



**Final Report
Recycling Collection Operations Review**

Prepared for:

Waste Diversion Ontario

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1 INTRODUCTION AND BACKGROUND

Waste Diversion Ontario's (WDO) Continuous Improvement Fund (CIF) has committed to providing funding to Bluewater Recycling Association (BRA) to convert the remainder of their recycling collection operations from manual to fully automated cart collection. The CIF funding is conditional on verifying that fully automated collection is a more efficient and effective method to collect recyclables in rural communities than the traditional manual collection alternative.

In May 2009, Stantec was retained by WDO to complete a Recycling Collection Operations Review (the "Study") to assess the efficiency of BRA's automated recycling collection. The Study evaluated the current recycling program using fully automated collection in the Town of St. Marys against Brooke-Alvinston Township (Alvinston) which has similar characteristics utilizing manual recycling collection services.

The Recycling Collection Operations Review included a time and motion study of two single family residential collection routes; one within St. Marys the other in Alvinston. A participant survey was also conducted in St. Marys to gather information on residents recycling practices and overall satisfaction with the cart/wheelie bin compared with the blue box program they previously utilized.

AET Group Inc. (AET) was retained separate from Stantec to complete a non-hazardous solid waste audit of a select group of households within St. Marys and Alvinston for the purpose of assessing improvements in the capture of recyclables with the fully automated cart and monitoring the impact on contamination. The results of the waste audits were combined with the findings from this Study.

2 WORK PROGRAM DEVELOPMENT

At the outset of the Study, a project initiation meeting was held with WDO, AET, and Stantec staff. This meeting was held to review the original terms of reference for the study, Stantec's proposed work program and AET's waste audit work program. Topics discussed during the meeting included: project timelines; the "control community" to be observed; waste audit schedule; the time and motion data collection methodology and schedule; information and data needs; and, reporting requirements.

3 SELECTION OF CONTROL COMMUNITY

Originally BRA recommended that the Town of Watford be used as the control community for the project. However, Watford's Town Council rejected the request to use their community in

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the Study. BRA then recommended the Village of Alvinston be chosen as the control community.

Alvinston is a community of 3,000 residents located in Eastern Lambton County and is part of the Township of Brooke-Alvinston. The community has similar demographics and density as St. Marys and uses manual recycling collection. Alvinston's manual collection and waste composition provided the baseline for assessing the efficiency and effectiveness of automated collection in rural communities.

4 CURRENT METHODS OF CURBSIDE WASTE COLLECTION

The Waste Management System currently operated by the two study communities is based on collection by the Town of St. Marys, and Brooke-Alvinston Township for the Village of Alvinston. The following subsections provide an overview of the waste management program operating in the two communities.

4.1 St. Marys

Single family residences in St. Marys receive curbside collection of two different waste streams as outlined below:

1. **Garbage** – Curbside collection service provided on a weekly basis year round for a total of 52 garbage collection days per household. Residents are permitted one bag per collection. Additional bags require a bag tag at a cost of \$2.00 per tag.
2. **Recyclables** – Curbside collection service provided (by BRA contracted by the Town of St. Marys) on a bi-weekly basis year round for a total of 26 recycling collection days per household. BRA allows single stream recycling containers, papers, and cardboard to be placed at the curb. Residents use 65 or 95 gallon carts/wheelie bins to setout their recycling. The cart/wheelie bin program started in October 2008. Residents are not allowed to place overflowing carts at the curbside. Material that will not fit into the cart can be taken to a recycling depot or held onto until the next collection day.
3. **Lead and Yard** - Curbside collection service of yard waste is available April to November.

4.2 Alvinston

Single family residences in Alvinston receive curbside collection of two different waste streams as outlined below:

1. **Garbage** – Curbside (one sided only) collection service provided (by BRA contracted by Brooke-Alvinston Township) on a weekly basis year round for a total of 52 garbage collection days per household. Residents are permitted seven bags per collection. No bag tags are required.
2. **Recyclables** – Curbside (one sided only) collection service provided (by BRA contracted by Brooke-Alvinston Township) on a weekly basis year round for a total of 52 recycling

collection days per household. BRA allows two stream recycling to be placed at the curbside. Papers are placed at the curbside, but beside the blue box.

This study was limited to the examination of St. Marys and Alvinston's system for curbside collection of recyclables provided to residential dwellings.

5 DATA COLLECTION METHODOLOGY

The following sections outline the data collection methodology employed. This methodology was confirmed at the outset of the project by the WDO representatives.

5.1 Waste Audit

AET completed the non-hazardous solid waste audit of a select group of single family households within St. Marys and Alvinston that receive curbside collection. The waste audits were completed on the weeks of June 30th and July 6th, 2009. The data collected for capture rates, tonnages and contamination rates was compared between the two communities and provided to Stantec. Bi-weekly data from St. Marys was converted to weekly equivalents for comparison purposes.

5.1.1 Sampling Process

A sample of 100 households was selected from the collection route list supplied by BRA in each of the two communities. 97 of the 100 listed addresses for the Town of St. Marys were single family households, and 84 of the 100 listed addresses for the Town of Alvinston were single family households. The other addresses were commercial or institutional properties.

The study was conducted over a two week period. Collection of recyclable and residual waste for St. Marys occurred on Tuesday, June 30th, 2009 (garbage and recycling collection) and on Tuesday, July 7th, 2009 (waste collection) in order to observe a complete bi-weekly waste/recycling generation cycle. Collection of recyclable and residual waste for Alvinston occurred on Friday, July 3rd, 2009 (garbage and recycling collection).

Collected materials were transported to be weighed and sorted by AET staff at the BRA facility, located at 409 Canada Avenue, Huron Park, Ontario.

5.1.2 Sorting Process

Upon arrival at the sorting facility, waste and recycling materials were sorted one waste stream at a time, one sample area at a time. The waste sort process consisted of distributing contents into specific waste stream/material type made up of 8 major waste groups and 56 sub categories. Waste categories used for sorting were consistent with Stewardship Ontario's

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waste sort categories for undertaking single-family residential waste audits with the amalgamation of some material categories which were not relevant to the scope of the audit. The consolidated sort categories were approved by WDO prior to waste auditing. A detailed description of each of these categories can be found in **Appendix A** of this report.

Weight measurements were taken using a digital scale to the nearest 1/100th kilogram and recorded according to material type.

Once all materials had been sorted and weighed, residual waste and recyclable materials were disposed of or recycled by BRA staff.

5.2 Time and Motion Study

5.2.1 Route Selection

For the purposes of this study, two different routes were selected (See **Appendix B** for Route Maps). Time and motion data was collected twice over a two-week period for each route.

Table 5-1 provides details of each route including number of households and the dates data was collected.

Table 5-1 Time and Motion Route Details

Community	Route	Number of Households	Date of Data Collection
St. Marys	North – Tuesday – Odd*	665	Tuesday, July 7 th 2009
Alvinston	n/a	656	Friday, July 10 th 2009
St. Marys	North – Tuesday – Odd*	665	Tuesday, July 21 st 2009
Alvinston	n/a	656	Friday, July 17 th 2009

*Route name provided by BRA

5.2.2 Data Collection Categories

One field technician travelled with the collection staff person for each route to document the time it takes for them to complete each task while collecting the recyclables at the curbside. To ensure consistency, the same field technician was used throughout the study.

Collection activities were broken down into separate categories as follows: 14 categories were used for on-route activities such as driving between stops, or getting out of the truck; 15 documented the off-route activities (ex: driving to the Material Recycling Facility). A sample

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worksheet and description of all the collection categories and respective activities is located in **Appendix C**.

Using a stop watch, the field technician documented, following a one-minute interval, the collection staff activities during each collection day. Using this methodology, the exact number of minutes required to complete each activity was determined. In addition, the percentage of time devoted to each activity was calculated.

The quantity of materials collected and number of loads per day on average for each study area route were provided by St. Marys and Alvinston as additional data to support the study and confirm study results where applicable.

5.2.3 Set Out Data

To determine the set out and participation rates for St. Marys, the number of cart/wheelie bins placed at the curb in St. Marys was documented. This data was collected by BRA and provided to Stantec from the route observed during the time and motion study.

Setout rates were calculated by counting the number of households on the route that set out recycling on the collection day divided by the total number of households on that route. The participation rate was calculated by counting the number of households on the route who set out recycling at least once over the four week period divided by the number of households on the route.

In Alvinston, blue boxes are set out on only one side of the street to make it easier for the collection trucks to pick up the recycling material. As a result the recycling containers on the curb could not be linked directly to a household and set out and participation rates could not be determined.

5.2.4 Anomalies and Study Limitations

There is currently no industry standard for the collection of time and motion data to measure collection efficiency. However, the methodology applied in this study is consistent with similar studies undertaken throughout Ontario. The following study anomalies and limitations should be noted:

- a) The time and motion data and container quantities have been extrapolated from a two week period and therefore do not take into consideration all intermittent/seasonal changes.
- b) A high occurrence of comingled recycled material (containers mixed with fibers) in Alvinston increased time spent on manually sorting materials into the two stream truck by collection driver.

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5.3 Participant Survey

A survey was distributed, by hand and, in a few cases, by mail, to residents of St. Marys to solicit information regarding customer satisfaction with the recycling cart/wheelie bin and recycling collection services. Survey participants were mailed a package containing a cover letter, questionnaire, and a postage paid return stamped envelope addressed to Stantec. Stantec tabulated the results of the survey, and examined the data resulting from the public survey. The results of the survey are included in this report. A copy of the letter and survey provided to residents is located in **Appendix D**.

6 ANALYSIS OF STUDY RESULTS

6.1 Waste Audit Results

The following section provides a summary of the waste audit completed for St. Marys and Alvinston.

6.1.1 Waste Audit Results – St. Marys

The average weekly residual waste generated per household in St. Marys is approximately 5.68kg. Of this approximately 90.16% (5.12kg) is non-recyclable material, and 9.84% (0.56kg) could have been diverted into the recycling stream. Fibres form the largest component of recyclable material in the waste stream with 3.25% of the total waste generated, followed by recyclable plastic materials at approximately 2.74%. The results over the two week period show that residents place approximate the same amount of recyclable material in the residual waste stream on weeks that include recycling collection as on the weeks that do not.

The average weekly quantity of recyclable material generated per household in St. Marys is approximately 3.45kg (bi-weekly generation rate was adjusted to weekly equivalent). Approximately 93.08% (3.21kg) of the total material collected was recyclable material, and approximately 6.92% (0.24kg) consisted of non-acceptable recyclable material. The major contaminant materials consisted of non-recyclable plastics at 2.81%, non-recyclable paper packaging at 1.46%, and organics at 0.78%.

6.1.2 Waste Audit Results - Alvinston

The average weekly residual waste generated per household in Alvinston is approximately 12.23kg. Of this approximately 81.78% (10kg) is non-recyclable material, and approximately 18.12% (2.23kg) could have been diverted into the recycling stream. Fibres account for approximately 7.52% of the total waste. Containers represent approximately 3.05% of the total waste stream.

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The average weekly quantity of recyclable material generated per household in Alvinston is approximately 4.14kg. It should be noted, that a rain event the night prior to the waste audit may have made some of the recyclable material heavier than normal.

Approximately 90.01% (3.72kg) of the total material collected was recyclable material, and approximately 9.99% (0.41kg) consisted of non-acceptable recyclable material. The major contaminant materials consisted of non-recyclable plastics at 3.75%, organics at 1.84%, and non-recyclable paper packaging materials at 1.11%.

6.1.3 Comparison of St. Marys and Alvinston Results

Residual waste generated by the residents of Alvinston is approximately 12.23kg per household weekly, which is considerably higher than the amount generated by the residents of St. Marys, approximately 5.68kg per household weekly. The amount of recyclable material in the waste stream is higher in Alvinston, at 12.22% than in St. Mary's at 9.84%. The lower amount of waste generated by the residents of St. Marys could be due to a 1 bag limit compared to that of the 7 bag limit in Alvinston, and/or to the partial bag tag program in place in St. Marys versus Alvinston.

The contamination rate of the recycling stream in Alvinston is approximately 9.99% while St. Marys had a contamination rate of 6.92%. The capture rate for recyclable material in St. Marys was 85.17%, which is significantly higher than the capture rates in Alvinston at 62.57%. The difference in the size of recycling containers available to residents of the two communities may influence the amount set out on a weekly basis. The partial bag tag program in St. Marys may also contribute to the increased recycling capture rates versus those in Alvinston. The 7 bag limit for garbage in Alvinston may also discourage the capture of recyclables in that community.

Community	Residual Waste (kg/hhs/wk)	Recycled Material in Waste Stream (% of total)	Recycling Stream Contamination Rate (%)	Recycling Material Capture Rate (%)
Alvinston	12.23	12.22%	9.99%	62.57%
St. Marys	5.68	9.84%	6.92%	85.17%
Difference	6.55	2.38%	3.07%	22.6%

A detailed comparison of waste audit results for each material category is provided in **Appendix E**.

6.2 Time and Motion Data Analysis

The following sections presents the time and motion data collected during the study.

6.2.1 Recyclables Collection in St. Marys

Table 6-1 provides: a breakdown of the time spent on and off-route to collect single stream recyclables for one route in St. Marys over a two week collection period; a breakdown of the average time spent on and off-route in St. Marys, over the two week collection period; average time spent on route per stop; average weight collected per household and average weight per container.

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Table 6-1 Single Stream Recyclables Collection in St. Marys

Route Overview							
Route	St. Mary's - Tuesday July 7		St. Mary's - Tuesday July 21		Average for St Mary's Routes		
No. Households	665		665		665		
Stream	Single Stream Recycling		Single Stream Recycling		Single Stream Recycling		
Total Minutes/day (on + off-route activities)	342		304		323		
Total Hours/day (on + off-route activities)	5.7		5.1		5.4		
% off route	31%		27%		29%		
% on route	69%		73%		71%		
Off-route activities (min)	Average (mins)	Average %	Average (mins)	Average %	Average (mins)	Average %	
Yard to Route	48	45%	39	48%	44	46%	
Time to MRF	38	36%	39	48%	39	42%	
Time dumping recycling	21	20%	4	5%	13	12%	
Time off-route (min)	107	100.00%	82	100.00%	95	100%	
On-route activities	Average (mins)	Average %	Average (mins)	Average %	Average (mins)	Average %	
Driving Between Stops	102	43%	107	48%	105	46%	
Loading/Returning Fibres (manual)	n/a	n/a	n/a	n/a	0	0%	
Loading/Returning Containers (manual)	n/a	n/a	n/a	n/a	0	0%	
Loading Container (with Mechanical Arm)	56	24%	53	24%	55	24%	
Returning Cart Curbside (with Mechanical Arm)	42	18%	42	19%	42	18%	
Container Rejections	0	0%	0	0%	0	0%	
Getting Out of Truck	3	1%	0	0%	2	1%	
Manually Adjusting Setout	1	0%	2	1%	2	1%	
Getting Into Truck	2	1%	2	1%	2	1%	
Contamination	0	0%	0	0%	0	0%	
Other: Loading/Returning Activities	16	7%	2	1%	9	4%	
Other: Non Loading/Returning Activities	0	0%	2	1%	1	0%	
Speaking with Public	0	0%	0	0%	0	0%	
Coffee/Lunch Break	13	6%	10	5%	12	5%	
Speaking with Management	0	0%	2	1%	1	0%	
Tagging Non-conformance	0	0%	0	0%	0	0%	
Driver/Truck Problems	0	0%	0	0%	0	0%	
Total On-route Activities (mins)	235	100.00%	222	100.00%	229	100%	
Distance (in Kilometres)							
Yard to Route	38		39		39		
Distance On-Route	30		29		30		
Off-route to MRF	39		39		39		
MRF to yard	0		0		0		
Route to Break Stop and Back	0		0		0		
Total Distance Driven (km):	107		107		107		
Total On-Route Activities							
Average Time/Stop (seconds)							
Average Driving Time/stop	9.2		9.7		9.4		
Average Time Loading/Returning Fibres (manual)	n/a		n/a		n/a		
Average Time Loading/Returning Containers (manual)	n/a		n/a		n/a		
Average Time Loading Container (with Mechanical Arm)	5.1		4.8		4.9		
Average Time Returning Cart Curbside (with Mechanical Arm)	3.8		3.8		3.8		
Average Time Container Rejections	0.0		0.0		0.0		
Average Time Getting In/Out of Truck	0.5		0.2		0.3		
Average Time Manually Adjusting Setout	0.1		0.2		0.1		
Average Time Contamination	0.0		0.0		0.0		
Average Time Other: Loading/Returning Activities	1.4		0.2		0.8		
Average Time Other: Non Loading/Returning Activities	0.0		0.2		0.1		
Average Time Speaking with Public	0.0		0.0		0.0		
Average Time Coffee/Lunch Break	1.2		0.9		1.0		
Average Time Speaking with Management	0.0		0.2		0.1		
Average Time Tagging Non-conformance	0.0		0.0		0.0		
Average Time Driver/Truck Problems	0.0		0.0		0.0		
Total Amount Collected (kg)							
Recyclables	5210		4440		4825		
Total	5210		4440		4825		
Weight/hhld							
Rec. kg/hhld	7.83		6.68		7.26		
Total weight (kg) /hhld	7.83		6.68		7.26		
Average Number of Containers							
Recyclable Containers	393		374		384		
Average Number of Containers per hhld							
Recyclable Containers/hhld	0.6		0.6		0.6		
Average Weight per Container							
Recyclable kg/container	13.3		11.9		12.6		

6.2.1.1 Findings of Recycling Collection Time and Motion Study in St. Marys

The purpose of the time and motion study is to provide WDO with current information on the efficiency of the automated recycling collection system currently being utilized in St. Marys. The following provides the key findings/results for automated recycling collection;

1. Collection of single stream recycling (including on and off route activities), takes on average 5.4 hours or 323 minutes to collect 4,825 kg of material.

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2. Driving time from the yard to the route and from the route to the MRF takes on average 95 minutes, which is equivalent to 29% of the total time for on and off route activities.
3. Collection operators for the single stream recycling collection are taking on average only 12 minutes for lunch and breaks. This could be a result of the fact that the total collection only takes 5.4 hours and the driver chooses to take his/her lunch after returning to the yard. It also suggests that the automated collection system is not putting a lot of physical strain on the collections staff, resulting in taking few breaks to rest.
4. Activities that fell outside of the detailed collection activities on the data collection were categorized as “other”. They included manually adjusting the compactor (17 minutes), waiting for residents to drop off their cart/wheelie bin (1 minute), checking the route map (1 minute), and switching seats with the field technician to properly drive on the highway (1 minute).
5. Time required for loading and returning the cart/wheelie bin to the curbside takes on average 109 minutes or 10.0 seconds/stop. This includes time for mechanically loading and returning the cart/wheelie bin to the curbside and time categorized under “other” that relates to loading/returning the cart/wheelie bin (manually adjusting the compactor, and waiting for residents to drop off their cart/wheelie bin).
6. 105 minutes or 9.4 seconds/stop of on route time was spent driving between households/stops;
7. The average number of recycling containers placed at the curb was 0.6 per household. The average weight of recyclables collected per container was 12.6 kg.

6.2.2 Recyclables Collection in Alvinston

Table 6-2 provides: a breakdown of the time spent on and off-route to collect single stream recyclables for one route in Alvinston over a two week collection period; a breakdown of the average time spent on and off-route in Alvinston, over the two week collection period; and the average time spent on route per stop.

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Table 6-2 Single Stream Recyclables Collection in Alvinston

Route Overview		Alvinston - Friday July 10		Alvinston - Friday July 17		Average for Alvinston Routes	
Route		656		656		656	
No. Households		656		656		656	
Stream		Single Stream Recycling		Single Stream Recycling		Single Stream Recycling	
Total Minutes/day (on + off-route activities)		502		472		487	
Total Hours/day (on + off-route activities)		8.4		7.9		8.1	
% off route		32%		33%		33%	
% on route		68%		67%		67%	
Off-route activities (min)		Average (mins)	Average %	Average (mins)	Average %	Average (mins)	Average %
Yard to Route		77	47%	63	41%	70	44%
Time to MRF		73	45%	81	52%	77	49%
Time dumping recycling		13	8%	11	7%	12	8%
Time off-route (min)		163	100.00%	155	100.00%	159	100%
On-route activities		Average (mins)	Average %	Average (mins)	Average %	Average (mins)	Average %
Driving Between Stops		81	24%	79	25%	80	24%
Loading/Returning Fibres (manual)		65	19%	65	21%	65	20%
Loading/Returning Containers (manual)		55	16%	52	16%	54	16%
Loading Container (with Mechanical Arm)		n/a	n/a	n/a	n/a	0	0%
Returning Cart Curbside (with Mechanical Arm)		n/a	n/a	n/a	n/a	0	0%
Container Rejections		1	0%	0	0%	1	0%
Getting Out of Truck		18	5%	16	5%	17	5%
Manually Adjusting Setout		1	0%	8	3%	5	1%
Getting Into Truck		17	5%	12	4%	15	4%
Contamination		13	4%	23	7%	18	6%
Other: Loading/Returning Activities		23	7%	18	6%	21	6%
Other: Non Loading/Returning Activities		3	1%	6	2%	5	1%
Speaking with Public		2	1%	3	1%	3	1%
Coffee/Lunch Break		55	16%	28	9%	42	13%
Speaking with Management		2	1%	7	2%	5	1%
Tagging Non-conformance		2	1%	0	0%	1	0%
Driver/Truck Problems		1	0%	0	0%	1	0%
Total On-route Activities (mins)		339	100.00%	317	100.00%	328	100%
Distance (in Kilometres)							
Yard to Route		93		82		88	
Distance On-Route		21		24		23	
Off-route to MRF		82		82		82	
MRF to yard		0		1		1	
Route to Break Stop and Back		0		1		1	
Total Distance Driven (km):		196		190		95	
Total On-Route Activities							
Average Time/Stop (seconds)							
Average Driving Time/stop		7.4		7.2		7.3	
Average Time Loading/Returning Fibres (manual)		5.9		5.9		5.9	
Average Time Loading/Returning Containers (manual)		5.0		4.8		4.9	
Average Time Loading Container (with Mechanical Arm)		n/a		n/a		n/a	
Average Time Returning Cart Curbside (with Mechanical Arm)		n/a		n/a		n/a	
Average Time Container Rejections		0.1		0.0		0.0	
Average Time Getting In/Out of Truck		3.2		2.6		2.9	
Average Time Manually Adjusting Setout		0.1		0.7		0.4	
Average Time Contamination		1.2		2.1		1.6	
Average Time Other: Loading/Returning Activities		2.1		1.6		1.9	
Average Time Other: Non Loading/Returning Activities		0.3		0.5		0.4	
Average Time Speaking with Public		0.2		0.3		0.2	
Average Time Coffee/Lunch Break		5.0		2.6		3.8	
Average Time Speaking with Management		0.2		0.6		0.4	
Average Time Tagging Non-conformance		0.2		0.0		0.1	
Average Time Driver/Truck Problems		0.1		0.0		0.0	
Total Amount Collected (kg)							
Recyclables		1660		1700		1680	
Total		1660		1700		1680	
Weight/hhld							
Rec. kg/hhld		2.53		2.59		2.56	
Total weight (kg) /hhld		2.53		2.59		2.56	
Average Number of Containers							
Recyclable Containers		n/a		n/a		n/a	
Average Number of Containers per hhld							
Recyclable Containers/hhld		n/a		n/a		n/a	
Average Weight per Container							
Recyclable kg/container		n/a		n/a		n/a	

6.2.2.1 Findings of Recycling Collection Time and Motion Study in Alvinston

The time and motion study provides the WDO with current information on the efficiency of the manual recycling collection system currently being utilized in Alvinston. The following provides the key findings/results for manual recycling collection;

1. Collection of two stream recycling (including on and off route activities), takes on average 8.1 hours or 487 minutes to collect 1,680 kg of material.

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2. Driving time from the yard to the route and from the route to the MRF takes on average 159 minutes, which is equivalent to 33% of the total time for on and off route activities.
3. Activities that fell outside of the detailed collection activities on the data collection were categorized as “other”. They included manually adjusting the compactor (39 minutes), putting education material in mail boxes (4 minutes), checking if bins need emptying (2 minute), checking the route map (2 minute), adjusting mirrors (1 minute), working windshield wipers on truck (1 minutes) and switching seats with the field technician to properly drive on the highway (1 minute).
4. Time required for loading and returning the cart/wheelie bin to the curbside takes on average 194 minutes or 17.7 seconds/stop. This includes time for mechanically loading and returning the cart/wheelie bin to the curbside and time categorized under “other” that relates to loading/returning the cart/wheelie bin (manually adjusting the compactor, and checking if bins need emptying).
5. 80 minutes or 9.4 seconds/stop of on route time was spent driving between households/stops.

6.2.3 Comparison of Time and Motion Study Results for St. Marys and Alvinston

Table 6-3 provides a comparison of the average time spent on and off-route to collect recycling in St. Marys and Alvinston.

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Table 6-3 Comparison Between St Marys and Alvinston – Average Time

Route Overview		Average for St Mary's Routes		Average for Alvinston Routes		Efficiency with Automated Collection (negative number represents savings)
Route		665		656		
No. Households		665		656		
Stream		Single Stream Recycling		Single Stream Recycling		
Total Minutes/day (on + off-route activities)		323		487		
Total Hours/day (on + off-route activities)		5.4		8.1		
% off route		29%		33%		
% on route		71%		67%		
Off-route activities (min)		Average (mins)	Average %	Average (mins)	Average %	
Yard to Route		44	46%	70	44%	-27
Time to MRF		39	42%	77	49%	-39
Time dumping recycling		13	12%	12	8%	-1
Time off-route (min)		95	100%	159	100%	-65
On-route activities		Average (mins)	Average %	Average (mins)	Average %	
Driving Between Stops		105	46%	80	24%	25
Loading/Returning Fibres (manual)		0	0%	65	20%	n/a
Loading/Returning Containers (manual)		0	0%	54	16%	n/a
Loading Container (with Mechanical Arm)		55	24%	0	0%	n/a
Returning Cart Curbside (with Mechanical Arm)		42	18%	0	0%	n/a
Container Rejections		0	0%	1	0%	-1
Getting Out of Truck		2	1%	17	5%	-16
Manually Adjusting Setout		2	1%	5	1%	-3
Getting Into Truck		2	1%	15	4%	-13
Contamination		0	0%	18	6%	-18
Other: Loading/Returning Activities		9	4%	21	6%	-12
Other: Non Loading/Returning Activities		1	0%	5	1%	-4
Speaking with Public		0	0%	3	1%	-3
Coffee/Lunch Break		12	5%	42	13%	-30
Speaking with Management		1	0%	5	1%	-4
Tagging Non-conformance		0	0%	1	0%	-1
Driver/Truck Problems		0	0%	1	0%	-1
Total On-route Activities (mins)		229	100%	328	100%	-100
Distance (in Kilometres)						
Yard to Route		39		88		-49
Distance On-Route		30		23		7
Off-route to MRF		39		82		-43
MRF to yard		0		1		0
Route to Break Stop and Back		0		1		-1
Total Distance Driven (km):		107		95		12
Total On-Route Activities						
Average Time/Stop (seconds)						
Average Driving Time/stop		9.4		7.3		2.1
Average Time Loading/Returning Fibres (manual)		n/a		5.9		n/a
Average Time Loading/Returning Containers (manual)		n/a		4.9		n/a
Average Time Loading Container (with Mechanical Arm)		4.9		n/a		n/a
Average Time Returning Cart Curbside (with Mechanical Arm)		3.8		n/a		n/a
Average Time Container Rejections		0.0		0.0		0.0
Average Time Getting In/Out of Truck		0.3		2.9		-2.6
Average Time Manually Adjusting Setout		0.1		0.4		-0.3
Average Time Contamination		0.0		1.6		-1.6
Average Time Other: Loading/Returning Activities		0.8		1.9		-1.1
Average Time Other: Non Loading/Returning Activities		0.1		0.4		-0.3
Average Time Speaking with Public		0.0		0.2		-0.2
Average Time Coffee/Lunch Break		1.0		3.8		-2.8
Average Time Speaking with Management		0.1		0.4		-0.3
Average Time Tagging Non-conformance		0.0		0.1		-0.1
Average Time Driver/Truck Problems		0.0		0.0		0.0
Total Amount Collected (kg)						
Recyclables		4825		1680		3145
Total		4825		1680		3145
Weight/hhld						
Rec. kg/hhld		7.26		2.56		4.69
Total weight (kg) /hhld		7.26		2.56		4.70
Average Number of Containers						
Recyclable Containers		384		n/a		n/a
Average Number of Containers per hhld						
Recyclable Containers/hhld		0.6		n/a		n/a
Average Weight per Container						
Recyclable kg/container		12.6		n/a		n/a

6.2.3.1 Findings of Time and Motion Study Results Between St. Marys and Alvinston

The time and motion study provides the WDO with current information on the efficiency of the automatic versus manual recycling collection system based on the time and motion studies completed in St. Marys and Alvinston. The following provides the key findings/results when comparing the two recycling collection systems and draws conclusion on the efficiency of automated versus manual collection;

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1. On route activities for automated collection are on average 100 minutes/day or 9.0 seconds/stop more efficient than manual collection despite collecting on both sides of the street instead of one as with manual collection.
2. Automated collection picked up 21.0 kg of recycling per minute of on route activities, versus 5.1 kg/minute during manual collection.
3. Time required for mechanically loading and returning the cart/wheelie bin to the curbside is on average 83 minutes/day or 7.7 seconds/stop faster than manual collection. Automated collection is on average 2.1 seconds/stop more efficient by using the mechanical arm to load/return containers versus manual collection. On average 5.6 seconds/stop is saved during other loading/returning activities including getting into/out of the truck (savings of 2.6 seconds/stop) and dealing with contamination (savings of 1.6 seconds/stop). The table below summarizes these results.

Loading/Returning Activity	Alvinston	St. Marys	Difference
Loading/Returning Container only	10.8 seconds/stop	8.7 seconds/stop	2.1 seconds/stop
All Activities Except Loading/Returning Container	6.8 seconds/stop	1.2 seconds/stop	5.6 seconds/stop
All Activities	17.6 seconds/stop	9.9 seconds/stop	7.7 seconds/stop

4. Collection operators for manual collection take on average 30 minutes longer for lunch and breaks than automated collection. This could be because manual collection is more physically demanding than automated collection, and therefore requires the collection operator to break more frequently. As mentioned previously, it could also be that the automated collection driver is able to eat their lunch after collecting their route since in both cases collection in St. Marys was finished by 12:30pm.
5. St. Mary's residents generated on average 7.26 kg of recycling per household (bi-weekly collection), compared with 5.12 kg in Alvinston (adjusted to bi-weekly equivalent for comparison purposes).

6.2.4 Recycling Set-out and Participation Rates

The setout study revealed that the average set out rate over the four weeks of study was 45%. The participation rate was 61%. Figure 6-1 illustrates the set out and participation rates for recycling in St. Marys.

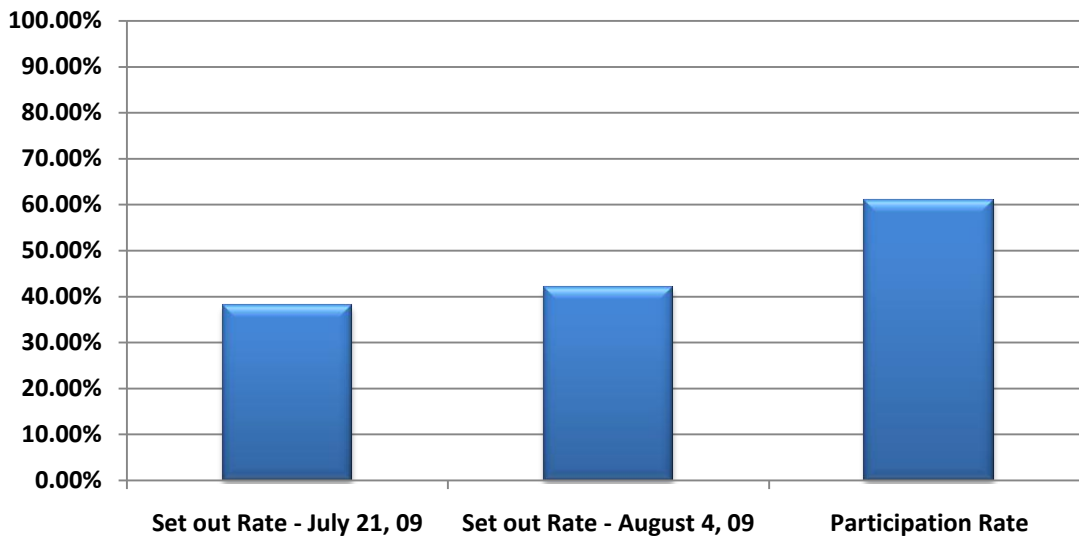
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Figure 6-1 Set Out and Participation Rates in St. Marys



6.2.5 Time Required to Operate Automated Vehicle

A sample of 100 residential households was randomly selected from the recycling collection route during the time and motion study conducted in St Marys to document the number of seconds required to use the mechanical arm to load/return the cart/wheelie bin to the curbside and the length of time between stops (i.e. to drive between households). The study took place while the field technician was conducting the time and motion study on Tuesday, July 7th, 2009 and Tuesday, July 21st, 2009. The starting address was the same for both days of the study. The mechanical arm was considered in use when the indicator light in the truck console began flashing. Time between stops was measured once the mechanized arm indicator light turned off.

The following study anomalies and limitations should be noted:

- a) Time tracked for loading and returning containers on Tuesday, July 7th included two instances when the arm was used to adjust improper curbside set-out of bins, manoeuvre around obstacles such as parked cars, and time was used to compact recycling.
- b) Time tracked between stops on Tuesday, July 21st included five stops that required additional time to complete compacting.

Anomalies, such as those listed above, can occur on collection routes depending on the streetscape and how material is set out in individual communities. Potential to experience

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anomalies should be considered during the implementation of any automated collection program.

Table 6-4 shows the results of the two day study, including time averages with and without the anomalies (where time at one household for the individual task took more than one minute) specified above.

Table 6-4 Time Required to Operate Automated Vehicle

	July 7th	July 21st	Average Time	July 7th (without anomalies)	July 21 st (without anomalies)	Average time (without anomalies)
Loading/Returning Container (seconds)	12.12	11.17	11.65	10.07	11.17	10.62
Time Between Stops (seconds)	9.52	14.97	12.25	9.52	9.86	9.69

The results of this study are consistent with those calculated during the time and motion study in St. Marys. During the time and motion study, it took on average 10.0 seconds/stop for loading and returning the cart/wheelie bin to the curbside and 9.4 seconds/stop to drive between households/stops.

6.3 Recycling Container Survey Results

Stantec developed a four-page questionnaire that was delivered to 665 households and some institutional and commercial properties in St. Marys. These properties were identical to those selected on the route for the time and motion study. Respondents were given approximately three weeks to complete and return the questionnaire. 261 questionnaires were filled out and returned out of the 665 delivered. 6 of the questionnaires filled out were from non-residential properties (i.e. school, hotel, church, public library, businesses etc.).

As mentioned previously, the cart/wheelie bin program started in October 2008. Residents therefore, have used the cart/wheelie bin for one full winter season.

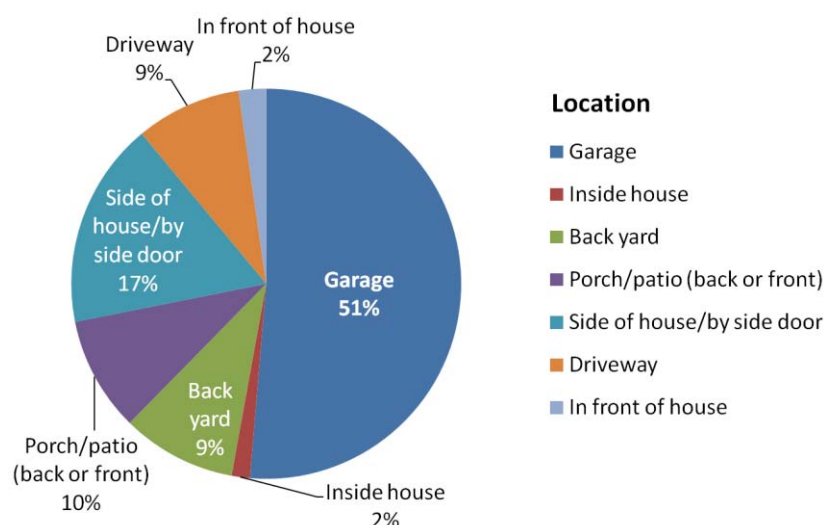
Based on the responses received from residences, the majority of households (42%) had two occupants. The remaining households varied evenly (approximately 15% for each) between one, three, four, or five or more occupants.

The majority (58%) of occupants in the households who responded were less than 49 years of age.

6.3.1 Recycling Practices

All respondents but one stated that they recycle. When asked where the cart/wheelie bin was stored, more than half (51%) stated the garage as their preferred location. Figure 6-2 illustrates the distribution of cart/wheelie bin storage locations. When asked about the frequency of their cart/wheelie set out, the majority of respondents (62%) put their cart/wheelie bin out for every collection (biweekly). 28% of respondents put their cart/wheelie bin out for collection once a month and the remaining 10% put the cart/wheelie bin out less than once a month.

Figure 6-2 Responses for Cart/Wheelie Bin Storage Locations



6.3.2 Fullness

The fullness of the cart/wheelie bin set out for collection was evaluated. More than half of the respondents put out a full or an overloaded cart/wheelie bin, however, only 5% claim that their cart/wheelie bin always or often runs out of room. Figures 6-3 illustrates the distribution of cart/wheelie bin fullness and Figure 6-4 illustrates how often the cart/wheelie bin runs out of room.

Figure 6-3 Responses for On Average how Full the Cart/Wheelie Bin is When Put Out

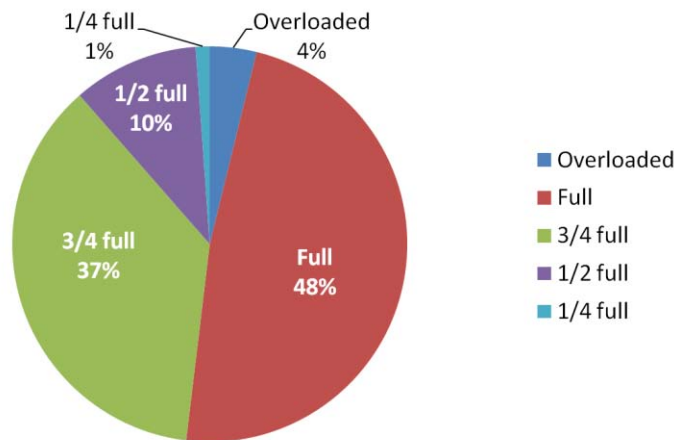
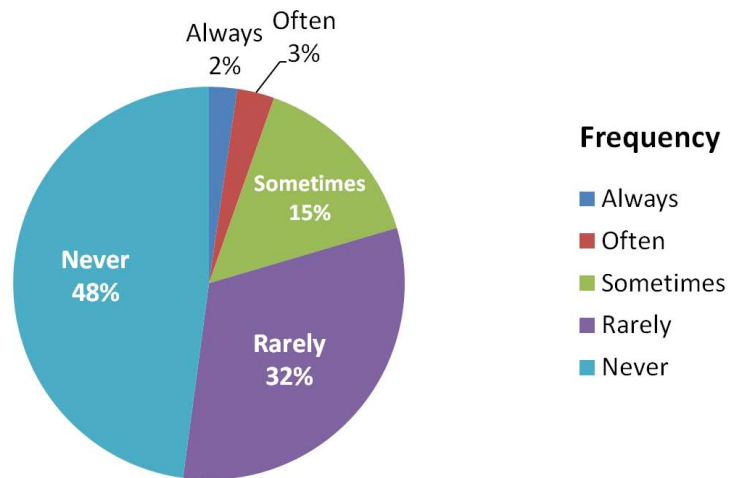


Figure 6-4 Responses to if the Cart/Wheelie Bin Runs out of Room



6.3.3 Satisfaction with Recycling Containers

Respondents were asked whether they found the cart/wheelie bin easy or difficult to move. The majority (89%) of respondents stated that their cart/wheelie bin is easy to move. Half of the remaining 11% who stated the cart/wheelie bin was difficult to move mentioned that snow hindered the cart/wheelie movement. Others cited that living on a slope caused difficulty in moving cart/wheelie bin uphill and downhill.

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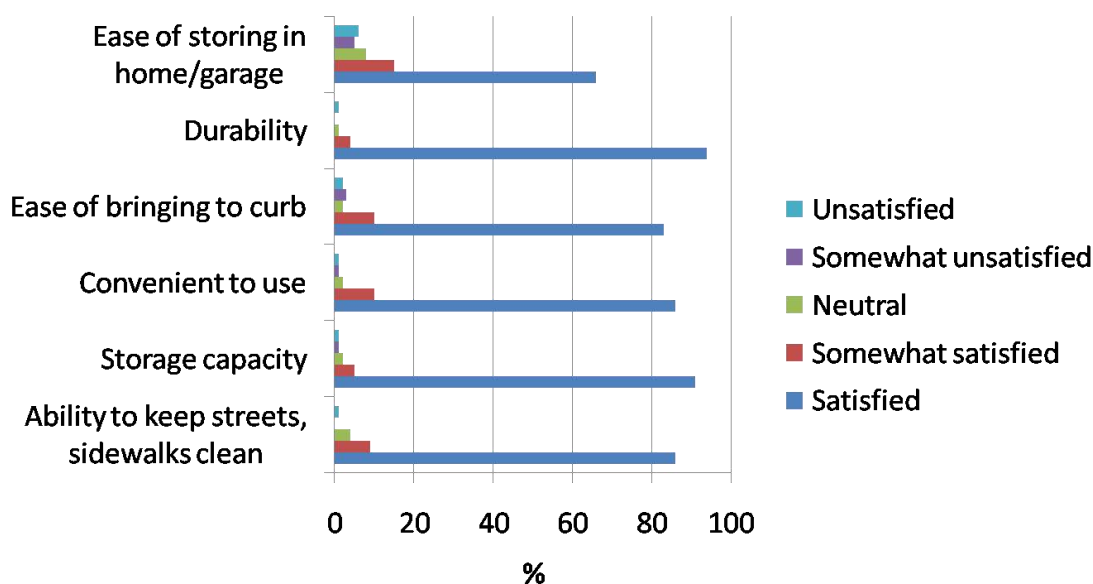
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Overall satisfaction with the recycling cart/wheelie bin was also evaluated, with a high percentage of respondents (87%) saying they were satisfied. There were no respondents who were completely unsatisfied and only 2% were somewhat unsatisfied.

Satisfaction of the cart/wheelie bin was also assessed based on a number of attributes such as ability to keep streets/sidewalks clean, storage capacity, convenient to use, ease of bringing to curb, durability, and ease of storing in home/garage. The responses illustrated in Figure 6-5 show that residents are satisfied with the cart/wheelie bin based on these attributes. This graph also demonstrates that the ease of storing the cart/wheelie bin in home/garage was the least favorable compared to the other attributes, nevertheless; that the percent satisfied was still relatively high (66%). Approximately 10% of respondents chose to leave the durability questions blank stating that they have not had the cart/wheelie bin long enough to respond to that question.

Figure 6-5 Frequency of Cart/Wheelie Bin Running Out of Room



6.3.4 Comparison of Cart/Wheelie Bin to Blue Box

Respondents were asked whether there was any change in the amount of recyclables they put out when using the cart/wheelie bin as opposed to the blue box. More than half (57%) reported no change in their recycling behaviours while the other 42% reported an increase in their rate of recycling. Only 1% of the respondents claimed they recycled less than before. They were also asked what recycling system they preferred and almost all (92%) of respondents preferred the

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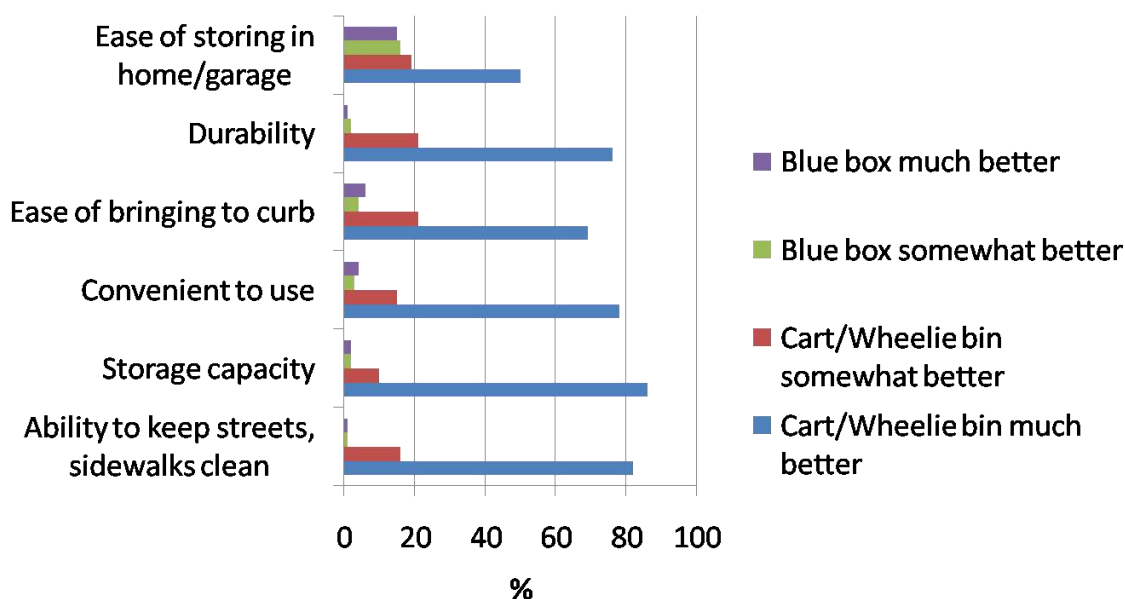
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cart based system over the blue box or a potential blue bag system which got 7% and 1% response rates respectively.

A comparison of the cart/wheelie bin and blue box systems were conducted for the following attributes: ability to keep streets/sidewalks clean, storage capacity, convenient to use, ease of bringing to curb, durability, and ease of storing in home/garage. Figure 6-6 illustrates the findings which show a very similar trend to that found in Figure 6-5. The cart/wheelie bin was highly favoured over blue box in all attributes. 31% of respondents did state that blue box was either somewhat or much better than the cart/wheelie bin for ease of storage, however, 50% of respondents did admit that the cart/wheelie was much better than blue box for storage. Some respondents chose not to respond on durability stating that they have not had the cart/wheelie bin long enough to answer that question.

Figure 6-6 Cart/Wheelie Bin and Blue Box Comparisons on Specific Attributes



6.3.5 Overall Satisfaction with Recycling Collection

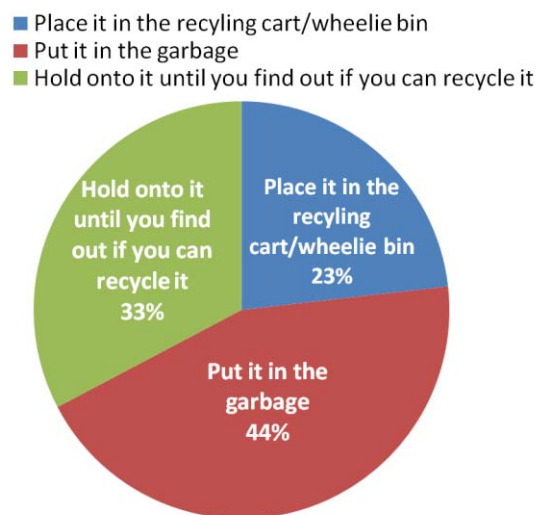
When asked about overall satisfaction with the recycling collection service provided to their homes, 85% and 10% replied that they were satisfied and somewhat satisfied respectively. The remaining 5% were either neutral or somewhat unsatisfied with the collection service. No respondent was completely unsatisfied.

6.3.6 Promotion and Education

Respondents were asked whether the educational material received from BRA and the Town of St. Marys was sufficient to know whether items were recyclable or not. The majority (85%) agreed that it was enough while the remaining (15%) believe it is not.

Lastly, the survey questioned what a resident would do if they were unsure whether an item was recycled or not. Figure 6-6 illustrates the three different scenarios.

Figure 6-7 What Respondents Do if they Don't Know if Something is Recyclable



6.3.7 Additional Comments

Almost half (43%) of the respondents provided additional comments, with the majority of respondents praising the new cart/wheelie bin and enjoying the fact that sorting the recyclables was no longer required. Key issues that were covered by the approximately 30% of the respondents (who provided comments) were as follows:

- Difficulty with storage and/or large size of cart/wheelie bin
- Difficulty in manoeuvring the cart/wheelie bin in winter

Other respondents made the following suggestions for the overall waste management program in St. Marys:

- Cart/wheelie bin lid should be made of heavier plastic
- Would like an organics collection program
- More recyclables should be accepted

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6.3.8 Summary of Key Findings

The majority of residents are satisfied with the cart/wheelie bin and prefer it over the blue box that they previously used. The cart/wheelie bin is preferred over the blue box on all compared attributes including ease of storage. 99% of respondents reported recycling the same amount (57%) or more (42%) as a result of the cart/wheelie bin as opposed to when they used the blue box. The majority of respondents are putting their cart/wheelie bin out for every collection (biweekly). 48% of the respondents state that their cart/wheelie bin is full, while 4% say its overloaded when set out for collection.

7 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the study, the following conclusions can be reached:

- On route, automated recycling collection is up to 100 minutes or 9.0 seconds/stop more efficient than manual collection to collection a similar number of households, despite collecting on both sides of the street instead of one, and collects 2.14 kg more material per household on average.
- Automated collection picked up, on average, 15.9 kg more recycling per minute during on route activities, versus manual collection.
- Loading/returning the recycling container is up to 7.7 seconds/stop more efficient than manual collection.
- Using the mechanical arm to load/return containers to the curbside takes on average between 10.0 and 10.62 seconds per stop.
- 42% of survey respondents reported an increase in their rate of recycling with the cart/wheelie bin versus blue box collection.
- 92% of respondents to the participant survey prefer the cart/wheelie system versus blue box collection.
- Survey respondents favoured the cart/wheelie bin over the blue box in all of the following attributes: ability to keep streets/sidewalks clean, storage capacity, convenient to use, ease of bringing to curb, durability, and ease of storing in home/garage.
- When asked about overall satisfaction with the recycling collection service provided to their homes, 85% and 10% replied that they were satisfied and somewhat satisfied respectively.
- The cart/wheelie bins provided sufficient capacity for up to 96% of the residents surveyed and supported the reduction in collection frequency to biweekly in St. Marys.

The results of this Study indicate that automated recycling collection for single family households in rural communities is more efficient than manual collection.

However, since the waste management programs in St. Marys and Alvinston are different in ways that may influence recycling behavior, it is recommended that WDO continue to monitor

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the performance of automated recycling collection for single family households in rural communities prior to funding a full conversion of BRAs recycling collection operations from manual to fully automated cart collection. As BRA proceeds with converting its communities to automated collection, WDO can use the opportunity to conduct a waste audit of Alvinston to determine the effect of moving to a cart based system on waste diversion, composition, and capture rates. The waste audit should be conducted 6 months after implementation of the cart based system. The results can be compared to those completed for this Study.

The results of the Study are specific to the waste systems, household densities and demographics of the communities assessed. Should WDO consider implementing automated collection in other types of communities, additional study should be undertaken to ensure potential issues associated with automated collection (i.e. on-street parking) are adequately assessed and addressed.

8 CLOSURE

We trust that this report meets your needs and satisfaction. If you require additional information regarding our conclusions and recommendations, please do not hesitate to contact the undersigned at (905) 631-8684.

Respectfully Submitted,

STANTEC LIMITED

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APPENDIX A

Waste Audit Categories

Material Category	Accepted in Recycling Program?	Description / Examples
PAPER		
Newspaper – Dailys and Weeklys	Yes	Daily and weekly newspapers published by the Canadian Newspaper Association (CNA) and the Ontario Community Newspapers Association (OCNA); Globe and Mail, Toronto Star, Hamilton Spectator, community newspapers. Consult Stewardship Ontario's list of OCNA/CNA publications. No inserts, flyers and magazines from newspapers.
Newspaper - Other	Yes	Non OCNA/CNA publications (e.g. TV guides, Auto Trader, Real Estate News) plus inserts and flyers from OCNA/CNA newspapers. Consult Stewardship Ontario's list of OCNA/CNA publications. Includes glossy flyers and advertising distributed with newspapers.
Telephone Books / Directories	Yes	Telephone books and other directories such as the Yellow Pages
Magazines & Catalogues	Yes	Glossy magazines, catalogues, calendars, annual reports (must be bound, i.e. stapled or glued).
Mixed Fine Paper	Yes	Fine household papers, writing paper, office paper, copy paper, bills and statements, ad mail, etc. Includes glossy flyers and advertising that are not distributed with newspapers.
Books	Yes	Hard and soft covered books
Other Paper		Gift wrap, construction paper, photographs, etc. This is a default paper category and as such should not contain a large amount material.
PAPER PACKAGING		
Corrugated Wine Bag in Box	Yes	Corrugated box from bag in box wine containers. No plastic liners.
Other Corrugated	Yes	Includes micro-flute corrugated containers, pizza boxes, waxed corrugated containers, etc.
Kraft Paper	Yes	Kraft paper bags and wrap, grocery or retail bags, potato bags, some pet food bags, etc. Includes brown, white, and coloured kraft paper and bags. No bags with bonded plastic or foil liners/layers/coatings. Includes bags with a light grease coating.
Boxboard / Cores	Yes	Boxboard, paperboard, cereal box, shoe box, frozen food box, cores from toilet paper/ toweling/gift wrap, etc. Includes wet-strength boxboard, fast food cartons such as fry/onion ring boxes and paper plates
Molded Pulp	Yes	Egg cartons, drink trays, other trays, molded pulp flower pots/trays, etc.
Paper Cups and Paper Ice-Cream Containers		Includes paper based cups with a plastic lining/layer such as coffee cups, soup cups, french-fry cups. Does not include containers that are plastic or plastic based.
Laminated Paper Packaging		Paper based packaging (at least 85% paper) with foil or plastic liners/layers/coatings, pouches, cookie bags, microwave popcorn bags, fast food sandwich wraps, gift bags, paper based trays, etc.
Composite Cans		Spiral wound cans with paper walls and plastic or metal tops or bottoms; frozen juice, Pringles, raisins, etc.
Gable Top Cartons		Polycoat containers with a gable shaped top; milk, juice, some foods, etc.
Aseptic Alcohol Over 630 ml		Tetra pak type polycoat packaging for alcoholic beverages over 630 ml.
Aseptic Alcohol 630 ml and Under		Tetra pak type polycoat packaging for alcoholic beverages less than or equal to 630 ml.
Aseptic Other Containers		Tetra pak type polycoat packaging, juice boxes, soup, etc.
Tissue/Toweling		Tissues, napkins, paper towels (includes wet/damp items)

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Material Category		Description / Examples
PLASTICS		
PET Beer Bottles Over 630 ml	Yes	#1 clear and coloured beer bottles over 630 ml.
PET Beer Bottles 630 ml and Under	Yes	#1 clear and coloured beer bottles less than or equal to 630 ml.
PET Other Alcohol Bottles Over 630 ml	Yes	#1 clear and coloured wine and liquor bottles over 630 ml.
PET Other Alcohol Bottles Over 100 ml and Less Than or Equal to 630 ml	Yes	#1 clear and coloured wine and liquor bottles over 100 ml and less than or equal to 630 ml.
PET Other Alcohol Bottles 100 ml and Under	Yes	#1 clear and coloured wine and liquor bottles 100 ml or less.
PET Beverage Bottles	Yes	#1 soft drink, water, juice, etc.
PET Other Bottles & Jars	Yes	#1 food and non-beverage bottles and jars, cooking oil, peanut butter, dish soap, etc.
PET Other Packaging		#1, bakery, clamshells, trays, ovenable/microwaveable trays, egg cartons. No bottles and jars
HDPE Beverage Bottles	Yes	#2 beverage bottles and jugs, juice, milk, etc.
HDPE Other Bottles & Jugs	Yes	#2, laundry soap, shampoo, windshield washer fluid, etc.
PVC Bottles & Jars		#3 bottles and jars only, lotions, soaps, bug repellants, shampoos, etc (PVC blister/bubble packs go into "Other Rigid Plastic Packaging")
Other Plastic Alcohol Containers 100 ml and Under		Other plastic alcoholic containers 100 ml or less.
Other Bottles, Jars & Jugs		#4 LDPE, #5 PP, & #7 mixed resin, mustard, ketchup, some juices
Polystyrene Packaging		#6 PS, trays, clamshells, cups & lids, pill and vitamin bottles, seedling trays, PS used to protect boxed product, "peanuts", etc. Non-packaging PS (e.g. plastic cutlery) goes into the "Durable Plastic Products" category
Wide Mouth Tubs & Lids	Yes	# 2 HDPE, #4 LDPE & #5 PP tubs and lids, dairy products, etc.
Large HDPE & PP Pails & Lids	Yes	>4litres and < 25 litres HDPE & PP pails, lawn, garden, pool supplies, kitty litter, paint, etc.
Polyethylene PE Plastic Bags & Film - Packaging	Yes	HDPE & LDPE retail carry-out bags/sacks, dry cleaning bags, bread bags, frozen food bags, milk bags, toilet paper and toweling, over-wrap, lawn seed, soil, peat moss, etc.
Polyethylene Plastic Bags & Film - Non-Packaging		HDPE & LDPE garbage bags, kitchen catchers, blue or clear bags for recyclables, sandwich and freezer bags, etc.
Laminated Pouches & Bag in Box Liners for Alcoholic Beverages		Laminated plastic pouches and plastic bag-in-box liners for wine and other alcoholic beverages.
Laminated/Other Plastic Film and Bags		Plastic film and bags that are at least 85% (by weight) plastic with up to 15% (by weight) other closely bonded or impregnated materials. This includes meat, poultry and fish wrap; vacuum sealed bacon bag; luncheon meat and cheese wrap; cereal liners; chip bags and other snack food bags; candy wraps; pasta bags; boil in a bag; plastic based food pouches; bubble wrap; cling wrap; some cookie bags, etc. No alcohol pouches / bag in box liners.
Other Rigid Plastic Packaging		Blister packaging, tubes for pharmaceutical & health care/cosmetic products, plant pots, unmarked/coded packaging, etc.
Durable Plastic Products		Non-packaging such as VCR tapes, CDs, toys, games, tupperware, etc. Include multi-material items that are mainly plastic – e.g. a plastic toy truck with metal axles. Plastic shoes, gloves, clothing go in Textiles.
METALS		
Aluminum Alcoholic Beverage Cans Over 1 L	Yes	Aluminum alcoholic beverages, beer cans over 1 L.
Aluminum Alcoholic Beverage Cans 1 L and Under	Yes	Aluminum alcoholic beverages, beer cans 1 L and under.
Aluminum Food Cans & Other Beverages	Yes	Soft drinks, soda, juice, certain brands of sardines and cat food
Aluminum Foil & Foil Trays	Yes	Aluminum foil wrap, pie plates, baking trays, etc.
Other Aluminum Containers	Yes	Aluminum aerosol containers, hair products, tubes, etc.
Steel Alcoholic Beverage Cans Over 1 L	Yes	Steel alcoholic beverages, beer cans, Sapporo, etc over 1 L.
Steel Alcoholic Beverage Cans 1 L and Under	Yes	Steel alcoholic beverages, beer cans, Sapporo, etc 1 L and under.
Steel Food & Other Beverages	Yes	Apple juice, soup, beans, peaches, etc. No alcohol containers.
Steel Aerosol Cans	Yes	Empty spray paint cans, cooking oil, whipped cream, etc.
Steel Paint Cans	Yes	Empty paint cans. No steel aerosol paint cans.
Other Metal		Scrap metal, copper pipe, hardware, etc. Includes multi-material items that are mainly metal. Includes empty propane tanks.

Waste Audit Program 2009 – Material Categories**Page 3 of 3**

Material Category		Description / Examples
GLASS		
Clear Glass Beer Over 630 ml	Yes	Clear glass beer bottles over 630 ml.
Clear Glass Beer 630 ml and Under	Yes	Clear glass beer bottles less than or equal to 630 ml.
Clear Glass Other Alcohol Over 630 ml	Yes	Clear glass wine and liquor bottles over 630 ml.
Clear Glass Other Alcohol Over 100 ml and Less Than or Equal to 630 ml	Yes	Clear glass wine and liquor bottles over 100 ml and less than or equal to 630 ml.
Clear Glass Other Alcohol 100 ml and Under	Yes	Clear glass wine and liquor bottles 100 ml or less.
Coloured Glass Beer Over 630 ml	Yes	Coloured glass beer bottles over 630 ml.
Coloured Glass Beer 630 ml and Under	Yes	Coloured glass beer bottles less than or equal to 630 ml.
Coloured Glass Other Alcohol Over 630 ml	Yes	Coloured glass wine and liquor bottles over 630 ml.
Coloured Glass Other Alcohol Over 100 ml and Less Than or Equal to 630 ml	Yes	Coloured glass wine and liquor bottles over 100 ml and less than or equal to 630 ml.
Coloured Glass Other Alcohol 100 ml and Under	Yes	Coloured glass wine and liquor bottles 100 ml or less.
Clear Glass Other Beverage and Food	Yes	Coloured glass food and other beverage containers, all sizes
Coloured Glass Other Beverage and Food	Yes	Coloured glass food and other beverage containers, all sizes
Other Glass		Window glass, plates and glasses, light bulbs (fluorescent tubes and compact fluorescents go in Other HSW)
HOUSEHOLD SPECIAL WASTE		
Batteries		All types
Paint & Stain		Cans / tubs still containing product, oil and latex paint, wood stain, varnish, etc.
Motor Oil		Oil filters and jugs or cans still containing oil
Other HSW liquids		Solvents, antifreeze, acids, pool chemicals, weed killer, gasoline, brake fluid, glues, adhesives, cleaners, nail polish remover, etc. Look for signal words such as "Poison", "Danger", "Warning", "Caution", and "Precautionary Statements".
Other HSW		Sharps, drug products, medicine, medical waste, fluorescent tubes, ionized smoke detectors, etc. Look for signal words such as "Poison", "Danger", "Warning", "Caution", and "Precautionary Statements".
ORGANICS		
Food Waste		Vegetable and fruit peelings, meats, fish, fats, oils, bones, etc
Yard Waste		Brush, branches, wood chips, grass, leaves, soil, plant material, ashes
Pet waste		Animal feces, bedding, kitty litter
OTHER MATERIALS		
Diapers and Sanitary Products		Diapers, sanitary napkins, hygiene products, etc.
Textiles		Clothing, shoes, mats, drapes, sheets, etc. Plastic rice sacks go in Other Rigid Plastic Packaging
Carpeting		Carpeting, underlay, mats
Construction & Renovation		Lumber, wood cut off, drywall, ceramic tiles, plaster, etc.
Computer / IT Equipment		PCs, notebooks, CRT and LCD monitors, scanners, printers, mouse, cables
Telecom Equipment		Phones, pagers, Blackberry, mobile phones, etc.
TV & Audio Equipment		Televisions, DVD, radio, VCR, etc
Small Kitchen Appliances		Blenders, coffee machine, etc.
Other Electronics		Electronic games, clocks, gadgets, anything with a plug or battery
Tires and Other Rubber		Rubber tires and tubes, other rubber items such as hoses
Ceramics		Ceramic plates, cups, plant pots, etc.
Furniture		Chairs, cabinets, tables, garden furniture
Mattresses		Mattresses and box springs, futons, foam mattresses
Other Large Bulky Items		Other large items not classified elsewhere
Other Waste		Materials not classified elsewhere, wooden fruit basket, vacuum bags, wax candles, furnace filters, etc.

APPENDIX B

Time and Motion Study Area Route Maps

ONLY DURING BROOKE NORTH

CHURCHILL LI

LASALLE LI

PETROILIA LI

ROKEBY LI

SHILOH LI

INWOOD RD

SUTORVILLE RD

LITTLE IRELAND RD

IWALNUT RD

START

ONLY DURING BROOKE NORTH

SHILO RD.

ARENA
SHED

NAUVOO ST.

MORREL ST.

RIVER ST.

LOOK

CENTRE ST

RAILROAD ST.

ELM ST.

END 1

LOVELL ST.

HENRY ST.

WALNUT ST.

ELGIN ST.

ALLEY

RIVER ST.

CHURCH ST.

START 2

END 2

MILLPOND ST.

OLD AGE
HOME GARBAGE
IN DEPOT CARTS BAGGED

FRANCIS ST.

LISCAR ST.

BROADWAY ST.

RIVER ST.

ALVINSTON NORTH NO TAGS 2 STARTS
BE SURE TO DO ALLEY ON RAILROAD LINE
BETWEEN RIVER AND ELGIN ST.

N



ST. MARYS N - TUESDAY - ODD - MAP 1 of 3

Map Date: June 09 - St Marys N 2A-ODD.pub



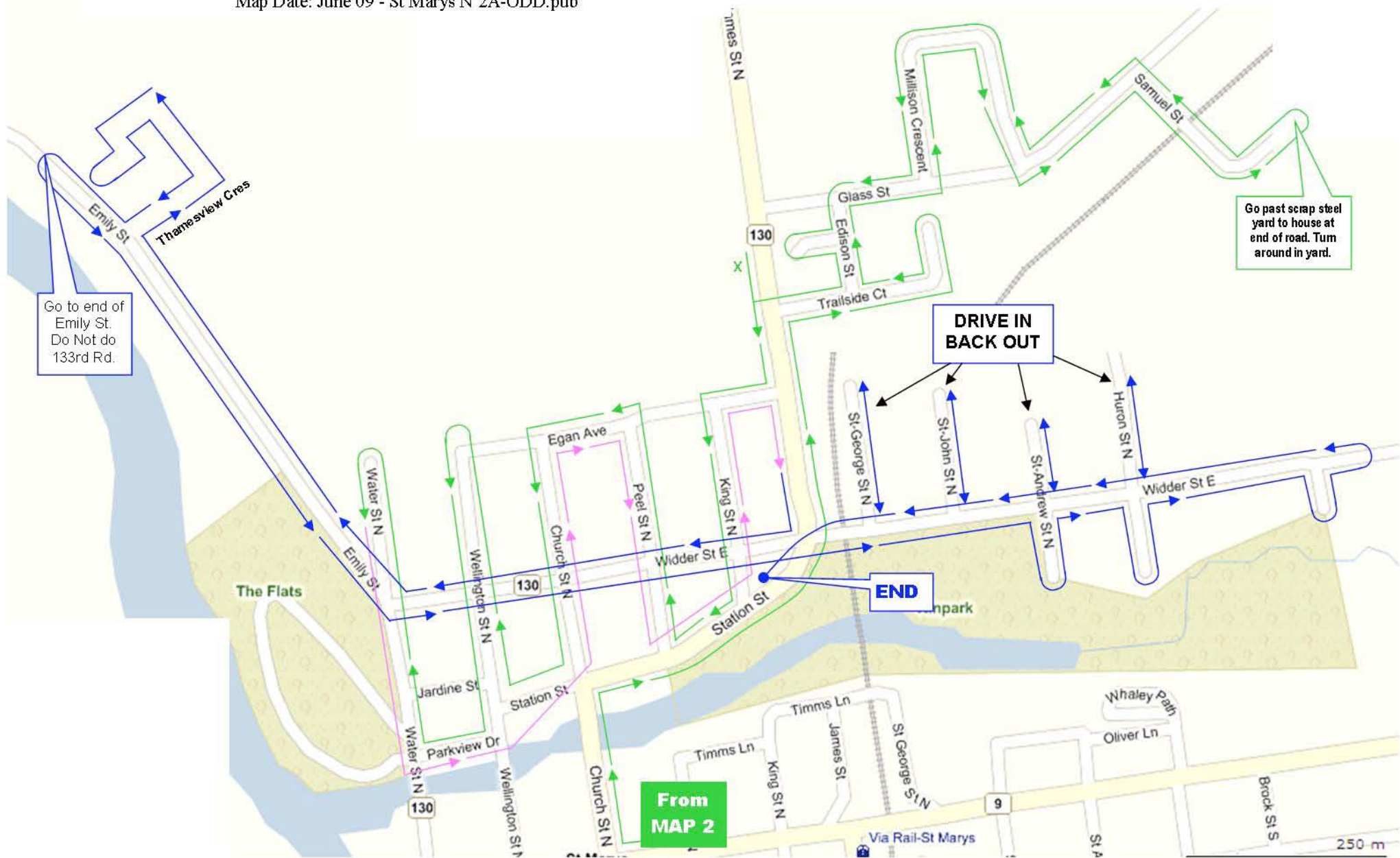
ST. MARYS N - TUESDAY - ODD - MAP 2 of 3

Map Date: June 09 - St Marys N 2A-ODD.pub



ST. MARYS N - TUESDAY - ODD - MAP 3 of 3

Map Date: June 09 - St Marys N 2A-ODD.pub



APPENDIX C

Time and Motion Study Data Collection

Sheet Categories

Sample Time and Motion Data Collection Form									
Location: 1		Date: 4							
Route: 2		Measured by: 5							
Weather: 3		Reading Times: Every 1 minute							
Collection Type: <input type="checkbox"/> Manual <input type="checkbox"/> Fully Automated		Streams Collected: Recycling							
Vehicle Type/Design:		Number of stops on route							
Start time: 6 am		Time finished at day end: 19 pm		Km Readings					
Time to route in am: 7 am		Total distance driven: 20 km		Yard: 21 Km					
				On route: 22 Km					
				Off route: 23 Km					
				Break Stop: 24 Km					
Time off-route		1st time 8 am/pm		Break No.1 15 am/pm		Break No.2 17 am/pm		On route: 25 Km	
Time to MRF		9 am/pm						Off route: 26 Km	
Time dumping Recycling		10 Min						MRF: 27 Km	
Tonnes collected		11 tonnes						On route: 28 Km	
Time going back to route		12 am/pm						Off route: 29 Km	
Time back on route		13 am/pm		16 am/pm		18 am/pm		Break Stop: 30 Km	
Time off-route		14 am/pm						On route: 31 Km	
								Off route: 32 Km	
								Yard: 33 Km	
On-route Activities									
Driving between stops	34								
Loading/Returning Fibres (Manual)	35								
Loading/Returning Containers (Manual)	36								
Loading Container (with mechanical arm)	37								
Returning Container to Curbside (with mechanical arm)	38								
Container Rejections	39								
Getting out of truck	40								
Manually Adjusting Setout	41								
Getting into truck	42								
Contamination	43								
Other (note/record on back by number)	44			Speaking with Public			Coffee/lunch break		
				45			46		
Speaking with Management/ Co-workers	47			Tagging Non Conformance Setout			Truck/Driver Problems		
				48			49		
Total Time	50			Total Ticks			51		
Number of setouts	52								
Notes (e.g. a lot of material at curb):									

Sample Time and Motion Data Collection Form - Category Descriptions	
1	Study Area Location
2	Route number (ie. _____)
3	Weather during day of collection (include precipitation and temperature if possible)
4	Date of collections
5	Data Collectors Name
6	Time when truck leaves yard in morning
7	Time when truck arrives at route – this is when the 60 second intervals start
8	Time when truck stops collections and prepares to leave route – this is when you stop collecting 60 second interval data
9	Time when truck arrives at MRF
10	Approximate time to dump the recyclables
11	Put in the total tonnes collected using weigh bills
12	Time when the truck is leaving MRF after it has already weighed out
13	Time when truck arrives back at route – this is when the 60 second intervals start
14	Time when truck finishes collections and prepares to leave route – this is when you stop collecting 60 second interval data
15	Time when collector leave route to go on break - this is when you stop collecting 60 second interval data
16	Time when collector arrives back at route - this is when the 60 second intervals start
17	Time when collector leave route to go on break - this is when you stop collecting 60 second interval data
18	Time when collector arrives back at route - this is when the 60 second intervals start
19	Time when truck returns to yard after all collections are complete
20	Total distance driven by the truck that day
21	Kilometre reading on the odometer when truck leaves yard in morning
22	Kilometre reading on the odometer when truck arrives on route for collections
23	Kilometre reading on the odometer when truck leaves route to take a break
24	Kilometre reading on the odometer when truck arrives at location of break
25	Kilometre reading on the odometer when truck arrives back at route for collections
26	Kilometre reading on the odometer when truck leaves route to dump materials collected (if necessary)
27	Kilometre reading on the odometer when truck arrives at MRF (if necessary)
28	Kilometre reading on the odometer when truck arrives back at route for collections
29	Kilometre reading on the odometer when truck leaves route to take a break
30	Kilometre reading on the odometer when truck arrives at location of break
31	Kilometre reading on the odometer when truck arrives back at route for collections
32	Kilometre reading on the odometer when truck finishes route
33	Kilometre reading on the odometer when truck returns to yard after all collections are completed
34	Operator is in truck and truck is in motion, moving from one stop to the next
35	Operator is loading the fibres into the truck or returning the blue box back to the curbside
36	Operator is loading the containers into the truck or returning the blue box back to the curbside
37	Operator has container in lift and is putting material into the truck
38	Operator has container in lift and is returning it to the curbside
39	The container/material is rejected (unable to pick up with lift, improper setout)
40	Operator is getting out of truck or walking to set out
41	Operator is manually adjusting set out
42	Operator is walking towards or getting into truck
43	Operator is sorting through contents of container to remove unacceptable materials
44	Keep track on back of page and make specific notes as to what is happening
45	Operator is speaking with public advising of proper setouts, etc
46	Operator is taking a coffee break, lunch break or stopped to rest and eat and/or drink
47	Operator is talking with his supervisor or with co-workers either in person or on radio/phone
48	Operator is tagging waste that has been setout improperly, may include calling this into base by house number
49	Operator may be injured and waiting for replacement or truck may be broken down
50	Total time on route – to be calculated at days end
51	Total Ticks – sum of all ticks collected in above boxes
52	Number of households that placed blue box material at the curb

Sample of 100 Households - St. Marys

Loading and Returning Container with Mechanical Arm (Reading Time: # of Seconds)

1	16	31	46	61	76	91
2	17	32	47	62	77	92
3	18	33	48	63	78	93
4	19	34	49	64	79	94
5	20	35	50	65	80	95
6	21	36	51	66	81	96
7	22	37	52	67	82	97
8	23	38	53	68	83	98
9	24	39	54	69	84	99
10	25	40	55	70	85	100
11	26	41	56	71	86	
12	27	42	57	72	87	
13	28	43	58	73	88	
14	29	44	59	74	89	
15	30	45	60	75	90	

Time Between Stops Using Automated Collection (Reading Time: # of Seconds)

1	16	31	46	61	76	91
2	17	32	47	62	77	92
3	18	33	48	63	78	93
4	19	34	49	64	79	94
5	20	35	50	65	80	95
6	21	36	51	66	81	96
7	22	37	52	67	82	97
8	23	38	53	68	83	98
9	24	39	54	69	84	99
10	25	40	55	70	85	100
11	26	41	56	71	86	
12	27	42	57	72	87	
13	28	43	58	73	88	
14	29	44	59	74	89	
15	30	45	60	75	90	

APPENDIX D

Participant Survey and Letter



Stantec

Stantec
203 - 3430 South Service Road
Burlington ON L7N 3T9
Tel: (905) 631-8684
Fax: (905) 631-8960



**Waste
Diversion
Ontario**

Project No. 1053087

July 9, 2009

Address 1

Address 2

St. Marys, Ontario, NAX XXX

Dear Resident:

REFERENCE: RECYCLING PROGRAM SURVEY

Your household has received this survey as part of a recycling study that is being led by Waste Diversion Ontario (WDO). This survey is designed to gather information from you and other St. Mary's residents about your local recycling program. Your responses will help WDO evaluate the recycling cart program and let them compare it to the use of blue boxes to collect recyclables in rural communities. Stantec is administering the survey on behalf of WDO.

Your responses are confidential. Your participation in this survey is completely voluntary and will not affect your recycling collection services.

Please submit your completed survey by **July 29th, 2009**. You can submit your completed survey via the self addressed envelope provided, or by email or fax to the contact below:

Kerrie Skillen
3430 South Service Road, Unit 203
Burlington, Ontario, L7N 3T9
Phone: 905-631-3923
Fax: 905-631-8684
Email: Kerrie.Skillen@Stantec.com

Please contact Kerrie if you have any questions about the survey.

Who is Waste Diversion Ontario?

Waste Diversion Ontario (WDO) is a non-crown corporation responsible for administering and delivering the blue box program in Ontario. WDO has provided funding to upgrade the Bluewater recycling facility and to provide recycling carts (i.e. wheelie bins) to residents of St. Mary's. WDO is interested in your input to help them determine whether recycling carts should be made available to other rural communities in Ontario.

Yours very truly,

STANTEC

Kerrie Skillen, M.E.S.
Team Leader and Project Manager, Central Canada Waste Services Group

p:\1000xxx\1050xxx\1053087 - wdo recycling operations review\participant survey\participant survey - final letter.docx



Recycling Container Survey

Household Demographics

1. *How many people live in your household? (please check one)*

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5+

2. *How many people in your household are within the following age ranges?*

Age Range **Number of people (please indicate how many in each age range)**

Under 18

18 to 35

36 to 49

50 to 64

65+

Recycling Practices – please check one for each question

3. *Do you recycle?*

- ☐ Yes
- ☐ No

If no, why not? _____

4. *Where do you store your cart/ wheelie bin?*

- ☐ Garage
- ☐ Inside house
- ☐ Back yard
- ☐ Porch/patio (back or front)
- ☐ Side of house/by side door
- ☐ Driveway
- ☐ In front of house

Experience Using the Cart/Wheelie Bin – please check one for each question

5. *On average, how often do you put out your cart/ wheelie bin for collection?*

- ☐ Every collection
- ☐ Monthly
- ☐ Less than monthly

6. *On average, how full is your cart/ wheelie bin when you put it out?*

- ☐ Overloaded
- ☐ Full
- ☐ $\frac{3}{4}$ full
- ☐ $\frac{1}{2}$ full
- ☐ $\frac{1}{4}$ full



Recycling Container Survey

7. *How often does your cart/ wheelie bin run out of room?*
- ☐ Always
 - ☐ Often
 - ☐ Sometimes
 - ☐ Rarely
 - ☐ Never
8. *Do you find the cart/ wheelie bin:*
- ☐ Easy to move?
 - ☐ Difficult to move? Why is the cart/ wheelie bin difficult to move? _____
- _____

Overall Satisfaction with the Cart/Wheelie Bin – please check one for each question

9. *How would you rate your overall satisfaction with your recycling cart/ wheelie bin?*
- ☐ Satisfied
 - ☐ Somewhat satisfied
 - ☐ Neutral
 - ☐ Somewhat unsatisfied
 - ☐ Unsatisfied
10. *How would you rate your satisfaction with your recycling cart/ wheelie bin based on the following?*
- i. Ability to keep streets, sidewalks clean**
 - ☐ Satisfied
 - ☐ Somewhat satisfied
 - ☐ Neutral
 - ☐ Somewhat unsatisfied
 - ☐ Unsatisfied
 - ii. Storage capacity**
 - ☐ Satisfied
 - ☐ Somewhat satisfied
 - ☐ Neutral
 - ☐ Somewhat unsatisfied
 - ☐ Unsatisfied
 - iii. Convenient to use**
 - ☐ Satisfied
 - ☐ Somewhat satisfied
 - ☐ Neutral
 - ☐ Somewhat unsatisfied
 - ☐ Unsatisfied
 - iv. Ease of bringing to curb**
 - ☐ Satisfied
 - ☐ Somewhat satisfied
 - ☐ Neutral
 - ☐ Somewhat unsatisfied
 - ☐ Unsatisfied



Recycling Container Survey

v. Durability

- ☐ Satisfied
- ☐ Somewhat satisfied
- ☐ Neutral
- ☐ Somewhat unsatisfied
- ☐ Unsatisfied

vi. Ease of storing in home/garage

- ☐ Satisfied
- ☐ Somewhat satisfied
- ☐ Neutral
- ☐ Somewhat unsatisfied
- ☐ Unsatisfied

Comparative Performance -

Cart/Wheelie Bin vs Blue Boxes – please check one for each question

11. *Do you recycle more, less or the same amount of material with your cart/ wheelie bin as you did with the blue box you used before?*
 - ☐ Recycle more than before
 - ☐ Recycle the same as before
 - ☐ Recycle less than before
12. *If you had a choice, which recycling system would you prefer to use?*
 - ☐ Blue Box system
 - ☐ Cart based system
 - ☐ Blue bag system
13. *How would you compare your cart/ wheelie bin to the blue box system based on the following points:*
 - i. Ability to keep streets, sidewalks clean**
 - ☐ Cart/Wheelie Bin much better
 - ☐ Cart/Wheelie Bin somewhat better
 - ☐ Blue box somewhat better
 - ☐ Blue box much better
 - ii. Storage capacity**
 - ☐ Cart/Wheelie Bin much better
 - ☐ Cart/Wheelie Bin somewhat better
 - ☐ Blue box somewhat better
 - ☐ Blue box much better
 - iii. Convenient to use**
 - ☐ Cart/Wheelie Bin much better
 - ☐ Cart/Wheelie Bin somewhat better
 - ☐ Blue box somewhat better
 - ☐ Blue box much better



Recycling Container Survey

iv. Ease of bringing to curb

- ☐ Cart/Wheelie Bin much better
- ☐ Cart/Wheelie Bin somewhat better
- ☐ Blue box somewhat better
- ☐ Blue box much better

v. Durability

- ☐ Cart/Wheelie Bin much better
- ☐ Cart/Wheelie Bin somewhat better
- ☐ Blue box somewhat better
- ☐ Blue box much better

vi. Ease of Storing in home/garage

- ☐ Cart/Wheelie Bin much better
- ☐ Cart/Wheelie Bin somewhat better
- ☐ Blue box somewhat better
- ☐ Blue box much better

Overall Satisfaction with Recycling Collection – please check one for each question

14. *How would you rate your overall satisfaction with the recycling collection service provided to your home?*

- ☐ Satisfied
- ☐ Somewhat satisfied
- ☐ Neutral
- ☐ Somewhat unsatisfied
- ☐ Unsatisfied

15. *Does the educational material you receive from Bluewater Recycling Association and the Town of St. Marys provide you with enough information to know what is and isn't recyclable?*

- ☐ Yes
- ☐ No

16. *If you don't know if something is recyclable, do you:*

- ☐ Place it in the recycling cart/wheelie bin
- ☐ Put it in the garbage
- ☐ Hold onto it until you find out if you can recycle it

Thank you for your comments and if you would like to add any additional comments, please do so below: _____

Please submit your completed survey by **July 29th, 2009** via the self addressed envelope provided, or by email or fax to:

Kerrie Skillen, Stantec, 3430 South Service Road, Unit 203, Burlington, Ontario, L7N 3T9

Phone: 905-631-3923, Fax: 905-631-8684, Email: Kerrie.Skillen@Stantec.com

APPENDIX E

Waste Audit Results

Bluewater Recycling Association Automated Bin vs. Blue Box Waste Composition Audit Results Analysis																
Sample Type: Sample Area: Sample Size (# Households): Date Collected (month/day/year): Audit Supervisor: Waste Stream: Collection Frequency:		Bi-weekly Ottocart Recycling Program							Weekly Blue Box Recycling Program							
		St. Mary's							Alvinston							
		97							84							
		06/30/09 & 07/07/09							03/07/09							
		M. Adams							M. Adams							
		Residual Waste			Recycling				Residual Waste			Recycling				
		Weekly (aggregate 2 weeks data adjusted to weekly average)			Bi-Weekly (adjusted to weekly average)				Weekly			Weekly				
Material Category	Accepted? ("X" if accepted in recycling program)	Net Weight (kg)	%	kg/hh/wk	Net Weight (kg)	%	kg/hh/wk	Recyclable Capture Rate	Net Weight (kg)	%	kg/hh/wk	Net Weight (kg)	%	kg/hh/wk	Recyclable Capture Rate	
1. PAPER																
Newsprint	R	3.96	0.72%	0.04	90.89	27.19%	0.94	95.82%	21.16	2.06%	0.25	77.85	22.40%	0.93	78.63%	
Telephone Books / Directories	R	0.00	0.00%	0.00	1.44	0.43%	0.01	100.00%	2.10	0.20%	0.03	0.62	0.18%	0.01	22.79%	
Magazines & Catalogues	R	3.18	0.58%	0.03	23.70	7.09%	0.24	88.19%	10.39	1.01%	0.12	7.90	2.27%	0.09	43.19%	
Mixed Fine Paper	R	10.00	1.82%	0.10	14.87	4.45%	0.15	59.80%	40.65	3.96%	0.48	8.03	2.31%	0.10	16.50%	
Books	R	0.79	0.14%	0.01	0.23	0.07%	0.00	22.55%	2.98	0.29%	0.04	0.97	0.28%	0.01	24.56%	
Other Paper	W	2.47	0.45%	0.03	4.88	1.46%	0.05	-	11.09	1.08%	0.13	3.57	1.03%	0.04	-	
Total Recyclable Paper		17.92	3.25%	0.18	131.13	39.22%	1.35	87.98%	77.28	7.52%	0.92	95.37	27.44%	1.14	55.24%	
Total Non Recyclable Paper		2.47	0.45%	0.03	4.88	1.46%	0.05	-	11.09	1.08%	0.13	3.57	1.03%	0.04	-	
Total Paper		20.39	3.70%	0.21	136.01	40.68%	1.40	-	88.37	8.60%	1.05	98.94	28.47%	1.18	-	
2. PAPER PACKAGING																
Corrugated	R	1.49	0.27%	0.02	42.47	12.70%	0.44	96.62%	19.04	1.85%	0.23	96.51	27.77%	1.15	83.52%	
Kraft Paper	R	2.09	0.38%	0.02	1.65	0.49%	0.02	44.12%	3.77	0.37%	0.04	6.38	1.84%	0.08	62.86%	
Boxboard / Cores	R	7.85	1.43%	0.08	38.20	11.42%	0.39	82.95%	26.49	2.58%	0.32	29.67	8.54%	0.35	52.83%	
Molded Pulp	R	0.87	0.16%	0.01	1.85	0.55%	0.02	67.96%	4.01	0.39%	0.05	1.60	0.46%	0.02	28.52%	
Paper Cups and Ice-Cream Containers	W	3.25	0.59%	0.03	0.40	0.12%	0.00	-	4.20	0.41%	0.05	0.38	0.11%	0.00	-	
Laminated Paper Packaging	W	2.92	0.53%	0.03	0.28	0.08%	0.00	-	5.99	0.58%	0.07	1.58	0.45%	0.02	-	
Composite Cans	W	1.08	0.20%	0.01	0.67	0.20%	0.01	-	2.72	0.26%	0.03	0.19	0.05%	0.00	-	
Gable Top Cartons	W	3.82	0.69%	0.04	0.64	0.19%	0.01	-	2.28	0.22%	0.03	0.77	0.22%	0.01	-	
Aseptic Containers	W	1.45	0.26%	0.01	0.22	0.06%	0.00	-	0.94	0.09%	0.01	0.18	0.05%	0.00	-	
Tissue/Toweling	W	18.64	3.39%	0.19	0.28	0.08%	0.00	-	18.07	1.76%	0.22	0.76	0.22%	0.01	-	
Total Recyclable Paper Packaging		12.30	2.23%	0.13	84.16	25.17%	0.87	87.25%	53.31	5.19%	0.63	134.16	38.61%	1.60	71.56%	
Total Non Recyclable Paper Packaging		31.16	5.66%	0.32	2.46	0.74%	0.03	-	34.20	3.33%	0.41	3.86	1.11%	0.05	-	
Total Paper Packaging		43.45	7.89%	0.45	86.62	25.91%	0.89	-	87.51	8.52%	1.04	138.02	39.72%	1.64	-	
3. PLASTICS																
PET Bottles & Jars	R	1.58	0.29%	0.02	13.33	3.99%	0.14	89.43%	6.54	0.64%	0.08	18.82	5.42%	0.22	74.21%	
PET Other Packaging	W	2.41	0.44%	0.02	1.62	0.48%	0.02	-	1.01	0.10%	0.01	0.88	0.25%	0.01	-	
HDPE Bottles & Jugs	R	1.45	0.26%	0.01	11.22	3.35%	0.12	88.55%	4.37	0.43%	0.05	6.36	1.83%	0.08	59.27%	
PVC Bottles & Jars	W	0.38	0.07%	0.00	0.04	0.01%	0.00	-	0.23	0.02%	0.00	0.43	0.12%	0.01	-	
Other Bottles, Jars & Jugs	W	0.77	0.14%	0.01	0.63	0.19%	0.01	-	1.61	0.16%	0.02	0.70	0.20%	0.01	-	
Wide Mouth Tubs & Lids	R	1.03	0.19%	0.01	0.41	0.12%	0.00	28.32%	1.16	0.11%	0.01	0.67	0.19%	0.01	36.61%	
Large HDPE & PP Pails & Lids	R	0.00	0.00%	0.00	0.23	0.07%	0.00	100.00%	1.15	0.11%	0.01	0.89	0.26%	0.01	43.63%	
Polyethylene PE Plastic Bags & Film - Packaging	R	11.04	2.01%	0.11	4.48	1.34%	0.05	28.87%	18.16	1.77%	0.22	3.52	1.01%	0.04	16.24%	
Polyethylene Plastic Bags & Film - Non-Packaging	W	6.70	1.22%	0.07	0.71	0.21%	0.01	-	14.07	1.37%	0.17	0.44	0.13%	0.01	-	
Laminated/Other Plastic Bags & Film	W	9.53	1.73%	0.10	0.60	0.18%	0.01	-	11.84	1.15%	0.14	0.47	0.14%	0.01	-	
Other Rigid Plastic Packaging	W	14.05	2.55%	0.14	4.80	1.43%	0.05	-	27.10	2.64%	0.32	6.96	2.00%	0.08	-	
Durable Plastic Products	W	9.72	1.76%	0.10	1.03	0.31%	0.01	-	45.64	4.44%	0.54	3.16	0.91%	0.04	-	
Total Recyclable Plastics		15.09	2.74%	0.16	29.66	8.87%	0.31	66.28%	31.38	3.05%	0.37	30.26	8.71%	0.36	49.09%	
Total Non Recyclable Plastics		43.55	7.91%	0.45	9.41	2.81%	0.10	-	101.50	9.88%	1.21	13.04	3.75%	0.16	-	
Total Plastics		58.64	10.65%	0.60	39.07	11.68%	0.40	-	132.88	12.94%	1.58	43.30	12.46%	0.52	-	
4. METALS																
Aluminum Food & Beverage Cans	R	0.59	0.11%	0.01	8.46	2.53%	0.09	93.48%	2.56	0.25%	0.03	10.67	3.07%	0.13	80.65%	
Aluminum Foil & Foil Trays	R	1.59	0.29%	0.02	0.82	0.24%	0.01	33.89%	2.51	0.24%	0.03	0.03	0.01%	0.00	1.18%	
Other Aluminum Containers	R	0.22	0.04%	0.00	0.63	0.19%	0.01	73.96%	0.56	0.05%	0.01	0.64	0.18%	0.01	53.33%	
Steel Food & Beverage Cans	R	1.56	0.28%	0.02	10.83	3.24%	0.11	87.40%	4.19	0.41%	0.05	14.40	4.14%	0.17	77.46%	
Steel Aerosol Cans	R	0.50	0.09%	0.01	0.54	0.16%	0.01	51.94%	1.71	0.17%	0.02	0.14	0.04%	0.00	7.57%	
Steel Paint Cans	R	0.82	0.15%	0.01	0.00	0.00%	0.00	0.00%	0.73	0.07%	0.01	0.00	0.00%	0.00	0.00%	
Other Metal	W	5.33	0.97%	0.05	1.07	0.32%	0.01	-	26.04	2.53%	0.31	0.58	0.17%	0.01	-	
Total Recyclable Metals		5.27	0.96%	0.05	21.26	6.36%	0.22	80.14%	12.26	1.19%	0.15	25.88	7.45%	0.31	67.86%	
Total Non Recyclable Metals		5.33	0.97%	0.05	1.07	0.32%	0.01	-	26.04	2.53%	0.31	0.58	0.17%	0.01	-	
Total Metals		10.60	1.93%	0.11	22.33	6.68%	0.23	-	38.30	3.73%	0.46	26.46	7.61%	0.32	-	
5. GLASS																
Clear Glass Beverage and Food	R	3.50	0.64%	0.04	27.68	8.28%	0.29	88.77%	8.79	0.86%	0.10	23.34	6.72%	0.28	72.64%	
Coloured Glass Beverage and Food	R	0.12	0.02%	0.00	17.30	5.17%	0.18	99.34%	4.10	0.40%	0.05	3.77	1.08%	0.04	47.90%	
Other Glass	W	3.46	0.63%	0.04	1.18	0.35%	0.01	-	6.04	0.59%	0.07	3.43	0.99%	0.04	-	
Total Recyclable Glass		3.62	0.66%	0.04	44.98	13.45%	0.46	92.56%	12.89	1.25%	0.15	27.11	7.80%	0.32	67.78%	
Total Non Recyclable Glass		3.46	0.63%	0.04	1.18	0.35%	0.01	-	6.04	0.59%	0.07	3.43	0.99%	0.04	-	
Total Glass		7.08	1.29%	0.07	46.16	13.81%	0.48	-	18.93	1.84%	0.23	30.54	8.79%	0.36	-	
6. HOUSEHOLD SPECIAL WASTE																
Batteries	W	1.44	0.26%	0.01	0.00	0.00%	0.00	-	1.12	0.11%	0.01	0.02	0.01%	0.00	-	
Paint & Stain	W	1.27	0.23%	0.01	0.31	0.09%	0.00	-	4.55	0.44%	0.05	0.99	0.28%	0.01	-	
Motor Oil	W	0.78	0.14%	0.01	0.00	0.00%	0.00	-	0.00	0.00%	0.00	0.00	0.00%	0.00	-	
Other HSW liquids	W	2.17	0.39%	0.02	0.00	0.00%	0.00	-	5.17	0.50%	0.06	0.00	0.00%	0.00	-	
Other HSW	W	1.17	0.21%	0.01	0.13	0.04%	0.00	-	1.82	0.18%	0.02	0.00	0.00%	0.00	-	
Total HSW		6.82	1.24%	0.07	0.44	0.13%	0.00	-	12.66	1.23%	0.15	1.01	0.29%	0.01	-	
7. ORGANICS																
Food Waste	W	227.74	41.36%	2.35	2.62	0.78%	0.03									

Bluewater Recycling Association Waste Composition Audit - Raw Results						
	Sample Area; Audit Supervisor: Waste Stream: Data Material Collected (mm/dd/yyyy):	St. Mary's Week One	St. Mary's Week Two	Alvinston	St. Mary's Automated Bin Recycling	Alvinston Blue Box Recycling
		M. Adams	M. Adams	M. Adams	M. Adams	M. Adams
		Residual Waste 97 households	Residual Waste 97 households	Residual Waste 84 households	Recycling 97 households	Recycling 84 households
		06/30/09	07/07/09	07/03/09	06/30/09	07/03/09
Material Category	Acceptable: Recyclable=R, Non- Recyclable=W, Acceptable Organics=O	Net Weight (kg)	Net Weight (kg)	Net Weight (kg)	Net Weight (kg) Note: 2 Weeks Generation Period	Net Weight (kg) Note: 1 Week Generation Period
1. PAPER						
1 Newsprint	R	3.13	4.79	21.16	181.78	77.85
2 Telephone Books/Directories	R	0.00	0.00	2.10	2.88	0.62
3 Magazines & Catalogues	R	1.49	4.86	10.39	47.40	7.90
4 Mixed Fine Papers	R	9.98	10.01	40.65	29.74	8.03
5 Books	R	1.25	0.33	2.98	0.46	0.97
6 Other Paper	W	1.86	3.07	11.09	9.75	3.57
Total Recyclable Paper	TR	15.85	19.99	77.28	262.26	95.37
Total Non Recyclable Paper	TND	1.86	3.07	11.09	9.75	3.57
Total Paper		17.71	23.06	88.37	272.01	98.94
2. PAPER PACKAGING						
1 Corrugated Cardboard	R	1.07	1.90	19.04	84.94	96.51
2 Kraft Paper	R	1.30	2.88	3.77	3.30	6.38
3 Boxboard / Rolls	R	7.17	8.53	26.49	76.39	29.67
4 Molded Pulp	R	0.34	1.40	4.01	3.69	1.60
5 Paper Cups	W	2.84	3.66	4.20	0.79	0.38
6 Laminated Paper & Packaging	W	2.49	3.35	5.99	0.55	1.58
7 Composite Cans	W	1.00	1.15	2.72	1.33	0.19
8 Gable Top Cartons	W	3.29	4.35	2.28	1.27	0.77
9 Aseptic Containers	W	0.72	0.70	0.94	0.43	0.18
10 Tissue/Toweling	W	15.27	22.01	18.07	0.55	0.76
Total Recyclable Paper Packaging	TR	9.88	14.71	53.31	168.32	134.16
Total Non Recyclable Paper Packaging	TND	25.61	35.22	34.20	4.92	3.86
Total Paper Packaging		35.49	49.93	87.51	173.24	138.02
3. PLASTICS						
1 PETE Other Bottles	R	1.17	1.98	6.54	26.66	18.82
2 PETE Packaging	W	2.18	2.64	1.01	3.24	0.88
3 HDPE Bottles & Jugs	R	1.59	1.31	4.37	22.43	6.36
4 PVC Bottles	W	0.75	0.00	0.23	0.07	0.43
5 Other Bottles, Jars & Jugs	W	0.67	0.87	1.61	1.26	0.70
6 Widemouth Tubs & Lids	R	0.81	1.24	1.16	0.81	0.67
7 Large HDPE & PP Pails & Lids (>4 litres)	R	0.00	0.00	1.15	0.45	0.89
8 Polyethylene Plastic Bags & Film - Packaging	R	12.20	9.88	18.16	8.96	3.52
9 Polyethylene Plastic Bags & Film - Non-Packaging	W	5.94	7.46	14.07	1.41	0.44
10 Laminated Other Plastic Bags & Film	W	7.63	11.42	11.84	1.20	0.47
11 Other Rigid Plastic Packaging	W	11.13	16.97	27.10	9.59	6.96
12 Durable Plastic Products	W	7.90	11.53	45.64	2.05	3.16
Total Recyclable Plastics	TR	15.77	14.41	31.38	59.31	30.26
Total Non Recyclable Plastics	TND	36.20	50.89	101.50	18.82	13.04
Total Plastics		51.97	65.30	132.88	78.13	43.30
4. METALS						
1 Aluminum Food & Beverage Cans	R	0.52	0.66	2.56	16.92	10.67
2 Aluminum Foil & Trays	R	1.43	1.75	2.51	1.63	0.03
3 Other Aluminum Containers	R	0.16	0.28	0.56	1.25	0.64
4 Steel Food & Beverage Cans	R	1.52	1.60	4.19	21.65	14.40
5 Steel Aerosol Cans	R	0.36	0.63	1.71	1.07	0.14
6 Steel Paint Cans	R	0.00	1.63	0.73	0.00	0.00
7 Other Metal	W	2.73	7.93	26.04	2.13	0.58
Total Recyclable Metals	TR	3.99	6.55	12.26	42.52	25.88
Total Non Recyclable Metals	TND	2.73	7.93	26.04	2.13	0.58
Total Metals		6.72	14.48	38.30	44.65	26.46
5. GLASS						
1 Clear Glass Beverage and Food	R	1.94	5.06	8.79	55.36	23.34
2 Coloured Glass Beverage and Food	R	0.23	0.00	4.10	34.60	3.77
3 Other Glass	W	3.80	3.12	6.04	2.35	3.43
Total Recyclable Glass	TR	2.17	5.06	12.89	89.96	27.11
Total Non Recyclable Glass	TND	3.80	3.12	6.04	2.35	3.43
Total Glass		5.97	8.18	18.93	92.31	30.54
6. SPECIAL WASTE						
1 Batteries	W	1.45	1.43	1.12	0.00	0.02
2 Paint & Stain	W	0.00	2.54	4.55	0.62	0.99
3 Motor Oil	W	1.56	0.00	0.00	0.00	0.00
4 Other HSW Liquids	W	2.17	2.16	5.17	0.00	0.00
5 Other HSW	W	1.42	0.91	1.82	0.26	0.00
Total HSW	TND	6.60	7.04	12.66	0.88	1.01
7. ORGANICS						
1 Food Waste	W	207.87	247.60	294.43	5.23	6.39
2 Yard Waste	W	6.80	2.94	35.84	0.00	0.00
3 Pet Waste	W	63.34	80.77	66.71	0.00	0.00
Total Acceptable Organics	TAO	0.00	0.00	0.00	0.00	0.00
Total Non-Acceptable Organics	TND	278.01	331.31	396.98	5.23	6.39
Total Organics		278.01	331.31	396.98	5.23	6.39
8. OTHER MATERIALS						
1 Sanitary Products	W	39.63	41.46	44.15	0.48	0.54
2 Textiles	W	29.05	17.15	49.90	0.14	1.59
3 Carpeting	W	0.97	0.46	78.76	0.00	0.00
4 Construction & Renovation	W	4.74	10.69	19.60	0.00	0.00
5 Electronics	W	2.46	3.92	11.74	0.00	0.00
6 Tires and Other Rubber	W	0.14	0.17	1.66	0.00	0.00
8 Ceramics	W	3.04	0.84	12.58	0.20	0.00
9 Furniture	W	0.00	0.00	0.00	0.00	0.00
10 Mattresses	W	0.00	0.00	0.00	0.00	0.00
19 Other Large Bulky Items	W	0.00	0.00	0.00	0.00	0.00
20 Other Waste	W	18.25	24.93	33.21	1.40	0.72
Total Acceptable Organics Other Materials	TAO	0.00	0.00	0.00	0.00	0.00
Total Recyclable Other Materials	TR	0.00	0.00	0.00	0.00	0.00
Total Non-Divertable Materials	TND	98.28	99.62	251.60	2.22	2.85
Total Other Materials		98.28	99.62	251.60	2.22	2.85
Total Recyclable Materials		47.66	60.72	187.12	622.37	312.78
Total Other Materials		453.09	538.20	840.11	46.30	34.73
Total All Materials		500.75	598.92	1,027.23	668.67	347.51