peel would realize a reduction of 384.07 tonnes in recycling contamination annually resulting in a collection cost savings of \$18,880.95. The projected full-scale implementation cost is \$296,951.00; therefore, the payback period would take approximately 16 years based on collection cost savings alone. The pilot and full-scale costs are outlined in further detail in section 5, Project Budget below. The business case which demonstrates the recycling contamination cost reduction calculation can be seen in *appendix 10* attached.

5. Project Budget

The pilot & full-scale Implementation Costs as shown in the tables below:

Table 7: Gravity Lock– Pilot and Full-Scale Implementation Costs

Equipment & Installation Cost	Units	Unit Cost	Tax	Total Cost for Pilot	Units	Unit Cost	ESTIMATED FULL SCALE
Gravity Lock	17	\$85.00	\$11.05	\$1,632.85	1006	\$85.00	<u>\$85,510.00</u>
Installation	17	\$145	\$18.85	\$2,785.45	1006	\$145.00	<u>\$145,870.00</u>
Container Maintenance	N/A	\$1,468.50	190.91	\$1,659.41		N/A	<u>N/A</u>
Pad Lock	17	\$4.50	0.59	\$86.45	1006	\$4.50	<u>\$4,527.00</u>
Total				\$6,164.16			<u>\$235,907.00</u>

Promotion & Education Costs	Units	Unit Cost	Total Cost for Pilot	Units	ESTIMATED FULL SCALE
Door Hangers	1500	\$ 0.36	\$546.69	59,000	\$21,240
Multi-Res Bags	965	\$ 1.08	\$1,046.83	N/A	N/A
Survey's	1500	\$ 0.17	\$254.25	N/A	N/A
Let Them Lose Posters	100	\$ 0.56	\$56.47	N/A	N/A
Set them Free Posters	100	\$ 0.56	\$56.47	N/A	N/A
Chute Room Posters	100	\$ 1.58	\$157.64	3,800	\$6,004
Total			\$2,118.35		\$27,244

Staff Cost & Vehicle	Units	Unit Cost	Total Cost for Pilot	Units	ESTIMATED FULL SCALE
Rollout	2 staff, 2 week rollout @ 35 hrs/wk	\$30/hour	\$4,200	730 hours	\$21,900
Measuring and Monitoring	1 staff, 4 weeks @ 10 hrs/wk (40 hours)	\$30/hour	\$1,200	180 hours	\$5,400
1 part time vehicle + fuel	45 days	\$50 per day	\$2,250.00	130 days	\$6,500
Total			\$7,650		\$33,800

Audit Costs	Units	Unit Cost	Total Cost for Pilot	ESTIMATED FULL SCALE
Per and Post Audits	4 staff x 3 audits (24 hrs)	\$30/hour	\$720.00	N/A

Total Pilot Costs	\$16,652.51
Total Full-Scale Costs	\$296,951.00

6. Lessons Learned

- Promotion and education were a key component in the success of this pilot. The engagement of residents and superintendents prior to the rollout worked well to obtain buy in. This also helped residents and superintendents understand the changes that were being implemented so material was not left on the ground around the recycling containers and that superintendents were properly using the locks. These were problems that the Region of Peel faced with an earlier trial of gravity locks.
- Ensure the company installing the gravity locks has prior experience installing them. During this pilot it was discovered that the gravity locks installed incorrectly. As a result did not work as intended beyond the first few weeks of implementation. This impacted the monitoring and measurement. Additional research to ensure the contractor fully understands how to install the gravity locks for optimum functionality would help to reduce the chance of this happening.
- Gravity locks did not eliminate the need for education and enforcement, as some buildings needed reminders to use their gravity locks. Gravity locks do reduce the number of staff hours needed as the number of non-compliance issues with buildings not locking their recycling containers should drop as superintendents become familiar with the gravity locks and how it makes their work easier. Superintendents were able to access to disengage the gravity locks via a padlock and key in order to gain access to the containers if they need to and therefore may forget to reengage the gravity locks. Locking the FEL recycling containers is part of the Region's Waste Collection By-Law #35-2015. Regular By-Law Enforcement is encouraged to ensure that proper procedures are being followed.

- The gravity locks may need maintenance and repairs over time. Many of these containers are stored outdoors and are exposed to the elements. The full burden of the repair costs is not yet known.
- Gravity lock installation costs on a brand-new FEL recycling container is lower than retrofitting an existing container. This is due to additional labor required for the vendor to travel to the site to install the gravity lock on an existing container. Municipalities who have in-house staff that can install these locks may also be able to reduce this aspect of the cost. Initial estimates show that purchasing the gravity locks directly from the supplier and using in-house staff to perform the installation could reduce the total install cost by 60% over using a 3rd party vendor (\$230 to \$90 per lock).
- Gravity locks did not make enough of an impact on the Region's recycling program to yield a savings in processing costs. The majority of the recycling processed at the Region of Peel's Materials Recycling Facility is from the 338,000 residential homes and this project would not significantly reduce overall contamination of the total incoming recycling material enough to lower the processing costs. There would also be no change to disposal costs either as recycling contamination is disposed of as residue at the same price as if it were collected correctly as garbage.

7. Conclusions

A summary of the key findings in this report are outlined below:

- The gravity lock pilot did successfully reduce the level of contamination generated in FEL recycling containers over a sustained period of time (7 months) in MR buildings without chutes.
- Black garbage bags were nearly eliminated decreasing from 7.84% of the audit sample in the pre-audit to 0.73% of the audit sample in the post audit.
- As shown in the audit data, the gravity locks were not successful at reducing smaller contaminants such as small grocery bags, textiles and scrap metal. These items are still easily fitted into the opening on the front of the FEL recycling container.
- The education and enforcement component of this study was successful in reducing the amount of litter left on the ground. This increased superintendent participation in locking their FEL recycling containers. Staff conducting site visits received less complaints from superintendents regarding litter being left in the ground.
- The business case for full scale implementation was not favorable.
- The average level of contamination generated at MR buildings with FEL recycling containers without chutes was calculated to be 31.39% (2,335 tonnes). Based on the pilot findings, it would be expected that an overall contamination reduction of 16.5% (384 tonnes) could be achieved if the locks were installed at all sites. In this case, the payback period if this program were to be

implemented full scale using a 3rd part vendor to install the locks would be 16 years. This does not take into account anticipated maintenance and replacement costs which is expected to increase the payback period.

7.1 Recommendations

In terms of performance, the gravity locks achieved the desired results: they led to a reduction in the level of contamination at MR building sites without chutes that use FEL recycling containers. However, the payback on a full-scale program was not favorable.

As standard locks, a regular pad lock and key, are the mechanism currently in place for FEL recycling containers, the Region relies on superintendents to unlock them on collection day and relock them after collection. Staff recommend that where standard locks are not a viable option – as superintendents cannot be relied upon to keep the recycling containers locked between collections, that gravity locks be considered as an alternative.

The Region of Peel will consider integrating gravity locks to target problematic locations with high contamination rates as part of their enforcement programs.

Appendix 1: Gravity Lock Illustrations



Appendix 2: Gravity Lock Pilot Locations:

TYPE	Civic Number	Street Name	Street Type		City	UNITS	BINS	
APT	186	CHURCH	ST	E	BRAMPTON	84	1	6YD
						-	1	4YD
APT	182	CHURCH	ST	E	BRAMPTON	93	2	4YD
APT	171	CHURCH	ST	E	BRAMPTON	61	1	4YD
APT	161	CHURCH	ST	E	BRAMPTON	61	1	4YD
APT	11	CHURCH	ST	W	BRAMPTON	120	2	4YD
APT	53	CHURCH	ST	E	BRAMPTON	73	2	4YD
PEEL LIVING	22	BEECH	ST		BRAMPTON	122	1	4YD
APT	33	KENNEDY	RD	S	BRAMPTON	118	2	4YD
APT	80	ORENDA	CREST		BRAMPTON	143	2	4YD
APT	535	MAIN	ST	N	BRAMPTON	18	1	6YD
APT	10250	KENNEDY	RD	N	BRAMPTON	72	1	4YD

TOTAL 965 17

Appendix 3: Gravity Lock Pilot Pre-Inspection Form

Pre-Gravity Lock Installation Inspections: Route 4973

Date: April 3, 2018

Completed By: Nathan Schaefer

Site Address	Container Locked	Lid Repair Required	Bin Fullness	Contamination Level	Additional Comments	Repairs
80 Brenda Crt. Brampton						
RP0603	No	No	50%	High	2 black bags, cardboard not broken down	n/a
RP1000	No	No	75%	High	3 large boxes not broken down	n/a
33 Kennedy Rd. S						
RP0376	No	No	100%	High	several tied grocery bags, paint can, cardboard not broken down	n/a
RP0410	No	No	100%	High	2 black bags, tied grocery bag, cardboard not broken down	n/a
186 Church St. E						
R1	No	No	100%	Moderate	2 black bag, cardboard not broken down	n/a
R2	No	No	100%	Moderate	black bag, tied grocery bag, unbroken cardboard	n/a
182 Church St. E						
RP0486	Yes	No	50%	Low	2 tied grocery bags	n/a
RP0507	Yes	No	25%	Low	clean	n/a
171 Church St. E						
RP0879	No	Yes	100%	Moderate	2 black bags, toaster, grocery bags	1x rod hinge, 2x lid, filler plate?
161 Church St. E						
RP0898	Yes	Yes	75%	Moderate	black bag, tied grocery bag, unbroken cardboard	1x rod hinge, 1x right lid, slot cables, slot pin
22 Beech St.						
RP0086	No	Yes	25%	Moderate	black bag, tied grocery bags, unbroken cardboard	1x rod hinge, 1x right lid, 1x slot cable, filler plate?
53 Church St. E						
RP0897	Yes	Yes	75%	Low	clean	2x lid
RP0919	Yes	Yes	75%	Low	plastic hangers	2x lid
11 Church St. W						
RP0831	No	Yes	100%	Low	cardboard not broken down	1x rod hinge, 1x right lid, (missing v-bracket)
RP0832	No	No	50%	Low	cardboard not broken down	n/a
535 Main St. N						
RP1230	No	Yes	25%	Low	cardboard not broken down, plastic pole	1x rod hinge, 2x lid
10250 Kennedy Rd. N						
RP0858	No	Yes	25%	Low	clean	1x rod hinge, 2x lid

Total Bins Set Out	17
Total Locked	5
Total Not Locked	12
% Not Locked	71%

Appendix 4: Gravity Lock Pilot Survey Questions



Apartment Recycling Survey: Due by April 24th in Lobby Drop Box

Building Address: _____

Date: _____

Apartment Recycling Survey	Strongly Disagree	Disagree	Agree	Strongly Agree	Don't Know
I regularly participate in this building's recycling program.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How do you transport your recyclables from your unit to the bins outside?					
I carry them down in a reusable bag I use over and over again				<input type="checkbox"/>	
Other, please describe: _____				<input type="checkbox"/>	
	Strongly Disagree	Disagree	Agree	Strongly Agree	Don't Know
The slot on the front of the recycling bin adequately fits all of my recyclables.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
When I don't know whether or not something is recyclable, I: (Please check off all that apply)					
Search to see if it is an acceptable item (Please list the reference materials you use) _____				<input type="checkbox"/>	
Just recycle the item(s), and let the recycling facility sort it out				<input type="checkbox"/>	
Throw the item(s) out as garbage				<input type="checkbox"/>	
	Yes	No	Don't Know		
Did you know that recycling items that don't belong in the program drive up the cost of the service for tax payers? Even if something is recyclable does not mean the Region is equipped to manage it.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Did you know that depositing your recyclables in the recycling bins in small tied off grocery bags also drive up the cost of the service for tax payers?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
The Region works hard to get you the recycling information you need. What's the best way to reach you?					
Through the Region's website				<input type="checkbox"/>	
Posters and flyers distributed in the building				<input type="checkbox"/>	
Other - Please fill in the blank: _____				<input type="checkbox"/>	
If you could change one thing to make your recyclable program better, what would it be?					

IMPORTANT: Please drop off your completed survey to the DROP BOX located in the LOBBY no later than April 24th, 2018

Public Works
7795 Torbram Rd., Brampton, ON L6T 0B6
Tel: 905 791-7800 Ext. 7964 www.peelregion.ca

Appendix: 5 Gravity Lock Pilot Survey Results

Gravity Lock Survey Results					
	Strongly Disagree	Disagree	Agree	Strongly Agree	Don't Know
I regularly participate in this building's recycling program	4%	1%	33%	60%	2%
	Reusable Bag	Other			
How do you transport your recyclables from your unit to the bins	77%	23%			
	Strongly Disagree	Disagree	Agree	Strongly Agree	Don't Know
The slot on the front of the drop off recycling bin adequately fits all my recyclables	8%	23%	41%	25%	3%
	Search for the Answers	Just Recycle The Items	Throw Items Out as Garbage		
When I don't know whether something is recyclable, I:	52%	18%	30%		
	Yes	No	Don't Know		
Did you know that recycling items that don't belong in the program drive up the cost of the service for taxpayers?	58%	20%	22%		
Did you know that depositing your recyclables in the recycling bins in tied off grocery bags also drives up the cost of the service?	66%	18%	16%		
	Posters and Flyers	Web Site	Other		
What's the best way to reach you?	80%	18%	2%		

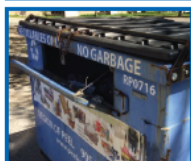
Appendix 6: Gravity Lock Pilot Education Material

One Small Change One **BIG** Difference

We've made your recycling bin safer.
Introducing the NEW gravity lock.

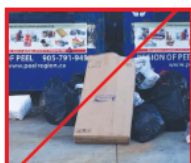


The gravity lock
keeps the top lid
in place.



Put your recyclables in the
front slot. Remember:

- dump them loose
into the bin
- don't tie them in
shopping bags



Always place garbage
and recycling items in
their proper containers.
Don't place these items
on the ground.

peelregion.ca/waste

**Region
of Peel**
working with you

Recycle Right!

Remember: **DO NOT**
recycle these items



• Garbage



• Wood



• Food Waste



• Unwanted
furniture



• Pots, pans
and dishes



• Items tied in plastic
shopping bags



• Empty
propane tanks



• Clothing,
blankets,
towels, etc.



• Large plastic
children's toys

WMG 07/01/18/23

peelregion.ca/waste

**Region
of Peel**
working with you

Let them **Loose!**

Don't put
your recycling
in plastic
shopping bags.

Your commitment to
recycling is making a big
difference. Thanks to you,
we've redirected 50% of
waste from landfill. Keep up
the good work.

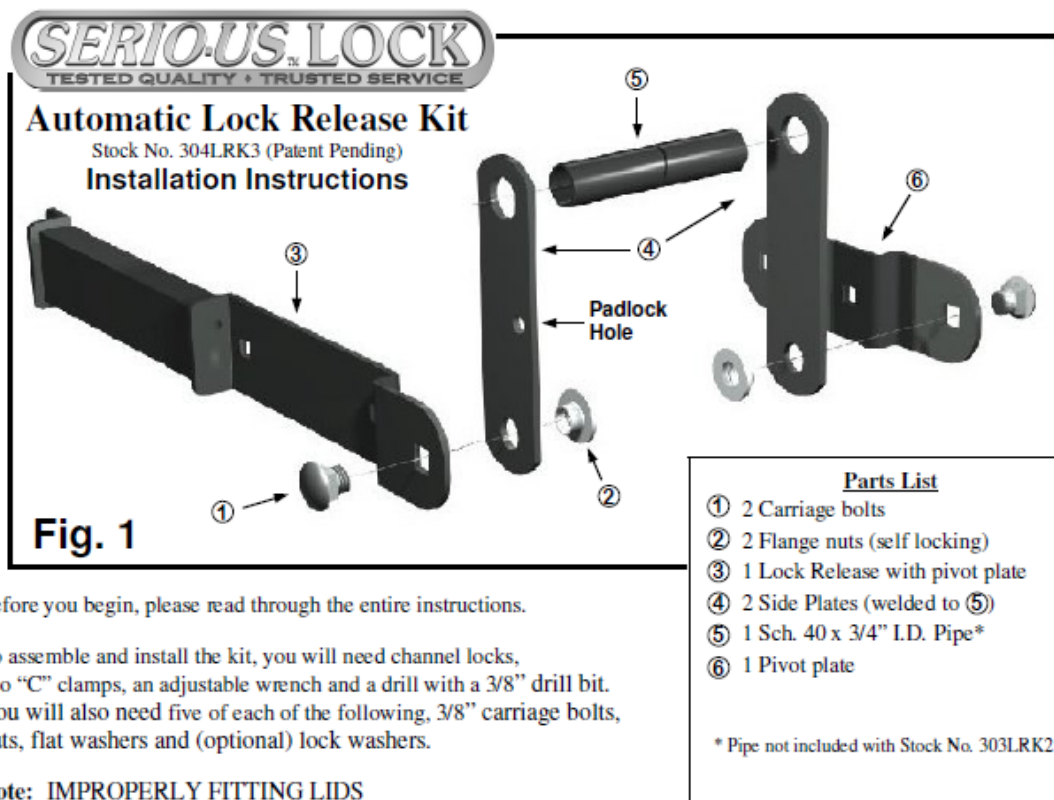
Avoid this common recycling
mistake. Your recyclables end
up in landfill if you tie them
in plastic shopping bags.

Learn more...
peelregion.ca/waste



**Region
of Peel**
working with you

Appendix 7: Gravity Lock Installation Instructions



Before you begin, please read through the entire instructions.

To assemble and install the kit, you will need channel locks, two "C" clamps, an adjustable wrench and a drill with a 3/8" drill bit. You will also need five of each of the following, 3/8" carriage bolts, nuts, flat washers and (optional) lock washers.

Note: IMPROPERLY FITTING LIDS

Lids that hang over or have handles that hang over the front of the container may cause complications during mounting and/or operation of the Automatic Lock Release Kit. Please call us to discuss possible solutions to the problem.

Step 1: Assemble kit as shown in figure 1. Making sure that the padlock hole is toward the front of the container. Use channel locks to tighten flange nuts.

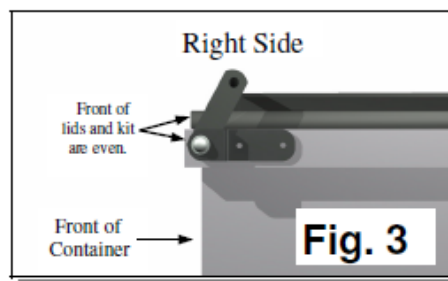
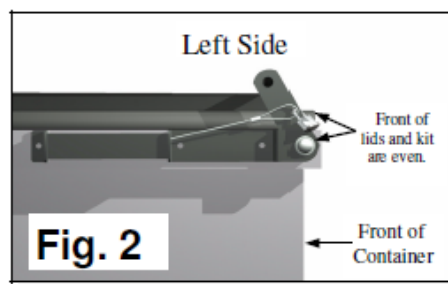
Step 2: Position Lock Release on left side of container, flush with the top of the channel and even with the front of the lids as shown in figure 2. Clamp in place.

Step 3: Position pivot plate on right side of container, flush with the top of the channel and even with the front of the lids as shown in figure 3. Clamp in place.

Step 4: Drill holes and bolt on with carriage bolts.

If you have any questions, please call
1-800-245-6251

Serio-us Industries, Inc., 58 Alco Place, Baltimore, MD. 21227
INS304P



Appendix 8: Gravity Lock Pilot Post-Inspection Form

Date: 05/17/18

Completed By: Anthony & Sara

Site Address	Container Locked Pre-Collection	Gravity Lock Re-engaged After Collection	Bin Fullness	Contamination Level	Additional Comments
80 Orenda Crt. Brampton					
RP0603	Yes	Yes	100%	Low	A garbage bag found on top of and in RP1000
RP1000	Yes	Yes	100%	Moderate	
33 Kennedy Rd. S					
RP0376	No	Yes	25%	High	Contamination in the form of toys, a tennis racket, a purse and textiles found in the bins. Super acknowledged that his Assistant most likely left the lids open not being familiar with the new lock. He assured he would talk with him and review the use of the lock. He also stated that building staff have noticed an increase in waste on the ground near the bins since the lock installation. See Hansen for addt. comments
RP0410	No	Yes	75%	High	
186 Church St. E					
R1	Yes	Yes	25%	Low	See Hansen for e-mail correspondence on-site meeting. It was agreed upon that By-Law would draft and deliver a letter outlining to residents that they are not to place waste on the ground
R2	Yes	Yes	100%	Low	
182 Church St. E					
RP0486	Yes	Yes	75%	Low	See Hansen for e-mail correspondence on-site meeting. It was agreed upon that By-Law would draft and deliver a letter outlining to residents that they are not to place waste on the ground
RP0507	Yes	Yes	100%	Low	
171 Church St. E					
RP0879	Yes	Yes	100%	Moderate	The Super did acknowledge that he was having to more frequently tend to the bin and push the material to the back of the bin. Residents are leaving more material on the lip of the slot or at the front of the bin instead of pushing it to the back
161 Church St. E					
RP0898	Yes	Yes	75%	Low	N/A
22 Beech St.					
RP0086	Yes	Yes	50%	Moderate	See Hansen for e-mail correspondence on-site meeting. It was agreed upon that By-Law would draft and deliver a letter outlining to residents that they are not to place waste on the ground
53 Church St. E					
RP0897	Yes	Yes	100%	Moderate	Some plastic bags full for recycling found in the bins. The Super did acknowledge once more that the truck had some difficulty during collection as the lock did not disengage right away. The possibility of meeting on-site with the truck during collection will be discussed
RP0919	Yes	Yes	75%	Low	
11 Church St. W					
RP0831	Yes	Yes	100%	Low	N/A
RP0832	Yes	Yes	75%	Low	
535 Main St. N					
RP1230	Yes	Yes	50%	Low	The Super required a second lock as the other lock he had was collected by the truck during collection. He forgot the lock on top of the bin while heading back into the building to collect a few clear bags of recycling.
10250 Kennedy Rd. N					
RP0858	Yes	Yes	75%	Low	N/A

Total Bins Set Out	17
Total Locked	15
Total Not Locked	2
% Not Locked	12%

Appendix 9 Material Composition Pre and Post Audits:

PRE AUDIT INBOUND AUDIT OVERVIEW(JAN 18 2018)		
MATERIAL	Kg	%
TOTAL FIBRE MATERIAL	86.16	44.17%
TOTAL CONTAINER MATERIAL	41.12	21.08%
TOTAL NON-ACCEPTABLE MATERIAL	67.80	34.75%
DOUBLE CHECK	195.08	100.00%

INBOUND COMPOSITION - DETAILED		
MATERIAL	KG	%
BLUE BOX MATERIAL in GROCERY BAGS	4.38	2.25%
BLUE BOX MATERIAL with CONTENTS	2.02	1.04%
FIBRE with PLASTIC OVERWRAP	0.80	0.41%
FUSED BLUE BOX MATERIAL	0.10	0.05%
INCORRECT BLUE BOX MATERIAL SET-OUT	7.30	3.74%
ORGANICS	7.46	3.82%
HARD PLASTICS	7.54	3.87%
SCRAP METAL	0.22	0.11%
TEXTILES	2.48	1.27%
MOTOR OIL CONTAINERS	0.00	0.00%
CONSTRUCTION MATERIAL	0.22	0.11%
ELECTRONIC MATERIAL	0.14	0.07%
HHW	0.46	0.24%
CRC MATERIAL	11.06	5.67%
HOT TAKE OUT CUPS	0.46	0.24%
OTHER POLYCOATS	0.16	0.08%
COMPOSITE PACKAGING	0.72	0.37%
WRAPPERS	0.86	0.44%
LESS THAN 50ML CONTAINERS	0.00	0.00%
LESS THAN 4 x 6 FIBRE	1.34	0.69%
UNACCEPTABLE MATERIAL	3.54	1.81%
INCONTINENCE and SANITARY PRODUCTS	0.56	0.29%
HOME OFFICE SUPPLIES	1.82	0.93%
OTHER PLASTICS (CAPS, BROKEN PLASTIC)	0.82	0.42%
DEBRIS and GLASS FINES	19.94	10.22%
BAGGED GARBAGE	15.30	7.84%
GARBAGE	38.44	19.70%
TOTAL NON-RECYCLABLE	67.80	34.75%

GRAVITY LOCK INBOUND AUDIT OVERVIEW(MAY 31)		
MATERIAL	Kg	%
TOTAL FIBRE MATERIAL	55.90	44.45%
TOTAL CONTAINER MATERIAL	31.18	24.79%
TOTAL NON-ACCEPTABLE MATERIAL	38.68	30.76%
DOUBLE CHECK	125.76	100.00%

INBOUND COMPOSITION - DETAILED		
MATERIAL	KG	%
BLUE BOX MATERIAL in GROCERY BAGS	6.08	4.83%
BLUE BOX MATERIAL with CONTENTS	2.90	2.31%
FIBRE with PLASTIC OVERWRAP	0.94	0.75%
FUSED BLUE BOX MATERIAL	0.00	0.00%
INCORRECT BLUE BOX MATERIAL SET-OUT	9.92	7.89%
ORGANICS	1.54	1.22%
HARD PLASTICS	0.92	0.73%
SCRAP METAL	3.46	2.75%
TEXTILES	7.98	6.35%
MOTOR OIL CONTAINERS	0.00	0.00%
CONSTRUCTION MATERIAL	2.66	2.12%
ELECTRONIC MATERIAL	0.00	0.00%
HHW	0.84	0.67%
CRC MATERIAL	15.86	12.61%
HOT TAKE OUT CUPS	0.16	0.13%
OTHER POLYCOATS	0.34	0.27%
COMPOSITE PACKAGING	0.90	0.72%
WRAPPERS	0.54	0.43%
LESS THAN 50ML CONTAINERS	0.00	0.00%
LESS THAN 4 x 6 FIBRE	0.98	0.78%
UNACCEPTABLE MATERIAL	2.92	2.32%
INCONTINENCE and SANITARY PRODUCTS	0.10	0.08%
HOME OFFICE SUPPLIES	0.00	0.00%
OTHER PLASTICS (CAPS, BROKEN PLASTIC)	0.60	0.48%
DEBRIS and GLASS FINES	6.82	5.42%
BAGGED GARBAGE	0.92	0.73%
GARBAGE	8.44	6.71%
TOTAL NON-RECYCLABLE	38.68	30.76%

Appendix 9 Continued

GRAVITY LOCK INBOUND AUDIT OVERVIEW (Dec 13)		
TOTAL FIBRE MATERIAL	51.38	47.15%
TOTAL CONTAINER MATERIAL	25.98	23.84%
TOTAL NON-ACCEPTABLE MATERIAL	31.60	29.00%
DOUBLE CHECK	108.96	100.00%
INBOUND COMPOSITION		
MATERIAL	KG	%
BLUE BOX MATERIAL in GROCERY BAGS	0.32	0.29%
BLUE BOX MATERIAL with CONTENTS	5	4.59%
FIBRE with PLASTIC OVERWRAP	2.5	2.29%
FUSED BLUE BOX MATERIAL		
INCORRECT BLUE BOX MATERIAL SET-OUT	7.82	7.18%
GREEN BIN MATERIAL	1.98	1.82%
HARD PLASTICS	1.72	1.58%
SCRAP METAL	0	
TEXTILES	0.18	0.17%
MOTOR OIL CONTAINERS	0	
CONSTRUCTION MATERIAL	0	
ELECTRONIC MATERIAL	0	
HHW	0	
CRC MATERIAL	1.90	1.74%
HOT TAKE OUT CUPS	0.34	0.31%
OTHER POLYCOATS	0.26	0.24%
COMPOSITE PACKAGING	0.16	0.15%
WRAPPERS	0.42	0.39%
LESS THAN 50ML CONTAINERS	0	
LESS THAN 4 x 6 FIBRE	0	
GARBAGE	13.54	12.43%
UNACCEPTABLE MATERIAL	14.72	13.51%
INCONTINENCE and SANITARY PRODUCTS	3.06	2.81%
HOME OFFICE SUPPLIES	0.36	0.33%
OTHER PLASTICS (CAPS, BROKEN PLASTIC)	0.22	0.20%
DEBRIS and GLASS FINES	1.54	1.41%
BAGGED GARBAGE	0	
GARBAGE		
TOTAL NON-RECYCLABLE	56.04	29.00%

Appendix 10 Gravity Lock Pilot Business Case

Front-End Recycling Container Gravity Lock Business Case

October 18, 2019

Step 1 - Annual FE REC Tonnage Collected	Quantity	Unit
Region of Peel 2017 Annual Front-End Recycling - Datacall	9,301.69	tonne
Approximate # Tonnes Marketed in 2017	7,627.39	tonnes

Demik, Robert:

In this section, the number of apartment buildings, containers and total cubic yards eligible for Gravity Locks is obtained from the Region's collection schedules. (Attached)

Step 2 - Estimated FE REC Tonnage From Eligible Containers	Quantity	Unit
Number of Apartments with FE REC, Not On Chute System	382	location
Number of Front-End Containers Eligible For Gravity Locks	1,006	container
Volume From Eligible Containers in Cubic Yards	4,207	cubic yard
Front-End Recycling Density Per Week (RFID)	34.00	kg/cu.yd
Front-End Lifts Per Year	52	lifts
Estimated Number Tonnes From Eligible FE REC Containers	7,438	tonne
Estimated Number Tonnes Marketed from Eligible FE REC Containers	6,099	tonne

Demik, Robert:

FE REC Density is obtained from the Region's Radio Frequency Identification System, which records the volume and weight of each lift to calculate an average density.

Step 3 - Gravity Lock Full Scale Installation Cost Using 3rd Party Vendor	Cost	Units	Total
Gravity Locks	\$ 85.00	1,006	\$ 85,510.00
Installation (3rd party vendor)	\$ 145.00	1,006	\$ 145,870.00
Pad Lock (Optional)	\$ 4.50	1,006	\$ 4,527.00
Total Parts & Labour	\$ 234.50		\$ 235,907.00
Door Hangers	\$ 0.36	59,000	\$ 21,240.00
Chute Room Posters	\$ 1.58	3,800	\$ 6,004.00
Staff Time (Hours)	\$ 30.00	910	\$ 27,300.00
Part Time vehicle + Fuel (Cost Per Day)	\$50	130	\$ 6,500.00
Total Education and Outreach			\$ 61,044.00
Grand Total			\$ 296,951.00

Appendix 10 Continued

Step 3.a - Gravity Lock Installation Cost Direct Purchase of Locks and In-house Installation	Cost	Unit	Unit
Locking Kit System	\$ 46.54	1006	\$ 46,819.24
3/4" Diameter Schedule 40 Pipe 77" Length	\$ 11.55	1006	\$ 11,619.30
Installation - Internal Staff Hours (4 locations per day) 20 weeks @ 35 hours per week	\$ 32.00	700	\$ 22,400.00
Vehicle plus fuel @ \$50/day	\$ 50.00	100	\$ 5,000.00
Pad Lock	\$ 4.50	1006	\$ 4,527.00
Total Parts & Labour			\$ 90,365.54
Door Hangers	\$ 0.36	59,000	\$ 21,240.00
Chute Room Posters	\$ 1.58	3,800	\$ 6,004.00
Staff Time (Hours)	\$ 30.00	910	\$ 27,300.00
Part Time vehicle + Fuel (Cost Per Day)	\$50	130	\$ 6,500.00
Total Education and Outreach			\$ 61,044.00
Grand Total			\$ 151,409.54

Step 4 - Estimated Contamination From Eligible FE REC Containers	Quantity	Unit
Estimated Number of Tonnes Contamination	2,335	tonne
Reduction Goal (10%)	233.48	tonne
Reduction Goal (15%)	350.22	tonne
Actual Reduction from Pilot: (16.54%)	384.07	tonnes
Reduction Goal (25%)	583.70	tonne
Reduction Goal (35%)	770.48	tonne
Reduction Goal (40%)	933.91	tonne

Demik, Robert:
31.39% average contamination rate for 2016, measured from in-bound FE REC audits applied to the 7,544 tonnes

Appendix 10 Continued

Step 5 - Residue Collection, Processing/ Disposal Costs	Quantity	Unit
Residue Disposal Costs	\$ 70.00	tonne
Processing Costs @ 17.01% and over MRF residue	\$ 107.35	tonne
Processing Costs @ 13-17% MRF residue	\$ 100.70	tonne
Front-End Garbage Collection Costs	\$ 29.24	tonne
Front-End Recycling Collection Costs	\$ 78.40	tonne
Total Collection Cost Savings (Per Tonne)	\$ 49.16	tonne
Total Processing Cost Savings (Per Tonne)	\$ 6.65	tonne

Demik, Robert:

In this section the cost savings is calculated based on collection costs. The Region does not incur additional disposal or processing costs for contamination. Regular garbage disposal applies at \$70 per tonne which is the same as if this material were to be collected as garbage

Step 6 - Annual Cost Savings	Collections Cost Savings	Potential Processing Costs Avoided
Annual Cost Savings @ 10% contamination reduction	\$ 11,477.78	\$ -
Annual Cost Savings @15% contamination reduction	\$ 17,216.67	\$ -
Actual contamination Reduction from Pilot 16.54%	\$ 18,880.95	\$ 2,554.07
Annual Cost Savings @ 25% contamination reduction	\$ 28,694.45	\$ 3,881.57
Annual Cost Savings @ 35% contamination reduction	\$ 37,876.68	\$ 40,559.28

Step 7 Estimated Payback Period (Years) Full Scale Rollout	Payback Period -3rd Party Vendor (Step 3)	Payback Period - Inhouse Install (Step 3.a)
Payback Period @ 16.54% contamination reduction	15.73	8.02