

Appendix 1



LANGLEY CITY

Streetscape Garbage and Recycling Audit



September 2021

September 17, 2021

Langley City
20399 Douglas Crescent
Langley, BC
V3A 4B3

Attention: Rick Bomhof, Director of Engineering, Parks & Environment

Streetscape Waste Composition Study

Dear Rick:

Dillon Consulting Limited (Dillon) is pleased to submit this final report to the City of Langley for the Streetscape Waste Composition Study. As outlined in the work plan, this report presents the results of the waste composition study, quantifying a baseline for the quantity and composition of waste disposed of in public garbage (single-stream) and three-stream receptacles in the City of Langley. It additionally provides the results of an observational user behaviour study.

Next steps towards the comprehensive management of waste in streetscape and public spaces have been provided within this document. We look forward to the opportunity to continue working with the City to further your waste diversion initiatives!

Sincerely,

DILLON CONSULTING LIMITED



Heidi Gerlach, EP
Project Manager, Associate

HG:js

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Table of Contents

Executive Summary

1.0	Introduction	1
1.1	Methodology.....	1
1.1.1	Waste Auditing.....	1
1.1.2	Observational Behaviour Auditing	3
2.0	Results	4
2.1	Waste Composition Study Results	4
2.1.1	Overall Garbage Composition	4
2.1.2	Composition by Container Type.....	5
2.1.3	Composition by Stream.....	7
2.1.4	Composition by Location	13
2.1.5	Generation and Sample Sizes.....	14
2.2	Contamination Categories	17
2.2.1	Contamination Categories by Stream	17
2.2.2	Contamination by Location	20
2.2.3	Contamination by Container Type	21
2.3	User Behaviour Observational Auditing Results	23
3.0	Conclusion	24
4.0	Next Steps	26
5.0	Project Limitations	27

Figures

Figure 1: Overall Primary Category Composition for Garbage Streams.....	iii
Figure 2: Primary Category Results by Container Type (Garbage Streams)	iv
Figure 3: Contamination Categories by Stream	v

Figure 4: Overall Primary Category Composition for Garbage Streams.....	4
Figure 5: Primary Category Results by Container Type (Garbage Streams)	5
Figure 6: Primary Category Results by Stream	8
Figure 7: Garbage (Standalone) Composition – Secondary Categories	11
Figure 8: Garbage (3-stream) Composition – Secondary Categories	11
Figure 9: Paper Stream Composition – Secondary Categories	12
Figure 10: Containers Stream Composition – Secondary Categories.....	12
Figure 11: Primary Category Results by Location (Garbage Stream Only)	13
Figure 12: Average Sample Size by Location and Container Type.....	15
Figure 13: Contamination Categories by Stream	18
Figure 14: Contaminants in Paper Recycling Stream	19
Figure 15: Contaminants in Container Recycling Stream	19
Figure 16: Contamination by Stream and Location.....	20
Figure 17: Contamination by Container Type	21

Tables

Table 1: Total Sample Weight by Container Type and Location	2
Table 2: Waste Composition Study Categories	2
Table 3: Primary and Secondary Category Results by Container Type (Garbage Stream)	6
Table 4: Single-Use Item Count Results by Container Type (Garbage Stream).....	7
Table 5: Primary and Secondary Category Results by Stream	9
Table 6: Single-Use Item Count Results by Stream	10
Table 7: Average Sample Size by Location and Container Type.....	16
Table 8: Contamination Categories	17
Table 9: Proposed Public Space Waste Management Strategy	26

Appendices

A	User Behaviour Observational Survey Results
B	Representative Photos

Executive Summary

Dillon Consulting Ltd. (Dillon) was retained by the City of Langley (City) to complete a baseline waste audit of existing streetscape receptacles in order to: quantify an accurate baseline for the quantity and composition of waste disposed of in public garbage receptacles (single-stream), evaluate the composition and contamination rates in existing three-stream streetscape receptacles, and inform waste diversion and litter abatement recommendations which may be incorporated as part of a City Public Spaces Waste Management strategy.

Two distinct parts of the streetscape audit were completed:

- A waste composition study, which analyzed materials collected on August 9, 2021; and
- A user behaviour observational study, which took place in McBurney Plaza and Douglas Park on August 13 and 14, 2021.

Material from 51 receptacles was audited. Seventeen of these receptacles were three-stream garbage and recycling stations, therefore 85 samples in total with a combined mass of 269.5 kg were analyzed. Overall, 19% of containers in the City were analyzed. Based on the quantity and proportion of each container type sampled, it is estimated that approximately 1,650 kg of public spaces materials (garbage and recycling streams) are generated daily. Dillon used staff feedback to generate our estimation. It assumes that all containers in the City are collected daily.

The overall material composition for all garbage streams is presented in **Figure 1**. The largest component of the garbage stream was pet waste (43.5%), followed by food and yard waste (22.7%).

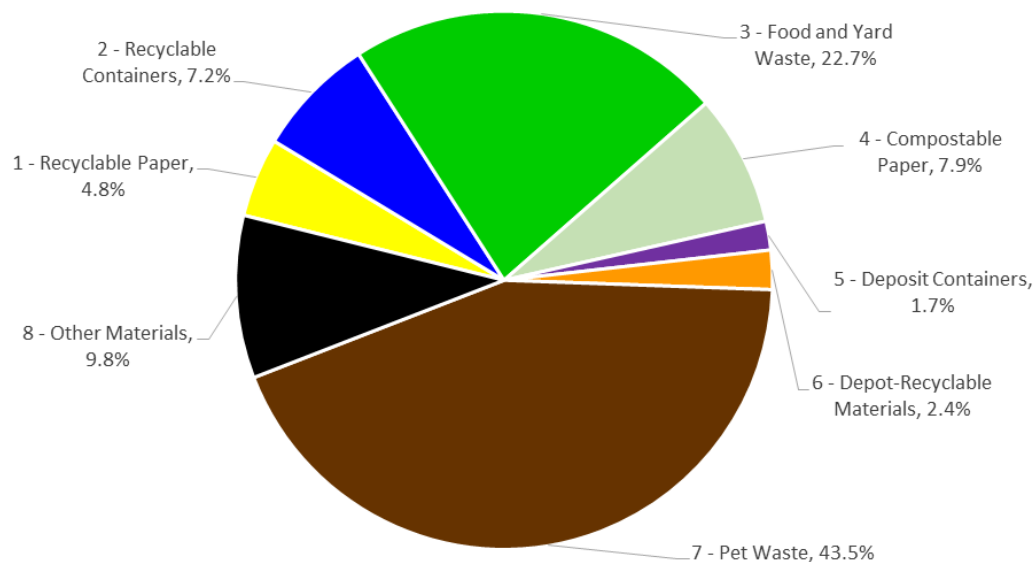


Figure 1: Overall Primary Category Composition for Garbage Streams

Waste composition study results are presented for each unique container type in **Figure 2**. In all garbage streams, pet waste and food and yard waste comprise the largest proportion of material.

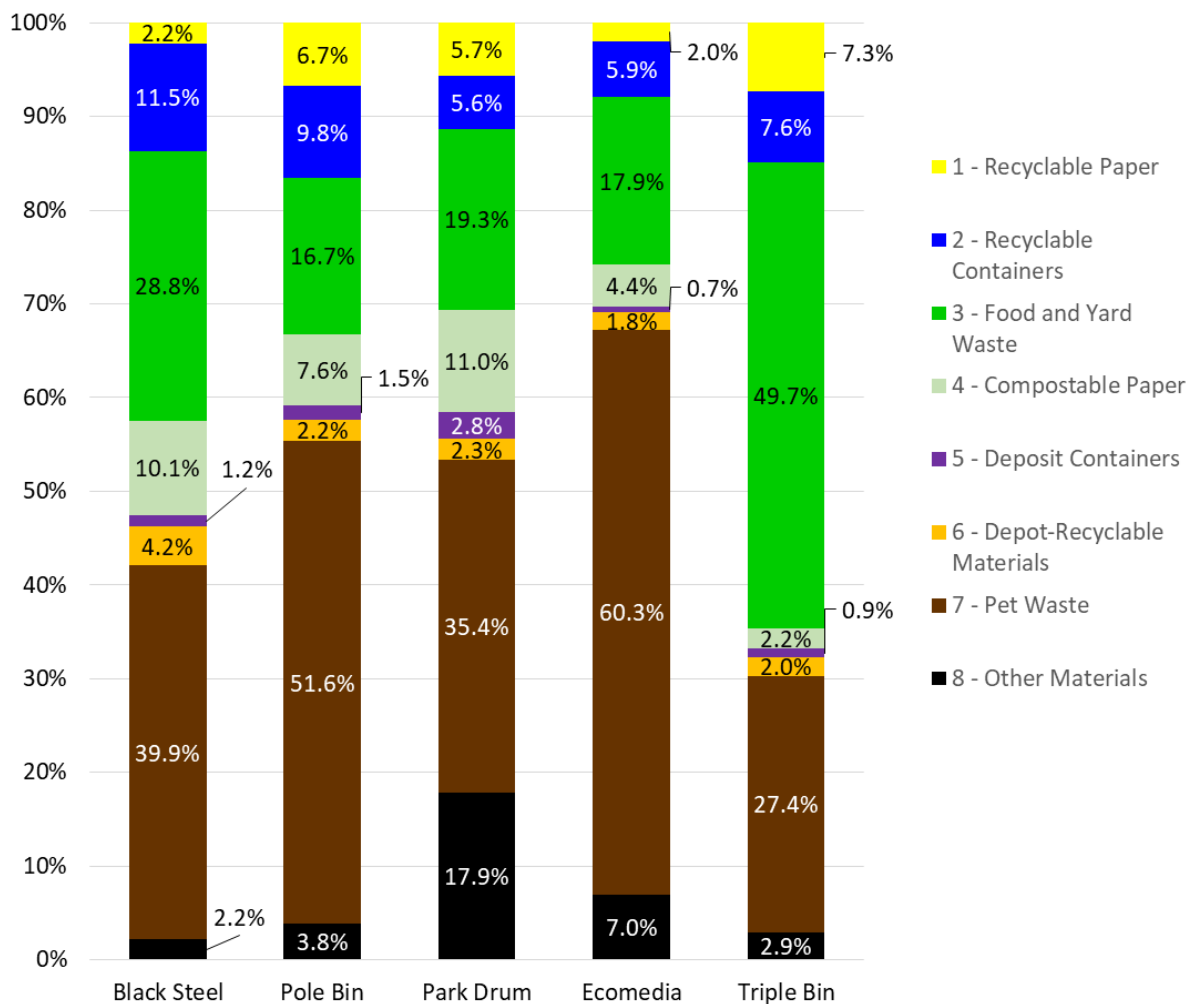


Figure 2: Primary Category Results by Container Type (Garbage Streams)

Single-use items were counted as part of the study. These included takeout containers and cups, plastic straws and utensils and masks. In total, 1,242 individual single-use items were identified in the 85 samples analyzed. Single-use compostable straws were *not* counted as single-use compostable paper takeout items, however, they were counted separately; 55 compostable paper straws were found in the 85 samples analyzed.

Waste composition was analyzed by stream to understand whether users were correctly using the 'Paper' and 'Containers' recycling streams where available. These results are presented in **Figure 3**.

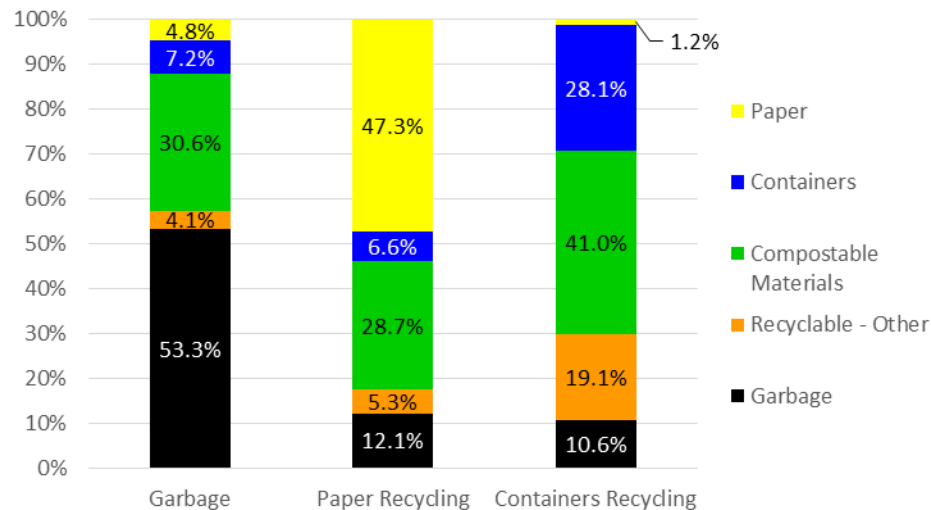


Figure 3: Contamination Categories by Stream

Overall, the paper recycling stream contained 47.3% recyclable paper. The containers recycling stream contained 28.1% recyclable containers. These percentages represent the actual capture rate for material that was placed in the correct stream (i.e., paper in paper recycling, containers in container recycling). The proportion of *all* recyclable materials (e.g. paper, containers and other recyclable materials) was much higher in both recycling streams (paper and containers) than in the garbage stream.

Where there are 3-stream stations located in close proximity to single-stream cans, it appears that users choose to use the 3-stream stations over the single-stream garbage containers. This was demonstrated both in the User Behaviour Observational Auditing Results (**Section 2.3**) and the Generation and Sample Sizes (**Section 2.1.5**).

Our study indicates that users of the recycling streams are attempting to recycle. This was also observed during the user behaviour observational study, which indicated that of those using the three-stream receptacles:

- 55% of users appeared to be reading the signage on the receptacles; and
- 77% of users appeared to put their material into the correct stream.

Contamination rates in the recycling streams are at present still very high. Douglas Park, McBurney Plaza, and the Downtown had the highest proportion of materials placed in the correct stream (i.e. least contamination). It is suggested that any pilot for streetscape recycling enhancements focus on these areas.

1.0

Introduction

Dillon Consulting Limited (Dillon) was retained by the City of Langley (City) to complete a baseline waste audit of existing streetscape receptacles in order to:

- Quantify an accurate baseline for the quantity and composition of waste disposed of in public garbage receptacles (single-stream);
- Evaluate the composition and contamination rates in existing three-stream streetscape receptacles; and
- Inform waste diversion and litter abatement recommendations which may be incorporated as part of a City Public Spaces Waste Management strategy.

Several opportunities exist to improve the streetscape program in Langley, including:

- Building on successes of and possibly harmonizing the streetscape recycling program with neighbouring municipalities (e.g. Township of Langley);
- Ensuring that all materials collected in recycling streams are appropriately directed to a recycling facility;
- Increasing diversion of recyclable materials; and
- Increasing consistency of streetscape receptacles in the City, thereby reducing user confusion.

1.1

Methodology

Two distinct parts of the streetscape audit were completed:

- A waste composition study, which analyzed materials collected on August 9, 2021; and
- A user behaviour observational study, which took place in McBurney Plaza and Douglas Park on August 13 and 14, 2021.

1.1.1

Waste Auditing

Waste was audited from streetscape receptacles throughout the City. Waste was collected on August 9, 2021. Collected bags of waste from each receptacle were labelled with the date, time and area (as applicable), and dropped off for storage and sorting at the City of Langley's Operations Centre. Dillon staff completed the baseline waste composition study at the Operations Centre on August 10-11, 2021.

The quantity of waste audited from each area and from each container type is presented in **Table 1**. Overall, 269.5 kg of waste was sorted. Sample locations were selected through collaboration with the City's Operations staff and were selected to be representative of public spaces waste in Langley.

Material from 51 receptacles was audited. Seventeen of these receptacles were three-stream garbage and recycling stations, therefore 85 samples with a total mass of 269.5 kg were analyzed. Overall, 19% of public spaces containers in the City were analyzed.

Table 1: Total Sample Weight by Container Type and Location

Container Type	Total Sample Weight (kg)									
	200 St	208 St	Bus Loop	City Park	Douglas Park	Downtown	McBurney Plaza	Other - Parks	Other - Streets	Total - By Container Type
Black Steel	-	-	-	22.5	-	2.6	-	-	-	25.1
Pole Bin	4.75	10.05	8.05	-	-	6.95	-	-	5.76	35.6
Park Drum	-	-	-	-	-	-	-	86.95	-	87.0
Ecomedia	-	-	10.2	23.4	5.25	37.95	6.4	-	-	83.2
Triple Bin	-	-		17.25	13.95	7.45	-	-	-	38.7
Total - By Location	4.8	10.1	18.3	63.2	19.2	55.0	6.4	87.0	5.8	269.5

Waste from each receptacle was sorted into eight categories with 23 subcategories. The waste composition study categories and subcategories have been provided in **Table 2**.

Table 2: Waste Composition Study Categories

#	Primary Category	Secondary Category
1	Recyclable Paper	Paper Packaging and Printed Paper
2	Recyclable Containers	Plastic Packaging
		Metal Packaging
		Single-Use Coffee Cups/Cold Drink Cups/Plastic Takeout Containers
3	Food and Yard Waste	All Food Waste
		All Yard Waste
4	Compostable Paper	Single-Use Compostable Paper Takeout Containers
		All Other Compostable Paper
5	Deposit Containers	Metal Deposit Containers
		Paper Deposit Containers
		Glass Deposit Containers
6	Depot-Recyclable Materials	Glass Packaging
		Plastic Film
		Styrofoam Packaging
		Single-Use Styrofoam Takeout Containers
		Plastic Deposit Containers
		All Other EPR-Managed Materials
		All Scrap Metal
7	Pet Waste	Pet Waste
8	Other Materials	Single-Use Masks
		Single-Use Straws/Plastic Utensils
		Illegal Dumping
		All other materials

Once the initial audit was completed a count was completed for single-use items. The categories which were counted are shown in red in **Table 2**, above. Notably, paper straws were not counted as single-use compostable paper items, however, a total count of paper straws found throughout the study was recorded (55).

The following items which are not expected to skew the results should be noted as a part of the waste composition study analysis methodology:

- Where food waste was found wrapped in plastic film or plastic bags, the film was left on in order to be more time efficient since the film did not have a significant weight;
- Where pet waste was found in plastic bags, the pet waste was left in the plastic bag in order to be more time efficient since the plastic bag did not have a significant weight; and
- Where household waste was found in bags, the bags were not opened and sorted during the waste composition study (i.e., that bag and the bag's contents were categorized as household waste). Following the auditing activities the bags that were assumed to be household waste were opened and the contents were recorded.

1.1.2

Observational Behaviour Auditing

Dillon staff completed user behaviour observations on August 13 and 14, 2021 at McBurney Plaza and Douglas Park. During the observations, a Dillon staff member used a smart phone to record information regarding demographics, waste disposal and diversion practices, and any occurrences of litter and illegal dumping. These observations were completed discreetly so that users did not feel as if they were being judged or tested.

2.0 Results

2.1 Waste Composition Study Results

This section presents the results of the waste composition study by container type, by stream, and by location. Additionally, **Section 2.1.5** presents a comparison of sample sizes between container types and locations and an estimate of streetscape material generated in the City.

2.1.1 Overall Garbage Composition

The overall material composition for all garbage streams is presented in **Figure 1**. The largest component of the garbage stream was pet waste (43.5%), followed by food and yard waste (22.7%). We note here yard waste was minimal and this category was predominantly (99%) food waste.

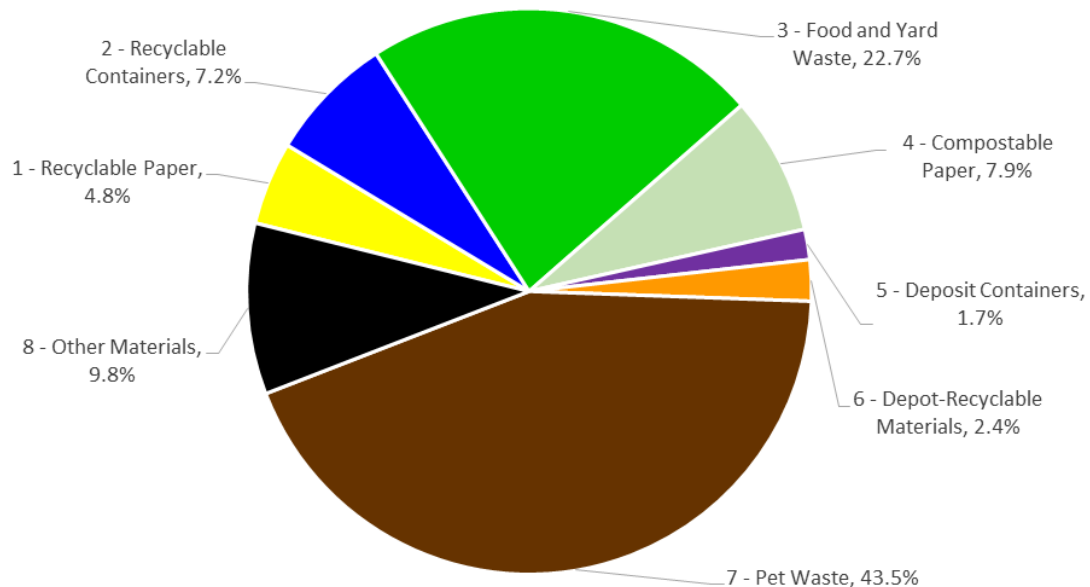


Figure 4: Overall Primary Category Composition for Garbage Streams

2.1.2

Composition by Container Type

Figure 5 presents the primary waste composition by container type for all garbage streams. These results are tabulated (with secondary categories) in **Table 3**. Single-use item counts are presented in **Table 4**. Overall, 868 single-use items were found in the 51 garbage samples analyzed. The number of single-use items found per sample is presented according to container type in **Table 4**. In all container types, the largest number of single-use items was from Single-Use Coffee Cups/Cold Drink Cups/Plastic Takeout Containers. On average, 17 single-use items were found per garbage sample.

In all garbage streams, pet waste and food and yard waste comprise the largest proportion of material.

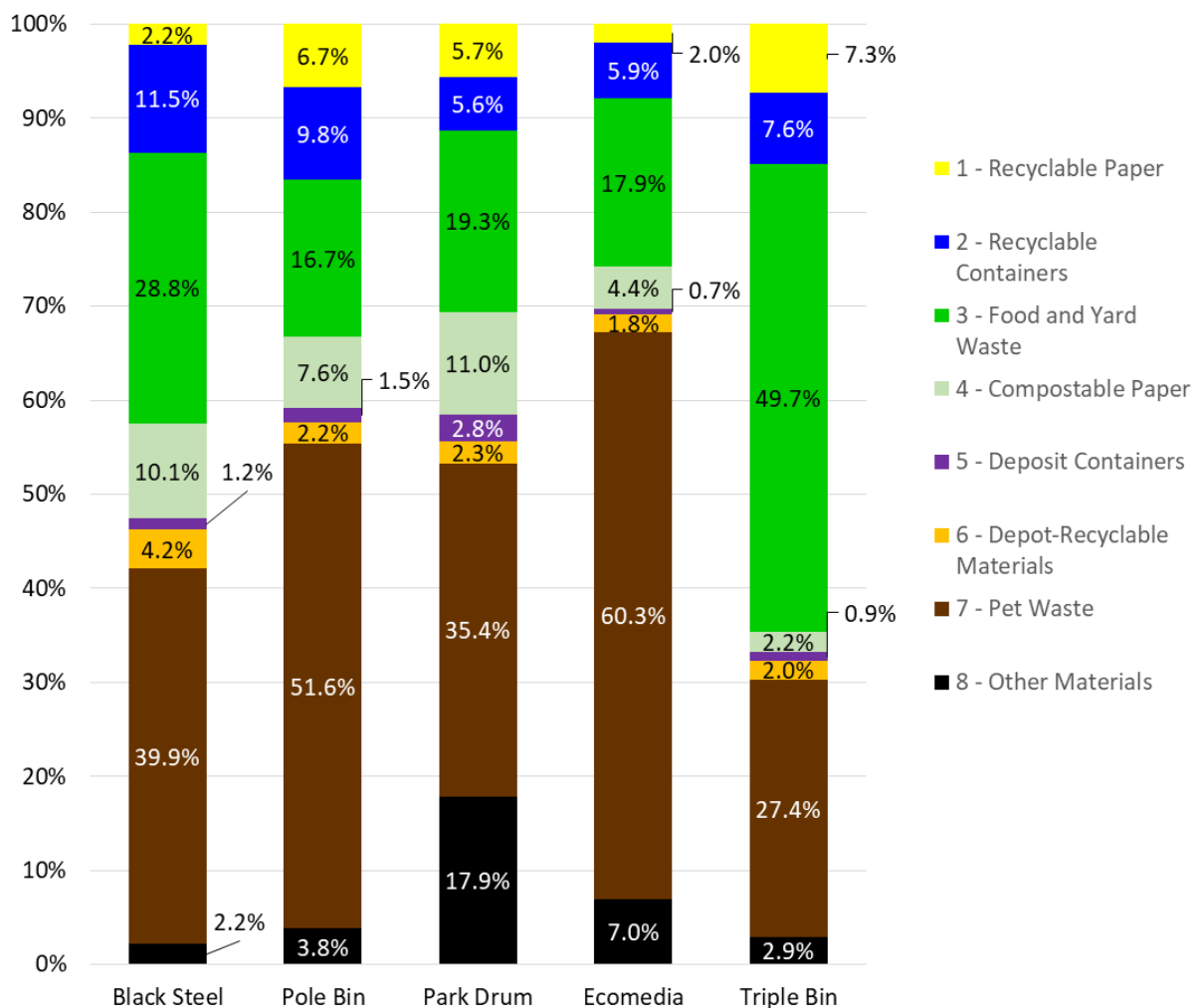


Figure 5: Primary Category Results by Container Type (Garbage Streams)

Table 3: Primary and Secondary Category Results by Container Type (Garbage Stream)

Row Labels	Black Steel	Pole Bin	Park Drum	Ecomedia	Triple Bin	Grand Total
1 - Recyclable Paper	2.2%	6.7%	5.7%	2.0%	7.3%	4.8%
01 - Paper Packaging and Printed Paper	2.2%	6.7%	5.7%	2.0%	7.3%	4.8%
2 - Recyclable Containers	11.5%	9.8%	5.6%	5.9%	7.6%	7.2%
02 - Plastic Packaging	7.1%	1.3%	1.8%	1.0%	0.7%	2.0%
03 - Metal Packaging	0.8%	0.0%	0.7%	0.3%	2.4%	0.7%
04 - Single-Use Coffee Cups/Cold Drink Cups/Plastic Takeout Containers	3.6%	8.6%	3.2%	4.7%	4.5%	4.6%
3 - Food and Yard Waste	28.8%	16.7%	19.3%	17.9%	49.7%	22.7%
05 - All Food Waste	28.8%	15.7%	18.6%	17.9%	49.7%	22.2%
06 - All Yard Waste	0.0%	1.0%	0.7%	0.0%	0.0%	0.4%
4 - Compostable Paper	10.1%	7.6%	11.0%	4.4%	2.2%	7.9%
07 - Single-Use Compostable Paper Takeout Containers	1.4%	0.4%	0.5%	0.9%	1.1%	0.7%
08 - All Other Compostable Paper	8.7%	7.2%	10.5%	3.5%	1.1%	7.2%
5 - Deposit Containers	1.2%	1.5%	2.8%	0.7%	0.9%	1.7%
09 - Plastic Deposit Containers	0.4%	0.8%	0.7%	0.5%	0.9%	0.7%
10 - Metal Deposit Containers	0.4%	0.7%	0.5%	0.1%	0.0%	0.4%
11 - Paper Deposit Containers	0.4%	0.0%	1.3%	0.1%	0.0%	0.6%
12 - Glass Deposit Containers	0.0%	0.0%	0.3%	0.0%	0.0%	0.1%
6 - Depot-Recyclable Materials	4.2%	2.2%	2.3%	1.8%	2.0%	2.4%
13 - Glass Packaging	0.0%	0.4%	0.0%	0.0%	0.0%	0.1%
14 - Plastic Film	3.6%	1.1%	1.9%	1.5%	1.3%	1.8%
15 - Styrofoam Packaging	0.6%	0.0%	0.1%	0.2%	0.7%	0.2%
16 - Single-Use Styrofoam Takeout Containers	0.0%	0.1%	0.1%	0.1%	0.0%	0.1%
17 - All Other EPR-Managed Materials	0.0%	0.1%	0.2%	0.0%	0.0%	0.1%
18 - All Scrap Metal	0.0%	0.4%	0.0%	0.0%	0.0%	0.1%
7 - Pet Waste	39.9%	51.6%	35.4%	60.3%	27.4%	43.5%
19 - Pet Waste	39.9%	51.6%	35.4%	60.3%	27.4%	43.5%
8 - Other Materials	2.2%	3.8%	17.9%	7.0%	2.9%	9.8%
20 - Single-Use Masks	0.2%	0.1%	0.1%	0.3%	0.2%	0.2%
21 - Single-Use Straws/Plastic Utensils	0.4%	0.2%	0.7%	0.3%	1.6%	0.6%
22 - Illegal Dumping	0.0%	0.0%	1.8%	0.0%	0.0%	0.7%
23 - All other materials	1.6%	3.5%	15.3%	6.4%	1.1%	8.3%

Overall, 868 single-use items were found in the 51 garbage samples analyzed. The number of single-use items found per sample is presented according to container type in **Table 4**. In all container types, the largest number of single-use items was from Single-Use Coffee Cups/Cold Drink Cups/Plastic Takeout Containers. On average, 17 single-use items were found per garbage sample.

Table 4: Single-Use Item Count Results by Container Type (Garbage Stream)

Single-Use Item Category	Single-Use Items per Sample (Garbage Streams)					
	Black Steel	Pole Bin	Park Drum	Ecomedia	Triple Bin	Overall Avg.
04 - Single-Use Coffee Cups/Cold Drink Cups/Plastic Takeout Containers	10.2	6.2	15.8	7.8	7.0	8.9
07 - Single-Use Compostable Paper Takeout Containers	4.4	0.3	2.2	1.6	1.2	1.5
16 - Single-Use Styrofoam Takeout Containers	0.4	0.1	0.3	0.2	0.0	0.2
20 - Single-Use Masks	1.0	0.4	1.2	1.9	0.5	0.9
21 - Single-Use Straws/Plastic Utensils	6.2	1.1	15.6	2.2	8.5	5.5
Grand Total	22.2	8.0	35.1	13.7	17.2	17.0

2.1.3

Composition by Stream

Figure 6 presents the primary category composition by stream. In the garbage stream, pet waste and food and yard waste comprised the largest component of the material. In the paper recycling stream, recyclable paper comprised the largest component of material (47.3%), and food and yard waste comprised the second-largest component (17.6%). In the containers recycling stream, food and yard waste comprised the largest component of material (35.7%), and recyclable containers comprised the second-largest component (28.1%).

Notably, the proportion of recyclable paper and containers is lower in the garbage stream than it is in the paper and containers recycling stream. Furthermore, the proportion of containers and paper is slightly lower in the standalone garbage receptacles than in the three-stream garbage receptacles, suggesting that more of the paper and containers is going into the paper and containers recycling streams.

These results are tabulated in **Table 5**. Results for secondary categories by stream are also presented graphically in **Figure 7** through **Figure 9**.

The number of single-use items found per sample is presented according to stream in **Table 6**. Overall, 1,242 single-use items were found in the 85 samples analyzed. In all streams, the most frequently found single-use item was single-use coffee cups/cold drink cups/plastic takeout containers.

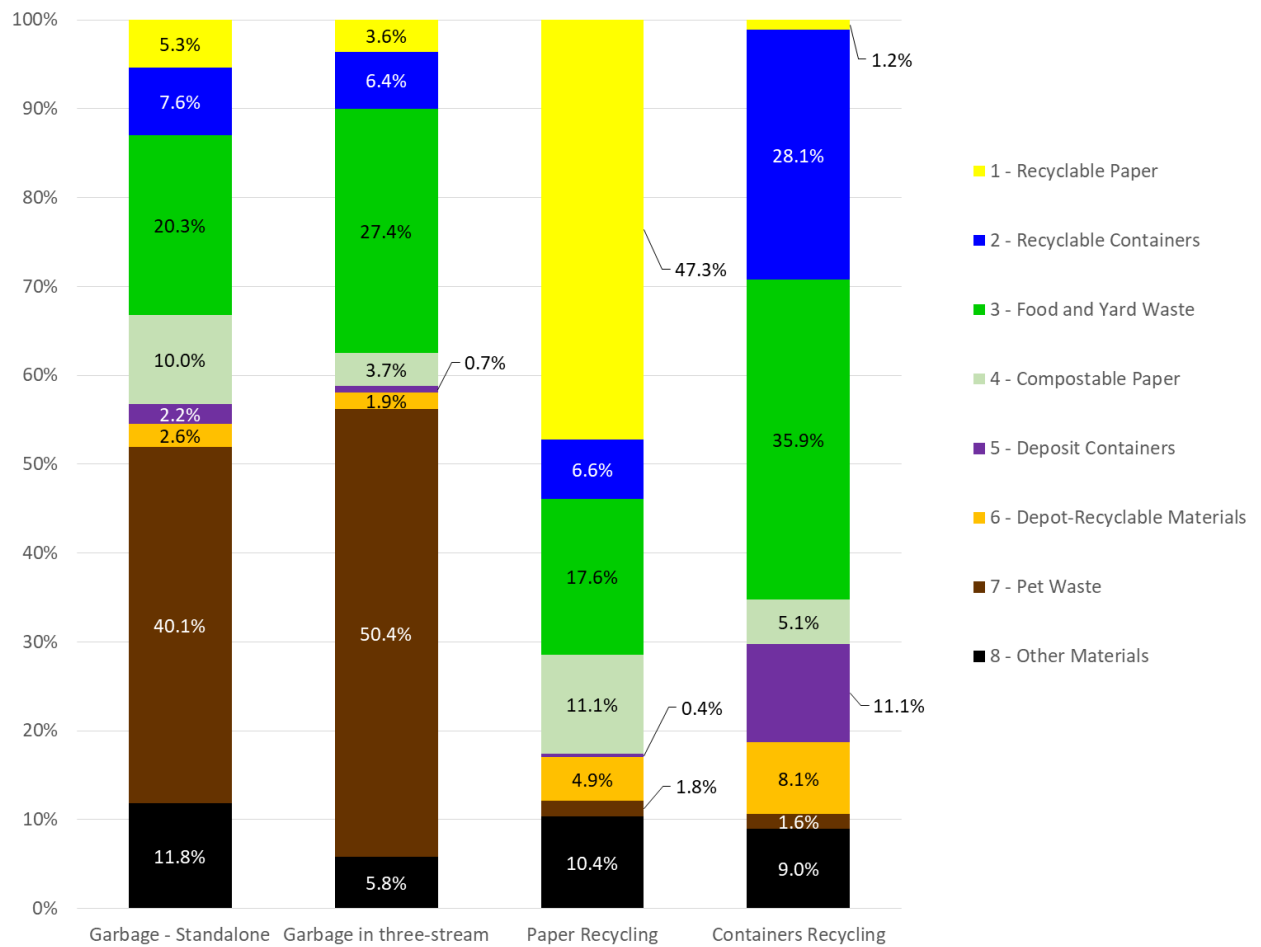


Figure 6: Primary Category Results by Stream

Table 5: Primary and Secondary Category Results by Stream

Row Labels	Garbage - Standalone	Garbage in three-stream	Paper Recycling	Containers Recycling	Grand Total
1 - Recyclable Paper	5.3%	3.6%	47.3%	1.2%	8.5%
01 - Paper Packaging and Printed Paper	5.3%	3.6%	47.3%	1.2%	8.5%
2 - Recyclable Containers	7.6%	6.4%	6.6%	28.1%	8.9%
02 - Plastic Packaging	2.6%	0.9%	1.8%	6.9%	2.4%
03 - Metal Packaging	0.5%	0.9%	0.4%	2.3%	0.8%
04 - Single-Use Coffee Cups/Cold Drink Cups/Plastic Takeout Containers	4.5%	4.6%	4.5%	18.9%	5.7%
3 - Food and Yard Waste	20.3%	27.4%	17.6%	35.9%	23.3%
05 - All Food Waste	19.6%	27.4%	17.6%	35.9%	22.9%
06 - All Yard Waste	0.6%	0.0%	0.0%	0.0%	0.4%
4 - Compostable Paper	10.0%	3.7%	11.1%	5.1%	8.0%
07 - Single-Use Compostable Paper Takeout Containers	0.6%	0.9%	3.5%	1.2%	1.0%
08 - All Other Compostable Paper	9.4%	2.8%	7.6%	3.9%	6.9%
5 - Deposit Containers	2.2%	0.7%	0.4%	11.1%	2.4%
09 - Plastic Deposit Containers	0.7%	0.6%	0.4%	2.5%	0.8%
10 - Metal Deposit Containers	0.5%	0.1%	0.0%	4.4%	0.7%
11 - Paper Deposit Containers	0.8%	0.1%	0.0%	0.7%	0.5%
12 - Glass Deposit Containers	0.2%	0.0%	0.0%	3.5%	0.4%
6 - Depot-Recyclable Materials	2.6%	1.9%	4.9%	8.1%	3.1%
13 - Glass Packaging	0.1%	0.0%	0.0%	2.3%	0.2%
14 - Plastic Film	2.0%	1.5%	2.3%	1.6%	1.9%
15 - Styrofoam Packaging	0.2%	0.3%	0.6%	0.2%	0.3%
16 - Single-Use Styrofoam Takeout Containers	0.1%	0.1%	0.2%	0.0%	0.1%
17 - All Other EPR-Managed Materials	0.1%	0.0%	1.2%	3.9%	0.5%
18 - All Scrap Metal	0.1%	0.0%	0.6%	0.0%	0.1%
7 - Pet Waste	40.1%	50.4%	1.8%	1.6%	36.2%
19 - Pet Waste	40.1%	50.4%	1.8%	1.6%	36.2%
8 - Other Materials	11.8%	5.8%	10.4%	9.0%	9.8%
20 - Single-Use Masks	0.1%	0.3%	0.0%	0.0%	0.1%
21 - Single-Use Straws/Plastic Utensils	0.5%	0.7%	0.2%	0.2%	0.5%
22 - Illegal Dumping	1.1%	0.0%	0.0%	0.0%	0.6%
23 - All other materials	10.1%	4.8%	10.2%	8.8%	8.5%

Overall, 1,242 single-use items were found in the 85 samples analyzed. The number of single-use items found per sample is presented according to stream in **Table 6**. In all streams, the most frequently found single-use item was single-use coffee cups/cold drink cups/plastic takeout containers.

On average, 18.1 single-use items were found per garbage – standalone sample, 14.9 single-use items were found per garbage in three-stream sample, 7.9 single-use items were found per paper recycling sample, and 14.1 single-use items were found per containers recycling sample.

Table 6: Single-Use Item Count Results by Stream

Single-Use Item Category	Garbage - Standalone	Garbage in three-stream	Paper Recycling	Containers Recycling	Grand Total
Number of Samples	34	17	17	17	85
Total Single-Use Items	614	254	134	240	1242
Category	Average Single-Use Items per Sample				
04 - Single-Use Coffee Cups/Cold Drink Cups/Plastic Takeout Containers	9.6	7.5	3.4	12.2	8.5
07 - Single-Use Compostable Paper Takeout Containers	1.4	1.5	2.1	0.5	1.4
16 - Single-Use Styrofoam Takeout Containers	0.2	0.1	0.2	0.1	0.2
20 - Single-Use Masks	0.7	1.4	0.8	0.1	0.7
21 - Single-Use Straws/Plastic Utensils	6.1	4.4	1.4	1.2	3.8
Grand Total	18.1	14.9	7.9	14.1	14.6

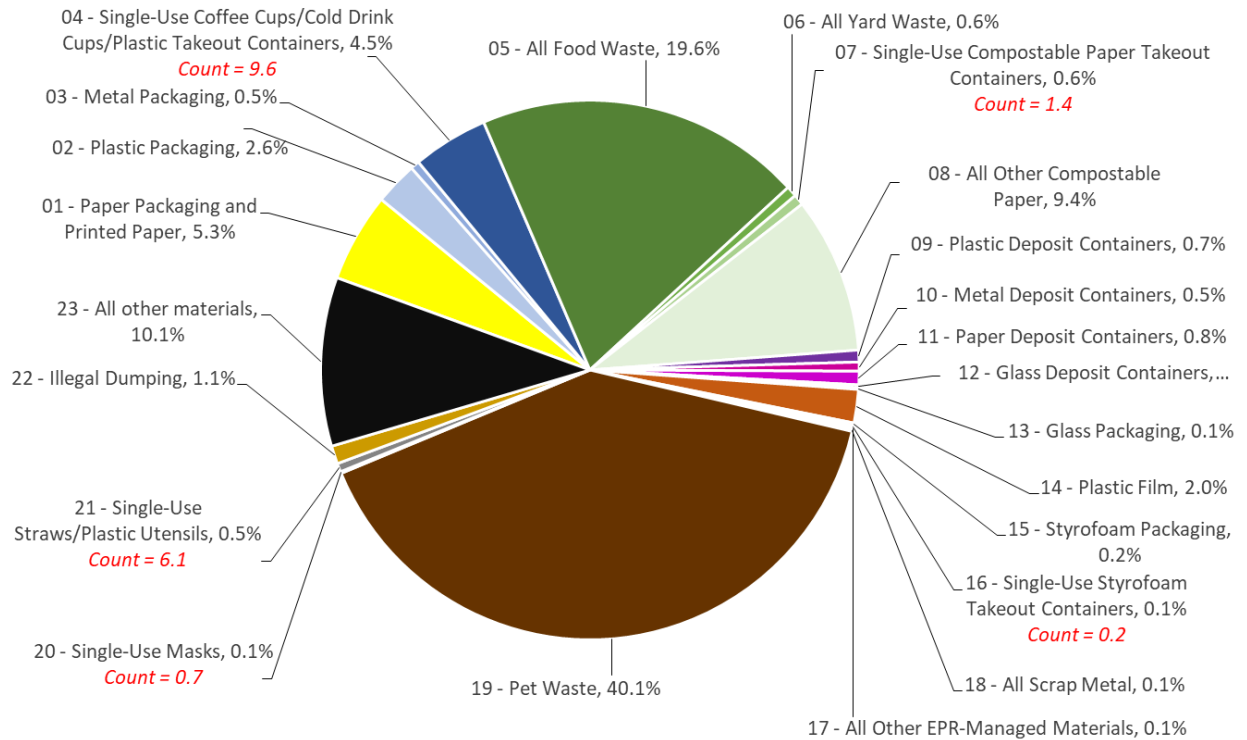


Figure 7: Garbage (Standalone) Composition – Secondary Categories

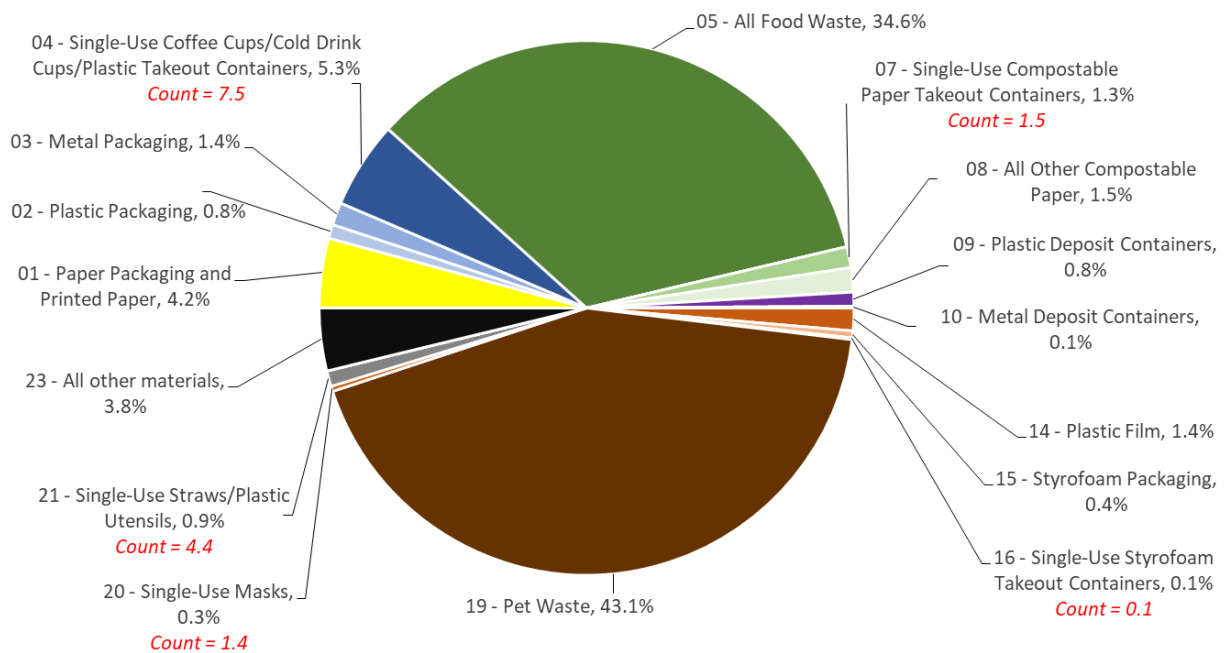


Figure 8: Garbage (3-stream) Composition – Secondary Categories

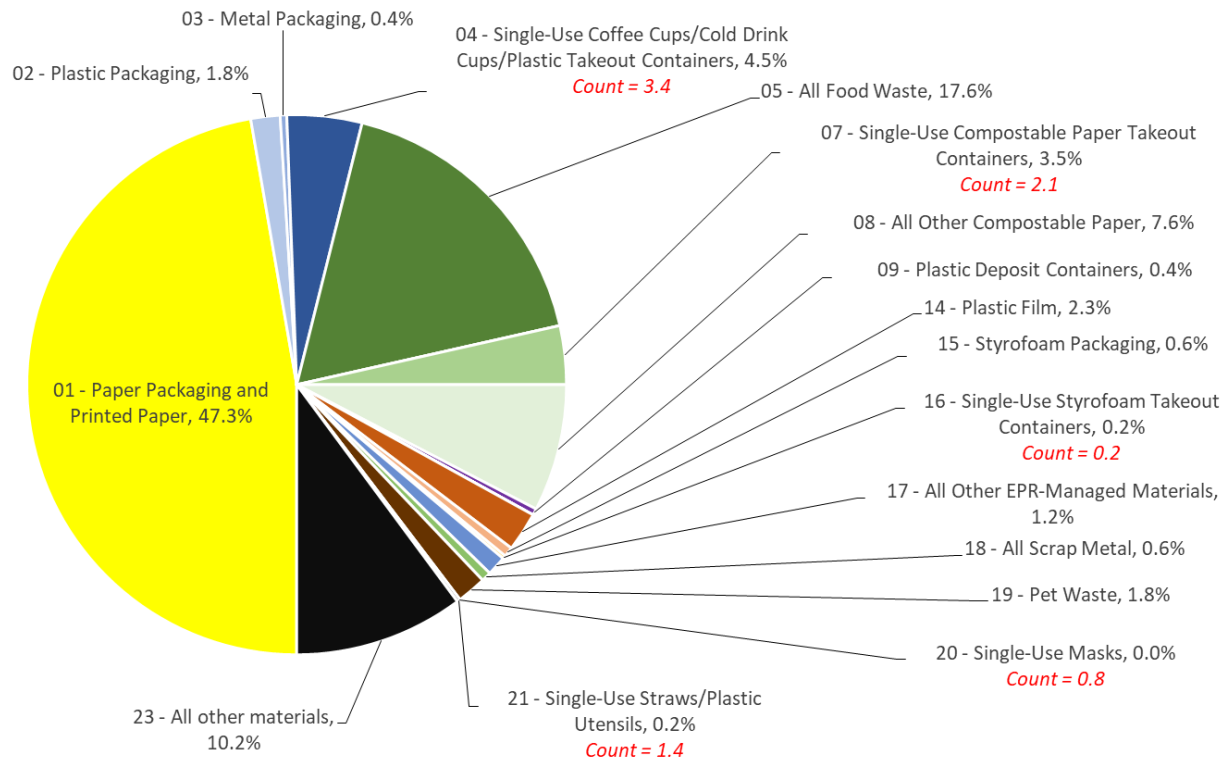


Figure 9: Paper Stream Composition – Secondary Categories

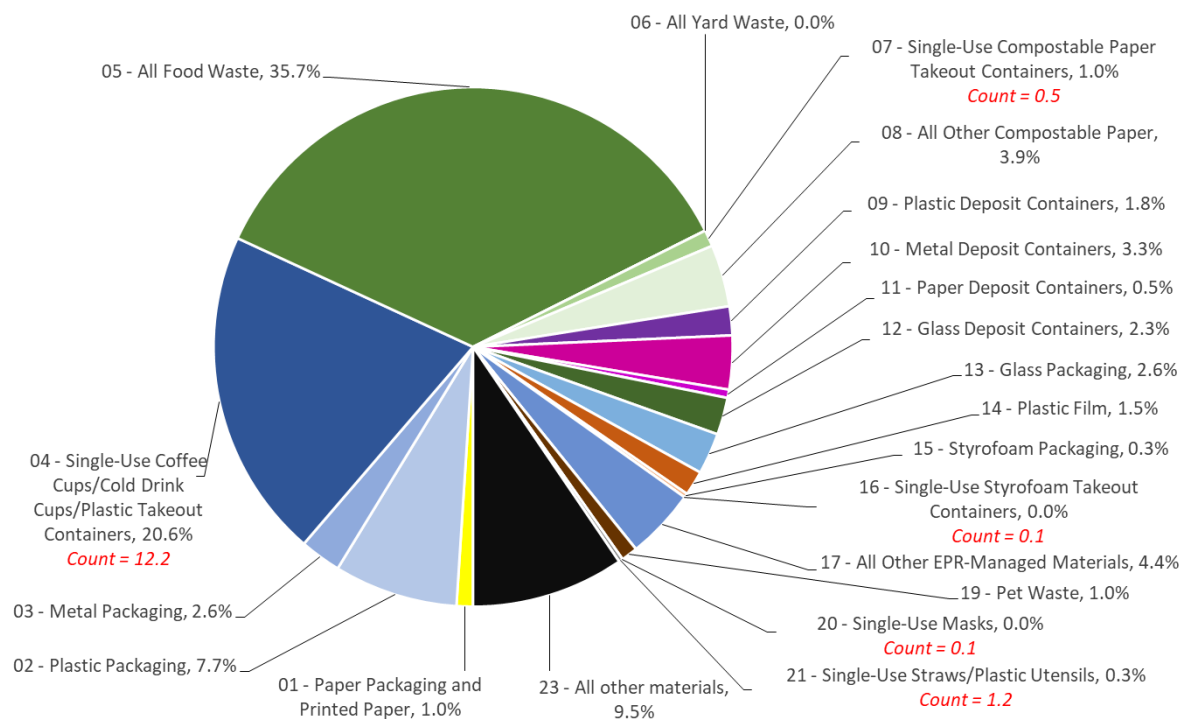


Figure 10: Containers Stream Composition – Secondary Categories

2.1.4 Composition by Location

Figure 11 presents the primary waste composition by location for all garbage streams.

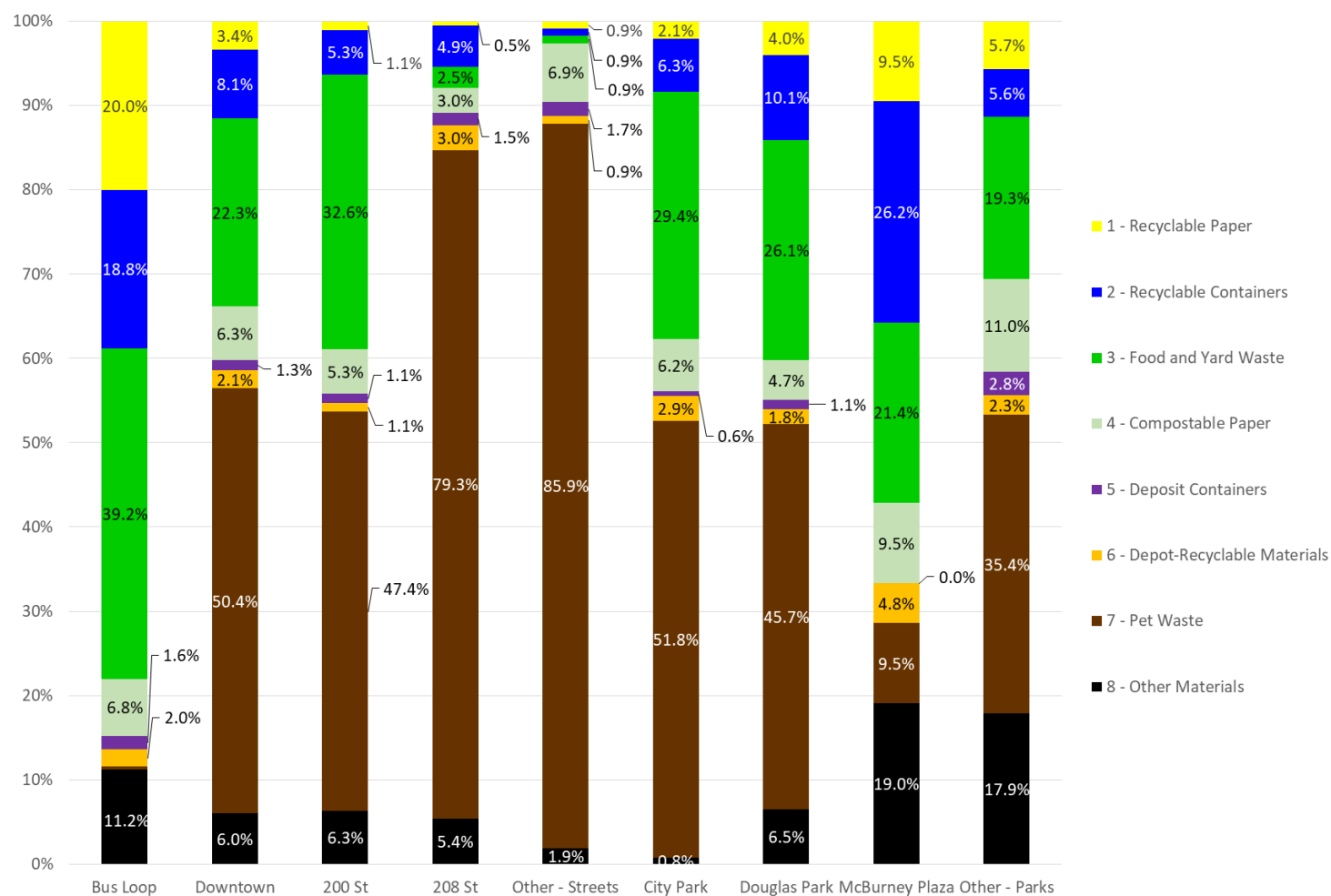


Figure 11: Primary Category Results by Location (Garbage Stream Only)

In general, waste composition was found to vary widely between locations.

- At the bus loop, the largest proportion of materials consisted of food and yard waste (39.2%) and recyclable paper (20.0%).
- Downtown, the largest proportion of material comprised pet waste (50.4%) and food and yard waste (22.3%).
- On 200 St, the largest proportion of material comprised pet waste (47.4%) and food and yard waste (32.6%).
- On 208 St, the largest proportion of material consisted of pet waste (79.3%).
- On Other – Streets, the largest proportion of material comprised pet waste (85.9%).
- In City Park, the largest proportion of material comprised pet waste (51.8%) and food and yard waste (29.4 %).
- In Douglas Park, the largest proportion of material comprised pet waste (45.7%) and food and yard waste (26.1%).
- In McBurney Plaza, the largest proportion of materials consisted of recyclable containers (26.2%) and food and yard waste (21.4%).
- In Other – Parks, the largest proportion of materials consisted of pet waste (35.4%) and food and yard waste (19.3%).

The number of samples from each location was relatively small, therefore specific conclusions should not be drawn from this data. However, the data is a good indicator of where the most pet waste is being generated.

2.1.5

Generation and Sample Sizes

Material from 51 receptacles was audited. Seventeen of these receptacles were three-stream garbage and recycling stations, therefore 85 samples with a total weight of 269.5 kg were analyzed. Overall, 19% of containers in the City were analyzed. Based on the quantity and proportion of each container type sampled, it is estimated that approximately 1,650 kg of streetscape materials (garbage and recycling streams) are generated daily. Dillon used staff feedback to generate our estimation. It assumes that all containers in the City are collected daily.

Figure 12 presents the sample sizes for the containers at each location and for each container type. In general, where there were three-stream receptacles available alongside single-stream receptacles, the three-stream receptacles had more material in them. This information is tabulated and presented in **Table 7**.

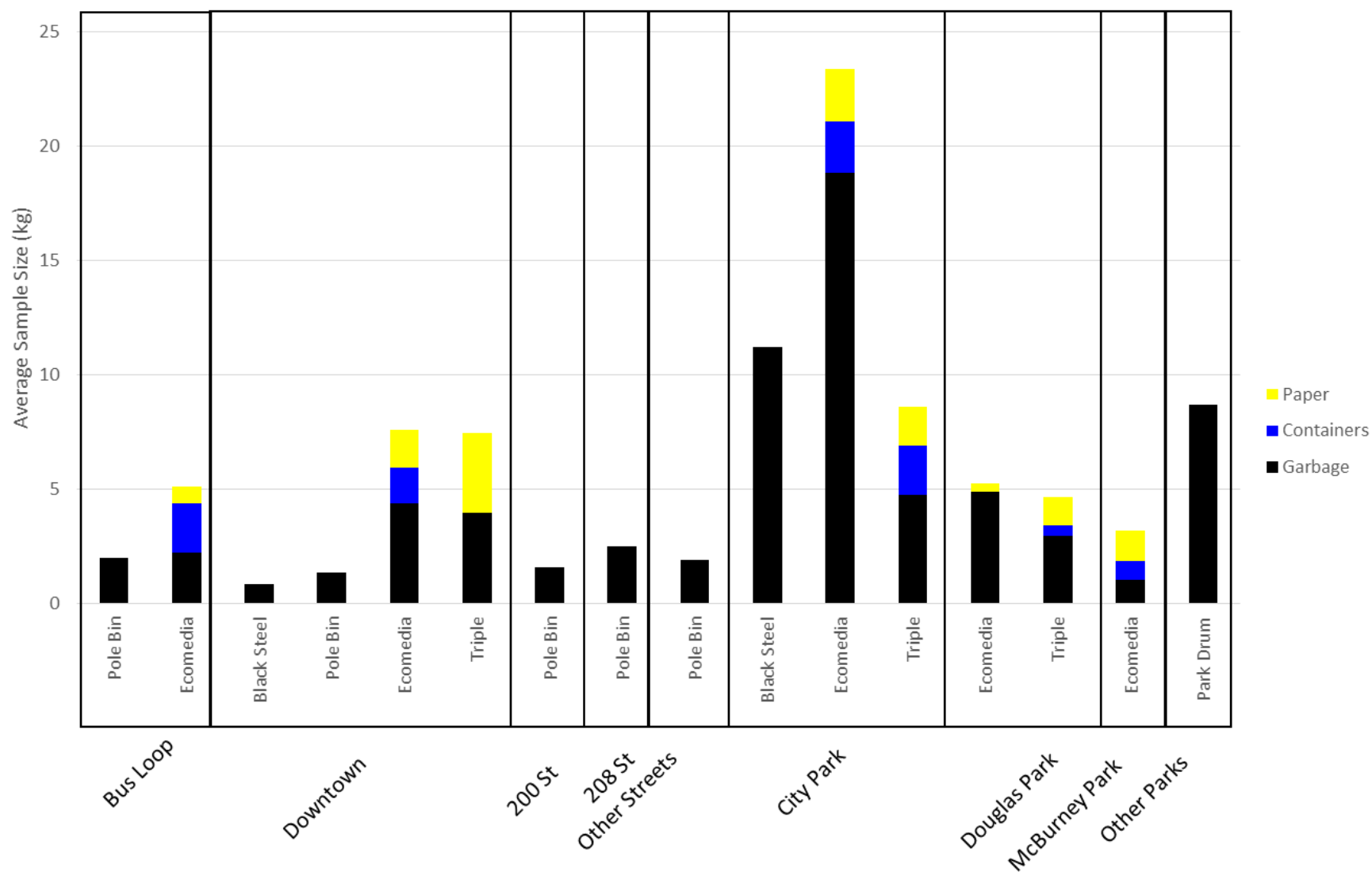


Figure 12: Average Sample Size by Location and Container Type

Table 7: Average Sample Size by Location and Container Type

Container Type	Bus Loop	Downtown	200 St	208 St	Other - Streets	City Park	Douglas Park	McBurney Plaza	Other - Parks	Average
Black Steel	-	0.87 kg (n=3)	-	-	-	11.25 kg (n=2)	-	-	-	5.02 kg (n=5)
Pole Bin	2.01 kg (n=4)	1.39 kg (n=5)	1.58 kg (n=3)	2.51 kg (n=4)	1.92 kg (n=3)	-	-	-	-	1.87 kg (n=19)
Park Drum	-	-	-	-	-	-	-	-	8.7 kg (n=10)	8.7 kg (n=10)
Ecomedia (all streams)	5.1 kg (n=2)	7.59 kg (n=5)	-	-	-	23.4 kg (n=1)	5.25 kg (n=1)	3.2 kg (n=2)	-	7.56 kg (n=11)
Garbage	2.23 kg (n=2)	4.39 kg (n=5)	-	-	-	18.85 kg (n=1)	4.9 kg (n=1)	1.05 kg (n=2)	-	4.75 kg (n=11)
Containers Recycling	2.15 kg (n=2)	1.56 kg (n=5)	-	-	-	2.25 kg (n=1)	0 kg (n=1)	0.8 kg (n=2)	-	1.45 kg (n=11)
Paper Recycling	0.73 kg (n=2)	1.64 kg (n=5)	-	-	-	2.3 kg (n=1)	0.35 kg (n=1)	1.35 kg (n=2)	-	1.36 kg (n=11)
Triple Bin (all streams)	-	7.45 kg (n=1)	-	-	-	8.63 kg (n=2)	4.65 kg (n=3)	-	-	6.44 kg (n=6)
Garbage	-	4 kg (n=1)	-	-	-	4.78 kg (n=2)	2.97 kg (n=3)	-	-	3.74 kg (n=6)
Containers Recycling	-	0 kg (n=1)	-	-	-	2.15 kg (n=2)	0.47 kg (n=3)	-	-	0.95 kg (n=6)
Paper Recycling	-	3.45 kg (n=1)	-	-	-	1.7 kg (n=2)	1.22 kg (n=3)	-	-	1.75 kg (n=6)
Average	3.04 kg (n=6)	3.93 kg (n=14)	1.58 kg (n=3)	2.51 kg (n=4)	1.92 kg (n=3)	12.63 kg (n=5)	4.8 kg (n=4)	3.2 kg (n=2)	8.7 kg (n=10)	5.28 kg (n=51)

2.2 Contamination Categories

To better understand usage of the containers, the categories were further simplified into five contamination categories. These are presented in **Table 8**.

Table 8: Contamination Categories

	Description
Paper	This category includes all paper which is typically accepted for recycling in streetscape recycling programs, including printer paper and paper packaging.
Containers	This category includes all containers which are typically accepted for recycling in streetscape recycling programs, rigid plastic packaging, metal packaging, and single-use polycoat cups (e.g. coffee cups).
Compostable Materials	This category includes all materials which are compostable and which could potentially be accepted into a streetscape recycling program for compostable materials, including food waste, yard waste, and compostable paper.
Recyclable - Other	This category includes all materials which are recyclable, but are not typically accepted in streetscape recycling programs.
Garbage	This category includes all materials for which there is presently no alternative disposal method.

2.2.1 Contamination Categories by Stream

Figure 13 presents the composition by stream for the contamination categories.

Overall, the paper recycling stream contained 47.3% recyclable paper. The containers recycling stream contained 28.1% recyclable containers. These percentages represent the actual capture rate for material that was placed in the correct stream (i.e., paper in paper recycling, containers in container recycling). The proportion of all recyclable materials (e.g. paper, containers and other recyclable materials) was much higher in both recycling streams (paper and containers) than in the garbage stream.

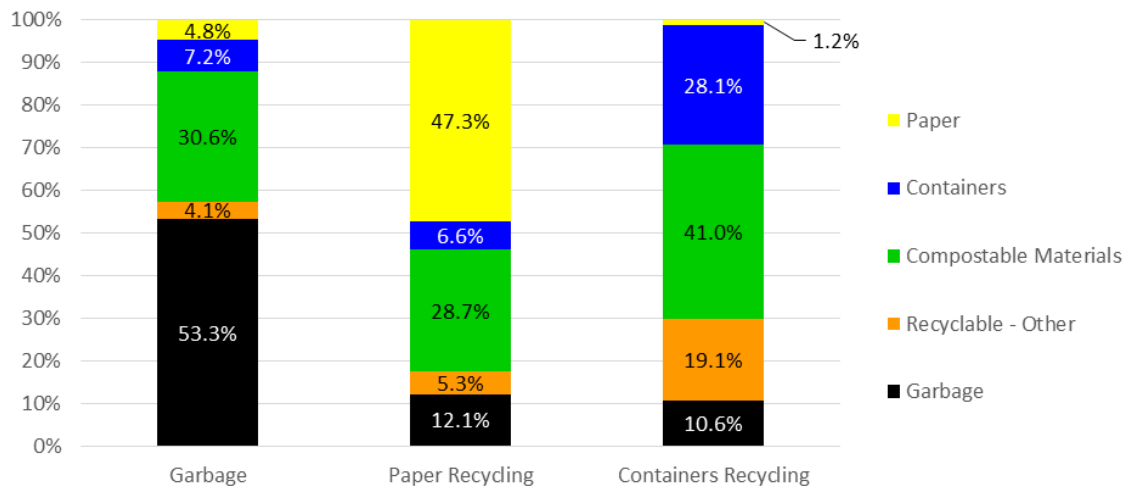


Figure 13: Contamination Categories by Stream

Figure 14 and **Figure 15** present the composition of contamination for the paper and containers recycling streams. These figures include material that was contamination *only*; materials which were placed in the correct stream (i.e. paper in paper stream, containers in container stream) are not included in these figures.

In both the paper and containers recycling stream, the top three contaminants are:

- Food waste (33.3% in the paper recycling stream and 50.0% in the containers recycling stream);
- All other materials (i.e., garbage) (19.3% in the paper recycling stream and 12.2% in the containers recycling stream); and
- All other compostable paper (14.4% in the paper recycling stream and 5.4% in the containers recycling stream).

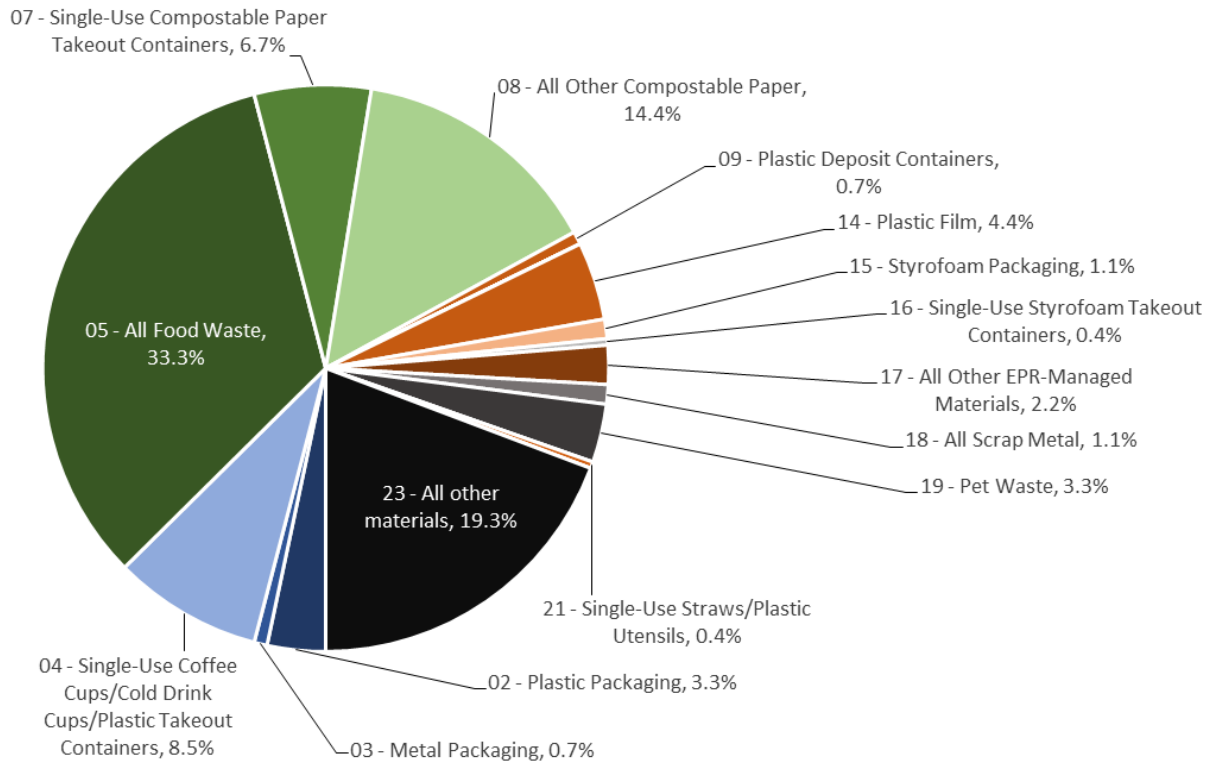


Figure 14: Contaminants in Paper Recycling Stream

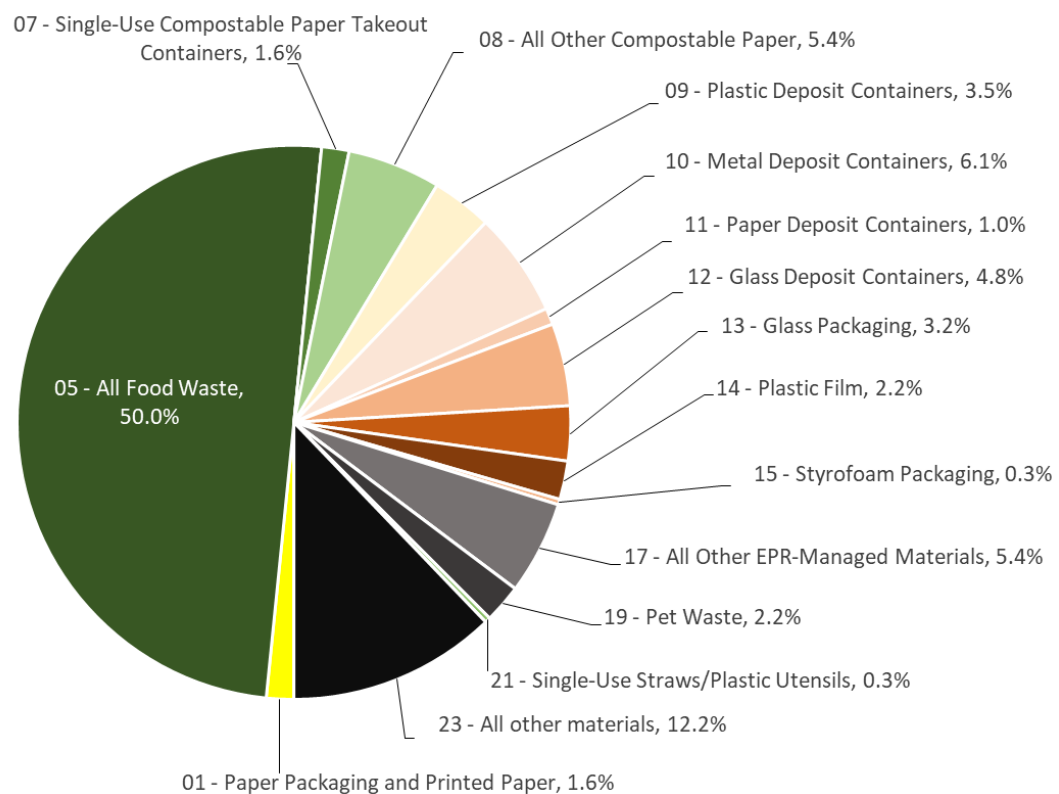


Figure 15: Contaminants in Container Recycling Stream

2.2.2

Contamination by Location

Figure 16 presents the contamination in the paper and containers recycling streams at each location where these streams were available. The hatching (diagonal lines) in the bar graph indicate contamination. The percentages are shown in this figure for all the materials that were disposed or recycled in the correct stream.

The areas with the best recycling performance (i.e., least contamination) were:

1. Douglas Park
 - The paper recycling stream contained 63.0% recyclable paper; and
 - The containers recycling stream contained 42.9% recyclable containers.
2. McBurney Plaza
 - The paper recycling stream contained 46.3% recyclable paper; and
 - The containers recycling stream contained 40.6% recyclable containers,
3. Downtown
 - The paper recycling stream contained 52.4% recyclable paper; and
 - The containers recycling stream contained 32.7% recyclable containers.

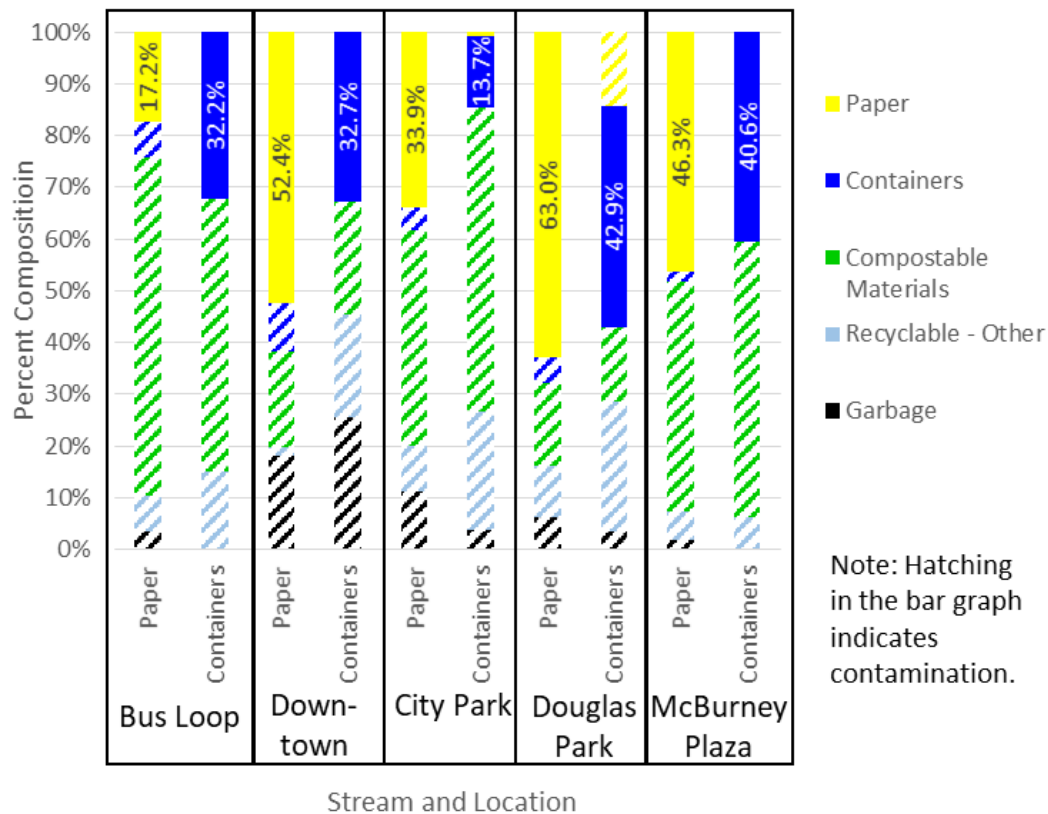


Figure 16: Contamination by Stream and Location

In general, the proportion of materials placed in the correct stream is fairly low, although performance was better for paper (in paper stream) than containers (in container stream).

- In the paper recycling stream, the proportion of recyclable paper ranges from 17.2% (in the bus loop) to 63.0% (in Douglas Park).
- In the containers recycling stream, the proportion of recyclable containers ranges from 13.7% (in City Park) to 42.9% (in Douglas Park).
- In general, compostable materials comprises the largest quantity of contamination.
- For both paper and containers streams, Douglas Park has the highest proportion of materials placed in the correct stream.
- The paper stream had the second-highest proportion of recyclable paper downtown (52.4%), and the containers stream had the second-highest proportion of recyclable containers at McBurney Plaza (40.6%).

2.2.3

Contamination by Container Type

Figure 17 presents the overall contamination in the paper and containers recycling streams for the two types of different recycling streams. The hatching (diagonal lines) in the bar graph indicate contamination. The percentages are shown in this figure for all the materials that were placed in the correct stream.

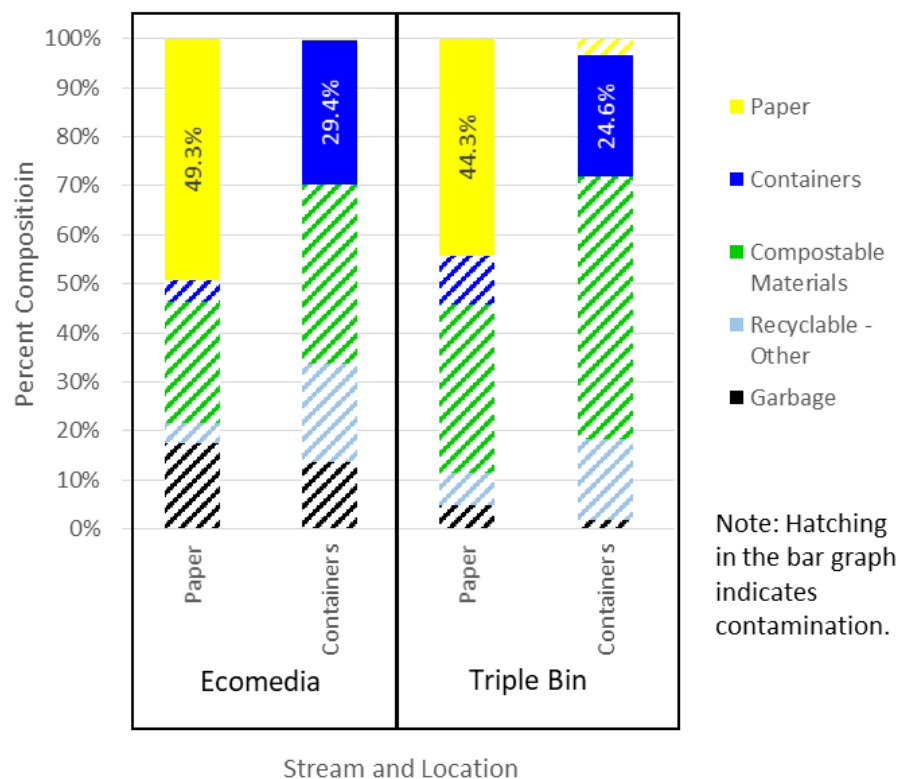


Figure 17: Contamination by Container Type

The recycling rates in both types of three-stream containers are similar. The paper recycling rates range from 44.3% to 49.3%, and the containers recycling rates range from 24.6% to 29.4%. The recycling rates in the Ecomedia bins are slightly higher than those in the Triple Bins, but this may be due to location and not container type.

2.3

User Behaviour Observational Auditing Results

The observational audit was performed on August 13 and 14, 2021 at McBurney Plaza and Douglas Park. In total, 32 users of the garbage and recycling containers were observed. Results included:

- Both single-stream and three-stream receptacles were available for use at both locations. Most users used the three-stream receptacles (68%).

Of those that used the three-stream receptacles:

- 59% of users spent less than 2 seconds deciding which stream to use, 27% spent 2-5 seconds deciding which stream to use, and 14% spent more than 10 seconds deciding which stream to use;
- 55% of users appeared to be reading the signage on the receptacles; and
- 77% of users appeared to put their material into the correct stream.

Complete results for the observational audit can be found in **Appendix B**.



3.0

Conclusion

Overall, 19% of containers in the City (85 samples with a total weight of 269.5 kg), were analyzed. Based on the quantity and proportion of each container type sampled, it is estimated that approximately 1,650 kg of streetscape material (garbage and recycling streams) is generated daily. Dillon used staff feedback to generate our estimation. It assumes that all containers in the City are collected daily. The largest component of the garbage stream was pet waste (43.5%), followed by food and yard waste (22.7%). We note yard waste was largely non-existent.

Where there are 3-stream stations, they tend to be used more often than the single-stream receptacles. When both types of stations are available, it appears that users choose to use the 3-stream stations over the single-stream garbage containers. This was demonstrated both in the User Behaviour Observational Auditing Results (**Section 2.3**) and the Generation and Sample Sizes (**Section 2.1.5**).

Many users are trying to correctly use the recycling streams, which is evident from the higher proportion of recyclable materials in these streams, as presented in **Section 2.1.1**. The proportion of materials placed in the correct stream (paper in paper stream, containers in container stream) varies widely between locations, from 13.7% to 63.0% (**Section 2.2.2**). Compostable organic materials was the most frequently found contaminant in the paper and containers recycling stream, perhaps indicating a user desire to divert this material as well.

Overall, the paper recycling stream contained 47.3% recyclable paper. The containers recycling stream contained 28.1% recyclable containers. These percentages represent the actual capture rate for material that was placed in the correct stream (i.e., paper in paper recycling, containers in container recycling). The proportion of *all* recyclable materials (e.g. paper, containers and other recyclable materials) was much higher in both recycling streams (paper and containers) than in the garbage stream.

- The paper recycling stream comprised 47.3% recyclable paper while the garbage stream only comprised 4.8% recyclable paper; and
- The containers recycling stream comprised 28.1% recyclable containers while the garbage stream only comprised 7.2% recyclable containers.

This indicates that users of the recycling streams are attempting to divert waste and recycle. This was also observed during the user behaviour observational study, which indicated that, of those using the three-stream receptacles:

- 55% of users appeared to be reading the signage on the receptacles; and
- 77% of users appeared to put their material into the correct stream.

Unfortunately, contamination rates at present are still high. In both the paper recycling and container recycling stream, contamination rates are over 50%. Thus, in order to properly recycle this material, significant efforts will need to be made to increase correct usage of these recycling streams.

The areas with the best recycling performance (i.e., least contamination) were:

1. Douglas Park
 - The paper recycling stream contained 63.0% recyclable paper; and
 - The containers recycling stream contained 42.9% recyclable containers.
2. McBurney Plaza
 - The paper recycling stream contained 46.3% recyclable paper; and
 - The containers recycling stream contained 40.6% recyclable containers.
3. Downtown
 - The paper recycling stream contained 52.4% recyclable paper; and
 - The containers recycling stream contained 32.7% recyclable containers.

It is suggested that any pilot for streetscape recycling enhancements focus on these areas.

4.0

Next Steps

Dillon completed this streetscape waste audit to understand the baseline waste composition in the City - to be used in a Public Spaces Waste Management Strategy. The next steps involved in a proposed Public Spaces Waste Management Strategy are outlined in **Table 9**.

Table 9: Proposed Public Spaces Waste Management Strategy

	Task	Description	Estimated Timeline	Status
1	Baseline Audit	<ul style="list-style-type: none"> Audited 25% of existing containers to understand material types and contamination rates Observational Behavioural Streetscape Audit Dillon analyzed data and provided a report with observations and insights 	Summer 2021	Complete
2	Current State Review and Jurisdiction Scan	<p><i>Suggested Activities Include:</i></p> <ul style="list-style-type: none"> Thorough scan of existing streetscape system and identify strengths and weaknesses Complete jurisdictional scan of streetscape systems in other nearby jurisdictions Policy review of existing City policies related to public space waste management Staff workshops 	2022	Pending
3	Identification and Analysis of Preferred Options	<ul style="list-style-type: none"> Identify preferred options based on findings of Tasks 1 and 2 Analyze preferred options to estimate expected diversion rates Costing exercise to determine changes to operational and capital cost increases Identification of possible funding sources Stakeholder engagement (e.g., workshops, surveys, etc.) Staff workshops 	2022	Pending
4	Pilot	<ul style="list-style-type: none"> Create a pilot program for preferred option(s) based on Task 3 findings Informed by type of receptacle, number of streams, pilot size, etc. 	2022/2023	Pending
5	City-Wide Implement Action	<ul style="list-style-type: none"> Implement streetscape program City-wide based on Task 4 findings 	2023+	Pending

5.0

Project Limitations

This report was prepared exclusively for the purposes, project and location outlined in this report. The report is based on the composition of the inbound material over a specific period of time as indicated in the report. Although a reasonable analysis was conducted by Dillon, Dillon's analysis was by no means exhaustive. Rather, Dillon's report represents a reasonable review of the audit results as a "snapshot" in time. These results only reflect the conditions of the period of time in which they were collected. The audit results for the assessments that took place August 10-14, 2021, are those reflected in this report.

Dillon prepared this report for the sole benefit of the City of Langley. The material in the report reflects Dillon's best judgement in light of the information available at the time of preparation. Any use which a third party makes of this report, or any reliance on or decision based on it, are the responsibilities of such third parties.

Appendix A

User Behaviour Observational Survey Results

What type of bin?	
Black Steel - paired	16%
Black Triple Bin	44%
Ecomedia Bin	25%
Park Drum	16%

User's estimated age range	
12 or under	3%
13-19	13%
20-30	19%
31-40	44%
41-50	9%
51-60	13%

How long was the user standing at the receptacle?	
0-2 seconds	63%
2-5 seconds	22%
5-10 seconds	3%
10+ seconds	13%

Did the user litter around the receptacle?	
No	100%

If the user littered around the receptacle, what material did they litter?	
n/a	100%

Did the user have to force their waste through the hole in the receptacle? (ie the hole was too small)	
Yes	6%
No	94%

Did the user appear to be illegally dumping?	
Yes	6%
No	94%

Did the user appear to be binning?	
Yes	3%
No	97%

Did the user try to force the lid off the receptacle?	
Yes	6%
No	94%

Of those using three-stream receptacles:	
Did it appear that the user was trying to read the signs on the receptacle?	
Yes	55%
No	27%
Couldn't tell	18%

Did the user appear hesitant to put the material into the receptacle?	
Yes	23%
No	77%

Did the resident appear to separate their waste?	
Yes	32%
No	14%
n/a (user only had one item)	55%

Did the user appear to put materials into the correct streams?	
Yes	77%
Partially	5%
No	14%
Don't know	5%

Appendix B

Representative Photos

Sample Category Photos



01 - Paper Packaging and Printed Paper



02 - Plastic Packaging



04 - Single-Use Coffee Cups/Cold Drink Cups/Plastic Takeout Containers



07 - Single-Use Compostable Paper Takeout Containers



09 - Plastic Deposit Containers



10 - Metal Deposit Containers



13 - Glass Packaging



14 - Plastic Film



16 - Single-Use Styrofoam Takeout Containers



19 - Pet Waste



20 - Single-Use Masks

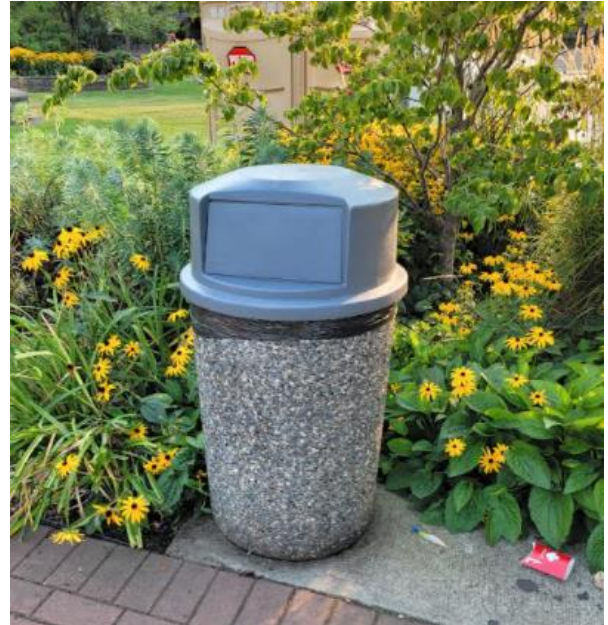


21 - Single-Use Straws/Plastic Utensils

User Behaviour Observational Study



Park Drum at Douglas Park



Concrete Bin at Douglas Park



Ecomedia Bin at McBurney Plaza



Triple Bin at Douglas Park