Waste Data Independent Review

Curbside Diversion Options Report

November 2023

Submitted by:
Paul van der Werf, PhD
Adjunct Professor in the Department of Geography and Ivey Business School,
Western University

Table of Contents

About the Independent Auditor

Paul van der Werf is an adjunct professor at Western University's Department of Geography and the Ivey Business School. Paul is a recognized waste management expert with more than 30 years of national and international professional experience. He combines considerable hands-on experience with data analysis skills. Paul's key areas of expertise include waste management data collection, analysis and modelling, and specialized waste diversion expertise in the areas of organic and recyclables management.

Paul holds an undergraduate degree in Environmental Biology from the University of Guelph as well as a Masters degree in Science (compost utilization). Paul completed his PhD at Western University, specializing in household food waste reduction.

Executive Summary

This independent review was conducted in response to Councillor Motion (2023-16-06) brought forward on June 14, 2023, directing Staff to undertake an independent third-party review to verify data being used to inform the development of the City's draft Solid Waste Master Plan.

The objective of this independent review was to verify if:

- All City-provided data to inform the Curbside Diversion Option (CDO) report were complete and calculated in-line with municipal best practices;
- All assumptions made in the CDO's technical documents are reasonable to support the project team's recommendations;
- The methodologies used to interpret the data are appropriate for the purposes of informing the CDO; and,
- All data and conclusions are accurate.

To meet the objectives, the independent review included the following activities to assess the appropriateness of the methodologies used for data collection, verify the accuracy of results, compare results to other jurisdictions (as applicable), and identify any data gaps:

- Review 2022 Set-Out Study Data Analysis and companion documents;
  - '2022 Set-Out Study Methodology';
  - 'Methodology for calculating results';
- Review Dillon Model updated with 2022 curbside collected tonnages and companion document;
  - 'Curbside Waste Diversion Policy - How the Model Works';
- Review CDO Council Report' (June 2023) and companion document;
  - 'CDO Financial Estimates';

Overall, the data and documents used as part of the CDO process (i.e., Set-Out Study) appear appropriate, reasonable, in line with industry best practices, and using qualified waste management consultants to help collect this data.

The financial projections are reasonable but should be updated annually. This includes excess garbage tonnage calculations, bag tag revenue calculations and top-line capital and operating costs to implement this policy.

Recommendations are based on keeping City data up-to-date and strengthening the representativeness of this data (for the Set-Out Study) and refining and updating cost estimates to implement this policy change.

Specifically, recommendations include:

- Repeat set-out study over four seasons; and
- Refine and update cost estimates to implement this policy change.

.

1.0 Introduction

City Staff initiated an invitational Request for Proposal (RFP) from external, qualified consultants with direct experience in the waste management field to undertake an independent third-party review of the data used by Solid Waste Services to support the Curbside Waste Diversion Policy including, but not limited to, waste volume projections, landfill waste capacity, waste diversion projections and proposed financial projections and report back to Council in the fall.

This report summarizes the review of documentation and data developed by the City of Ottawa for the Curbside Diversion Option report.

2.0 Background and Context

The City of Ottawa is in the process of developing a new Solid Waste Master Plan (SWMP) that will guide how the City manages waste over the next 30 years. Staff is in the third phase of the Waste Plan's development and will be tabling the draft Solid Waste Master Plan for Committee and Council for receipt in Q4 2023. The Final Waste Plan will be tabled for Council approval at the end of Q2 2024.

In June 2019 when Ottawa City Council received the Solid Waste Master Plan Roadmap Report, Council approved the scope and framework for the development of the City of Ottawa's 30-year SWMP. The scope and framework included several "component projects" alongside the SWMP that would either supplement or integrate with the SWMP. The Curbside Diversion Options project was identified as a short-term need to support increasing household participation in recycling and green bin programs by reducing the number of garbage items eligible for bi-weekly garbage collection. Project scoping began in late-2020 and a recommendation for a Partial Pay-As-You-Throw (PAYT) program was brought forward for Council consideration in June, 2023. After extensive discussion, City Council approved a motion to adopt a 3-item garbage limit and have Staff undertake an independent third-party review to verify data being used to inform the recommendation.

2.1 Independent Review Objectives and Scope

The objective of this independent review was to verify if:

- All City-provided data to inform the Waste Plan's technical documents were complete and calculated in-line with municipal best practices;
- All assumptions made in the Waste Plan's technical documents are reasonable to support the project team's recommendations;

- The methodologies used to interpret the data are appropriate for the purposes of informing a Waste Plan; and,
- All data and conclusions are accurate.

The scope of this independent review included an assessment of all data collection methods, audit methodologies, projection development and analysis used by the City in the development of the Curbside Diversion Options recommendation to determine if it is in-line with industry best practices and that it can be relied on for both long-term planning purposes and shorter-term initiatives. Data provided to the City by third party consultants was assessed to determine if it is reasonable to be used for program planning, based on available industry insight and data. This included some Quality Assurance (QA) and Quality Control (QC) reviews of the work done by other consultants who collected data on behalf of the City. All information received by this independent reviewer was reviewed to identify gaps and/or potential concerns and recommendations were provided for future City projects to consider.

The independent review was conducted between September 6 and October 6, 2023.

3.0 Independent Review Approach and Methodology

The independent review provides an assessment as to whether the current information, data, modelling, assumptions, framework, and projections are reliable and defendable to support decision making for both short-term initiatives and long-term strategy planning.

This report deals specifically with the data used to support the development of the City's Curbside Diversion Option (CDO) report.

In June 2023, the City prepared a Curbside Diversion Option (CDO) report that was presented to, but, rejected by Council. The CDO proposed a PAYT program which included an annual allotment of 55 garbage tags (i.e., an average of about 2 garbage items per bi-weekly set-out) per curbside-residential household. If curbside-residential households want to set out additional garbage they would need to purchase additional garbage tags. The CDO and its supporting documents were reviewed.

The independent review methodology included the following activities:

- '2022 Set-Out Study Data Analysis';
    - '2022 Set-Out Study Methodology';
    - 'Methodology for calculating results';

- Dillon Model updated with 2022 curbside collected tonnages';
    - 'Curbside Waste Diversion Policy - How the Model Works';
- 'CDO Council Report' (June 2023);
    - 'CDO Financial Estimates';
    - City decision log and other supporting information.

The following process, as applicable, was followed:

- Assess the appropriateness of the **methodologies** use for data collection;
- Verify **accuracy** of results;
- **Compare** results to other jurisdictions (as applicable); and,
- Identify any **data gaps**.

Any identified gaps in the data analysis and methodologies were recorded and described in the report. For any gaps the following was undertaken:

1. Indicate whether any identified gaps impede or bring-into question, the nature/basis of the work completed or if the data can still support the decisions being made even with any gaps. It is of utmost importance for City staff to understand that even with any potential gaps, the work completed is good to support policy recommendations, strategy planning and shorter-term initiatives.

2. Provide any necessary recommendations to the City for how to improve data collection/analysis and outline any, if any, best practices that were missed.

4.0 Independent Review Observations

4.1 2022 Set Out Study

The 2022 Set-Out Study ("Set-Out Study) and its supporting documents, were used to provide evidence for current garbage and diversion item set-out. Set-out studies are completed as a municipal best practice to understand household participation in curbside waste programs and to inform a recommended reduced garbage limit based on what households were currently setting out for collection.

Review of Methodology

The City of Ottawa conducted a Set-Out Study of curbside-residential households over a four-week period in September-October 2022, to understand waste set-out at its 298,000 (2021) curbside-residential households. The City undertook a statistical analysis to

determine the optimal sample size (i.e., number of households to be measured for set-out) using a confidence level of 95% and confidence interval of 2. This resulted in an estimate of 2,382 households that would need to be sampled. This is detailed in the City document '2022 Set-Out Study Methodology'. This estimate was independently confirmed using the Qualtrics sample size calculator.[1]

However, this sample size calculation approach assumes that samples will be randomly selected from the population. This was not the case for this study as considerable and reasonable detail was provided, by the City, in terms of households selected for this study.

This approach to sample collection is referred to as purposive sampling in which researcher judgement is used to select the sample.[2] In this case the City wanted to include households from the 2018-2019 Curbside-residential Waste Audit, proportional sampling by the City's urban/suburban/rural areas, and a mix of neighbourhoods with different average household incomes. Further, specific streets and consecutive homes were selected for sample collection.

There is no ready sample collection tool available for this approach. However, in some cases something called Slovin's formula ($n = N/(1+Ne^2)$) is used, where N=population size and e=error rate.[3] Using 298,000 as the population (i.e., household) number and 2% error rate results in an estimated 2,479 household sample size. This is reasonably similar to the number of sample households calculated for the set-out study (i.e., 2,382) and City target of a 2,400 household sample.

The City ultimately selected 2,303 households and put in considerable effort to ensure that they were representative of Ottawa households. This is a reasonable sample size.

The City document 'Methodology for calculating results' details how the data was reviewed. The focus of this Set-Out Study was on the garbage stream. The City adopted a conservative data analysis approach. For garbage set-out they only measured and averaged households that had set-out garbage. That is, if a household had not set out garbage it was not included in these calculations.

---

[1] https://www.qualtrics.com/blog/calculating-sample-size/
[2] https://www.qualtrics.com/experience-management/research/non-probability-sampling/
[3] https://www.researchgate.net/post/How_to_compute_appropriate_sample_size_for_non-probability_sampling/6152bc31acae15464008cecc/citation/download

From extensive waste auditing experience, a ‘rule of thumb’ is that about ten per-cent of households do not set out any waste on a given week. The key reason for this is that no one is at home (e.g., on vacation or otherwise away) on a waste collection day.

Assessment of Accuracy

The data in the City’s 2022 Set-Out Study Data Analysis Excel document was reviewed, and samples of this data were checked for accuracy. The data checked appeared to be accurate.

The City estimated that, on average, a curbside-residential household set-out 2.1 items of garbage per bi-weekly set-out.

Table 4.1 depicts an independent analysis of bi-weekly garbage set-out, over the course of the Set-Out Study. It shows that on both weeks an average of 76% of households set-out garbage (while 24% did not). Further, it shows that 62% set out garbage on both collection weeks and that 10% did not set out any garbage on either week.

Table 4.1 Overview of Garbage Set-Out

	Garbage Week 1	Garbage Week 2	Garbage Set-Out Week 1 & 2	No Garbage Set-out both weeks
Households with Set Out	1,760	1,743	1,418	219
Total Households	2,303	2,303	2,303	2,303
Per-cent set-out	**76**	**76**	**62**	**10**

Further, it was calculated that only 3% (i.e., 68) of households set-out no diversion items (i.e., black/blue bin, organics) over the four weeks of the study and that importantly only 0.7% (16) of households set-out no garbage or diversion items. It could be argued, on that basis, that except for the 16 above noted households that did not participate at all during the four week Set-Out Study, that the lack of garbage set-out from otherwise participating households could be considered when developing an average set-out of garbage items.

Additional analysis of the set-out data was undertaken taking into account that only 16 households had not set out any garbage or diversion items during the Set-Out Study. These households could be deemed to be non-participating and can be eliminated from

the Set-Out Study. The remaining households participated, in one way or another, during the study.

Table 4.2 depicts a comparison of Ottawa weekly garbage set-out items and an independent analysis that includes any household that participated at any point during the study. On this basis the average weekly set-out is 1.8 garbage items/week (i.e., during bi-weekly collection) and lower than the City's average of 2.1 (i.e., 2.1 garbage items * 26 garbage collection=55 garbage tags). This reduced average is reflected in the urban, suburban and rural geographies, as well. Finally, and importantly, the median garbage items set-out drops from 2 to 1. What this means is that the City's initial analysis is robust and that a bi-weekly average of 2.1 garbage items is potentially achievable for the 24% of households that currently set-out more than 2.1 or 1.8 garbage items/week.

Table 4.2 Comparison of Garbage Set-Out – Ottawa analysis and Independent analysis

	Garbage Week 1		Garbage Week 2		Average	
	Ottawa analysis	Independent analysis	Ottawa analysis	Independent analysis	Ottawa analysis	Independent analysis
	Garbage Items/Week					
Average Garbage Set-out	2.1	1.8	2.1	1.8	2.1	1.8
Average Garbage Set-out "urban"	2.1	1.6	2.1	1.8	2.1	1.7
Average Garbage Set-out "suburban"	2.1	1.8	2.1	1.7	2.1	1.7
Average Garbage Set-out "rural"	2.5	2.0	2.4	1.8	2.4	1.9
Median Garbage Set-out	2.0	1.0	2.0	1.0	2.0	1.0

The City's CDO report included some additional information gathered from the Set-Out Study that was independently reviewed including that:

- 74% of garbage set-outs already, on average, set out 2.1 garbage items or less and this was independently confirmed;
- 58% of materials in the garbage stream could be diverted. This was independently confirmed (57%) from data gathered in the 2018-2019 Four Season Curbside Waste Audit Study Report of curbside-residential homes in Ottawa; and
- Participation in waste diversion programs decreased as households set-out more garbage items. While this is true, it is nuanced. Glass, metal and plastic (GMP) set-out does not start to decline until 5 garbage items are set-out. Fibre set-out does not start to decline until 6+ garbage items are set-out. Finally, green bin set-out starts to decline when 2 or more garbage items are set-out. The impact on

waste diversion program participation is most marked for green bin usage and this is a good start for promotion and education activities if the policy is enacted.

Finally, the City's CDO report indicates that the potential in garbage reduction by moving to a 55-garbage tag limit per year garbage set-out (i.e., PAYT) is up to 19% (by year 1 after policy implementation) to 28% (by year 5 after policy implementation).

Table 4.3 provides an independent assessment of that claim. It calculated the number of curbside-residential households that placed more than 2.1 garbage items out per set-out; the number of excess items this entailed; and, after applying an average weight per garbage item, the estimated garbage tonnage that could be reduced.

The average weight per garbage item was developed by estimating total number of garbage items set-out per year, by all 2022 Ottawa curbside-residential households, and then dividing that into the 2022 curbside-residential garbage tonnage. The foregoing resulted in an estimated potential 27% reduction in annual garbage tonnage. This aligns well with the above noted 28% City estimate but in this context represents essentially 100% compliance with all excess garbage (i.e., beyond 2.1 garbage items per set-out) being diverted and/or otherwise reduced. This is unlikely, with compliance being a combination of additional waste diversion, the purchase of garbage tags with set-out of excess garbage items (i.e., beyond 2.1 garbage items per set-out), additional filling of current garbage items (i.e., making them heavier) and actual waste reduction.

Table 4.3 Comparison of Garbage Set-Out – Ottawa analysis and Independent analysis

	%	Households	Excess items	Estimated Weight
		#	#	tonnes
Households with 3 items	11.3	34,121	798,421	6,503
Households with 4 items	5.7	17,140	846,734	6,896
Households with 5 items	3.4	10,332	779,054	6,345
Households with 6 items	2.1	6,408	649,732	5,292
Households with 6+ items	3.6	10,973	1,397,965	11,386
Totals	**26.1**	**78,974**	**4,471,905**	**36,421**
Per-cent reduction				**27**

Comparison to Other Jurisdictions

Not appliable.

Data Gaps

The approach to collecting set-out data was reasonable, appropriate and used an industry standard methodology.

It is, however, recommended that this study be repeated over the all seasons to verify results of the 2022 Set-Out Study and to develop a more comprehensive estimate.

Further, the amount of garbage reduction and increased diversion is unknown. The 19 - 28% estimates of curbside-residential garbage reduction represent a good starting point but should be viewed as indicative rather than definitive. This further examined in Section 4.2 of this report.

4.2 Dillon Impact of Policy Change on Waste Generation Model

The 2022 Set-Out Study was used to help estimate weekly set-out of curbside-residential garbage and other streams. It was used primarily to inform the CDO with regard to changing current curbside-residential garbage set-out (i.e., current maximum 6 garbage items per set-out) to a PAYT system which contemplates 55 garbage tags per year, per curbside-residential household (i.e., average of 2.1 garbage items per bi-weekly set out). Single-family households would be supplied with 55 garbage tags per year to affix to garbage items at set-out and have the option to purchase additional garbage tags.

In 2022, Dillon Consulting developed a model (Curbside Model) to estimate the potential impact(s) of a new curbside waste diversion policy, including the above noted PAYT, on Ottawa's curbside-residential waste stream. The model provides estimated garbage tonnage reduction as well as how much divertible waste could move from the garbage stream into the recycling, green bin, and leaf and yard waste streams as a result of a number of different policies.

Review of Methodology

The Curbside Model relied on the waste data from other municipalities that implemented various curbside waste diversion policies (e.g., PAYT, partial PAYT, bag and container limits, and clear garbage bags). Municipal tonnage data reported through the Resource Productivity and Recovery Authority (RPRA) Datacall system (Datacall)[4] was retrieved and used in the Curbside Model. The Datacall, which was established in 2002, was used because it provides a consistent reporting process for all municipalities on waste tonnage

[4] https://rpra.ca/programs/about-the-datacall/

and waste diversion data. For each of these municipalities, data for the year prior to implementing a new curbside waste diversion policy and the subsequent five years was retrieved to measure any waste diversion impacts from these new policies. Any change in waste diversion rate shows the amount of waste that was removed from the garbage stream and into the waste diversion streams. Data was averaged by policy type (e.g., PAYT, partial PAYT, bag and container limits, and clear garbage bags).

To apply the foregoing model outputs (e.g., estimated impact on waste diversion of various policy changes) to Ottawa, the City's 2018-2019 Four Season Curbside Waste Audit Study data was applied to 2019 City garbage tonnages (i.e., pre-pandemic tonnages). This waste audit data shows the proportion of material in Ottawa's curbside waste stream that was Blue Bin, Black Bin, Green Bin, and Leaf and Yard Waste material (i.e., divertible materials). This was used in the Curbside Model to estimate the impact on waste diversion if Ottawa implemented any of these new policies. In essence it estimated the amount of divertible materials that would be moved from the garbage stream to the City's waste diversion streams.

Assessment of Accuracy

The Curbside Model presented the waste diversion impact of various curbside waste diversion policies implemented by various municipalities and then applied them to Ottawa. It suggested that for a partial PAYT policy, as contemplated in the CDO, that curbside garbage set-out could be reduced by up to 19% in year 1 and up to 28% by year 5 after program implementation.

This is a reasonable approach to understanding the waste diversion impacts of various waste diversion policy changes.

One potential issue is that the average waste diversion impact of a policy change relied on three or fewer and in some cases a single data point (e.g., Partial PAYT with a 3 bag/container limit every second week). This is a function of municipalities developing very specific policies for themselves.

A second issue is that waste diversion is assumed to change, over five years, due to a single policy change. While reducing the amount of garbage that can be set out can have a profound impact on garbage tonnages there is the risk that its impact is overestimated because there could also be other policy impacts at play.

At best the Curbside Model presents an indication of potential waste diversion impact and actual results could vary considerably and this was communicated to Council.

An independent analysis showed that the change to a 55-garbage tag/year set-out limit could result in a reduction of almost 36,000 tonnes of garbage/year (Table 4.4) if there was full compliance with this proposed policy change. Further, the estimated impact of curbside-residential waste diversion would be from 1.3-12.8% and for overall waste diversion 1.0-10.4%. These estimates assume that this policy change would only result in curbside-residential households placing what is now considered excess garbage into the appropriate waste diversion stream. It does not account for additional filling of garbage bags/bins or any waste reduction activities (whether that be actual garbage reduction or finding other homes for excess garbage) that might result from this policy change.

Table 4.4 Overview of Potential Reduction in Garage and Impact on Waste Diversion

% compliance	0	10	20	30	40	50
tonnes reduced/year	-	3,642	7,284	10,926	14,569	18,211
% reduction/year	-	3	5	8	11	14
% estimated impact on single-family waste diversion		1.3	2.6	3.8	5.1	6.4
% estimated impact on overall waste diversion		1.0	2.1	3.1	4.1	5.2
% compliance		60	70	80	90	100
tonnes reduced/year		21,853	25,495	29,137	32,779	36,421
% reduction/year		16	19	22	24	27
% estimated impact on single-family waste diversion		7.7	8.9	10.2	11.5	12.8
% estimated impact on overall waste diversion		6.2	7.2	8.3	9.3	10.4

Comparison to Other Jurisdictions

The Curbside Model is based on the measured waste diversion impacts of various curbside-residential curbside waste diversion policies.

Data Gaps

The approach to collecting data for the Curbside Model is reasonable. Its projection capabilities are limited, however, due to relatively few data points and the inherent risk(s) of attributing all garbage reduction/waste diversion impacts to a single policy.

The Curbside Model can be used to provide an indication of possible waste set-out, waste diversion and waste reduction changes as a result of implementing a 55-garbage tag/year set-out limit (i.e., PAYT).

However, a great deal of the actual impact of this potential policy change will be based on the level of enforcement/compliance required by the City. As noted by the City in its communications to Council, for this policy to be effective there will need to be considerable enforcement/compliance activities, particularly at the outset of this proposed policy change.

In terms of any impacts on the life of the Trail Waste Facility Landfill, the Curbside Model outputs should be viewed as indicative rather than definitive.

4.3 CDO Financial Estimates

The City developed cost and revenue estimates to implement a 55-garbage tag/year partial PAYT set-out policy.

Review of Methodology

As noted in Section 4.2 the Curbside Model used appears reasonable. However, the current application of the Curbside Model to estimate costs may be problematic.

These estimates were based on estimates of up to 19% reduction in garbage disposal in year 1 and up to 28% reduction by year 5, extracted from the Curbside Model. These percentages are then applied to the current Ottawa curbside-residential excess garbage (i.e., weight of set outs greater than 2.1 items per set-out.) as reduction, with the remainder (i.e., 81% year 1; 72% year 5) used to calculate the number of tags required. It seems likely that potential garbage tonnage reduction should have been applied to total curbside-residential garbage, not the subset of excess garbage generated by those who dispose more than 2 garbage items per set-out.

Further, the average garbage item weight used (i.e., 33 pounds or 15kg) is based on a by-law limit not the actual Ottawa garbage item weight. On this basis the City estimates that there is close to 72,000 (6,089,094 /2,201*26) tonnes/year of excess (i.e., greater than 2.1 items per set-out) garbage.

City staff gathered various capital and operating unit costs for bag tags, bins, additional staff, fleet and additional material processing had been properly gathered. It is assumed that unit costs were researched by the City, and this process appears reasonable. Except for additional material processing, these costs are disconnected from estimated tonnes of excess garbage and logically tied to the number of curbside residential households

(e.g., costs of garbage tag production and distribution) or estimated through professional judgement (e.g., additional staff required to implement the new policy).

Assessment of Accuracy

In the June 2023 CDO report to Council staff estimated that the costs to implement this new policy would include:

- A one-time capital cost of up to $3.5 million in 2024, funded from the reserve, for a citywide promotion and education campaign, additional recycling and green bins for residents, and temporary staff to help implement the program.
- An estimated increase in the annual operating budget of up to $1.5 million per year starting in 2024 for increased organics processing, preparation, and distribution of tags to all households, and two additional Solid Waste Inspectors.
- The sale of additional tags could offset operating costs by approximately $450,000 per year in year one and decrease to approximately $400,000 by year five, as behaviour changes.

It is clear, from supporting documentation provided by the City, how the $3.5 million one-time capital costs and $1.5 million annual operating costs were estimated.

The City calculated garbage bag tag revenue by reviewing the garbage bag tags sold in other municipalities, after the implementation of similar reductions in allowable garbage set-out. What the review of other municipal programs showed was that in general that the potential of additional household costs was a great incentive to change behavior, resulting in relatively few sales of garbage bag tags. This resulted in a conservative estimate of garbage bag tag revenue, which reflects the point of this policy change to incentive behaviour change rather than generate revenue.

An independent assessment of the potential number of additional items and potential bag tag revenue was undertaken.

The City estimated that each garbage bag/container weighs 15kg (i.e., 33 pounds). Dividing the total annual garbage disposed by single-family households and dividing by annualized garbage bag/container set outs results in an average of 8.1kg per set-out garbage item. On this basis there is about 36,421 tonnes/year of excess garbage set-out annually (see Table 4.3).

If all excess garbage was tagged, approximately 4.5 million bag tags would need to be purchased by curbside-residential households and this would generate a revenue of around $13 million dollars (Table 4.5). This is a worst-case scenario and based on the experiences of other Ontario municipalities highly unlikely. This excess garbage will either be set-out and affixed with bag tags; diverted to blue/black bin or organic waste programs; added to garbage set-out that falls within the 55 bag tags distributed by the City (i.e., put more garbage in containers/bags) or actually reduced.

Table 4.5 Overview of Number of Bag Tags for Excess Waste and Potential Revenue

Estimated number of bag tags	4,471,905
Cost per bag tag	$ 3.00
Annual revenue	$ 13,415,715
Bi-weekly revenue	$ 515,989

Table 4.6 presents an overview of annual bag tag revenue for excess garbage based on the amount that remains in the garbage stream as opposed to being directed to the diversion stream. For instance, if 90% of excess garbage is diverted or otherwise reduced the remaining 10% requires a purchased tag prior to set-out. This will result in annual bag tag revenue of about $1.3 million and a revenue of $368/tonne of garbage or $41/tonne for diversion activities. Since the costs to manage this now excess garbage are already budgeted (i.e., part of existing costs) this new bag-tag revenue can help off-set new program costs (e.g., tags, bins, staff time, collection, processing). As can be seen in the row ‘Revenue/tonne diverted’ the more effective this policy is (i.e., in terms of driving excess garbage to diversion) the less revenue will be available to off-set new diversion costs. It seems very likely, based on the experiences of other municipalities, that garbage bag revenue will be at lowest part of the range estimated in Table 4.6 and possibly as low as suggested by the City, in their above noted estimates.

Table 4.6 Overview of Number of Bag Tags for Excess Waste and Potential Revenue

% of excess garbage set at curb	0	10	20	30	40	50
tonnes/year garbage	-	3,642	7,284	10,926	14,569	18,211
tonnes/year diversion		32,779	29,137	25,495	21,853	18,211
Annual tag revenue	-	$ 1,341,572	$ 2,683,143	$ 4,024,715	$ 5,366,286	$ 6,707,858
Bi-weekly tag revenue	-	$ 51,599	$ 103,198	$ 154,797	$ 206,396	$ 257,995
Revenue/tonne of garbage		**$ 368**	**$ 368**	**$ 368**	**$ 368**	**$ 368**
Revenue/tonne diverted		**$ 41**	**$ 92**	**$ 158**	**$ 246**	**$ 368**
% of excess garbage set at curb		**60**	**70**	**80**	**90**	**100**
tonnes reduced/year		21,853	25,495	29,137	32,779	36,421
tonnes/year diversion		14,569	10,926	7,284	3,642	-
Annual tag revenue		$ 8,049,429	$ 9,391,001	$ 10,732,572	$ 12,074,144	$ 13,415,715
Bi-weekly tag revenue		$ 309,593	$ 361,192	$ 412,791	$ 464,390	$ 515,989
Revenue/tonne		**$ 368**	**$ 368**	**$ 368**	**$ 368**	**$ 368**
Revenue/tonne diverted		**$ 553**	**$ 859**	**$ 1,473**	**$ 3,315**	**$ -**

The costs of the various items required to implement the 55-garbage tag/year set-out policy (i.e., PAYT) were assessed and are summarized in Table 4.7. As noted above these costs are, except for additional material processing, disconnected from estimated tonnes of excess garbage and reasonably tied to the number of curbside residential households and professional judgement.

Table 4.6 Cost Items Review

Cost Items	Cost assumptions	Comments
Production of bag tags	Cost per tag ranges from $0.008-$0.02/tag. They could be mailed with calendar or mailed separately.	Staff undertook research with internal print shop and estimates seem reasonable.
Ordering Additional Bins	Assumed that new bin requests would be 0.33 of current annual bin requests.	Mindful that this is difficult to estimate the estimate is a bit arbitrary.
Fleet	Compliance and enforcement staff require vehicles	Staff used professional judgement
P&E	This includes line items for paid advertising, development of creative and outreach costs.	

Additional FTEs	Assumes 10 FTE+6 summer students to 15FTE +12 summer students	Staff used professional judgement
Staff Costs	This includes standard cell phone, computer, uniforms and office space costs for new staff	This seems reasonable.
Organics/ Leaf & Yard Processing Costs	Estimated a range of new tonnage of organics and leaf & yard waste from the Curbside Model and applied Ottawa's current processing costs.	It is difficult to predict how much excess garbage will end up in which diversion stream although, as noted above, increased garbage set-out does appear to be related to reduced green bin usage. The estimated processing costs do not appear to be offset by avoided disposal costs.

The potential impact of this new policy on processing costs was independently assessed. From calculations included in the Curbside Model it was estimated that up to 18,000 tonnes/year of new waste diversion would take place.

For simplicity, and because it is unclear the amount of excess garbage that will be diverted to particular diversion streams, a weighted average of $133/tonne (using 2022 tonnage costs and 2022 tonnages per waste stream) was calculated. This would be offset by avoided garbage disposal of $41.25/tonne (and the avoided cost of delaying landfill expansion). Thus, the net processing cost per diverted tonne is estimated to be $93/tonne. On this basis, Table 4.7 depicts the estimated tag revenue and annual new processing costs depending on the level of compliance. New net processing costs range from $338,000-$3,050,000/year.

However, and importantly the costs of blue and black box management transferred to the private sector on July 1, 2023. Further, the Curbside Model estimated that up to 7,651 tonnes/year leaf and yard waste and organics would be diverted as a result of the new policy. On this basis and using the same 2022 data a new diverted tonnage weighted average of $78/tonne was calculated. If offset by avoided garbage disposal costs the new

net processing costs range from $137,000-$1.212,000. This is similar to what was estimated by the City.

Table 4.7 Cost Items Review

% of excess garbage set at curb	0	10	20	30	40	50
tonnes/year garbage	-	3,642	7,284	10,926	14,569	18,211
tonnes/year diversion		32,779	29,137	25,495	21,853	18,211
Annual tag revenue	**-**	**$ 1,341,572**	**$ 2,683,143**	**$ 4,024,715**	**$ 5,366,286**	**$ 6,707,858**
Annual new processing costs	**-**	**$ 3,048,467**	**$ 2,709,748**	**$ 2,371,030**	**$ 2,032,311**	**$ 1,693,593**
% of excess garbage set at curb		**60**	**70**	**80**	**90**	**100**
tonnes reduced/year		21,853	25,495	29,137	32,779	36,421
tonnes/year diversion		14,569	10,926	7,284	3,642	-
Annual tag revenue		**$ 8,049,429**	**$ 9,391,001**	**$ 10,732,572**	**$ 12,074,144**	**$ 13,415,715**
Annual new processing costs		**$ 1,354,874**	**$ 1,016,156**	**$ 677,437**	**$ 338,719**	**$ -**

Comparison to Other Jurisdictions

Not applicable.

Data Gaps

The actual costs to implement this new policy are difficult to predict. While many of the cost components are included in the information reviewed it is recommended that these estimates be regularly updated. In particular, this should include a refined estimate for anticipated garbage set out reduction as a result of the policy; annual updated capital and operating costs; and annual updated estimates for anticipated garbage bag tag revenues for excess garbage.

5.0 Conclusions and Recommendations

Overall, the data and documents used as part of the CDO process (i.e., Set-Out Study) appear appropriate, reasonable, in line with industry best practices, and using qualified waste management consultants to help collect this data.

The financial projections are reasonable but should be updated annually. This includes excess garbage tonnage calculations, bag tag revenue calculations and top-line capital and operating costs to implement this policy.

Recommendations are based on keeping City data up-to-date and strengthening the representativeness of this data (for the Set-Out Study) and refining and updating cost estimates to implement this policy change.

Specifically, recommendations include:

- Repeat set-out study over four seasons; and
- Refine and update cost estimates to implement this policy change.

Disclaimer

In preparing this report, I relied, in whole or in part, on data and information provided by the City of Ottawa and third parties that was current at the time of such usage. I have worked to assess this data and to determine if it is well developed, accurate, and appropriate.

Therefore, while I have utilized my best efforts in preparing this report, I do not warrant or guarantee the conclusions set forth in this report which are dependent or based upon data, information or statements supplied by third parties or the client, or that the data and information have not changed since being provided in the report.